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ASSESSMENT OF THE PRODUCTION AND PRODUCTIVITY OF GINGER (ZINGIBER OFFICINALE ROSCOE) BY SMALL-SCALE FARMERS IN ABIA STATE, NIGERIA

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ABSTRACT

This paper examined the production and productivity of ginger (zingiber officinale roscoe) by small scale farmers in Abia State, Nigeria. The objectives of the study include: to describe selected socioeconomic profiles of the respondents; evaluate the productivity levels of ginger farms in the region and determine factors influencing ginger production. A multi-stage random sampling technique was used to select respondents. Primary data were collected from 120 rural household' heads using a well-structured questionnaire. The data were analyzed using descriptive and inferential statistics, including frequency, percentage, mean and multiple regression analysis. The results indicated moderately high production practices, particularly in land preparation, planting, fertilizer, pest control, yield and income. However, productivity showed high income variability. Factors such as age, education, income, household size, farming experience and number of training sessions significantly influenced ginger production with an R^2 (coefficient of multiple determinations) valued at 0.765. This implies that 76.5% of the total observed variations in the dependent variable (Y) were accounted for while 23.5% were due to unexplainable error. F–statistics was significant at the 1.0% level, indicating the models fitness. Based on the findings, enhancing and improving access to education and trainings will improve the economic viability and sustainability of ginger farming in Abia State. This will ultimately benefit local farming communities and the broader agricultural sector, thereby enhancing productivity.

Keywords: Ginger, Production and Productivity, Small-scale Farmers

Introduction

Ginger (*Zingiber officinale Roscoe*) is the underground stem (rhizome) which is used as a spice and preservative (Sasu, 2023). It is a pungent, spicy herb widely utilized for medicinal and culinary purposes and is one of the most commonly used condiments worldwide. The rhizome can be consumed fresh, dry or in juice forms. It offers numerous benefits including antioxidants, anti-inflammatory properties and therapeutic compounds like gingerol, paradol, shogaol and zingerone (Indiarto *et al.,* 2021). Ginger contains about two per cent (2%) essential oils, which are extracted from the rhizome for use in confectioneries, perfumery, beverages and pharmaceuticals. It is an important export commodity in global trade (Ezra, *et al.,* 2017).

In 2016, Nigeria was the third highest exporter of ginger, preceded by China and India with a global production share of 16% amounting to 522, 964 tonnes (Bala, 2016). The worth of ginger exported by Nigeria in 2016 was $8.2 million representing 9.6% of the total world export (Nwaekpe *et al*., 2019). Nigerian ginger is rated the best in the international market due to its pungency and high level of oleoresin oil, the active ingredient that stimulates demand for the product. Nigeria produces an average of 50,000 metric tonnes of fresh weight ginger per annum (Ezeagu, 2006). Out of this, 10 % is locally consumed fresh, while 90% is dried. About 20% of the dried ginger is consumed locally, while the remaining 80% is exported (Onwunali *et al*., 2023). Ginger powder is used as a flavoring in biscuits, cakes, cookies and can be preserved in syrups. Ginger waste meal has also shown promises of being a substitute for maize in the diet of growing rabbits (Nmadu & Marcus, 2014).

In Nigeria,two major varieties of ginger are cultivated: yellow ginger (Umudike Ginger 1(UG 1) and black ginger (Umudike Ginger 11[UG 11]) Onwusiribe, *et al.,* (2020). UG 1 has a higher yield compared to UG 11, but UG 11 is more pungent (Nwaekpe *et al*., 2019).

Ginger is extensively used to address various health conditions, including loss of appetite, asthmatic conditions, bloated stomach, rheumatoid conditions, anemic conditions, liver associated conditions and disorders, vomiting, swollen joints, fatigue, back pains, mal-digestions,flatulence, mal-absorption syndrome, stomachache, piles, weakness in heart functions, heart disorders, elephantiasis, allergies, throat associated disorder, cough, Hiccough, common cold, injuries, malnutrition, fever due to infections, chronic fever, lethargy and physical weakness, physical weakness due to delivery, chronic osteoarthritis conditions, headaches, pain due to nervous disorders, diabetes, loss of speech (Ewuziem, Onyenobi, Ironkwe&Tokula, 2015 and Nwaekpe *et al*, 2015).

Ginger is a high-value spice crop renowned for its culinary and medicinal properties. Originating from Southeast Asia, ginger has become a significant crop in various parts of the world due to its versatile uses and growing global demand. In Nigeria, ginger cultivation is gaining momentum, especially in regions with favorable agro-climatic conditions, such as Abia State. Small-scale farmers in Abia State engage in ginger production as an important economic activity, contributing to local livelihoods and food security. Despite the potential benefits, the production and productivity of ginger face numerous

challenges, including inadequate access to inputs, poor agronomic practices, pest and disease pressures, and market fluctuations (Ewuziem, Onyenobi, Ironkwe&Tokula, 2015).

The cultivation of ginger in Abia State represents a crucial agricultural activity with the potential to significantly contribute to the local economy, provide employment opportunities, and enhance food security. Nigeria is the second world ginger producer in the world, cultivating over 84,156 hectares yield 821,38 hg/ha. In 2017, production rose to 834,600 metric tons but by 2021, it had dropped to 726,000 metric tons with 734,000 metric tons in the preceding year. Nigeria has yet to fully harness the economic benefits of growing ginger, due to low-quality seeds and limited use of technology (Yakubu, Baba & Gadzama, 2020).

The ginger production sector in Abia State and Nigeria at large faces numerous challenges that hinder its development and the realization of its full potential. The primary issues encompass limited access to modern farming techniques, inadequate market information, fluctuating market prices, and the impacts of climate change on agricultural productivity (Igbo, 2020).Ginger is perishable due to the poor state of storage and other infrastructural facilities in Nigeria, post-harvest losses are significant, leading to market glut during harvest periods and marked scarcity during off-seasons. In Nigeria, ginger cultivation is a crucial agricultural activity for many small-scale farmers, particularly in Abia State. Despite its economic importance, there is limited data on the productivity of ginger and the challenges faced by small-scale farmers in this region. This study aims to fill this gap by assessing the production practices, productivity levels, and constraints encountered by ginger farmers in Abia State.

Objectives of the study

i. To describe the socioeconomic profiles of the respondents
ii. To evaluate the productivity levels of ginger farms in the region
iii. To determine factors influencing ginger production in the study area.

Methodology

Study Area

The study was conducted in Abia state, Nigeria. The State is located in the southeastern region of Nigeria and it has favorable agro-climatic conditions for ginger cultivation. Firstly, multi stage sampling technique was used to select 120 rural household heads across the three agricultural zones (Aba, Ohafia and Umuahia) in the state. In the second stage, two (2) blocks were randomly selected from each of the three (3) agricultural zones due to the vast production of ginger across the state, giving a total of six (6) blocks. In the third stage, two (2) circles were randomly selected from each of the blocks making a total of 12 circles. In the fourth and last stage, ten (10) rural household' heads were selected from each of the circles making a total of 120 respondents that constituted the sample for the study.

Data Collection

A mixed-method approach was employed, combining quantitative surveys and qualitative interviews. Data were collected from 120 small-scale ginger farmers using structured questionnaires. Additionally, in-depth interviews were conducted with 20 key informants, including extension agents and local agricultural officers.

Data Analysis

Data were analyzed using descriptive statistics to determine socio-economic characteristics of respondents, average yields, production costs, and income. The multiple regression analysis was also used for analysis.

Multiple Regression Model

The OLS/Multiple regression expressed implicitly as follows.

$Y = f(X_1\ X_2\ X_3\ X_4\ X_5\ X_6\ X_7, X_8 X_9 X_{10} X_{11} X_{12}, ei)$ …….. (3.3)

The four functional forms of OLS in explicit form is specified as;

Linear Function

$Y = ß + ß_1x_1 + ß_2x_2 + \ldots\ldots\ldots\ldots\ldots\ldots\ldots ß_nx_n + ei$

Exponential function

$LogY = ß + ß_1x_1 + ß_2x_2 + \ldots\ldots\ldots\ldots\ldots\ldots\ldots ß_nx_n + ei$

Semi-log function

$ß_0 + ß_1 lnx_1 + ß_2 lnx_2 \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots ß_n lnx_n + ei$

Cobb Douglas function

$Log\ Y = ß_0 + ß_1 lnx_1 + ß_2 lnx_2 \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots ß_n lnx_n + ei$

Where,

Y = Access to improved ginger production technologies (measured by number of mean adoption scores of the respondents)

X_1= Sex (1 = male and female = 0)

X_2= Age (years)

X_3 = Marital status (1 = married, 0 = single)

X_4= Education level (Number of years spent in school)

X_5 = household size (number of persons)

X_6 = farmers experience (years)

X_7 = farm size (ha)

X_8 = monthly income (₦)

X_9 = number of training (number of times)

X_{10} = capital (₦)

X_{11} = extension contact (number of times)

e = error term

RESULT AND DISCUSSIONS

Socio-economic Characteristics of Respondents

The results in Table 1 showed that 76.67% of the respondents had farming experience of between 11–20 years, while 15% of them had between 1–10 years and cumulatively, 8.33% fell between 21–40 years. The mean years of farming experience among the rural farmers in the study area was **19.4 years**. The result shows that 48.3% of the respondents had farm sizes of between 0.6–1.0 hectares, about 25.0% of the respondents had 0.1–0.5 hectares and 1.0–1.5 hectares respectively, as against 0.16% that had farm sizes that ranged between 1.6–2.0 hectares. The mean farm size of the farmers was **1.1 hectares**. Large farm size increases agricultural productivity and improves farmer's technical, allocation and resource use efficiency as well as enhances access to credit and other farm inputs. The result also showed monthly mean farm income of **₦102, 000.00.** The result further shows that 45.83% of the respondents had no contact with the extension agents, 28.33% had contact with extension agents in the range of 3-4 times/month while 25.84% had contact with extension agents 1-2 times a month. The implication of this finding is that the ginger farmers in the study area were poorly visited by extension agents to ascertain their farming problems, know where they need assistance and pass across to them any new/improved technologies.

Table 1: Distribution of Respondents (Producers) According to Selected Socio-economic Characteristics (n =120)

Variables	Frequency	Percentage	Mean
Farming Experience (years)			
1-10	18	15.0	
11-20	92	76.67	
21-30	9	7.5	
31-40	1	0.83	**19.4 years**
Farm Size (hectares)			
0.1 - 0.5	30	25	
0.6 - 1.0	58	48.3	
1.1 - 1.5	30	25	
1.6 - 2.0	2	1.7	**1.1 hectares**
Farm income (₦)			
10,000-50,000	13	10.83	
51,000 – 100,000	49	40.83	
101,000 – 150,000	50	41.67	
151,000 – 200,000	8	6.67	**₦102,000.00**
Extension Contacts			
No Contact	55	45.8	
1 – 2	31	25.8	
3 – 4	34	28.3	**2.2 times**
Total	**120**	**100**	
Cooperative Membership			
Yes	26	21.67	
No	94	78.33	
Total	**120**	**100**	

Field survey, 2023

Production Practices

1. Land Preparation and Planting

Method: 78% of farmers use manual tilling with hand tools.
Planting Season:85% of farmers plant ginger at the onset of the rainy season.
Seed Source: 92% of farmers use rhizomes from their previous harvests as seed material.

2. Fertilization and Pest Control

Fertilizer Use: 65% of farmers apply organic manure, while 20% use chemical fertilizers sporadically.
Pest Control: 70% of farmers use traditional methods, including manual weeding and local herbal solutions, with 30% applying minimal pesticides.

3. **Yield**

Average Yield: 7.5 tons per hectare.
Potential Yield:15-20 tons per hectare in regions with advanced practices.

4. Income

Average Annual Income: ₦150,000 per hectare.
Income Variability**:** Fluctuations due to market prices and production issues.

Productivity

Table 2: Productivity and Economic Returns

Metric	**Value**
Average Yield (tons/ha)	7.5
Potential Yield (tons/ha)	15-20
Average Annual Income (₦/ha)	120,000
Income Variability	High

Field survey, 2023

Factors Influencing Ginger Production

The results of the Ordinary Least Square Regression (OLS) on the factors influencing ginger output in the study area were presented in Table 3. Four functional forms were tried, with the Double-log functional form being selected based on the magnitude of the R^2 value, the number of significant variables and the F- ratio. The R^2 (coefficient of multiple determination) value was 0.765 indicating that 76.5% of the total observed variations in the dependent variable (Y) were explained by the model while 23.5% were due to unexplainable error. F–statistics were significant at1.0% level indicating the model's fitness.

The coefficient of age (-0.773) was statistically significant at the 10.0% level and negatively related to ginger output. This implies that as the age of farmers increase, their farm output decreases. This inverse relationship suggests that while farming experience may increase with age, the physical strength required for farm labour decreases. Thus, as the farmer gets older, he may increase in farming experience but his strength level for farm labour decrease. The result conforms to Titilayo and Banake (2014) who found negative relationship between age and output, indicating that older farmers tend to have lower production levels. The coefficient of education (1.149) was positively related to ginger output and is statistically significant at 1.0% level of probability. The result implies that a 1.0% increase in the level of education among respondents in the study area will lead to 114.9% increase in the ginger output. This finding conforms to the *a priori* expectation that education enhances farmers' awareness, access to information as well as the technical and managerial know-how. Oduro-Ofori, Aboagye and Acquaye (2014) found that increased education among farmers positively influences their access to, adoption of improved agricultural practices. This is encouraging because Imonikhe in Sukhjinder (2015) states that education enhances farmers ability to make accurate and meaningful management decision. The coefficient of income (0.113) was also statistically significant at 1.0% level and positively related to ginger output. This implies that a unit increase in income will lead to 11.3% increase in ginger output of the respondents. This result may be attributed to the fact that increased income enables farmers to adopt new marketing strategies, buy new equipment, ease transportation and improves investment into their enterprises. This result is similar to Nmadu and Akinola (2015) who revealed that farmers with larger farm incomes have a greater capacity to pay wage rates, encouraging the use of hired labour relative to family labour. Based on these findings, the study rejects the null hypothesis that there is no significant relationship between the socioeconomic characteristics of ginger farmers and ginger output in the study area at 1.0% alpha level. The study concludes that education and income are significant factors influencing ginger production in the study area.

Table 3: OLS Regression Result of the Factors Influencing Ginger Output in the Study Area

Variables	Linear	Exponential	Semi-Log	+ Double Log
(Constant)	-2338.142	8.980	103387.027	11.173
	(-0.032)	(9.566)***	(4.714)***	(4.507)***
Sex	39594.605	0.659	29725.679	.637
	(0.651)	(0.473)	(1.363)	(0.588)
Age	-194.886	0.007	-37351.323	-.773
	(-0.255)	(0.681)	(-0.972)	(-1.779)*
Marital status	-26405.1	-0.303	-28338.511	-0.417
	(-3.097)***	(-2.794)**	(1.236)	(1.361)
Education	3244.229	0.064	-34888.386	1.149
	(1.805)*	(2.501)**	(1.151)	(3.355)***
Household size	-302.356	0.005	1376.132	.068
	(-0.122)	(0.172)	(0.106)	(3.461)***
Farming experience	1950.902	0.010	14972.501	.089
	(1.983)**	(0.832)	(4.160)***	(3.767)***
Farm size	1945.149	.0825	2778.072	1.195
	(0.852)	(1.048)	(1.090)	(0.964)
Monthly income	0.422	1.823E-6	474.305	.113
	(2.071)	(0.705)	(2.037)**	(5.768)***
Number of training	-0.057	1.967E-6	4482.591	.288
	(-0.637)	(1.740)*	(4.112)***	(2.60)**
Capital	0.054	1.766E-6	8394.982	.048
	(0.247)	(0.633)	(0.767)	(0.390)
Extension contact	945.149	.025	-22358.072	0.195
	(0.252)	-(0.048)	(-1.090)	(-0.907)
Labour cost	246.548	0.011	1613.220	0.188
	(10.152)***	(5.537)***	(7.055)***	(6.611)***
R-Square	**0.685**	**0.655**	**0.616**	**0.765**
R Adjusted	**0.618**	**0.609**	**0.597**	**0.733**
F – ratio	**14.710*** **	**11.711*** **	**12.27*** **	**16.144*** **

Field Survey, 2020 Key: * Significance at 10%, ** Significance at 5%, * Significance at 1% ***, + = Lead Equation and the values in bracket are the t-value**

Conclusion

In conclusion, the majority of ginger farmers in the study area have been farming for an average of 19 years, with a mean farm size of 1.1 hectares. While the monthly farm income from ginger production is somewhat encouraging, most farmers reported inadequate extension visits and contacts. The results indicated a moderate level of proficiency in production practices such as land preparation, planting, fertilizer application and pest control. However, there was significant income variability in productivity. The study found that factors such as age, education, income, household size, farming experience and the number of training sessions significantly influenced ginger production in the study area. Based on these findings, enhancing access to education and trainings will improve the economic viability and sustainability of ginger farming in Abia State, ultimately benefiting the local farming communities and the broader agricultural sector. Such improvements are likely to enhance productivity and ensure more stable income for farmers.

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