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SCIENTIFIC PAPER

ANALYSIS OF HOUSEHOLD CROP COMMERCIALIZATION IN NIGERIA

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Abstract: *N*
igeria is experiencing a gradual shift from subsistence to commercialized agriculture, thereby increasing involvement and activities at different nodes of agribusiness. Participation of farmers in markets is an important determinant of well-being and development, and one of the pathways towards economic growth. This study analysed household crop commercialization in Nigeria. The secondary data used were the General Household Survey (GHS, 2018) Wave 4. Data were analysed using descriptive statistics, household crop commercialization index (HCCI) and ordered probit regression model.
Mean age of Nigerian farmers was 50.04 years (±15.22), majority (85.68%) were male, married (82.51%), and 72.14% had formal education. Farming is viable in all the geopolitical zones and majority (87.64%) of the farmers were from the rural sector, holding a mean total plot size of 12.61(±15.63) hectares, and planted 3 crops on the average. The most produced crop categories are cereals (46.75%), tubers (20.70%) and legumes (19.00%); legumes and cereals are highest in the North, and tubers in the South. Subsistence households were 32.81% (HCCI=0), only 1.71% of the households were fully commercial (HCCI=100), while semi-subsistence households (0≤HCCI≤100) constitute 65.48%. Years of education ($p<0.05$) and crop production in North East and North West zones ($p<0.01$) constrain commercialization, while at $p<0.01$, crop production in the rural sector and the South zones, and increased land holding are the drivers of household crop commercialization in Nigeria.
Nigerian farming households are mainly semi-subsistence and are diversified in crop production. Nigeria relies more on market participation of the semi-subsistence households, through their marketable surplus, to feed her teeming population and for exports. Further attention on rural infrastructure development in all geopolitical zones and awareness creation on producing market oriented products will increase agribusiness activities. This will generate green decent jobs that will take unemployed youths off the streets of urban centres. This is in tune with the economy diversification bid and the new Nigeria Economic Sustainability Plan of the Federal Government of Nigeria.

Keywords: *Crop commercialization, Cereals, Tubers, Legumes, Semi-subsistence*
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1 INTRODUCTION

Crop commercialization occurs when farming households move away from subsistence crop production to increased market orientation; transformation from production for household subsistence to production for the market. Ochieng et al. (2015) explained that crop commercialization is all about market orientation and participation. Farming households participate in crop market through their marketable surplus. In the context of crop commercialization, marketable surplus are quantities of products available for consumption by the non-farming population, and as raw materials for manufacturing and processing industries (Rohana and Bandara, 2010).

The non-farming population gets the marketable surplus through different markets, and linkages with industries for supply of produce as raw materials. This helps to measure the extent of commercialization of the production activities of a particular crop; while high proportions of marketable surpluses indicate greater market orientation of the producers (crop farmers), lesser proportions of surpluses mean that the producers are more subsistence-oriented or non-commercial. Crop commercialization can be addressed from two perspectives; first, as an increase in the marketed output, which is measured as the ratio of output sold to the production output, and secondly, as the amount of inputs purchased per unit of output (Gebremedhin and Jaleta, 2009).

Smallholder crop commercialization could be seen as the strength of the linkage between farm households and markets at a given point in time. Inability to sell irregular bumper harvests depress prices, undermining the income

of small farmers who manage to produce a surplus. Crop commercialization promotes agribusiness as it allows increased participation of individuals and poor households in domestic, national and international exchange economy and results in higher average farm incomes and lower farm inequality (Oteh and Nwachukwu, 2014). Poole (2017) explained that the participation of crop farmers in markets is an important determinant of well-being and development.

Gani and Adeoti (2011) stressed that market access plays a remarkable role in ensuring better income and welfare for smallholder farmers through diverse channels. By raising income, markets increase purchasing power, which, in turn, creates demand for consumer goods, thereby enhancing farmers' welfare. Market participation of smallholder crop farmers leads to gradual decline in real food prices due to increased competition and lower costs in food marketing and processing. These changes improve the welfare of smallholder farmers in two ways; low food prices increase the purchasing power for food for consumers while, to producers, a decline in food prices enables reallocation of limited household incomes to high value non-food agribusiness sectors and off-farm enterprises.

At household level, commercialization is mainly influenced by agro climatic conditions and access to infrastructure and market; factor and import markets, demographic and population change, availability of new technologies, market creation, and infrastructure. In addition, commodity price, availability of family labour, and geographic location of the household influence commercialization. According to Fischer and Qaim (2012), factors that influence crop commercialization can be grouped into long term and short term, and can either facilitate or hamper commercialization process. Some examples of the long term factors are population growth and rural infrastructure; population growth can increase the quantity of marketable surplus by increasing its demand, while rural infrastructure affects crop commercialization through its impact on prices, and diffusion of technology, thus affecting combination of inputs and outputs (Barrett, 2008).

Examples of short term factors that influence crop commercialization are consumption effects and income effects (Kirui and Njiraini, 2013). Kirui and Njiraini (2013) reported that lower level of crop commercialization is explained by many factors such as remoteness of many villages, low productivity, low farm gate prices, high market margins, lack of information and lack of market accessibility as many crop farmers walk approximately 18 kilometres to the closest market away from the village centre and more often, there is no public services to reach the market. All these factors hinder smallholder farmers from exploiting the benefits of participation in crop market.

Smallholders' decision to enter and participate in crop market is influenced by many household and environmental factors. It is constrained by crop pests and diseases, unreliable rainfall, access to irrigation and socioeconomic factors (size of farmland, draught power and family labour). Agricultural input and output markets are among the major constraints of crop commercialization. In this regard, low quality and quantity of produce, absence of market for the produce, transportation problems, price fluctuation and rising prices of inputs like labour, fertilizer and associated inputs are mentioned as bottlenecks for crop commercialization. Household size, lack of price information, distance to local market and expensive farm inputs reduce the intensity of crop marketing (Ugwu and Alimba, 2018).

