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DRIVERS OF MARKET-ORIENTED LAND USE DECISIONS AMONG FARM HOUSEHOLDS IN NIGERIA

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ACRONYMS

APRA	Agricultural Policy Research in Africa
ATA	Agricultural Transformation Agenda
C	contingency
CADP	Commercial Agriculture Development Project
CCI	Crop Commercialisation Index
FRM	Fractional Response Model
OLS	Ordinary Least Squares
MOI	Market Orientation Index
MSF	medium-scale farm
MSFH	medium-scale farm household
SSF	small-scale farm
SSFH	small-scale farm household
TLU	tropical livestock unit
VIF	Variance Inflation Factor

EXECUTIVE SUMMARY

Agricultural commercialisation is a process that involves the transformation of agriculture from subsistence to market-oriented production in a way that substantially impacts income, consumption and nutrition of farm households. In recent times, the Nigerian Government has devised strategies aimed at intensifying smallholder transformation for enhanced food security, employment creation and poverty reduction. However, despite these efforts, the process of agricultural commercialisation in Nigeria has not progressed as fast as expected. Consequently, this study examines agricultural commercialisation in Nigeria with the aim of establishing factors that are constraining commercialisation and identifying potential policy levers that can be used to fast-track the process. The study adopts the concept of market orientation as the measure of the level of agricultural commercialisation. It investigates key policy-related factors that could influence the decisions of small-scale farm households (SSFHs) and medium-scale farm households (MSFHs) on land allocation to crops produced for sale. The study uses survey data collected from 1,099 small-scale and 1,008 medium-scale farmers from Ogun and Kaduna states in 2019. The survey was conducted by the Agricultural Policy Research in Africa (APRA) programme. Using the Fractional Response Model (FRM), major factors that influence farm households' market orientations were identified. The study findings support the following conclusions:

- Larger farms tend to allocate a greater proportion of their farmland to crop production for sale, relative to smaller farms. This implies that putting in place policies that encourage the growth of medium-scale farms (MSFs), especially by facilitating processes through which smallholders *step up* into medium-scale farming, could potentially enhance agricultural commercialisation in Nigeria.
- Market orientation, and by implication crop commercialisation, is enhanced by improved access to land markets, hired labour, agro-input markets, extension services, and physical infrastructure, such as all-weather roads. Thus, policies aimed at improving farm households' access to inputs and outputs markets are important drivers of agricultural commercialisation.
- These drivers of market-orientation were found to have stronger marginal effects on MSFHs as opposed to SSFHs. This implies that MSFs are potentially more responsive to policies addressing the identified drivers. Consequently, the identified policy thrusts may promote increased land allocation to market-oriented crops and by extension enhanced agricultural commercialisation in Nigeria.

Keywords: *farm households, crop commercialisation, market orientation, land allocation decisions*

1 INTRODUCTION

Agricultural commercialisation is a process that involves the transformation of agriculture from subsistence to market-oriented production (Goletti 2005) in a way that substantially impacts income, consumption and nutrition of farm households. Specifically, it involves the transformation of the decision-making processes of subsistence farmers with regard to product and input choices based on the principle of profit maximisation (Pingali and Rosegrant 1995). The agricultural commercialisation process is characterised by increasing engagement of farmers with the market, either to procure inputs or to sell farm produce.

'Smallholder commercialisation' refers to the process in which farmers intensify their use of productivity-enhancing technologies on their farms, achieve greater output per unit of land and labour expended, produce greater farm surpluses, expand their participation in markets, and ultimately raise their incomes and living standards. Smallholder commercialisation is a crucial feature of the structural transformation process considered by most development economists to be the major pathway from a semi-subsistence agrarian society to a more diversified and food-secure economy with higher general living standards (Rajni 2016).

In this process of structural transformation, millions of commercialised small farmers recycle increased cash earnings through the economy, thereby stimulating demand and employment growth in non-farm sectors. This in turn results in rising demand for food and other farm products, which could become a major pull for new investment inflow into the agricultural sector from the non-farm sector (referred to by APRA as '*stepping in*'). As the demand for non-farm goods and services rise, the labour force responds by shifting gradually from farm to non-farm sectors, resulting in increased demand for education and job skills. As the process continues, some farmers are encouraged to '*step out*' of the farm into viable non-farm activities to provide a reasonable standard of living, while others would '*step up*' by consolidating or enlarging their scale of farming operations. It can be said, therefore, that the starting point of any structural transformation in Africa's agri-food system would be broad-based smallholder-led agricultural commercialisation.

Agricultural commercialisation and smallholder transformation has, in recent times, become a key policy focus/strategy for achieving food security, poverty reduction, and employment in Africa. For example, since 2008, the Federal Government of Nigeria has promoted increasing commercialisation of agricultural production through different schemes, policies and programmes. Prominent among these are the Commercial Agriculture Development Project (CADP) and the Agricultural Transformation Agenda (ATA). CADP (2009-2017) was a World Bank-funded scheme, run by the Federal Ministry of Agriculture and Rural Development, which was aimed at strengthening agricultural production systems for targeted value chains among small- and medium-scale commercial farmers in five states: Cross River, Enugu, Kaduna, Kano and Lagos. The total number of beneficiaries projected to directly participate in the project over a period of five years was estimated at 50,000 (10,000 per state). Small and medium commercial farms were to benefit directly, while households were expected to benefit indirectly through access to roads, energy and markets. The project – which had a total budget of US$179 million – was comprehensive in scope and involved multiple overlapping components that were all aimed at increasing agricultural commercialisation. The components included: capacity building of farmers, facilitation of access to markets, promotion of commercialisation technology for farms, provision of capital, and development of road and electricity infrastructure.

ATA, which was vigorously implemented by the Federal Government of Nigeria between 2011-2015, was also a development strategy premised on the philosophy that agriculture is a business or commercial enterprise, rather than a development project. The ATA programmes and projects focused on increasing famers' access to productive inputs and agribusiness finance, creating stronger linkages along selected agricultural value chains, and development of product markets. The ultimate goal was to increase farm household incomes, increase food security, reduce poverty, and create jobs through a transformed agricultural sector that operated as if agriculture were a commercial enterprise.

Despite these efforts, the process of smallholder transformation and agricultural commercialisation in Nigeria has not progressed as fast as expected. Consequently, it has become important to investigate the factors that are potential drivers or constraints of this process, to gain a better insight into policies that would be able to further enhance the process of agricultural commercialisation in Nigeria.

'Market orientation' of farmers is an important measure of the level of agricultural commercialisation and is different from output market participation as a measure of commercialisation. Market-oriented agricultural production is considered a viable option to ensure sustainable food security and welfare (Pingali 1997), and has been promoted by policymakers with the expectation that it could raise household income and increase productivity of food crops due to increased input use (Ntakyo and Van den Berg 2019). Market-oriented agricultural production is measured by an index called the Market Orientation Index (MOI) which is a household level measure of the share of total farmland a household allocates to the cultivation of crops for sale. Thus, this measure does not only focus on output market participation as the household Crop Commercialisation Index (CCI) does, but also incorporates decisions on land allocation by farmers.

Unlike the CCI, the MOI measure of agricultural commercialisation takes account of production constraints that farmers face in producing crops for the market, such as the high cost and poor availability and quality of inputs, high transportation costs, crop perishability, inadequate market infrastructure, unreliable market information, etc. Household CCI, which was introduced by Strasberg *et al.* (1999) and Govereth, Jayne and Nyoro (1999), is represented by a continuum ranging from pure subsistence (CCI = 0) to a completely commercialised production system (CCI = 100) and has the main advantage of going beyond the traditional dichotomies of sellers versus non-sellers, or between staple and cash crop producers.

This study investigates the market orientation of farm households in Nigeria. Specifically, we determine the crop commercialisation levels of farm households by scale of operation; assess the extent to which farm households are market oriented across selected locations and by scale of operation, and identify the major factors that drive market orientation of farm households in Nigeria, with particular emphasis on access variables, with a view to identifying strategies for enhancing market orientation in land allocation decisions among SSFHs and MSFHs.

Several studies have investigated agricultural commercialisation through the use of CCI (Jaleta, Gebremedhin and Hoekstra 2009; Otieno *et al.* 2009; von Braun and Immink 1994), but very few have used the concept of MOI to assess the level of agricultural commercialisation of farmers in Nigeria (Osmani and Hossain 2016; Tefera 2014; Adenegan, Olorunsomo and Nwauwa 2013; Gebremedhin and Jaleta 2012; Wolday, 1994). These few existing studies have modelled MOI as a function of different independent variables and analysed them using different econometric models. Apart from adding to the scanty literature on the use of MOI as a measure of agricultural commercialisation, this study is unique in several other ways. First, we use a sample of farmers that extends beyond the traditional smallholder farm size range of less than 5ha, which most of the previous studies have used. The range of farm sizes used in this study is between 0 and 60ha. Second, is that none of the previous studies has utilised FRM to model market orientation among farmers, which this study has. Most of the previous studies have used Ordinary Least Squares (OLS) or Tobit models. Third, is that this study uses a broad sample of farmers which cut across several commodity groups, as against previous studies that examined narrowly-defined populations such as smallholder pulse farmers, smallholder root and tuber crop farmers, or smallholder grain crop farmers. Finally, this study compares the market orientation behaviour of famers across geological zones and scales of operation.

2 THEORETICAL FRAMEWORK AND LITERATURE REVIEW

2.1 The concept and measurement of market orientation

Market access is crucial for smallholder farmers to increase their incomes, improve their livelihoods, and contribute to local economic development (Barham and Chitemi 2009). Smallholder farmers are equipped with few assets and often have limited access to credit, to upgrade production systems and explore new markets (Wiggins, Kirsten and Llambí 2010). These farmers face many constraints that hinder them from taking advantage of market opportunities (Barrett 2008). They are constrained in what they can produce, and are confronted with limited marketing opportunities, limited ability to diversify into new crops, and limited negotiation power.

The concept of market orientation in agriculture is a common phrase in developing and transition economy policy discussions and literature (Leavy and Poulton 2007; Berhanu, Hoekstra and Azage 2006). Often, the transformation of the subsistence sector to the market-oriented agribusiness model is seen as the key for development in Sub-Saharan Africa (Berhanu, Hoekstra and Azage, 2006). Market orientation in agriculture measures the degree of the allocation of resources (land, labour and capital) to the production of agricultural produce that are meant for exchange or sale (Immink and Aarcon 1993; Hinderink and Sterkenburg, 1987).

Market orientation is influenced by factors related to household and household-head characteristics, ownership of livestock as an alternative source of cash income, production and market access factors, and institutional support services. Market oriented small- and medium-scale farmers produce commodities that can be marketed in a planned way using market signals such as prices (Gebremedhin and Jaleta 2012; Goshu, Kassa and Ketema 2012).

The farm household's *i* MOI (MOI_i) is given in Equation 1, as used by Gebremedhin and Jaleta (2012) and Mekie *et al.* (2019). It is computed from the land allocation pattern of the household, weighted by the marketability index of each crop. The CCI is used to determine the proportion of the total amount of each crop produced for sale, as used by Abafita, Atkinson and Kim (2016); Osmani and Hossain (2016); Degye, Belay and Mengistu (2013). Thus MOI as a measure of commercialisation does not only consider the output market but also the factors that determine household land allocation patterns to various crops. It is assumed that a more commercialised and profit-oriented farmer will allocate more land to marketable crops among the crops cultivated.

$$MOI_i = \frac{\sum_{j=1}^{J} CCI_j \times L_{ji}}{L_i^T};\ L_i^T > 0 \quad \text{and } 0 < MOI_i \leq 1 \qquad (1)$$

Where

$$CCI_j = \frac{\sum_{i=1}^{N} X_{ji}}{\sum_{i=1}^{N} Y_{ji}};\ Y_{ji} > X_{ji} \quad \text{and } 0 \leq CCI_{ji} \leq 1 \qquad (2)$$

The CCI is used to determine the proportion of the total amount of a crop that is sold to market. The household CCI of j^{th} crop is denoted by CCI_j. This is the proportion of the value of crop *j* sold (X_{ji}) compared to the total value produced (Y_{ji}), and aggregated over all households in a farming system. This household CCI (CCI_j) ranges from 0 to 1, where a value close to 0 indicates that subsistence crops are mainly produced for home consumption, while a value closer to 1 indicates that commercial crops are mainly produced for the market.

L_{ji} in Equation 1 is the amount of land allocated to produce crop *j* by i^{th} farm household and L^T_i is the total crop land operated by i^{th} the farm household in the production year under consideration. The value MOI_i of ranges from 0 to 1, where a market-oriented household will have a value of closer to one, which indicates that the household allocates a higher proportion of its total land to crops produced for sale.

2.2 Factors affecting market orientation: theoretical underpinning

This study models MOI as a function of several explanatory variables, some of which are 'policy related' and others are merely 'control variables'. The choice of independent variables for the estimated MOI model

is based on a combination of economic theory and empirical literature. Market orientation in agriculture is basically a production decision, influenced both by production conditions and market signals (Berhanu and Moti 2010). Two broad categories of factors could hypothetically affect agricultural commercialisation or market orientation of farm households. These are demand-side factors and supply-side factors.

2.2.1 Demand-side factors

Demand-side factors include prices and access to markets. Higher prices and better access to market would encourage commercialisation. Higher prices are an incentive to produce and market more, and could sometimes be the direct result of government policy action. For example, the state could offer to buy up crops at a guaranteed price, often set equally across the country.

The second demand-side factor is better market access, which could result in increased farm income through opportunities for higher farm gate prices, higher sales volume and reduced postharvest handling loses. Product market failure that is characterised by 'high transaction costs' could lower the market orientation for farm households. Increased market access can come through improved transport infrastructure such as roads and the resulting reduction in costs of transportation. This reduction in transportation costs could in turn result in higher prices being offered by traders at the farm gate. Variables such as distance to product markets, quality of farm roads, ownership of transportation by households, point of product sales (on-farm/farm gate or distant market), on-farm processing capacity, and on-farm storage capacity could serve as proxies for market access. This study specifically investigates the influence of demand-side market access variables such as access to traders with heavy carriage vehicles, established product markets, and all-weather roads.

2.2.2 Supply-side factors

The major supply-side factors that could potentially drive agricultural commercialisation or market orientation include access to technical advances, scale of operation, input market access, land tenure security, and some household-level characteristics. Access to information and knowledge on the use of technical advances that can help enhance productivity, through extension services, could potentially increase market orientation. Uptake of these technology packages could sometimes be more easily taken advantage of by larger-scale farms compared with smallholder farms due to easier access to credit and information. This implies that scale of operation could potentially influence market orientation. Access to farm inputs and farm machinery services could also increase market orientation by easing land preparation and increasing labour productivity. Increased access to labour markets is also expected to increase market orientation of farm households since payments made for labour must be retrieved through the sale of crops in the market. If rural markets fail in terms of insecure land rights, market orientation of farm households could be negatively affected. For example, if land ownership rights are not secured, farmers are less likely to plant permanent crops, which are mostly cash crops with a very high CCI. Important household characteristics that could exact supply-side influence on market orientation include off-farm income opportunities, education, age and marital status of household head, household size and whether a farmer is indigenous to the community where the farm is located.

This study is particularly interested in investigating the influence of supply-side access variables such as access to land markets, agro-dealers, hired labour and extension services on farm households' market orientation.

2.3 Review of empirical literature on drivers of market orientation

A number of studies have empirically investigated the factors that could potentially influence market orientation among smallholder farmers. Table 2.1 presents a list and brief comparison of these studies.

As shown in Table 2.1, Gebremedhin and Jaleta (2012), working with data from Ethiopia, modelled household-level MOI as a function of household and household-head characteristics (age, sex, literacy of household head, and household size); household endowment of crop production factors (labour supply, access to land and farm equipment); ownership of livestock; access to markets and roads and ownership of transport equine (distance to nearest market and nearest all-weather road, ownership of equine); access to institutional services (extension and credit); agro-ecological factors affecting production (rainfall and altitude); and land fragmentation. All of this data was analysed using the OLS model since the dependent variable is continuous. The results of this study show that household size, labour supply, ownership of horses, access to all-weather roads and extension services, rainfall, altitude, and land fragmentation significantly influenced household market orientation in the study area.

Similarly, using the OLS regression technique, Onubuogu and Onyeneke (2012) modelled market orientation of root and tuber crop farmers as a function of seven determinants: farmer's household size, farmer's age, contacts with extension agents, farmer's income, level of education, membership of cooperative societies, and farm size. The data was analysed using OLS regression. Their results showed that the farmers' age, educational

Table 2.1: Summary of empirical literature review

Empirical studies	Objectives	Methodology	Major findings	Gap(s)
Gebremedhin and Jaleta (2012): Market Orientation and Market Participation of Smallholders in Ethiopia: Implications for Commercial Transformation	Analysed the determinants of market orientation and market participation in Ethiopia, and examined if market orientation translates into market participation.	Used the OLS model since the dependent variable is continuous.	Market orientation of smallholders in the study area is found to be moderate, with an average MOI of 29 per cent.	Although the choice of a model for the determinants of MOI depends on the nature of the dependent variable, it was not clear from the study whether the MOI is a ratio between 0-1 or censored values, even though they are continuous, leading to some doubt in the appropriateness of the model.
Onubuogu and Onyeneke (2012): Market Orientation of Root and Tuber Crops production in Imo State, Nigeria.	Determined the level of market orientation of root and tuber crop production and its determinants.	Used OLS regression technique to analyse the determinants of MOI of root and tuber crops.	Results show that market orientation of root and tuber crop production is affected by household socioeconomic factors and institutional support services.	It was not clear how the MOI was estimated and how the non-participants (those with MOI equal to zero was accounted for using the OLS.
Adenegan, Olorunsomo and Nwauwa (2013): Determinants of Market Orientation Among Smallholders Cassava Farmers in Nigeria.	Analysed the factors determining smallholder cassava farmer's market orientation.	Used the Tobit regression model to analyse the MOI determinants of cassava farmers.	Results obtained from econometric analysis revealed that age, education, gender and distance significantly influenced market orientation.	This study was largely based on crop-specific and area-specific estimates. It fails to capture the variability across regions or by farm size.
Tefera (2014): Determinants of Smallholder Pulse Producers Market Orientation in Southern Ethiopia.	Analysed the determinants of pulse producers' market orientation.	Used the Tobit regression model to analyse the determinants of pulse producers market orientation.	The Tobit estimation shows that household-head education level, access to credit and land positively influenced chickpea market orientation. A male household head and access to credit increased the predicted value of haricot bean market orientation.	The study suffers from a weak theoretical framework with a small sample size of 183 for a region like southern Ethiopia.
Osmani and Hossain (2016): Smallholder Farmers' Market Orientation and the Factors Affecting it in Bangladesh.	Assessed the state of market orientation of smallholder farmers, their use of inputs, and identified the factors that influence the move towards market orientation of smallholders.	The study applied OLS to identify the factors determining smallholders' market orientation.	The results show that smallholder farmers in the study area are not subsistence oriented as, on average, 65 per cent of their commodities are sold in the market. The sample farmers are moderately market oriented with an average MOI of 0.59, indicating that they allocate 59 per cent of their cultivable land to marketable crops.	The OLS estimates presented in this study are less reliable than if FRM estimates were used, because the model has a fractional dependent variable.
Mekie *et al.* (2019): Market Orientation and Market Participation of Smallholder Barley Producers in Case of North Gondar Zone: Implications for Commercial Transformation	Analysed factors that influenced smallholder barley producer's market orientation and market participation, and examined whether market orientation translated into market participation or not.	Used OLS regression model to analyse factors that influence smallholder barley producer's market orientation and market participation.	Results showed that market orientation is significantly affected by membership of a cooperative, TLU, land cultivated for barley, land fragmentation, access to market information and extension service	OLS estimation of factors affecting farmer's market orientation in the study area was not properly justified, given that the dependent variable is fractional.

Nwafor (2020): The Market Orientation of Smallholder South African Farmers in a Disaster Context: An Input-side Perspective within a Seed Systems Approach	Determined the market orientation among smallholder maize farmers in the Mhlaba local municipality.	Used Tobit regression model to determine the market orientation of smallholder maize farmers.	Smallholder farmers surveyed had an average MOI of 0.55, with maximum and minimum values of 0.79 and 0.40 respectively.	The study aligns to the view that market orientation studies need to be crop-specific within an identified geographical area or context (Osmani and Hossain 2016), without taking into consideration the advantages of aggregate values.
Abafita, Atkinson and Kim (2016): Smallholder Commercialisation in Ethiopia: Market Orientation and Participation	Examine the impact of market orientation on the market participation of smallholder cereal farmers in Ethiopia, drawing on data from the latest 2009 Ethiopian Rural Household Survey.	Heckman's two-stage model and IV regressions are employed.	Market orientation was found to strongly enhance market participation.	Although the study aggregated values of all six crops to compute the MOI, the study lacked a theoretical framework and did not go further to analyse by scale of operation.

Source: Compiled by the authors

level, household size, access to extension, income and farm size were significant variables affecting market orientation in the study area.

Adenegan, Olorunsomo and Nwauwa (2013) in their study on the determinants of market orientation among smallholder cassava farmers in Nigeria modelled farmers' MOI against 16 independent variables which included age of the farmers, gender, farming experience, mode of farming, educational level, gender, household size, land ownership, involvement in non-farm activities, produce sales price, membership of marketing association, access to market information and credit, land fragmentation, access to extension agents, road types, and distance of the farmers to market. The data was analysed using the Tobit regression model. The results showed the age of the farmer, gender, level of education and distance to market, as the significant variables that influenced farmers' market orientation.

In a similar study by Tefera (2014) on the determinants of smallholder pulse producers market orientation in southern Ethiopia, the Tobit model was used to model market orientation as a function of human capital (age, sex, education, household head) resource endowment (labour supply, tropical livestock units (TLUs), expense of fertiliser), access to market information and access to institutional factors (credit and market information). The study omitted natural factors such as rainfall and agro-ecology because of data limitation. The results show that the coefficients of household-head education level, access to credit, cultivable land area per farmer, sex of the household head and expenditure on fertiliser were the significant factors that influenced market orientation among smallholder pulse farmers in the study area.

In a study using data from Bangladesh, Osmani and Hossain (2016) conceptualised eight independent variables such as farm size, farming experience, education level, cost of chemical fertiliser, use of improved seeds, access to extension services, value of cash crops, and value of food crops as determinants of the level of market orientation, and used OLS for analysis. Farm size, use of improved seeds, access to extension services, and value of cash crops were found to be drivers of market orientation among farmers.

Mekie *et al.* (2019) in their study on market orientation and market participation of smallholder barely producers in Ethiopia conceptualised market orientation by modelling MOI with size of household, age of household head, farming experience, distance from point of production to the nearest market, livestock owned (measured in TLU), total land cultivated, land covered by barely, land fragmentation index, yield, sex of the household head, literacy status of the household head, access to market information and credit, cooperative membership, access to extension services, and non-farm income. The OLS regression model was applied to the data. The results show that membership of a cooperative, tropical livestock unit, land fragmentation, and access to market information and extension services were important factors that affected market orientation.

Most studies on household crop market orientation are largely based on crop-specific and area-specific estimates (for instance Gebreselassie and Sharp 2007). Such analyses not only fail to capture variability across regions (geographic and agro-ecological), but more importantly, they limit the ability of the findings to be generalised at the national level. Unlike previous studies, our dependent variable is constructed on the

basis of the aggregate values of two groups of crops (arable cash crops and permanent cash/tree crops) and is also analysed by scale of operation. This approach, according to Heltberg and Tarp (2002), helps to maximise the use of available information and facilitate substitution of crops as it is more likely to take exogenous variables into account that may increase participation in the sale of an individual crop at the expense of another.

3 MATERIALS AND METHODS

3.1 Study location

The study locations were Kaduna State in northern Nigeria and Ogun State in southern Nigeria. Kaduna State covers an estimated area of 46,05sq km which is about 5 per cent of Nigeria's total land area (923,768sq km). Kaduna State, in the north-west geo-political region of Nigeria, shares borders with Zamfara, Katsina, Niger, Kano, Bauchi, Nasarawa, and Plateau states and the Federal Capital Territory, Abuja. It is located globally between latitudes 9˚ 03' and 11˚ 32' north of the Equator and longitudes 6˚ 05' and 80˚ 38' east of the Greenwich Meridian.[1] The state experiences a tropical continental climate with two distinct seasonal climates; dry and rainy seasons. The wet season (May to October) is very much heavier in the southern part of the state, in places like Kafanchan and Kagoro, which have an average of over 1,524mm, compared to Makarfi and Ikara in the northern part which have an average of 1,016mm. The average annual rainfall and humidity are 1,272.5mm and 56.64 per cent respectively, while the average daily minimum and maximum temperatures are 15.1˚C and 35.18˚C.

Kaduna State is a trade centre and a major transportation hub for the surrounding agricultural areas, with its rail and road junction. The population of Kaduna was 6,113,503 as of the 2006 Nigerian census with a projected annual growth rate of 3.18 per cent. Agriculture is the main stay of the economy of Kaduna State with about 80 per cent of the people actively engaged in farming. Cash and food crops are cultivated and the produce include yam, cotton, groundnut, tobacco, maize, beans, guinea corn, millet, ginger, rice and cassava.

Ogun State is situated in the sub-humid tropical region of south-west Nigeria and has a tropical climate with distinct wet and dry season periods, and a total land area of 16,409.26sq km. Ogun State is bounded on the west by Benin, on the south by Lagos State and the Atlantic Ocean, on the east by Ondo State, and on the north by Oyo and Osun states. It is situated between latitude 6.2°N and 7.8°N and longitude 3.0°E and 5.0°E. The mean annual rainfall and temperature are about 1,270mm and 28ºC respectively. The agroclimatic conditions of the state are characterised by a bimodal rainfall pattern, making it possible for farmers to cultivate arable crops such as maize, rice, vegetables and spices at least twice a year. The vegetation cover in the state, which ranges from freshwater swamps in mangrove forests in the south-east, to woody Guinea savanna in the north-west, also make the state's environment conducive for livestock production (cattle, sheep, goat, pig, poultry and other smaller farm animals). The state is notable for having a high concentration of industrial estates and being a major manufacturing hub in Nigeria. The population of Kaduna was 3,751,140 as of the 2006 Nigerian census.

3.2 Sampling procedure and sample size

The study was informed by a rich empirical data set at the household level, collected during a 2018 commercial agriculture field survey in Kaduna and Ogun states. A multistage sampling procedure which combined purposive, cluster and proportionate random sampling techniques was utilised to select a sample of 1,008 MSFHs and 1,099 SSFHs. In the first stage of the survey, Kaduna and Ogun were purposively selected based on the giant strides they have made in providing the necessary policy environment for the development of commercial agriculture. In the second stage, all the LGAs in Kaduna and Ogun states were clustered into three groups by senatorial districts, and one LGA was selected per cluster, based on land size and having a high concentration of farming households. This resulted in the selection of Kachia, Chikun and Soba LGAs from Kaduna South, Kaduna Central, Kaduna North senatorial district respectively, and Ijebu East, Imeko Afon and Obafemi Owode LGAs from Ogun East, Ogun West and Ogun Central senatorial districts respectively. In the third stage, three wards in each LGA in Kaduna State and 4 wards from each LGA in Ogun State were selected using a combination of cluster and random sampling. Proportionate random sampling was then used to select a total of 1,008 MSFHs and 1,099 SSFHs across Ogun and Kaduna states. Data collection was cross sectional in nature and was carried out with the aid of a structured electronic questionnaire (see Muyanga *et al.* (2019) for a more detailed exposition on the sampling and data collection process and features). In this study, SSFs are those that operate less than 5ha while MSFs operate on between 5-100ha.

3.3 FRM specification

For the determinants of household market orientation, we use the FRM. This method was used to identify factors that could potentially influence the market orientation status of farm households in the study area. The key dependent variable of interest is the MOI, which ranges between 0-1. The bounded nature of such a variable and the possibility of observing values at the boundaries raise interesting functional form and inference issues. In this paper, we specify and analyse a class of functional forms with satisfying econometric properties. The empirical work follows the method of Papke and Wooldridge (1996), who estimated a model of employee participation rates in 401 (k) pension plans. A few authors (Cassar 2004; Rajan and Zingales 1995) have opted for using a Tobit approach for data censored at zero. However, Ramalho and Silva (2009) argued that the stringent assumptions associated with the Tobit model makes the use of FRM a better option for modelling fractional dependent variables like leverage ratios.

When there are many observations at the upper and/or lower limits of the response variable, it is relatively common to use Tobit models for data censored at 1 and/or 0. Again, there are some problems with this approach. First, only in the two-limit Tobit model are the predicted values of y restricted to the unit interval. However, that model can only be applied when we have observations in both limits, which is often not the case. Second, conceptually as some authors argue (Maddala 1983), a Tobit model is appropriate to describe censored data in the interval (0, 1) but its application to data defined only in that interval is not easy to justify: observations at the boundaries of a fractional variable are a natural consequence of individual choices and not of any type of censoring. Third, the Tobit model is very stringent in terms of assumptions, requiring normality and heteroskedaticity of the dependent variable, prior to censoring.

For this study, the approach for modelling fractional data without boundary observations has been adopted. The model requires the correct specification of (non-linear) conditional expectation of the fractional response variable. The model is applicable to cases where there are a finite number of boundary observations. As estimated by Papke (1995), we allowed for a diminishing marginal effect of the independent variables by using a conditional mean of the form with the probit function. To illustrate the methodological issues that arise with fractional dependent variables, suppose that a variable $y, 0 \leq y \leq 1$, is to be explained by a $1 \times K$ vector of explanatory variables $x=(x_1, x_2,....,x_k)$, with the convention that $x_1=1$ Determinants of market orientation model is expressed thus:

$$E\ (y_i|x) = \beta_1 + \beta_2 x_2 + \cdots + \beta_k x_k = x\beta \qquad (3)$$

Where, y_i is the MOI (MOI_i) as expressed in Equation 1, β is a $K \times 1$ vector. Equation 3 rarely provides the best description of $E(y|x)$. The primary reason is that y is bounded between 0 and 1, and so the effect of any particular x_i cannot be constant throughout the range of x (unless the range of x is very limited). To some extent this problem can be overcome by augmenting a linear model with non-linear functions of x, but the predicted values from an OLS regression can never be guaranteed to lie in the unit interval. Thus, the drawbacks of linear models for fractional data are analogous to the drawbacks of the linear probability model for binary data.

The final specification for the estimation is Equation 4 which is another form of expressing Equation 3 because $\log [/(1 - y)]$ can take on any real value as y varies between 0 and 1, so it is natural to model its population regression as a linear function.

$$E\left(log\left[\frac{y}{1-y}\right]\middle|x\right) = x\beta \qquad (4)$$

The description of the model variables and the a priori expectation is as presented in Table 3.1.

Married farm owners/managers are expected to be more market oriented compared to those who are single, because they would have higher cash requirements to meet increasing family responsibilities. Marriage also implies increased supply of family labour and decision-makers in the family. It can also mean more mouths to feed, hence less to sell to the market. Male headed households are expected to be more market oriented due to their resource accessibility advantages over female-headed farm households. Household endowments/access to factors of production such as labour, land, and farm equipment are expected to be positively associated with market orientation. We expect ownership of livestock to be negatively associated with crop market orientation since they offer alternative cash income sources. Access to tractor and animal traction is expected to exert a positive influence on market orientation. Access to markets is expected to reduce marketing costs, thus encourage market orientation. Agricultural services (such as extension services) are

Table 3.1: Summary of empirical literature review

Variables	Type	Description	A priori expectation
Dependent			
MOI	Continuous but bounded	Farm household MOI (0 < MOI < 1)	Not applicable
Explanatory			
Sex (X_1)	Dummy	If household head is male = 1, otherwise = 0	+
Marital status (X_2)	Dummy	If the household head is married = 1; otherwise = 0	±
Native (X_3)	Dummy	If household head is a native of the community = 1; otherwise = 0	±
[i]Access to fertiliser (X_4)	Dummy	If have access to fertiliser use = 1; otherwise = 0	+
[i]Family labour use (X_5)	Dummy	If farm used only family labour = 1; otherwise = 0	-
[i]Extension visit (X_6)	Dummy	If there are extension visits to the household head or by the household during the last 1 year = 1; otherwise = 0	+
[i]Land market access (X_7)	Dummy	If household sourced at least one plot of farmland from the market = 1; otherwise = 0	+
Farm size (X_8)	Continuous	Plot areas cultivated by farmers	+
Livestock ownership (X_9)	Continuous	Measured as tropical livestock unit (TLU)	-
Youth (X_{10})	Dummy	Farm household head is below the age of 35 years = 1; otherwise = 0	±
No formal education (X_{11})	Dummy	If household head has no formal education = 1; otherwise = 0	-
Off farm income (X_{12})	Continuous	Flow of income that is not from the farm	±
[i]Access to all-weather road (X_{13})	Dummy	If farm household has access to all-weather road = 1; otherwise = 0	+
[i]Access to established market (X_{14})	Dummy	If have access to an established market = 1; otherwise = 0	+
[i]Access to agro-dealer (X_{15})	Dummy	If have access to an agro-dealer = 1; otherwise = 0	+
[i]Access to traders with heavy loader vehicle (X_{16})	Dummy	If have access to traders with a heavy loader vehicle = 1; otherwise = 0	+
State (X_{17})	Dummy	If in Kaduna State = 1; otherwise = 0	±
Kachia LGA (X_{18})	Dummy	If farm household reside in Kachia LGA = 1; otherwise = 0	±
Chikun LGA (X_{19})	Dummy	If farm household reside in Chikun LGA = 1; otherwise = 0	±
Ijebu East LGA (X_{20})	Dummy	If farm household reside in Ijebu East LGA = 1; otherwise = 0	±
Obafemi Owode (X_{21})	Dummy	If farm household reside in Obafemi Owode LGA = 1; otherwise = 0	±

Note: [i] are the access variables of interest in this study

expected to enhance farmer skills and knowledge, link farmers with modern technology and markets, ease liquidity and input supply constraints (Lerman 2004), and thus increase market orientation. Households with educated heads are expected to have better skills, and better access to information and the ability to process information, which should better enhance market orientation.

Age of household head could also be an important determinant of market orientation. It was found by Bellemare (2012) that there is direct relationship between market orientation and age. That is, farm households with more youthful heads are expected to allocate more land to crops produced for the market. This is probably due to the fact that youths are very receptive to new ideas and change. They could also be very adventurous. They are willing to take more risk than older people.

The indices of market orientation and the values of selected model covariates were computed using household level data. Before running the FRM, all the hypothesised explanatory variables were checked for the existence of multicollinearity problems using the Variance Inflation Factor (VIF) for association among the continuous explanatory variables (Tattao 2007) and contingency (C) coefficients (Glen 2018) for dummy variables. In this study, VIF and C coefficients were used to test the multicollinearity problem for continuous and dummy variables respectively. A rule of thumb for interpretation, value of VIF equals to one implies no correlation, between 1-5 indicates moderately correlated, and greater than five shows highly correlated independent variables. In general, a VIF above 10 indicates high correlation and is cause for concern. A value of C closer or equal to zero shows that the variables are independent of each other, and the reverse when C is further away from zero.

4 RESULTS AND DISCUSSION

4.1 Classification of crops into commercial or food crop categories

4.1.1 Classification of crops into commercial and food crop categories across states

Tables 4.1-4.3 present the CCI computations for three categories of crops namely: food crops, arable cash crops and permanent cash (or tree) crops. Relying on literature, we categorise crops or crop groups with an CCI of more than 75 per cent as 'commercial crops', while those below that threshold are considered to be primarily produced for food and thus classified as: 'non-commercial crops' (Ohen, Etuk and Onoja 2013; Goletti 2005). In this study, commercial crops are also referred to as 'cash crops' or 'market-oriented crops', since they are primarily produced for sale; while non-commercial crops are referred to as 'food crops'.

Table 4.1 shows that the CCI of all seven crops under the starch/sugar food group range from 0.83-0.94 for MSFs, and are therefore classified as commercial/cash crops. The situation is similar for SSFs, where the CCI for six crops, except for potato, range from 0.78-0.94. Analysis reveals that potato is grown as a food crop on SSFs. Table 4.1 also shows that the CCI for all six vegetable crops ranges between 0.90 and 1 for MSFs and 0.93-1 for SSFs. Thus, vegetables are grown as commercial or cash crops by both MSFs and SSFs. In the case of arable fruits, only pineapple is cultivated primarily for the market by both MSFs and SSFs (CCI = 0.94 for MSFs and 1 for SSFs). Watermelon is a commercial crop only to MSFs (CCI = 0.97 for MSFs), while banana is a cash crop (CCI = 0.97 for SSFs) only to SSFs. In addition, cabbage, spinach, and Bambara nut are cultivated exclusively by MSFs and primarily for the market.

Table 4.2 shows that all 'cereal crops' (maize, sorghum, rice and millet) with a CCI ranging from 0.42-0.70 for MSFs and 0.40-0.68 for SSFs are cultivated primarily for food and are thus classified as 'food crops'. Groundnut is a commercial crop under both MSFs and SSFs, while soya beans is a food crop. Cowpeas and ginger are also classified as food crops as a result of having a CCI below the 75 per cent threshold.

Crops grown as food crops under both MSFs and SSFs are all cereals (maize, sorghum, rice, and millet), beans/cowpeas, soya beans and ginger. Oil palm is a commercial crop on MSFs but a food crop on SSFs. Melon and banana are cultivated as commercial crops by SSFs, but as food crops by MSFs.

In Tables 4.1 and 4.2 we observe that, except for ginger, all the food crops have a higher CCI under MSFs than SSFs. This implies that even when crops are grown primarily for food, commercialisation is higher under MSFs than with SSFs. That is, 'food crop commercialisation' seem to be higher with MSFs relative to SSFs. Thus, the results suggest that the degree of crop commercialisation varies by crop types and crop groupings. Crops grown as cash/commercial or market-oriented crops under both MSFs and SSFs are all tree/permanent crops except oil palm (cashew, citrus, cocoa, guava, coconut, kolanut) (Table 4.3).

Table 4.1 Arable cash CCI across Ogun and Kaduna states

Crop	Total production in ₦ (MSF)	Total sales in ₦ (MSF)	CCI (MSF)	Total production in ₦ (SSF)	Total sales in ₦ (SSF)	CCI (SSF)
Cassava	24,013,305	22,631,930	0.9425	11,666,729	10,865,710	0.9313
Cocoyam	15,306.9	13,125	0.8575	4,890	4,890	1.0000
Plantain	122,984	112,534	0.9150	71,485	58,210	0.8143
Potato	58,514.75	50,931.5	0.8704	2,240	0	0.0000
Sugar cane	830,225	775,225	0.9338	299,350	283,000	0.9454
Sweet potato	34,900	32,440	0.9295	4,000	3,500	0.8750
Yam	1,736,604.25	1,446,963	0.8332	651,138	509,923	0.7831

Sugar/starch total	**26,811,840**	**25,000,000**	**0.9324**	**12,699,835**	**11,725,233**	**0.9233**
Cabbage	7,100	6,400	0.9014	0	0	0.0000
Eggplant/garden egg	5,528.68	5,272	0.9536	8,500	8,500	1.0000
Leafy vegetable	26,718	24,858	0.9304	7,297	6,953	0.9529
Okra	11,447.76	11,436.64	0.9990	1,110	1,100	0.9910
Spinach	550	550	1.0000	0	0	0.0000
Tomato	832,977	800,242	0.9607	334,191	312,191	0.9342
Vegetable total	**884,663.8**	**848799**	**0.9595**	**351,098**	**328,744**	**0.9363**
Banana	130,035	63,697	0.4898	2,260	2,200	0.9735
Pineapple	15,234.36	14,317.8	0.9398	3,500	3,500	1
Watermelon	25,037.5	24,216	0.9672	0	0	0
Arable fruit total	**170,306.9**	**102,231**	**0.6003**	**5,760**	**5,700**	**0.9896**
Ginger	2,096,165	1,011,555	0.4826	559,508	305,105	0.5453
Melon	7,680	1,447.5	0.1885	2,010	1,910	0.9502
Onion	2,500	2,500	1.0000	7,600	6,640	0.8737
Pepper	811,846	754,980	0.9300	274,774	260,231	0.9471
Spices/condiments total	**2,918,191**	**1,770,483**	**0.6067**	**843,892**	**573,886**	**0.6800**
Bambara	300	300	1.0000	0	0	0.0000
Arable nut total	**300**	**300**	**1.0000**	**0**	**0**	**0.0000**

Source: APRA Nigeria Field Survey, April/May 2018

Table 4.2 Arable food CCI across Ogun and Kaduna states

Crop	Total production in ₦ (MSF)	Total sales in ₦ (MSF)	CCI (MSF)	Total production in ₦ (SSF)	Total sales in ₦ (SSF)	CCI (SSF)
Maize	8,986,790	6,291,738	0.7001	2,857,880	1,934,415	0.6769
Sorghum	786,960	381,450	0.4847	269,075	99,420	0.3695
Rice	1112,410	686,285	0.6169	309,695	143,200	0.4624
Millet	100649	42,355	0.4208	10,300	4,200	0.4078
Cereal total	**10,974,209**	**7,394,228**	**0.6738**	**3,446,950**	**2,181,235**	**0.6328**
Groundnut	400,704.5	314,981	0.7861	102,665	77,582	0.7557
Soya beans	454,730	297,950	0.6552	199,440	111,700	0.5601
Arable oilseed total	**855,434.5**	**612,931**	**0.7165**	**302,105**	**189,282**	**0.6265**
Beans/ cowpea	298,300	175,200	0.5873	91,930	38,430	0.4180
Pulses total	**298,300**	**175,200**	**0.5873**	**91,930**	**38,430**	**0.4180**
Ginger	2,096,165	1,011,555	0.4826	559,508	305,105	0.5453
Spice/condiment total	**2,096,165**	**1,011,555**	**0.4826**	**559,508**	**305,105**	**0.5453**

Source: APRA Nigeria Field Survey, April/May 2018

Table 4.3 Permanent cash (or tree) CCI across Ogun and Kaduna states

Crop	Total production in ₦ (MSF)	Total sales in ₦ (MSF)	CCI (MSF)	Total production in ₦ (SSF)	Total sales in ₦ (SSF)	CCI (SSF)
Cashew	110,120	107,680	0.9778	26,385	26,385	1.0000
Citrus	29,877.12	27,599.62	0.9238	1,800	1,800	1.0000
Cocoa	1,018,206	987,946	0.9703	116,639	116,009	0.9946
Guava	150	150	1.0000	0	0	0.0000
Coconut	500	500	1.0000	0	0	0.0000
Oil palm	33,517.5	30,260	0.9028	4,700	2,400	0.5106
Kolanut	356,293	354,593	0.9952	19,035	19,035	1.0000
Tree crop total	**1,548,664**	**1,508,729**	**0.9742**	**168,559**	**165,629**	**0.9826**

Source: APRA Nigeria Field Survey, April/May 2018

Results presented in Table 4.3 indicate that for MSFs, all tree/permanent crops have a CCI ranging between 0.90 and 1, indicating very high levels of crop commercialisation. The situation looks similar with SSFs except for oil palm which has a CCI of 0.51 and is thus classified as a food crop. Thus, all tree/permanent crops are primarily cultivated for cash by both MSFs and SSFs, except for oil palm which is produced primarily for food by SSFs. Hence, the lower CCI.

4.1.2 Classification of crops into commercial and food crop categories for Ogun State

Tables 4.4-4.6 present CCI results for only Ogun State. The result shows that all crops grown by farmers in Ogun State are primarily commercial crops without

Table 4.4 Arable cash CCI – Ogun State

Crop	Total production in ₦ (MSF)	Total sales in ₦ (MSF)	CCI (MSF)	Total production in ₦ (SSF)	Total sales in ₦ (SSF)	CCI (SSF)
Cassava	23,685,285	22,348,680	0.9436	11,583,910	10,788,630	0.9313
Cocoyam	12,606.9	12,175	0.9657	4,890	4,890	1.0000
Plantain	122,984	112,534	0.9150	71,488	58,210	0.8143
Potato	0	0	0.0000	0	0	0.0000
Sugar cane	0	0	0.0000	0	0	0.0000
Sweet potato	0	0	0.0000	0	0	0.0000
Yam	934,714	844,160	0.9031	135,428	117,080	0.8645
Sugar/starch total	**24,755,589.9**	**23,317,549**	0.9419	**11795716**	**1,0968,810**	0.9299
Cabbage	0	0	0.0000	0	0	0.0000
Eggplant/garden egg	3,500	3,500	1.0000	0	0	0.0000
Leafy vegetable	26,462	24,602	0.9297	5,882	5,638	0.9585
Okra	641.6	630.48	0.9827	1,080	1,080	1.0000
Spinach	550	550	1.0000	0	0	0.0000
Tomato	578,252	555,497	0.9606	223,135	212,065	0.9504
Vegetable total	**609,405.6**	**584,779.48**	0.9596	**230,097**	**218,783**	0.9508
Banana	129,525	63,197	0.4879	2,260	2,200	**0.9735**
Pineapple	15,234.36	14,317.8	0.9398	3,500	3,500	**1.0000**
Watermelon	0	0	0.0000	0	0	**0.0000**
Arable fruit total	**144,759.36**	**77,514.8**	**0.5355**	**5,760**	**5,700**	**0.9896**
Ginger	60,000	60,000	1.0000	390	390	**1.0000**
Melon	7,680	1,447.5	0.1885	410	310	**0.7561**

Onion	0	0	0.0000	0	0	**0.0000**
Pepper	597,846	561,187	0.9387	217,332	208,292	**0.9584**
Spice/condiment total	665,526	622,634.5	0.9356	218,132	208,992	**0.9581**
Bambara	0	0	0.0000	0	0	**0.0000**
Arable nut total	**0**	**0**	0.0000	**0**	**0**	**0.0000**

Source: APRA Nigeria Field Survey, April/May 2018

Table 4.5 Arable cash CCI – Ogun State

Crop	Total production in ₦ (MSF)	Total sales in ₦ (MSF)	CCI (MSF)	Total production in ₦ (SSF)	Total sales in ₦ (SSF)	CCI (SSF)
Maize	2,924,295	2,797,150	0.95652	909,275	834,715	0.9180
Sorghum	0	0	0.00000	150	150	1.0000
Rice	237,060	231,060	0.97469	25,570	23,670	0.9257
Millet	0	0	0.00000	0	0	0.0000
Cereal total	**3,161,355**	**3,028,210**	0.95788	**934,995**	**858,535**	0.9182
Groundnut	177,777	170,747	0.96046	23,145	21,695	0.9374
Soya beans	4,500	4,500	1.00000	0	0	0.0000
Arable oilseed total	**182,277**	**175,247**	0.96143	**23,145**	**21,695**	0.9374
Beans/Cowpea	11,700	11,200	0.95726	1,000	800	0.8000
Pulses total	**11,700**	**11,200**	0.95726	**1,000**	**800**	0.8000
Ginger	60,000	60,000	1.00000	390	390	1.0000
Spices/condiments total	**60,000**	**60,000**	1.00000	**390**	**390**	1.0000

Source: APRA Nigeria Field Survey, April/May 2018

Table 4.6 Tree (or permanent) CCI – Ogun State

Crop	Total production in ₦ (MSF)	Total sales in ₦ (MSF)	CCI (MSF)	Total production in ₦ (SSF)	Total sales in ₦ (SSF)	CCI (SSF)
Cashew	110,120	107,680	0.9778	26,385	26,385	1.0000
Citrus	29,877.12	27,599.62	0.9238	1,800	1,800	1.0000
Cocoa	1,018,206	987,946	0.9703	116,639	116,009	0.9946
Guava	150	150	1.0000	0	0	0.0000
Coconut	500	500	1.0000	0	0	0.0000
Oil palm	33,117.5	30,260	0.9137	4,700	2,400	0.5106
Kolanut	356,293	354,593	0.9952	19,035	19,035	1.0000
Tree crop total	**1,548,263.62**	**1,508,728.62**	0.9745	**168,559**	**165,629**	0.9826

Source: APRA Nigeria Field Survey, April/May 2018

regard to scale of operation. The only exception is oil palm production under scale, which has a CCI of 0.51.

4.1.3 Classification of crops into commercial and food crops in Kaduna State

Tables 4.7-4.8 present CCI results for only Kaduna State. Except for ginger, most of the crops presented in Table 4.7 have a CCI of above 0.75 and are thus classified as commercial or cash crops, while those presented in Table 4.8 and have a CCI of below 0.75 are classified as food crops. It is important to take note of the difference in classification of crops in Ogun *vis-à-vis* Kaduna State. In Ogun State all arable crops are grown primarily for cash. This is not the case in Kaduna, where all cereals,

Table 4.7 Arable cash CCI – Kaduna State

Crop	Total production in ₦ (MSF)	Total sales in ₦ (MSF)	CCI (MSF)	Total production in ₦ (SSF)	Total sales in ₦ (SSF)	CCI (SSF)
Cassava	328,020	283,250	0.8635	82,819	77,080	0.9307
Cocoyam	2,700	950	0.3519	0	0	0.0000
Plantain	0	0	0.0000	0	0	0.0000
Potato	58,514.75	50,931.5	0.8704	2,240	0	0.0000
Sugar cane	830,225	775,225	0.9338	299,350	283,000	0.9454
Sweet potato	34,900	32,440	0.9295	4,000	3,500	0.8750
Yam	801,890.25	602,803	0.7517	515,710	392,843	0.7618
Sugar/starch total	**2,056,250**	**1,745,599.5**	0.8489	**904,119**	**756,423**	0.8366
Cabbage	7,100	6,400	0.9014	0	0	0.0000
Eggplant/garden egg	2,071	2,022.68	0.9767	8,500	8,500	1.0000
Leafy vegetable	256	256	1.0000	1,415	1,315	0.9293
Okra	10,806.16	10,806.16	1.0000	30	20	0.6667
Spinach	0	0	0.0000	0	0	0.0000
Tomato	254,725	244,745	0.9608	111,056	100,126	0.9016
Vegetable total	**274,958.16**	**264,229.84**	0.9610	**121,001**	**109,961**	0.9088
Banana	510	500	0.9804	0	0	0.0000
Pineapple	0	0	0.0000	0	0	0.0000
Watermelon	25,037.5	24,216	0.9672	0	0	0.0000
Arable fruit total	**25,547.5**	**24,716**	0.9675	**0**	**0**	0.0000
Ginger	2,036,165	951,555	0.4673	559,118	304,715	0.5450
Melon	0	0	0.0000	1,600	1,600	1.0000
Onion	2,500	2,500	1.0000	7,600	6,640	0.8737
Pepper	214,000	193,793	0.9056	57,442	51,939	0.9042
Spice/condiment total	2,252,665	1,147,848	0.5096	625,760	364,894	0.5831
Bambara	300	300	1.0000	0	0	0.0000
Arable nut total	**300**	**300**	1.0000	**0**	**0**	0.0000

Source: APRA Nigeria Field Survey, April/May 2018

Table 4.8 Arable food CCI – Kaduna State (production & sales are in naira)

Crop	Total production in ₦ (MSF)	Total sales in ₦ (MSF)	CCI (MSF)	Total production in ₦ (SSF)	Total sales in ₦ (SSF)	CCI (SSF)
Maize	6,062,495	3,494,585	0.5764	1,948,605	1,099,700	0.5644
Sorghum	786,960	381,450	0.4847	268,925	99,270	0.3691
Rice	875,350	455,225	0.5200	284,125	119,530	0.4207
Millet	88,049	34,755	0.3947	10,300	4,200	0.4078
Cereal total	**7,812,854**	**4,366,015**	0.5588	**2,511,955**	**1,322,700**	0.5266
Groundnut	222,927.5	144,234	0.6470	79,520	55,887	0.7028
Soya beans	450,230	293,450	0.6518	199,440	111,700	0.5601
Arable oilseed total	**673,157.5**	**437,684**	0.6502	**278,960**	**167,587**	0.6008
Beans/cowpea	286,600	164,000	0.5722	90,930	37,630	0.4138

Pulse total	**286,600**	**164,000**	0.5722	**90,930**	**37,630**	0.4138
Ginger	2,036,165	951,555	0.4673	559,118	304,715	0.5450
Spice/condiment total	**2,036,165**	**951,555**	0.4673	**559,118**	**304,715**	0.5450

Source: APRA Nigeria Field Survey, April/May 2018

oil seeds, pulses and ginger are cultivated primarily for food.

4.2 Analysis of market orientation by scale and by state

Table 4.9 presents the results of household MOI computed by states and by scale of operation (small, lower medium and upper medium) for a better comparison. Panel A shows that MOI for MSFHs and SSFHs are similar (0.77). That is, farm households on average, irrespective of scale of operation, allocate about 77 per cent of their crop farmland to the cultivation of crops for sale. This observed MOI value is higher than the MOI of 0.59 observed for smallholder farmers in Bangladesh (Osmani and Hossain 2016). Panel B shows that the MOI results do not change significantly when the scale of operation is re-categorised into three rather than the two previous groups in panel A. However, we observe that the MOI for the MSFHs who operate over

Table 4.9 Household MOI by scale of operation and by state

A. Combined results of data by two scales of operation					
Farm scale category	**Number of sampled households**	**Mean MOI**	**Std. Dev.**	**Min. MOI**	**Max. MOI**
0-100ha (all farms)	2,107	0.7715	0.1378	0.4376	0.9862
5-100ha (medium)	1,008	0.7716	0.1400	0.4913	0.9862
<5ha (small)	1,099	0.7714	0.1357	0.4376	0.9842
B. Combined results of data by three scales of operation					
Farm scale category	**Number of sampled households**	**Mean MOI**	**Std. Dev.**	**Min. MOI**	**Max. MOI**
<5ha (small)	1,099	0.7714	0.1357	0.4376	0.9842
5-20ha (lower medium)	930	0.7705	0.1389	0.4913	0.9862
>20ha (upper medium)	78	0.7845	0.1538	0.5332	0.9796
	Disaggregated results by scale of operation and states				
C. Kaduna State					
Farm scale category	**Number of sampled households**	**Mean MOI**	**Std. Dev.**	**Min. MOI**	**Max. MOI**
<5ha (small)	530	0.6479	0.6529	0.4376	0.9531
5-20ha (lower medium)	481	0.6504	0.5950	0.4913	0.8938
>20ha (upper medium)	34	0.6413	0.0745	0.5332	0.9148
D. Ogun State					
Farm scale category	**Number of sampled households**	**Mean MOI**	**Std. Dev.**	**Min MOI**	**Max MOI**
<5ha (small)	569	0.8864	0.6450	0.5833	0.9842
5-20ha (lower medium)	449	0.8991	0.6424	0.6450	0.9862
>20ha (upper medium)	44	0.8951	0.0967	0.5394	0.9796

Source: APRA Nigeria Field Survey, April/May 2018

20ha is slightly higher at 78.5 per cent than 77 per cent for the MSFHs who operate less than 20ha across the two states.

Panel C and D shows that farm households in Ogun State are substantially more market-oriented than farm households in Kaduna State. Specifically, the MOI for farm households in Kaduna State is between 0.64 and 0.65 compared with an MOI for farm households in Ogun State, which ranges between 0.889 and 0.90. In other words, farm households in Kaduna and Ogun states allocate about 65 per cent and 90 per cent of farmland respectively to cultivate crops meant for sale to the market. This finding suggests that the average MSFs and SSFs in Ogun State are more market oriented than MSFs and SSFs in Kaduna State.

4.3 Descriptive analysis of model variables

Descriptive statistics of variables used in the fractional response regression analysis are presented for the

Table 4.10 Descriptive statistics of the determinants of farm household MOI (combined data)

Variable	Mean	Std. Dev.	Min.	Max.
Dependent				
Farm household MOI	0.7715	0.1378	0.4376	0.9862
Explanatory				
Sex (X_1) (household head is male = 1)	0.9502	0.2176	0	1
Marital status (X_2) (household head is married = 1)	0.9227	0.2671	0	1
Native (X_3) (household head is a native of the community where the farm is located = 1)	0.1740	0.3792	0	1
Access of fertiliser (X_4)	0.6055	0.4889	0	1
No access to hired labour (X_5) (household used only family labour = 1)	0.7658	0.4236	0	1
Access to extension services (X_6) (at least one extension visit in the season = 1)	0.1238	0.3294	0	1
Land market access (X_7)	0.3201	0.4666	0	1
Farm size (X_8) (in hectares)	6.2244	7.2185	0.06	100
Livestock ownership (X_9) (in TLU)	0.1670	0.2900	0	1.11
Youth (X_{10}) (household head age less than 36 years = 1)	0.1897	0.3921	0	1
No formal education (X_{11}) (household head has no formal education =1)	0.2404	0.4274	0	1
Off farm income (X_{12}) (in ₦)	262,225.9	584,781	0	12,400,000
Access to all-weather roads (X_{13})	0.8023	0.3984	0	1
Access to an established market (X_{14})	0.3936	0.4887	0	1
Access to agro-dealer services (X_{15})	0.2688	0.4435	0	1
Access to traders with heavy carriage vehicles (X_{16})	0.3969	0.4894	0	1

Source: APRA Nigeria Field Survey, April/May 2018

Table 4.11 Descriptive statistics of the determinants of farm household MOI (disaggregated by state)

Variable	Kaduna State		Ogun State		t-test
	Mean	Std. Dev.	Mean	Std. Dev.	
Dependent					
Farm household MOI	0.6488	0.0630	0.8921	0.0662	86.38***
Explanatory					
Sex (X_1) (household head is male = 1)	0.9636	0.1873	0.9370	0.2430	-2.81***
Marital status (X_2) (household head is married = 1)	0.9225	0.2675	0.9229	0.2668	0.04
Native (X_3) (household head is a native of the community where the farm is located = 1)	0.1110	0.3143	0.2359	0.4248	7.67***
Access to fertiliser (X_4)	0.9732	0.1616	0.2444	0.4299	-51.36***
No access to hired labour (X_5) (household used only family labour = 1)	0.8325	0.3736	0.7002	0.4584	-7.26***
Access to extension services (X_6) (at least one extension visit in the season = 1)	0.1206	0.3258	0.1269	0.3330	0.44
Land market access (X_7)	0.2526	0.4347	0.3863	0.4871	6.64***
Farm size (X_8) (in hectares)	5.9161	6.3623	6.5272	7.9618	1.95*
Livestock ownership (X_9) (in TLU)	0.3148	0.3468	0.0219	0.0775	-26.88***
Youth (X_{10}) (household head is aged less than 36 years = 1)	0.2517	0.4342	0.1288	0.3351	-7.29***
No formal education (X_{11}) (household head has no formal education = 1)	0.2957	0.4566	0.1861	0.3894	-5.94***
Off farm income (X_{12}) (in ₦)	232528.7	460509.1	291392.7	684215.1	2.32**
Access to all-weather roads (X_{13})	0.7206	0.4489	0.8825	0.3221	9.53***
Access to an established market (X_{14})	0.3120	0.4635	0.4737	0.4995	7.70***
Access to agro-dealer services (X_{15})	0.2813	0.4499	0.2566	0.4370	-1.28
Access to traders with a heavy carriage vehicle (X_{16})	0.3828	0.4863	0.4107	0.4922	1.31
Kachia LGA (X_{17})	0.3349	0.4722	0.0000	0.0000	-
Chikun LGA (X_{18})	0.3330	0.4715	0.0000	0.0000	-
Ijebu East LGA (X_{19})	0.0000	0.0000	0.3289	0.4701	-
Obafemi Owode (X_{20})	0.0000	0.0000	0.3393	0.4737	-

Note: ***, **, and * are significant at 1 per cent, 5 per cent, and 10 per cent significant levels, respectively
Source: APRA Nigeria Field Survey, April/May 2018

Table 4.12 Descriptive statistics of the determinants of farm household MOI (by scale of operation)

Variable	SSF		MSF		t-test
	Mean	Std Dev	Mean	Std. Dev.	
Dependent					
Farm household MOI	0.7714	0.1357	0.7716	0.1400	-0.03
Explanatory					
Sex (X_1) (household head is male = 1)	0.9372	0.2427	0.9644	0.1855	-2.87***
Marital status (X_2) (household head is married = 1)	0.8963	0.3050	0.9515	0.2150	-4.77***
Native (X_3) (household head is a native of the community where the farm is located = 1)	0.1456	0.3529	0.2050	0.4039	-3.60***
Access to fertiliser (X_4)	0.5387	0.4987	0.6782	0.4674	-6.61***
No access to hired labour (X_5) (household used only family labour = 1)	0.7934	0.4050	0.7356	0.4412	-6.62***
Access to extension services (X_6) (at least one extension visit in the season = 1)	0.1083	0.3109	0.1406	0.3478	-2.25**
Land market access (X_7)	0.2293	0.4206	0.4188	0.4936	-9.51***
Farm size (X_8) (hectares)	2.3951	1.1237	10.3911	8.6102	-30.51***
Livestock ownership (X_9) (TLU)	0.1477	0.2731	0.1880	0.3060	-3.20***
Youth (X_{10}) (household head age less than 36 years = 1)	0.2530	0.4349	0.1208	0.3260	7.84***
No formal education (X_{11}) (household head has no formal education = 1)	0.2457	0.4307	0.2347	0.4240	0.59
Off farm income (X_{12})	206655.2	335017.4	322693.3	765036.1	-4.57***
Access to all-weather road (X_{13})	0.8207	0.3837	0.7822	0.4130	2.22**
Access to an established market(X_{14})	0.4631	0.4989	0.3178	0.4659	6.90***
Access to agro-dealer services (X_{15})	0.2966	0.4570	0.2386	0.4264	3.01***
Access to traders with a heavy loader vehicle (X_{16})	0.3985	0.4898	0.3950	0.4891	0.16
Kachia LGA (X_{17})	0.3226	0.4679	0.3476	0.4767	-0.85
Chikun LGA (X_{18})	0.3396	0.4740	0.3262	0.4693	0.46
Ijebu East LGA (X_{19})	0.3251	0.4688	0.3333	0.4719	-0.28
Obafemi Owode (X_{20})	0.3585	0.4799	0.3172	0.4658	1.42

Note: ***, **, and * are significant at 1 per cent, 5 per cent, and 10 per cent significant levels, respectively
Source: APRA Nigeria Field Survey, April/May 2018

combined data (Table 4.10), data classified by state (Table 4.11), and data classified by scale of operation (Table 4.12)

4.4 Analysis of factors affecting farm household market orientation in Nigeria

Table 4.13 presents the results of the estimated MOI fractional response probit model using combined data from Ogun and Kaduna states. High multicollinearity among the independent variables inflates standard errors and may render important determinants insignificant. The results of our multicollinearity test shows that there is no serious multicollinearity problem as all VIFs were below 10 and C coefficients were closer to zero. The FRM estimated results presented in Table 4.13, show that the likelihood function of MOI was highly significant at 1 per cent level (LR chi^2 = -1039.2 with Prob > chi^2 = 0.000), indicating a strong explanatory power of independent variables in explaining factors driving market orientation among farmers (goodness of fit of the model).

The results show that five variables (farm size, access to land markets, agro-dealers and traders with heavy carriage vehicles, and the state) were found to exert the expected positive and significant influence on MOI. More specifically, the results show that households that operate larger-sized farms tended to allocate a larger proportion of their farmland to crop production for sale to the market. The marginal effect estimate of 0.0046 implies that the proportion of farmland allocated to crops produced primarily for sale increases by 0.005 per cent for every 1 per cent increase in size of farm land operated. This suggests a positive influence of scale of operation on crop commercialisation in the study area and that farm households with larger farms tended to allocate their land to producing crop that placed them in a better position to participate in output markets. This influence of scale of operation on market orientation is more important in Ogun State than in Kaduna State (see Table 4.14). Our result is consistent with several prior findings in other places (Osmani and Hossain 2016; Omiti 2009; Barrett 2008; Rios, Masters and Shively 2008) who observed a positive relationship between market orientation and land size, concluding that farmers with larger farm sizes often produce more for the market.

Secondly, farm households who have access to land markets through purchasing, renting or leasing of one or more of the household's plots of farmland, tend to allocate a higher proportion of farmland to crops meant for sale, compared with farm households who accessed land solely from non-market sources such as inheritance, community, family etc. The marginal effect estimate of 0.0079 implies that the farmers that have access to a land market, on average, allocate about 0.8 per cent more of their crop land to crops produced for sale, relative to those without access. This may imply that a complementary effect exists between land markets and crop production for sale in the study area and suggests that crop commercialisation would be enhanced by improvements in land markets. We observe that this effect is stronger with farm households in Kaduna State compared with Ogun State (Table 4.14).

Thirdly, farm households with access to agro-dealer services allocated 1.03 per cent more of their farmland to crops produced for sale than those without access (Table 4.13). This effect is more important in Ogun State compared with Kaduna State (Table 4.14). Access to agro-dealers is expected to increase productivity and thus enhance market orientation. This finding is consistent with several prior findings such as de Janvry, Fafchamps and Sadoulet (1991), Barrett (2008) and Omiti (2009).

Fourth, the coefficient of access to heavy carriage vehicles is positive and significant, as expected. The results show that farm households with access to traders with heavy carriage vehicles tended to allocate 0.8 per cent more of their total farmland to cops produced for sale. This suggests that road and market infrastructural development policies could potentially enhance market orientation and by implication agricultural commercialisation in the study area.

Fifth, the coefficient of the state is positive and significant at 5 per cent showing that farm households in Kaduna State are less market oriented compared with those in Ogun State. Farm households in Ogun State allocated 21 per cent more of their farmland to crops for sale compared with farm households from Kaduna State. This may be due to the fact that Ogun State is located nearer to Lagos, the commercial nerve centre of Nigeria. Ogun State also shares Nigeria's international borders with several West African neighbours.

Table 4.14 also shows that farm households who use 'only family labour' tend to allocate less land to crops meant for sale compared with those who used some hired labour. In other words, households who have no access to hired labour are less market oriented. By implication, access to hired labour therefore increases famers' capacity to increase production of crops for the market. Thus, policies that promote better functioning labour markets that increase access to hired labour would potentially enhance agricultural commercialisation, by increasing market orientation. This effect is stronger in Kaduna State compared with Ogun State (see Table 4.14). This observed negative effect of family labour on market orientation contrasts with the findings of Barrett (2008) who observed that family labour supply is positively associated with market orientation.

Table 4.13 FRM estimation results for farm household MOI using the combined data

MOI	Coefficient	Robust Std. Err.	z	Marginal effect
Sex (household head is male = 1)	0.0290	0.0331	0.88	0.0080
Marital status (household head is married = 1)	0.0186	0.0266	0.70	0.0051
Native (household head is a native of the community where the farm is located = 1)	0.0106	0.0163	0.65	0.0029
Access to fertiliser	-0.1379***	0.0222	-6.20	-0.0382
No access to hired labour (household used only family labour = 1)	-0.0269*	0.0138	-1.95	-0.0075
Access to extension services (at least one extension visit in the season = 1)	-0.0158	0.0149	-1.06	-0.0044
Land market access	0.0286**	0.0127	2.25	0.0079
Farm size (hectares)	0.0166**	0.0072	2.30	0.0046
Livestock ownership (TLU)	-0.0050	0.0153	-0.33	-0.0014
Youth (household head age less than 36 years = 1)	-0.0015	0.0136	-0.11	-0.0004
No formal education (household head has no formal education = 1)	0.0024	0.0118	0.21	0.0007
Off-farm income	0.0000801	0.0011	0.07	0.0000222
Access to all-weather road	-0.0083	0.0120	-0.69	-0.0023
Access to an established market	-0.0148	0.0118	-1.25	-0.0041
Access to agro-dealer services	0.0373***	0.0122	3.06	0.0103
Access to traders with a heavy carriage vehicle	0.0284***	0.0110	2.57	0.0079
State (Ogun = 1; Kaduna = 0)	0.7533***	0.0208	36.30	0.2087
Constant	0.4534	0.0358	12.65	
Number of observations	2,107			
Wald $chi^2(17)$	5,462.98			
Prob>chi^2	0.000			
Log likelihood	-1039.2			
Pseudo R^2	0.0824			

Note: ***, **, and * are significant at 1 per cent, 5 per cent, and 10 per cent significant levels, respectively

Source: APRA Nigeria Field Survey, April/May 2018

Table 4.14 FRM estimation results for farm household market orientation disaggregated by state

MOI	Kaduna	z	Marginal effect	Ogun	z	Marginal effect
Sex (household head is male = 1)	-0.0307	-0.97	-0.0114	0.0568	0.94	0.0104
	(0.0316)			(0.0606)		
Marital status (household head is married = 1)	0.0158	0.59	0.0058	-0.0027	-0.05	-0.0005
	(0.0268)			(0.0581)		
Native (household head is a native of the community where the farm is located = 1)	0.0298**	1.99	0.0110	-0.0519*	-1.66	-0.0095
	(0.0149)			(0.0312)		
Access to fertiliser	-0.0349	-0.98	-0.0129	-0.1023***	-3.79	-0.0188
	(0.0356)			(0.0270)		
No access to hired labour (household used only family labour = 1)	-0.0277**	-2.04	-0.0103	-0.0032	-0.14	-0.0006
	(0.0136)			(0.0237)		
Access to extension services (at least one extension visit in the season = 1)	-0.0122	-0.97	-0.0045	-0.0387	-1.26	-0.0071
	(0.0126)			(0.0308)		
Land market access	0.0203*	1.73	0.0075	-0.0128	-0.46	-0.0023
	(0.0117)			(0.0275)		
Farm size (hectares)	0.0014	0.18	0.0005	0.0330**	2.66	0.0061
	(0.0077)			(0.0124)		
Livestock ownership (measured in TLU)	0.0140	0.92	0.0052	-0.1100	-0.78	-0.0202
	(0.0153)			(0.1414)		
Youth (household head age less than 36 years = 1)	0.0167	1.19	0.0062	-0.0733**	-2.51	-0.0135
	(0.0140)			(0.0292)		
No formal education (household head has no formal education = 1)	0.0031	0.24	0.0012	0.0053	0.20	0.0010
	(0.0128)			(0.0262)		
Off-farm income	-0.0006	-0.59	-0.0002	01	0.00	01
	(0.0011)			(0.0027)		
Access to all-weather roads	-0.0020	-0.17	-0.0007	-0.0364	-1.24	-0.0067
	(0.0120)			(0.0293)		
Access to an established market	-0.0059	-0.52	-0.0022	-0.0235	-1.07	-0.0043
	(0.0113)			(0.0220)		
Access to agro-dealer services	-0.0033	-0.28	-0.0012	0.0975***	3.75	0.0179
	(0.0116)			(0.0260)		
Access to traders with a heavy loader vehicle	0.0164	1.50	0.0061	0.0406*	1.85	0.0075
	(0.0110)			(0.0219)		
Kachia (resident in Kachia LGA = 1)	-0.1162***	-8.10	-0.0430			
	(0.0143)					
Chikun (resident in Chikun LGA = 1)	-0.0128	-0.99	-0.0047			
	(0.0129)					
Ijebu East (resident in Ijebu LGA = 1)				0.1327***	4.68	0.0244
				(0.0283)		
Obafemi Owode (resident in Obafemi LGA = 1)				-0.0674**	-2.57	-0.0124
				(0.0262)		
Constant	0.4302	7.88		1.2716***	13.82	
	(0.0546)			(0.0920)		
Number of observations	1045			1062		
Wald $chi^2(18)$	152.85			163.53		

Prob>chi^2	0.000			0.000		
Log likelihood	-676.23			-360.1937		
Pseudo R^2	0.0016			0.0084		

Note: ***, **, and * are significant at 1 per cent, 5 per cent, and 10 per cent significant levels, respectively. The value in the parenthesis is the Robust Standard Error
Source: APRA Nigeria Field Survey, April/May 2018

4.5 Factors affecting farm household market orientation by scale of operation

The study also investigated the market-oriented farmland allocation behaviour of MSFHs and SSFHs as separate populations. According to results presented on Table 4.15, two factors (being native and having a lack of access to hired labour) are observed to exert a significant negative affect on MOI among MSFHs, while youthfulness of the household head negatively affected the MOI for both MSFHs and SSFHs.

The marginal coefficient of -0.0269 for nativity implies that the MSFHs whose household heads are native allocate about 2.7 per cent less land to cultivate crops for sale than MSFHs whose household head is a non-native. Secondly, MSFHs and SSFHs whose household heads are youths (below the age of 36 years) are less market oriented relative to those with more elderly household heads. MSFHs headed by youths allocated 1.9 per cent less land to market-oriented crops, while SSFHs with youthful household heads allocate about 1.4 per cent less land to market-oriented crops. Third, MSFHs who use 'only family labour' are less market oriented relative to those who used some hired labour. Its marginal coefficient implies that MSFHs who had access to hired labour allocated 2.7 per cent more land to crops cultivated for sale compared with MSFHs who used only family labour.

In addition, we observe a significant positive relationship between MOI and four variables among MSFHs and not SSFHs: access to extension services, land markets and agro-dealer services, and off-farm income. First, MSFHs that have access to extension services are more market oriented than those who do not. They allocate 3.6 per cent more of their farmland to crops for sale relative to those MSFHs who do not have access to extension services, while access to extension services is not an important determinant of market orientation among SSFHs.

Second, access to land markets positively influences market orientation among MSFHs, but not among SSFHs. We observe that MSFHs who have access to land markets allocate 2.5 per cent more land to crops for sale relative to those without access. Third, access to agro-dealers' influence market orientation positively and significantly among MSFHs but is not significant among SSFHs. This suggests that market orientation is associated with scale of operation. Fourth, off-farm income has a positive and significant influence on market orientation among MSFHs, but not among SSFHs.

Finally, there are two factors that significantly and positively affect market orientation among both MSFHs and SSFHs. These are access to all-weather roads and an established marketplace. Farm households, irrespective of scale, who have access to all-weather roads allocate 2.4 per cent more land to the cultivation of crops meant for sale. Market orientation of MSFHs is more responsive to access to established marketplaces compared with SSFHs. Specifically, MSFHs who have access to established marketplaces allocate about 3 per cent more land to market-oriented crops compared with 1 per cent for SSFHs with access to established markets. Government programmes like the Central Bank of Nigeria's Anchor Borrowers Program[2] is focused on increasing farmer's access to both input and output markets and could therefore enhance market orientation of farm households, as revealed in this study.

In terms of policy implications, policies aimed at enhancing agricultural commercialisation among SSFHs should focus mainly on increasing access to all-weather roads and established marketplaces. Agricultural commercialisation can be enhanced among MSFHs by policies that focus on increasing access to labour markets, extension services, land markets, and agro-dealer services, in addition to all-weather roads and established marketplaces.

Table 4.15 FRM estimation results for farm household market orientation by scale of operation

MOI	Small scale	z	Marginal Effect	Medium scale	Z	Marginal Effect
Sex (household head is male = 1)	-0.0606	-1.27	-0.0172	0.0265	0.40	0.0075
	(0.0478)			(0.0664)		
Marital status (household head is married = 1)	0.1240***	3.09	0.0352	-0.1018*	-1.83	-0.0288
	(0.0402)			(0.0556)		
Native (household head is a native of the community where the farm is located = 1)	-0.0214	-0.75	-0.0061	-0.1050***	-3.35	-0.0297
	(0.0287)			(0.0314)		
Access to fertiliser	-0.6529***	-27.15	-0.1852	-0.6335***	-20.89	-0.1791
	(0.0241)			(0.0303)		
No access to hired labour (household used only family labour = 1)	-0.0236	-0.95	-0.0067	-0.0880***	-3.46	-0.0249
	(0.0248)			(0.0254)		
Access to extension services (at least one extension visit in the season = 1)	-0.0007	-0.02	-0.0002	0.1015**	2.80	0.0287
	(0.0289)			(0.0363)		
Land market access	0.0417*	1.79	0.0118	0.0887***	3.82	0.0251
	(0.0233)			(0.0232)		
Farm size	0.0260	1.58	0.0074	0.0318	1.46	0.0090
	(0.0164)			(0.0217)		
Livestock ownership (TLU)	-0.2205***	-7.45	-0.0625	-0.2696***	-9.44	-0.0762
	(0.0296)			(0.0286)		
Youth	-0.0486**	-2.21	-0.0138	-0.0660**	-2.21	-0.0187
	(0.0220)			(0.0299)		
No formal education (household head has no formal education = 1)	-0.0383*	-1.78	-0.0109	-0.0055	-0.24	-0.0016
	(0.0215)			(0.0234)		
Off-farm income	-0.0008	-0.43	-0.0002	0.0050**	2.20	0.0014
	(0.0019)			(0.0023)		
Access to all-weather road	0.0859***	3.44	0.0244	0.0864***	3.81	0.0244
	(0.0250)			(0.0227)		
Access to an established market	0.0387**	2.03	0.0110	0.1132***	4.52	0.0320
	(0.0250)			(0.0250)		
Access to agro-dealer services	-0.0345*	-1.76	-0.0098	0.0553**	2.14	0.0156
	(0.0196)			(0.0258)		
Access to traders with a heavy loader vehicle	0.0187	0.98	0.0053	0.0227	1.01	0.0064
	(0.0192)			(0.0225)		
Constant	1.0991***	14.44		1.3231***	13.07	
	(0.0761)			(0.1012)		
Number of observations	1099			1008		
Wald $chi^2(16)$	1816.29			1301.76		
Prob>chi^2	0.000			0.000		
Log likelihood	-554.739			-506.954		
Pseudo R^2	0.0611			0.0641		

Note: ***, **, and * are significant at 1 per cent, 5 per cent, and 10 per cent significant levels, respectively. Value in the parenthesis is the Robust Standard Error

Source: APRA Nigeria Field Survey, April/May 2018

5 SUMMARY OF FINDINGS

5.1 Crop classifications

i. All seven tree/permanent crops cultivated, except oil palm, are primarily cultivated for cash by both MSFHs and SSFHs.

ii. