



**FACTORS INFLUENCING THE ADOPTION OF GINGER PRODUCTION
TECHNOLOGIES IN SOUTHERN KADUNA, KADUNA STATE NIGERIA**

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ABSTRACT

The study examined the factors influencing the adoption of ginger production technologies in southern Kaduna, Kaduna State Nigeria. Multistage sampling technic was employed in selecting 215 respondents. Data was collected through the administration of questionnaire and analysed using descriptive and inferential statistics. The result reveals that majority (76.6%, 71.1% and 70.2%) of the respondents were male, married and had attended tertiary levels of education with a mean age of 38 years, household size of 6 persons, 16 years of farming experience, 2.4ha of farm size and income of ₦784,839.45. The result further shows that most (91.7% and 90.8%) of the respondents each adopted combination of organic and inorganic fertilizers, harvesting and fertilizer application, weeding, respectively. The finding further shows that income ($P < 0.01$) and marital status ($P < 0.05$) of the respondents had significant influence on the adoption of ginger production technologies in the study area. The study it is concluded that marital status and income were the factors influencing the adoption of ginger production technologies in the study area. It is recommended that ginger producers should form and participate actively in cooperatives so as to increase their accessibility to information and production inputs.

Keywords: Adoption, Factors, Ginger, Production and Technologies.

INTRODUCTION

Ginger (*Zingiber officinale* Rosc.) is an important commercial crop grown for its aromatic rhizomes which is used both as a spice and a medicine. It is marketed in different forms such as raw ginger, dry ginger, bleached dry ginger, ginger powder, ginger oil, ginger oleoresin, ginger ale, ginger candy, ginger beer, brined ginger, ginger wine, ginger squash, ginger flakes etc. Ginger root and ginger oil are also used as preservative and flavoring agent. Ginger is one of the oldest and most important spices used in different kinds of food preparation (Jakkawad *et al.*, 2017). Ginger possesses a warm pungent taste and a pleasant odor; hence it has a wide use as a flavoring in numerous food preparation, beverages, ginger bread, soups, pickles and many soft drinks. Ginger is the most widely grown by all farming communities in the Jaba region. Indeed, it is the main cash crop that all small holder farmers in the region are willing and deeply involved in cultivating due to high profit. This made some farmers in the area to devote all their farmlands to ginger production as against subsistence crops such as guinea corn or maize. In terms of local consumption, however, it is the least among all the other cultivars. This is because; over 95% of its produce is exported to various countries of the world as export commodity (Ahmed, 2018). There are two major varieties of ginger grown in Nigeria which differ in the colour of their rhizomes namely, the reddish and yellow varieties. The yellow variety appears to be widely planted than the reddish variety.

It is believed that the adoption of new agricultural technology, such as the high yielding varieties that kickstarted the green revolution in Asia, could lead to significant increases in agricultural productivity in Africa and stimulate the transition from low productivity subsistence



agriculture to a high productivity agro-industrial economy (Onyeneka, 2017). In this regard, Mendola (2007) observes that the adoption of high yielding varieties has had a positive effect on household well-being. In addition, empirical studies (Diagne *et al.*, 2009; Bellon *et al.*, 2006 and Evenson and Gollin, 2003) show that gains from new agricultural technology influenced the poor directly, by raising incomes of farm households and indirectly, by raising the employment and wage rates of functionally landless laborers, and by lowering the price of food staples. Nigeria ranked first in terms of the percentage of total hectares of ginger under cultivation but her contribution to total world output is too low compared to other countries. This could be attributed to the fact that most of production is undertaken by smallholder and traditional farmers with rudimentary production techniques and low yields.