Despite all these challenges and constraints, participating in crop commercialization helps to improve livelihoods of smallholder farmers. Hence, crop commercialization is one of the pathways towards economic growth by increasing agricultural productivity in Nigeria who relies on agricultural production. Factors such as age, the number of household members who assist in farm work, vocational training and farmers being landlords are factors that affect market participation positively.

Although there are streams of benefits that are inherent in market participation, studies show that participation in market by smallholder crop farmers in developing countries such as Nigeria is very low and has slowed down agriculture driven economic growth (Barrett, 2008). Low levels of commercialization reduce involvement of smallholder farmers in agribusiness due to lack of market orientation in the course of production. There is need to analyse market orientation of crop farming households in Nigeria, measured by the levels of commercialization or market participation, which is an indicator of the involvement of the farming households in agribusiness. This study analysed household crop commercialization in Nigeria.

Broadly, this study analysed household crop commercialization in Nigeria. Specifically, the study

i. Profiled crops grown by farming households (by zone and sector)
ii. Determined the level of household crop commercialization in Nigeria
iii. Analysed the determinants of household crop commercialization in Nigeria

Nigeria is experiencing a gradual shift from subsistence to commercialized agriculture. Nigeria economy has been known to depend mostly on oil revenue. Diversification into agricultural sector has been the major focus of the government as it seems like the main push needed from the overdependence on oil, especially as the prices of brent crude has been unstable at the international markets. Agribusiness is one of the ways of diversifying the economy. To be able to take advantage of the agricultural sector, there is need for restructuring of the sector from the subsistence production practices by the major drivers, that is, the rural producer of this sector into a market-oriented production. Commercializing smallholder agriculture cannot be neglected in achieving economic development especially for a country like Nigeria that still depend on agricultural sector for proper growth in the economy.

Also, emerging evidence across the world on the impact of Covid-19 suggests that economic and productive lives are affected. Generally, households earn less and have reduced livelihood opportunities due to Covid-19 related restrictions on movement which hamper households' ability to cultivate land

and engage in other activities. The results of this study on crop commercialization will shed light into agribusiness potentials of farming households. This will provide a way to induce greater levels of commercialization and increase volumes of agribusiness activities among farming households. These will help in executing the economy diversification bid and the new Nigeria Economic Sustainability Plan of the Federal Government of Nigeria during and after post covid-19 periods.

1.1 Conceptual Framework

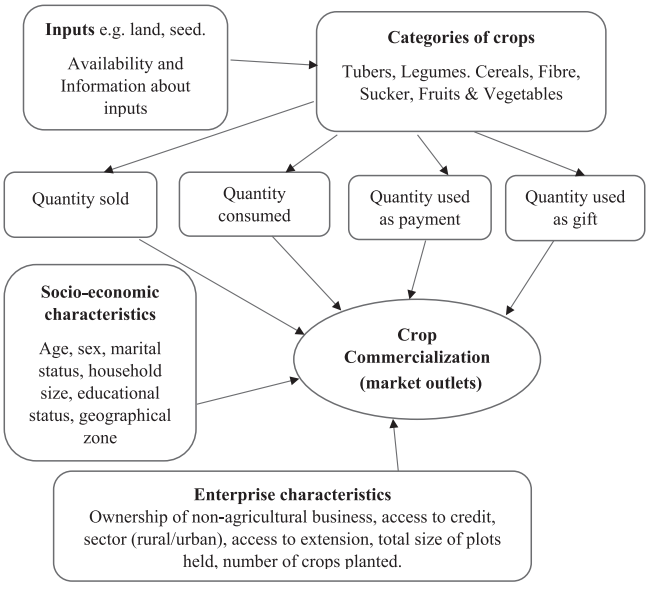
The conceptual framework on household crop commercialization in Nigeria is shown in Figure 1. The figure shows the relationship between crop commercialization and its various determinants, as well as the effect of crop commercialization on farmers and the economy as a whole. Various factors determine the types of crops farmers cultivate; soil type, availability of different inputs, information about the crop, and etcetera. Farmers make decision on whether to plant legumes, tubers, cereals, or others, based on those factors. The uses of each crop to farmers however differ, the quantity consumed for some is higher than what is sold and used as gift or payment, while for some, quantity sold will be the highest. Crops that are the major food source will only be sold after enough quantity for the household in a year has been removed.

The quantities of crops sold will therefore depend on the extent of other uses of that crop, and this affects the extent of crop commercialization. The quantity of crops that will be sold after removing other uses determine the level of market participation and commercialization of farmers. Socio-economic characteristics of farmers also affect their levels of commercialization. A farmer with large household size, for example, might have to keep larger quantities of grains for household consumption, which will reduce the quantity to be sold. Farmers that are leaving their active age may find it difficult to produce in large quantities, and may also find it difficult to get their produce to the market, compared to young and active farmers. This can discourage them from selling large quantities.

The figure also shows that enterprise characteristics affect commercialization. A farmer that has other non-agricultural business that already settles his bills may decide to consume all of his farm produce and probably give excess out as gifts, thereby reducing commercialization. Farmers with large hectares of land will probably practice commercialization more than a farmer with small land size. Producing crops in large quantities will make it possible for the farmer to keep portions for other uses and still have enough to market.

Commercialization is a key for restructuring the economy. Farmers that practiced commercialization will have increased income, which will help to cater for other basic needs. It can also help to improve the nutrient intake of farmers, since they will be able to purchase other nutritional food items aside from what they produce on the farm, and have higher living standards. According to Alawode et al. (2018), commercialization is characterized by expansion in output sales which raises cash earnings of rural farmers. Crop commercialization will also help the country to achieve self-sufficiency in food production and increase the volume of activities at all agribusiness nodes. This will be achieved if majority of Nigerian farming households produce for the market. It means there will be food in our local/domestic markets and farmers can also be oriented to produce quality crops for international market which will help to boost the foreign exchange of the country.

Figure 1: Conceptual framework on Household Crop Commercialization in Nigeria



Source: Alawode and Makinde, 2021.

1.2 Empirical Review

Ahmed and Murtala (2013) examined the impact of agricultural commercialization on food security in Nigeria using OLS regression method. The results showed that commercialization enhances food security in the country. Other variables they found to significantly contribute to food security were domestic food production and food import. Per capita income showed a very weak relationship with food security. They concluded that commercialization of agriculture is important for ensuring food security and land reforms, and provision of credits to smallholder farmers are needed to encourage commercialization. They therefore recommended that policies to improve food security in the country should be geared towards increasing domestic food production and improving the distribution of income.

In their study, Ele et al. (2013) determined the household commercialization index. They identified the variation in the level of commercialization among households in the three agricultural zones, and identified the micro-level factors determining the level of commercialization in Cross River State, Nigeria. The degree of commercialization in the study area was found to be moderately high (about 60.40%). On the average, households sold about 56.10%, 66.60% and 58.50% of their total production (in grain equivalent terms)

for the Southern, Central and Northern zones respectively. Tobit regression analysis showed that total quantity of food crops produced, farming experience, access to agricultural extension service, size of land used for cultivation, membership in cooperatives and household size are important factors determining the level of commercialization of smallholder farms.

Kabiti *et al*. (2016) determined factors that affect smallholder commercialization of farming enterprises. Input and output commercialization indices were derived for all the participating farmers. Tobit model was used to regress the indices and farmer specific variables. The study showed that the farmers are fairly commercialized for both input and output sides. In addition, factors that determined input and output commercialization are varied. The paper recommended increased public and private sector contribution towards commercialization through training and financial support and increased remittances by family members outside farming. The study concluded that smallholder farmers had a great potential for commercialization if necessary conditions were met.

Falola *et al*. (2017) carried out a study on the determinants of commercial production of wheat in Nigeria: A case study of Bakura Local Government Area, Zamfara State. They analyzed data using descriptive statistics, household commercialization index (HCI) and tobit regression. They found that the average HCI was 54.7%, implying that there was a gap of 45.3% for the farmers to attain full commercialization level. Farm size, fertilizer, credit, access to improved varieties, age of household head, using man-power as the only source of labour for cultivation and non-farm income were found to significantly influence household commercialization of wheat production.

Alawode *et al*. (2018) examined the relationship between rural land market and commercialization among crop farming households in Southwestern Nigeria. Descriptive statistics, land market index, crop commercialization index and tobit regression model were used for data analysis. They found that majority (74%) of the farmers acquired their farm plots through inheritance. The crop driving commercialization in the study area was maize, with crop commercialization index of 72%. They also found that participation in land market had positive effect on crop commercialization, the crop commercialization index for farming households participating in land market is expected to be 0.05 higher than that of the farming households which are not participating. They concluded that crop commercialization increases with participation in land market and recommended formulation of policies which will give room for flexibility in land redistribution that will make farmers have better access to land.

Ugwu and Alimba (2018) analysed the determinants of commercialization of staple crops among smallholder farmers in South East Nigeria. They analysed data using descriptive statistics, household commercialization index and multiple regression analysis. The commercialization indices indicated that the extent of commercialization was highest in cassava (57%) and rice (49%). The variables found to be the determinants of commercialization include sex, household size, processing cost and market distance. Favourable indices for commercialization are high sales of products, improvement in crop farming and processing, and relevant policy formulations. They also found that even though the crops have potentials of being transformed into different products, they were limited to mainly gari (a processed form of cassava) and milled rice for paddy rice. Major challenges identified include inadequate processing and storage facilities and poor access to credit facilities. They recommended that government should refurbish old facilities, assist farmers in putting new ones in place, and set up strategies to facilitate farmers' access to credit. Also, farmers should participate actively in farm associations.

2 MATERIALS AND METHODS

2.1 Study Area

The study area for this research is Nigeria. Nigeria is a country located in West Africa, on the Gulf of Guinea. Nigeria is made up of 36 states and a Federal Capital Territory, and grouped into six geopolitical zones: North Central, North East, North West, South East, South South, and South West. The population of Nigeria is predominantly rural; approximately one-third live in urban areas. The vast arable land in Nigeria makes it suitable to plant many food and cash crops. Nigeria produces tradeable agricultural commodities in which it has comparative advantage. For example, Nigeria is the sixth largest producer of cocoa beans and the fifth largest producer of plantain in the world in 2017 (FAO, 2019).

2.2 Sources of Data

Secondary data were used for this study. The secondary data were the General Household Survey (GHS, 2018). The Nigeria General Household Survey panel component (GHS-Panel) is part of a larger regional project in sub-Saharan Africa to improve agricultural statistics. The GHS-Panel is a nationally representative survey of approximately 5,000 households. The 2018/19 GHS-Panel is the fourth round (wave 4) of the survey with prior rounds conducted in 2010/11, 2012/13, and 2015/16. The data consist of post-planting and post-harvest data. The post-harvest and household data were merged together to obtain the required data for the study. The cleaned data gave 2,807 households. The required data are on crop commercialization, socio-economics and enterprise characteristics of the households. The data on commercialization include different crops produced, quantities of crops produced, quantities of crops sold, quantities given out in kind for labour, quantities paid as rent, quantities consumed, quantities given out as gift, and quantities kept or saved for the following season. Also, the socio-economic characteristics include age, sex, marital status, household size, educational level, geopolitical zone, and enterprise characteristics include ownership of non-agricultural business, access to credit, sector (rural/urban), access to extension, total size of plots held, number of crops planted

2.3 Analytical methods

Data were analysed using descriptive statistics, household crop commercialization index (HCCI) and ordered probit regression model

Descriptive statistics

Descriptive statistics were used to profile the socio-economic and enterprise characteristics of the farmers. They include percentages and mean. Results are presented in frequency distribution tables. Also, descriptive statistics were used to profile the crops grown by farming households by zone (North Central, North East, North West, South East, South South, and South West), and sector (rural and urban) (Objective 1). Various crops grown by farmers were grouped into 7 categories: Legumes, Tubers, Cereals, Sucker, Fibre, Fruits & Vegetables, and Tree crops.

Household Crop Commercialization Index (HCCI)

The extent of crop commercialization was assessed using Household Crop Commercialization Index (HCCI) (Objective 2). Gross quantity of crops produced was obtained from adding together the quantities of crops sold, quantities given out in kind for labour, quantities paid as rent, quantities consumed, quantities given out as gift, and quantities kept or saved for the following season. HCCI measures the ratio of the gross quantities of crop sales in year i to the gross quantities of all crops produced by the household in the same year i expressed as a percentage.

HCCI is given as:

$$HCCI_h \frac{\text{Gross quantity of all crops sold in year i}}{\text{Gross quantity of all crops produced in year i}} = x\ 100$$

$HCCI_h$=Household crop commercialization index for all crop sales

HCCI ranges between 0 and 100

Where HCCI = 100 if household sells all its output - Pure subsistence

HCCI = 0 if household consumes all its output - Full commercial

0%<HCCI<100% = household sells different proportions of its output - Semi-subsistence

The commercialization indices of households were further categorised into 3; low, medium and high levels of commercialization.

Low - 0-33%, Medium - 33-66%, High - 66-100%

Households' level of crop commercialization (low, medium and high) were profiled by significant socio-economic and enterprise characteristics.

Ordered Probit Regression Model

Ordered probit regression was used to analyse the determinants of household crop commercialization (Objective 3). The dependent variable Y* (commercialization level of household) has 3 categories; high, medium and low.

Model specification for the ordered probit regression model is given as:

$$Y=\beta_0+\beta_1X_1+\beta_2X_2+\beta_3 X_3+\beta_4 X_4+\beta_5 X_5+\beta_6X_6+\beta_7X_7+\beta_8 X_8+\beta_9X_9+\beta_{10}X_{10}+\beta_{11}X_{11}+\beta_{12}X_{12}+\varepsilon$$

Y=Level of crop commercialization by households; 1=high, 2=medium, 3=low

The independent variables are the socio-economic and enterprise characteristics of the head of households:

X_1=Age (years)

X_2=Sex (male, female)

X_3=Marital status (never married, married, not married)

X_4=Household size (number of persons)

X_5=Years of education

X_6=Ownership of non-agricultural activities (yes, no)

X_7=Sector (rural, urban)

X_8=Zone (North Central, North East, North West, South East, South South, South West)

X_9=Credit access (yes, no)

X_{10}=Extension access (yes, no)

X_{11}=Number of crops planted

X_{12}=Total size of plot held (3-5 hectares, 5-10 hectares, > 10 hectares)

β_0=Constant term

β_1-β_{12}=Regression coefficients to be estimated;

ε= error term

3 RESULTS AND DISCUSSIONS

3.1 Socio-economic and Enterprise Characteristics of Farming Households' Heads

The Socio-economic characteristics of farming households' heads are presented in Table 1. The mean age of 50.04 years (±15.22) indicates that the farming population in Nigeria are ageing and majority (85.68%) of the farmers were male, implying that farming activities in Nigeria are dominated by men. Those that were married either monogamous or polygamous were (82.51%) and a mean household size of 6.69(±3.72) means that, on the average, there are 7 persons in farmers' households. More than one-quarter (27.86%) of the farmers had no formal education, 37.26% and 24.37% had primary and secondary education, respectively. Meanwhile, only about one-tenth (10.51%) of the farmers had tertiary education. Transition of subsistence to commercial agriculture is enhanced by the level of education of farmers. Involvement of more educated farmers in crop production will increase the activities of farmers at the different nodes of agribusiness. Therefore, low level of education of Nigerian farmers has implications on achieving high level of commercialization in Nigeria. However, farming is viable in all the geopolitical zones of the country. Different crops thrive in different zones of the country, which account for high contribution of agriculture to GDP.

The enterprise characteristics of the farming households' heads are presented in Table 2. About half (50.34%) of the farmers owned non-agricultural business. This implies that Nigerian farmers engaged in non-agricultural businesses, signifying livelihood/income diversification, not only within different nodes of agribusiness, but also into non-agricultural

related businesses. Access to credit by Nigerian farmers is very low as only 15.43% of the farmers were able to source for formal credit. Expectedly, majority (87.64%) of farmers were from the rural sector. Nevertheless, the results underscores the fact that there is urban farming in Nigeria as more than one-tenth (12.36%) of the farmers were from the urban sector. Most (40.33%) of the farmers held total plot size greater than 10 hectares. Higher sizes of land held can translate to higher levels of crop production if farmers put them into productive and efficient use, with appropriate and improved inputs, thereby leading to higher levels of commercialization. Meanwhile, more than one-quarter (29.28%) of the farmers held less than 3 hectares of land, and some held as low as 0.005 hectare. Less than one-quarter (20.24%) of the farmers practiced specialization (planting one crop. Specialization is expected to increase greater experience and expertise in doing, thereby increasing the production of the crops concerned. However, Nigerian farmers planted 3 crops on the average as the highest proportion (68.50%) planted 2 to 4 crops. Crop diversification has been identified to reduce the vulnerability of farming households to harvesting shocks, especially households who depend on rain-fed agriculture. Higher levels of crop production is expected to increase the level of commercialization of crops by households.

Table 1: Socio-economic characteristics of farming households' heads in Nigeria

Socio-economic characteristics	Frequency (n=2,807)	Percentage
Age		
≤ 30	285	10.15
31-60	1,865	66.44
>60	657	23.41
Min 17, Max 130		
Mean 50.04(±15.22)		
Sex		
Male	2,405	85.68
Female	402	14.32
Marital status		
Married	2,316	82.51
Not married	414	14.75
Never Married	77	2.74
Household size		
1-5	1,197	42.64
6-10	1,215	43.28
>10	395	14.08
Min 1, Max 33		
Mean 6.69(±3.72)		
Level of education		
No formal education	782	27.86
Primary education	1,046	37.26
Secondary education	684	24.37
Tertiary education	295	10.51
Geopolitical zone		
North Central	493	17.56
North East	646	23.02
North West	606	21.59
South East	516	18.38
South South	358	12.75
South West	188	6.70

Source: Computed from Nigeria GHS Data, 2021

Table 2: Enterprise characteristics of farming households' heads in Nigeria

Enterprise characteristics	Frequency n=2,807	Percentage
Ownership of non-agricultural business	1,413	50.34
Access to credit	433	15.43
Access to extension service	460	16.39
Sector		
Urban	347	12.36
Rural	2,460	87.64
Total plot held (hectares)		
≤ 3	822	29.28
3.01-5.0	316	11.26
5.01-10.0	537	19.13
>10.0	1,132	40.33
Min 0.005, Max 175.49		
Mean 12.61(±15.63)		
Number of crops planted		
1	568	20.24
2-4	1,923	68.50
5-8	308	10.97
>8	8	0.29
Min 1, Max 12		
Mean 2.76 (±1.46)		

Source: Computed from Nigeria GHS Data, 2021

3.2 Crops grown by farming households (by zone and sector)

The vast arable land in Nigeria makes it suitable to plant many food and cash crops. Table 3 shows the various categories of crops grown in Nigeria (by zone and sector). The most produced crop category is cereals (46.75%), followed by tubers (20.70%) and legumes (19.00%). Other categories of crops; sucker, fibre, fruits & vegetables and trees, are produced in smaller proportions (less than 10%). The major categories of crops grown in Nigeria are cereals, tubers and legumes; these crops are consumed by humans and also of great use in the livestock subsector. Greater levels of production of all the crop categories, especially with specialization, are expected to enhance crop commercialization in Nigeria.

From these 3 main categories of crops, the highest proportions of crops produced in the North (North Central, North East and North West) are legumes and cereals, while the highest proportions of crops produced in the South (South East, South South and South West) are tubers. Sanusi and Salimonu (2006) confirmed the high production of yam in Oyo state, Southwest Nigeria. Also, greater proportions of tree crops, and fruits & vegetables are produced in the South while the least category of crops produced in Nigeria is fibre (0.38%). Before the advent of oil, cereals and legumes (groundnut) were found in the North while tree crops such as cocoa were found in the South for exports. Also, all the crops, except fibre, are produced both in the rural and urban sectors though cereals and legumes are more produced in the rural sector.

According to Olayide et al. (2011), Nigeria used to boast of high surplus in agricultural trade and food self-sufficiency, especially in the 1960s. Today, Nigeria has lost the leading position it once occupied as it is now a major importer of food

Table 3: Categories of crops grown in Nigeria

Variable	Crop Categories (%)						
	Legumes	**Tubers**	**Cereals**	**Sucker**	**Fibre**	**Fruit &Veg**	**Tree**
Zone							
North Central	15.85	27.60	47.92	1.04	0.24	6.18	1.16
North East	33.79	1.17	63.20	0.19	0.24	1.22	0.19
North West	22.91	2.37	67.88	0.00	0.95	5.85	0.05
South East	12.06	34.00	28.86	4.20	0.06	13.90	6.92
South South	9.47	51.75	16.46	8.79	0.68	10.03	2.82
South West	0.30	41.13	18.78	6.56	0.00	9.84	23.40
Total	19.00	20.70	46.75	2.42	0.38	7.09	3.65
Pearson chi2(30) = 4.1e+03 Pr = 0.000							
Sector							
Urban	11.22	31.16	37.69	3.18	0.00	8.88	7.87
Rural	20.21	19.07	48.16	2.30	0.44	6.81	3.00
Total	19.00	20.70	46.75	2.42	0.38	7.09	3.65
Pearson chi2(6) = 223.0187 Pr = 0.000							

Source: Computed from Nigeria GHS Data, 2021

Examples of crops in different categories:

Legumes: *Beans, Melon, Groundnut/Peanuts;* ***Tubers:*** *Sweet Potato, Cassava, Cocoyam, Yam* ***Cereals:*** *Wheat, Rice, Sorghum, Maize, Millet, Soya beans;* ***Sucker:*** *Plantain, Banana;* ***Fibre:*** *Cotton;* ***Fruits & Vegetables:*** *Agbono, Pumpkin Leave, Pineapple, Water Melon, Pepper;* ***Tree:*** *Rubber, Oil Palm, Tangerine, Coconut, Cocoa, Cashew, Orange, Kolanut, Mango*

and agricultural commodities. Nigeria now spends billions of naira on importation of food and agricultural products. This situation is paradoxical as Nigeria is well-endowed with the requisite natural and human resources needed to be food self-sufficient. Besides, most governments are adjudged as successful or failed on the basis of meeting the basic needs of their citizens in terms of food.

3.3 Level of Crop Commercialization by Households in Nigeria

The extent of crop commercialization by Nigerian farming households are presented in Table 4. Household commercialization index (HCCI) ranges between 0 and 100%. The households are grouped into 3 categories on the basis of the results.

Subsistence: The subsistence households are those with HCCI of 0. They are non-commercial. This implies that they do not sell any part of the crop produce. They produce mainly for household consumption. This group can include those that go into crop production to augment household food provision. Production at this level will not boost agribusiness in Nigeria. This group makes 32.81% of the households. This is quite high, considering the efforts of the Federal Government of Nigeria in making agribusiness one of the means of diversification of the economy.

Commercial: The households that are fully commercial (HCCI =100). This is perfect market orientation where all the crop production is meant for the market. Profit is very important to the commercial farming households as they use improved inputs on the farm. Only 1.71% of the households are fully commercial. More commercial farming activities are necessary to make more crop produce available for local consumption, as well as for exports. The goals of Nigeria's agricultural development policy is to ensure that the nation produces enough food and becomes less dependent on importation so as to ensure adequate and affordable food for all.

Semi-subsistence: Households within the continuum of subsistence and full commercial crop production ($0 \leq HCCI \leq 100$). They can also be called semi-commercial. They produce for households and put the rest to the market; marketable surplus. This group of households, that is, the semi-subsistence constitutes 65.48%. Semi-subsistence farmers aim at food self-sufficiency, crop diversification and monetary income. The category of semi-subsistence farmers empbasize agricultural commercialization as agricultural transformation process whereby farmers graduate from mainly consumption-oriented subsistence production towards market and profit oriented production systems. Rohana and Bandara (2010) explained that high proportions of marketable surpluses indicate greater market orientation of the producers; lesser proportions of surpluses mean that the producers are more subsistence-oriented.

The results imply that Nigeria depends more on the marketable surplus of the semi-subsistence households to feed her teeming population. This stresses the fact that increase in food availability will be achieved by the greater orientation of the households towards market. This will also increase the activities of the households at all agribusiness nodes. Martey et al. (2012) emphasized that smallholder agriculture contributes greatly to national income, employment, foods and nutrition in Nigeria. According to Alawode et al. (2018), commercialization is characterized by expansion in sales of output (marketable surplus) which raises cash earnings of farming households in their small-scale agricultural enterprises (agribusiness).

The proportion of the semi-subsistence households show why Nigerian farmers diversify in crop production. This

reduces their vulnerability to risks and shocks. Nigeria has the potentials to be food self-sufficient by the re-orientation of the agricultural sector and proper repositioning of the semi-subsistence farmers who are the providers of food for the non-farming population in Nigeria. Ahmed and Murtala (2013) emphasized that higher levels of commercialization enhances food security in Nigeria.

Table 4: Extent of Crop commercialization by farming households in Nigeria

HCCI (0≤HCCI≤100)	Frequency n=2,807	Percentage
0	921	32.81
≤ 25.0	541	19.27
24.01-50.0	676	24.08
50.01-75.0	402	14.32
75.01-99.9	219	7.81
100	48	1.71
Min 0, Max 100		
Mean 29.9(±29.3)		

Source: Computed from Nigeria GHS Data, 2021

Household crop commercialization was further categorised into low (<33%), medium (33-66%) and high (66-100%). The results are presented in Table 5. More than half (58.25%) of the households were in the low category, about one-quarter (26.26%) were in the medium category while 15.50% were in the high level. Going by FAO (1989) grouping of farmers into three different categories based on the marketable surplus as a percentage of total production, those in the low commercialization category can be classified as subsistence households, those in the medium commercialization category as transition households and those in the high commercialization category as commercial households.

Table 5: Level of crop commercialization by farming households in Nigeria

HCCI (0≤HCCI≤100)	Frequency n=2,807	Percentage
Low	1,635	58.25
Medium	737	26.26
High	435	15.50

Source: Computed from Nigeria GHS Data, 2021

Socio-economic characteristics and level of crop commercialization

The results of the significant relationships between socio-economic characteristics and levels of commercialization are presented in Table 6.

The relationship between age and level of commercialization was significant at 1%. The highest proportion of farmers (60.64%) within the age of 31-60 years were found in the low commercialization category. This could be due to the fact they are the group in the active family years, implying they produced more for households consumption.

Significant at 5%, the relationship between marital status shows that the highest percentage (59.46%) of those that were married were in the low commercialization category. This could be based on the responsibility of providing food for the household members, especially in the polygamous setting with large household sizes and high number of dependents. Those that were never married (57.14%), found in the low commercialization category, could have dependents that they catered for.

The relationship between household size and level of crop commercialization was significant at 1%. The highest proportion (19.80%) of households of 1-5 members were found in the high commercialization category while the highest proportion (67.85%) of those with household members greater than 10 were found in the low commercialization category. Larger household sizes, especially with more dependents, translate to lower levels of commercialization.

Geopolitical zones in Nigeria and level of crop commercialization had significant relationship at 1%. The highest proportion of households in the low commercialization category (75.85%) were in the North East, followed by North West (68.32%) and North Central (54.16%). This implies that there is low level of crop commercialization in the North than South. In essence, legumes and cereals, which are most produced in the North (Table 3) are used more to provide for households.

This implies that Nigeria can pay greater attention to the North to improve the production of legumes and cereals for higher levels of commercialization. Also, medium and high levels of commercialization in tubers (Table 3) and other categories of crops in the South can be improved to enhance overall crop commercialization in Nigeria.

Table 6: Socio-economic characteristics and level of crop commercialization

Socio-economic Variable	Commercialization Level		
	Low	Medium	High
Age			
≤ 30	156 (54.74)	82 (28.77)	47 (16.49)
31-60	1,131 (60.64)	462 (24.77)	272 (14.58)
>60	348 (52.97)	193 (29.38)	116 (17.66)
Pearson chi2(4) = 13.4321 Pr = 0.009			
Marital status			
Married	1,377 (59.46)	602 (25.99)	337 (14.55)
Not married	214 (51.69)	117 (28.26)	83 (20.05)
Never Married	44 (57.14)	18 (23.38)	15 (19.48)
Pearson chi2(4) = 12.2502 Pr = 0.016			
Household size			
1-5	629 (52.55)	331 (27.65)	237 (19.80)
6-10	738 (60.74)	317 (26.09)	160 (13.17)
>10	268 (67.85)	89 (22.53)	38 (9.62)
Pearson chi2(4) = 44.5627 Pr = 0.000			
Zone			
North Central	267 (54.16)	162 (32.86)	64 (12.98)
North East	490 (75.85)	127 (19.66)	29 (4.49)
North West	414 (68.32)	151 (24.92)	41(6.77)
South East	261 (50.58)	162 (31.40)	93 (18.02)
South South	160 (44.69)	87 (24.30)	111 (31.01)
South West	43 (22.87)	48 (25.53)	97 (51.60)
Pearson chi2(10) = 426.3909 Pr = 0.000			

Source: Computed from Nigeria GHS Data, 2021

Figures in parentheses are percentages

Enterprise characteristics and level of crop commercialization

The results on enterprise characteristics and their significant relationship with levels of commercialization are presented in Table 7

Ownership of non-agricultural business and level of crop commercialization had significant relationship at 10%, higher proportion (16.86%) of households without non-agricultural business were found in the high commercialization category than those with non-agricultural business (14.15%). Also, at 1% level of significance, farmers who had access to credit had higher proportions in high (20.09%) and medium (29.79%) commercialization categories, while those without access to credit had higher proportion (59.73%) in the low commercialization category. These imply that access to credit improves commercialization.

At 1% level of significance, those in the rural sector had higher proportion (59.11%) in the low commercialization category, while those in the urban sector had higher proportion (24.78%) in the high commercialization category. Also, at 1%, households who held more than 10 hectares had the highest proportion (63.34%) in the low commercialization category, those that held 3-5 hectares (24.05%) had the highest proportion in the high commercialization category. The means of acquisition of land could be paramount here as those that acquired land through transaction to pay rent, often utilise land better to yield more income than those without obligation to pay rent on their land.

The number of crops planted had significant relationship with level of commercialization at 1%. From the results, the households who practiced specialization, that is, planting of 1 crop had the highest proportion (28.87%) under the high commercialization category while those who planted between 5-8 crops had the highest proportion under the low commercialization category. Surprisingly, those who planted more than 8 crops had the highest proportion under the medium commercialization level.

Table 7: Enterprise characteristics and level of crop commercialization

Enterprise characteristics	Commercialization Level		
	Low	Medium	High
Ownership of non-agricultural business			
Yes	822 (58.17)	391 (27.67)	200 (14.15)
No	813 (58.32)	346 (24.82)	235 (16.86)
Pearson chi2(2) = 5.4849 Pr = 0.064			
Access to credit			
Yes	217 (50.12)	129 (29.79)	87 (20.09)
No	1,418 (59.73)	608 (25.61)	348 (14.66)
Pearson chi2(2) = 15.2275 Pr = 0.000			
Sector			
Urban	181 (52.16)	80 (23.05)	86 (24.78)
Rural	1,454 (59.11)	657 (26.71)	349 (14.19)
Pearson chi2(2) = 26.0988 Pr = 0.000			
Total plot held (hectares)			
< 3	454 (55.23)	215 (26.16)	153 (18.61)
3.01-5.0	154 (48.73)	86 (27.22)	76 (24.05)
5.01-10.0	310 (57.73)	148 (27.56)	79 (14.71)
>10.0	717 (63.34)	288 (25.44)	127 (11.22)
Pearson chi2(6) = 45.6566 Pr = 0.000			
Number of crops planted			
1	332 (58.45)	72 (12.68)	164(28.87)
2-4	1,117 (58.09)	559 (29.07)	247 (12.84)
5-8	185 (60.06)	101 (32.79)	22 (7.14)
>8	1 (12.50)	5 (62.50)	2 (25.00)
Pearson chi2(6) = 146.4145 Pr = 0.000			

Source: Computed from Nigeria GHS Data, 2021

Figures in parentheses are percentages

3.4 Determinants of Household Crop Commercialization

The results of the ordered probit regression on the determinants of household crop commercialization are presented in Table 8. The model is significant at 1%. The socio-economic and enterprise characteristics that were found to significantly affect household crop commercialization are discussed in this section. The factors are categorised into two; the constraints and drivers of household crop commercialization in Nigeria.

Constraints to Household Crop Commercialization

Age was found to negatively affect household commercialization level at 5% level of significance. This implies that as the age of the farmer increases, his commercialization level becomes lower. Increase in farmer's age by 1 year reduces the probability of high commercialization by 0.17%. Older farmers may not be able to cope with rigours of farming, thereby reducing their levels of crop production and their levels of commercialization.

Significant at 10%, household size was found to influence commercialization level negatively. The higher the household size, the lower the probability of household being in the high commercialization level. Increase in household size by 1 person reduces the probability of household being at high commercialization level by 0.53%. Increase in household size, especially of dependents, increases the quantity of produce consumed by the household members, making the household to tend more towards subsistence, rather than commercial agriculture.

The number of years spent in school reduces the level of commercialization. From Table 1, only 10.51% of the farmers had tertiary education. This means that young elites in Nigeria are not much attracted to farming. Those involved are probably part of those that are into farming to augment family income, so they are part of those who owned non-agricultural businesses. From Table 8, 1 more year of education translated to 0.54% reduction in probability of commercialization at 5% level of significance. This is in line with the findings of Aderemi et al. (2014), who found that as the level of education increased, there was a significant decrease in the level of commercialization.

The North East and North West zones in Nigeria have negative effects on crop commercialization, at 1% level of significance. Crop production in the North East and North West zones reduce the probability of commercialization by 18.4% and 12.8% respectively. From Table 3, legumes and cereals are produced more from the North and they are also more subsistent. This could be explained by the security crisis

in the North, leading to disruption of farming activities so that households feed from whatever they are able to produce or source from others, while some households could not produce at all, having fled their homes, for fear of attacks and untimely death by kidnappers and bandits.

Age, household size, years of education, and North zones are the constraints to household crop commercialization in Nigeria.

Drivers of Household Crop Commercialization

Although crop production takes place in the rural and urban sectors in Nigeria (Table 3), the rural sector showed a significant positive effect on crop commercialization at 5%, when compared with the urban sector. Although, according to Table 7, higher proportion of farming households in the urban sector are in the high commercialization level, the results that rural sector significantly and positively influence commercialization in Table 8 could be so because more Nigerian farmers (87.64%) are found in the rural sector (Table 2). Greater involvement of farming households in crop production in the rural sector will increase the probability of commercialization by 5.9%. This implies that promoting crop production among farming households in the rural sector will increase the level of marketable surplus, thereby increasing commercialization.

All the South geopolitical zones in Nigeria positively affect crop commercialization in Nigeria at 1% level of significance. Crop production in the South West, South South and South East increase the probability of commercialization by 31.8%, 12.5% and 11.4%, respectively. This could be explained by the relative peace enjoyed in the South. This implies that the South, especially, the South West drives commercialization in Nigeria. Findings of Alawode et al. (2018) showed that the zone driving commercialization in Nigeria is the South West. Since tubers, fruits & vegetables, suckers and tree crops are found more in the South (Table 3), commercialization of these categories of crops can be greatly increased. FAO, (2019) pointed out that Nigeria is the sixth largest producer of cocoa beans and the fifth largest producer of plantain in the world in 2017.

The different categories of plot sizes held had positive effect on the level of commercialization by households. This shows that increased landholding increases the level of crop commercialization significantly at 1%. Whatever the category of land held, high level of commercialization is enhanced. This can be explained by the fact that most (65.48%) of the farming households in Nigeria are semi-subsistence (Table 4). More responsive use of land with improved inputs will increase crop production and enhance commercialization. Holding more land for cultivation translates to about 15% increase in the probability of commercialization by households. The result is in line with the findings of Aderemi et al. (2014) that increased landholding significantly increases the level of commercialization.

The rural sector, the South zones (especially the South West), and the total size of plots held, are the drivers of crop commercialization in Nigeria.

4. CONCLUSIONS

Nigerian farmers are mainly semi-subsistence, diversified in crop production, and producing different categories of crops. Nigeria relies more on market participation of the semi-subsistence households through their marketable surplus to

Table 8: Determinants of Household Crop Commercialization in Nigeria

HCCI	Marginal effect	Coefficient	Standard error	z	P>|z|
Age	-0.001660**	-0.001660	0.0006969	-2.38	0.017
Sex (female)	-0.072164	-0.072164	0.0467887	-1.54	0.123
Marital status					
Not married	0.059804	0.059804	0.0474920	1.26	0.208
Never married	0.003444	0.003444	0.0496137	0.07	0.945
Household size	-0.005348*	-0.005348	0.0027811	-1.92	0.055
Years of education	-0.005451**	-0.005451	0.0024623	-2.21	0.027
Ownership of non-agric. activities	0.012227	0.012227	0.0184414	0.66	0.507
Sector (rural)	0.059121**	0.059121	0.0273824	2.16	0.031
Zone					
North East	-0.184448***	-0.184448	0.0296504	-6.22	0.000
North West	-0.127543***	-0.127543	0.0310659	-4.11	0.000
South East	0.113844***	0.113844	0.0349513	3.26	0.001
South South	0.124644***	0.124644	0.0345320	3.61	0.000
South West	0.318023***	0.318023	0.0414338	7.68	0.000
Credit access (yes)	0.057146**	0.057146	0.0230412	2.48	0.013
Extension access (yes)	0.016578	0.016580	0.0234913	0.71	0.480
Number of crops planted	0.033288	0.033288	0.0255091	1.30	0.192
Total size of plot held (ha)					
3-5 hectares	0.126217***	0.126217	0.0306009	4.12	0.000
5-10 hectares	0.099969***	0.099969	0.0288228	3.47	0.001
> 10 hectares	0.154861***	0.154861	0.0274848	5.63	0.000
Constant		0.196318	0.0659695	2.98	0.003

Source: Computed from Nigeria GHS Data, 2021

*LR chi2(19) = 255.79, Prob > chi2 = 0.0000, Log likelihood = -1176.5277, Pseudo R2 = 0.0980 ***, **, * significant at 1%, 5% and 10% respectively*

feed her teeming population and for exports. There is low level of crop commercialization in the North than South. Age, household size, years of education, and crop production in North zones constrain household crop commercialization in Nigeria. This means that young elites in Nigeria are not much attracted to farming. The rural sector, crop production in the South zones (especially, the South West), and the total size of plots held, are the drivers of crop commercialization in Nigeria.

Further attention should be given to rural infrastructure development in all geopolitical zones; rural institution capacities building and awareness creation on producing market oriented products, thereby encouraging crop commercialization and increasing agribusiness activities. This will generate green decent jobs that will take unemployed youths off the streets of urban centres. This is in tune with the economy diversification bid and the new Nigeria Economic Sustainability Plan of the Federal Government of Nigeria. Also, increasing the landholding of households with small holdings requires land reforms that will allocate land to more efficient crop producing households. However, monitoring the production activities of the farming households towards market orientation will increase crop production and commercialization by improving the level of marketable surplus of the many semi-subsistence farmers in Nigeria.

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