In addition, the smallholder farmers are constrained by many problems like inadequate attention towards farming of the crop as a business enterprise, therefore not adequately focused on profit maximizing motive. This entails a little change of the economic behaviour of the farmer, his social relationships and local knowledge with little commercialization. Therefore, improving ginger production by farmers from subsistence to commercial production is long overdue as these resource poor farmers are faced with production and post-production challenges ranging from non-use of improved varieties, manual land preparation, inadequate inputs, local processing techniques, inadequate credit/capital, which often results in low production/ha and poor ginger quality. There appears to be relative decline in ginger yield while soil erosion seems to be on the increase in this area. This has led ginger farmers to put enormous pressure on the available land, to the extent of farming on marginal land, which may be unsustainable. Although, there are several studies in the area that have attempted to describe the farming practice of ginger in Southern Kaduna such as Sati and Bala (2017) and Ibrahim (2018) among others, there exist no single attempt to describe the knowledge, attitude and practices of farmers towards the adoption of ginger production technologies in the area. Based on the aforementioned problems, this study wish to be conducted.

The broad objective was to analyse factors influencing the adoption of ginger production technologies in Southern Kaduna, Kaduna State Nigeria. The specific objectives of the study were to:

- i. describe the socioeconomic characteristics of the respondents;
- ii. examine the adoption level of ginger production technologies; and
- iii. determine factors influencing the adoption of ginger production technologies.

MATERIALS AND METHODS

The Study Area

The study area was conducted in Southern Kaduna region of Kaduna State comprising of five local government areas, namely: Jaba, Jema'a, Kachia, Kagarko, and Zangon Kataf Local Government Areas. The study area is located between latitude 9°5' to 10°10' North and longitude 7°16' to 8°35' East. The region has an estimated land area of has estimated land area of 531km² (Ganiyu *et al.*, 2021), with a projected population of 1,903,365 people in 2023 at 3.5% growth rate (NPC 2023). The distinctive geographical location of these areas that lies around the escarpment of Jos plateau, largely characterized with hilly undulating topography; cold and warm micro climate; and dense mountain/guinea Savanna vegetation, made the region favourable for the cultivation of wide varieties of cultivars ranging from trees to cereals and tuber crops. The climate of the area is tropical continental with distinct seasonal regimes, oscillating between cool to hot dry and humid to wet (dry and wet seasons). The rainy season starts from April and ends in October



with a mean annual rainfall of 2000mm. August and September are the wettest months and the annual average temperature ranges from 23°C to 28°C. The months of November to March are the dry season periods. The primary occupation of over 75 percent of the active population is farming (Ibrahim, 2018), with ginger as the main cash crop.

Sampling Technique and Sample Size

A multistage sampling procedure was employed for the study. In the first stage the Southern Kaduna region of the State was purposively selected because of the intensity of ginger cultivation. In the second stage three local government areas (Kachia, Jaba and Kagarko) was randomly selected from the Southern region of Kaduna State. The third stage involved a random selection of three districts from each local government areas. A sampling frame or registered farmers from, (Kachia, Jaba and Kagarko) was obtained from KSDP with a total of 501.

Data Collection and Analysis

The instruments used for the data collection was a well-structured questionnaire. Data were collected through the administration of the structured questionnaires to respondents with the assistance of trained enumerators. Data was then analysed using both descriptive and inferential statistics. Descriptive statistics such as the frequency distribution, percentages, mean score, standard deviation and ranking while, the inferential statistics was Tobit regression analysis.

RESULTS AND DISCUSSION

Socioeconomic Characteristics of the Respondents

The result from Table 1 depicts the socioeconomic characteristics of the respondents, the finding revealed that 29.8%, 20.2% and 18.3% of the respondents were within the ages of 20-39, 40-49, and 50-59 years, respectively. The result also shows that 1.9% of the respondents were within the ages of 60-69 years with a mean age of 39 years in the study area. This finding implies that most of the respondents were within their active ages of production in agriculture implying that such respondents could be willing to adopt technologies in ginger production to boost their levels of income and also improve their living standards. The biological designation or identification of respondents is referred to as sex, which is the state of being male or female. The result from the Table showed that majority (76.6%) of the respondents were male while 23.4% of the respondents were female. This finding implies that most of the respondents were male, this is not unconnected to the cultural and religious believe of the respondents which to extend prohibits women participation in some tedious farming activities in northern Nigeria.

The results in the Table revealed that majority (71.1%) of the respondents were married while 3.2% and 1.8% 23.9% of the respondents were single. Widowed and divorced, respectively. This finding implies that most of the respondents were married and had certain levels of responsibilities hence the need to adopt improved ginger production technologies among the respondents cannot be over emphasized. This result is in line with Onwunali *et al.* (2023) which revealed that ginger farming in the study was dominated by married individuals.

The result in Table 1 shows that majority (70.6%) of the respondents had tertiary level of education. The finding further shows that 20.2%, 9.2% and 0.5% of the respondents had secondary, primary and NCE levels of education in the study area. This finding implies that most of the respondents had attended one form of education or another which helps to improve their knowledge, attitude, practice and adoption of ginger production technologies in the study area. Hassan *et al.* (2020) reported that educated male farmers dominated crop production in North



West. The result in the Table above also showed that more than half (54.6%) of the respondents had a household size of 1-5 persons, while 35.3%, 8.7% and 1.4% of the respondents had a household size of 6-10, 11-15 and 16-20 persons, respectively with an average of 6 persons. This implies that most of the respondents had a relatively large household size and this could be of advantage in the area of supply for farm labour. This finding is in agreement with a conducted in Anambra and Enugu States by Nwaekpe *et al.* (2022) which revealed that the mean household size of respondents was 6 persons.

The results also revealed that 42.2% and 33.9% of the respondents had farming experience of 1-10 years and 11-20 years. The result also shows that 15.6%, 6.9% and 1.4% of the respondents had a farming experience of 21-30 years, 31-40 years and 41-50 years, respectively with an average 16 years. This finding implies that most of the respondents had relatively good number of years in ginger production which could influence their knowledge and attitude to adoption of technologies in the study area. The farming experience of 7-13 years indicated good average knowledge of ginger cultivation base on the positive relationship between experience and production (Alfred *et al.*, 2018). The result in the Table also showed that majority (82.1%) of the respondents had a farm size of 0.5-3.0, while 14.7%, 2.8% and 0.5% of the respondents had a farm size of 3.5-6.0, 9.5-12.0ha and 6.5-90ha, respectively with a mean of 2.4ha. the result shows that respondents had a mean farm size of. This finding implies that most of the respondents had relatively small farm size which shows that their production of ginger is relatively a small-scale production in the study area. The results support those of Nmadu and Marcus (2012) and Abah *et al.* (2015) who reported average size of land under cultivation by ginger producers was 0.36 hectares.

The result in the Table 1 also showed that majority (74.8%) of the respondents had an income of ₦50,000-₦950,000. The finding also showed that 10.6%, 7.3% and 3.7% of the respondents had an income of ₦951,000-₦1,550,000, ₦1,551,000-₦2,550,000, ₦2,551,000-₦3,550,000 and ₦3,551,000 and above, respectively with average of ₦784,839.45. This finding implies that most of the respondents had relatively high-income levels in the study area. This is contrary to the findings of Mazzza *et al.* (2019) who reported low income among respondents. The result in the Table 2 shows that more than half (58.7%) of the respondents had no access to extension contact, while 41.3% of the respondents had contact with agent to extension contact in the study area. This finding implies that most of the respondents had no contact with extension agents which could ultimately lead to negative effects on respondents' attitudes and knowledge to adoption of ginger production technologies in the study area. This result agrees with the of Michael (2010) on the Evaluation of farmers' response to extension services on ginger production in of Kaduna State, which reveals that majority of the respondents in the study area had no contact with extension agent.

The result in the Table reveals that more than half (56.4%) of the respondents were not members of cooperatives in the study area. The result also shows that 43.6% of the respondents belong to one form of cooperatives or another in the study area. This finding implies that more than half of the respondents were not members of any cooperative which results to low access to inputs thereby resulting to low level knowledge and adoption of production technologies among the respondents in the study area. This result is in line with the findings of Nwaekpe *et al.* (2022) which reported that most of the respondents in the study area were not members of any form of cooperative.



Table 1: Socio-economic characteristics of the respondents

Variables (n = 218)	Frequency	Percentage	Mean
Age (Years)			
20-29	44	20.2	39
30-39	65	29.8	
40-49	65	29.8	
50-59	40	18.3	
60-69	4	1.9	
Sex			
Male	167	76.6	
Female	51	23.4	
Marital Status			
Single	52	23.9	
Married	155	71.1	
Divorced	4	1.8	
Widowed	7	3.2	
Educational Background			
Primary	20	9.2	
Secondary	44	20.2	
Tertiary	154	70.6	
Household size			
1-5	119	54.6	6
6-10	77	35.3	
11-15	19	8.7	
16-20	3	1.4	
Farming Experience			
1-10	92	42.2	16
11-20	74	33.9	
21-30	34	15.6	
31-40	15	6.9	
41-50	3	1.4	
Farm Size (Hectares)			
0.5-3.0	179	82.1	2.4
3.5-6.0	32	14.7	
6.5-9.0	1	0.4	
9.5-12.0	6	2.8	
Level of Income(₦)			
50,000-950,000	163	74.8	784,839.45
951,000-1,550,000	23	10.6	
1,551,000-2,550,000	16	7.2	
2,551,000-3,550,000	8	3.7	
3,551,000 and above	8	3.7	
Contact with Extension Agent			
No	128	58.7	
Yes	90	41.3	
Membership of Cooperative			
No	123	56.4	
Yes	95	43.6	

Source: Field Survey (2024)

Adoption Level of Ginger Production Technologies by Respondents

The result from Table 2 depicts the adoption levels of ginger production technologies in the study area, the finding shows that the major technologies adopted in ginger production were

combination of organic and inorganic fertilizer (91.7%), harvesting (91.7%), fertilizer application (90.8%) and weeding (90.8%) which were ranked 1st and 3rd by the respondents, respectively. According to Statista (February 2022), the quantity of ginger produced in Nigeria in 2020 was over 734,000 metric tons, while output in the study area was about 2.69 metric tons.

The findings also indicated that some of the technologies adopted were by storage (89.9%), use of chemical (86.7%), recommended spacing practice (81.7%), plant protection measures (80.3%) and processing (80.35%) which were ranked 5th, 6th, 7th and 8th respectively. Other technologies adopted by the respondents in ginger production were assessment of soil type (78%), practice of good agronomic practice (75.7%), seed treatment (74.3%), use of 10cm planting depth (73.4%), use of ginger sett (72%), use of improved varieties (64.2%) and irrigation management (54.1%) which were ranked 10th, 11th, 12th, 13th, 14th, 15th and 16th respectively. This finding implies that respondents were actively involved in all the aspects of ginger production technologies which helped increase their adoption level in the study area. This was in line with Ejechi *et al.* (2018) who reported that the respondents used an array of ginger production technologies in Southern Kaduna of Kaduna State.

Table 2: Adoption Level of Ginger Production Technology

Variables	Percentage*	Rank
Combination of organic and inorganic manure	91.7	1 st
Harvesting	91.7	1 st
Fertilization	90.8	3 rd
Weeding	90.8	3 rd
Storage	89.9	5 th
Use of chemicals	86.7	6 th
Recommended Spacing	81.7	7 th
Plant protection Measures	80.3	8 th
Processing	80.3	8 th
Soil type	78.0	10 th
Good agronomic practices	75.7	11 th
Seed treatment	74.3	12 th
Use of planting depth of 10cm	73.4	13 th
Use of ginger sett for production	72.0	14 th
Use of improved ginger varieties	64.2	15 th
Irrigation Management	54.1	16 th

Source: Field Survey, 2024 *Multiple response

Factors Influencing Adoption of Ginger Production Technologies

The result from Table 3 shows the factors influencing the adoption of ginger production technologies among the respondents in the study area, the finding reveals that income (6.715) of the respondents was positive and significant ($P < 0.01$) influencing adoption of ginger production technologies among the respondents. This finding implies that a unit increase in income of the respondents will lead to increase in adoption of production technologies among the respondents, which was in line with a prior expectation that adoption of ginger production technologies will result to increase in yield which in turn increases income of the respondents in the study area.

The result also shows that marital status (1.050e+00) was positive and significant ($P < 0.05$) influencing adoption of ginger production technologies among the respondents. This finding

implies that increase in number of married respondents participating in ginger production will lead to increase in adoption of ginger production technologies in the study area. This cannot be unconnected to the level of responsibilities of household needs on married respondents ranging from personal needs such as shelter, food, health, clothing, school fees among others which requires money hence married respondents' willingness to adopt ginger production technologies so as to increase their yield and income to meet up with their household needs in the study area.

The result further shows that age, sex, educational level, household size, access to credit, membership of cooperatives, access to extension, occupation and farming experience of the respondents were not significant and had no influence on respondents' adoption of ginger production technologies. This finding implies that increase or decrease in these factors will not lead to increase or decrease in adoption of ginger production technologies in the study area. This contradicts the findings of Yusuf (2018), who reported credit was significant. This is contrary to the findings of Obasi *et al.* (2013) and Chidiebere-Mark & Ibe (2018) who found that farm size had positive and significant relationships with ginger productivity.

Table 3: Factors Influencing Adoption of Ginger Production Technologies

Variables	Coef.	Std. Error	z	P z
(Intercept):1	1.217e+01	1.706e+00	7.132	9.9e-13
(Intercept):2	1.294e+00	4.791e-02	27.014	<2e-16
Age	-4.082e-02	3.558e-02	-1.147	0.2512
Sex	2.625e-01	6.227e-01	0.422	0.6734
Marital status	1.050e+00	4.922e-01	2.133	0.0329**
Educational level	-4.524e-01	4.163e-01	-1.087	0.2771
Household size	6.985e-02	7.971e-02	0.876	0.3809
Income	6.715e-07	2.563e-07	2.620	0.0088***
Access to credit	-6.759e-01	8.222e-01	-0.822	0.4110
Membership of cooperatives	-7.069e-01	7.676e-01	-0.921	0.3571
Access to extension	6.663e-01	7.864e-01	0.847	0.3969
Occupation	1.751e-01	1.993e-01	0.878	0.3798
Years of farming experience	-5.755e-03	3.483e-02	-0.165	0.8687

Source: Field Survey, 2024 ***Significant at (P<0.01) and **Significant at (P<0.05)

CONCLUSION AND RECOMMENDATIONS

Based on the result of the finding it can be concluded that farmers' income and marital status were the significant factors influencing the adoption of ginger production technologies in the study area. Also most of the farmers in the study area had highly adopted the combination of organic and inorganic fertilizer, harvesting, weeding and use of chemicals technologies to mention few. From the findings of this study the following recommendations were made:

- Through the use of extension agents, farmers should be encouraged to form cooperative as this will enable them to obtain credit/loans that will help with the production of ginger.
- More capital investment from both Government and private enterprise will enable mechanize production of ginger which will in turn reduce its high cost of labour and translate into a high yield.
- Government and NGOs should train and retrain the extension agents for good service delivery to target farmers in the study area.
- Farmers should encourage to adopt and sustain more ginger farming technologies.



- v. Government and other private organisations should help the ginger farmers by linking them directly to interventional marketers either through e-marketing or other channels.

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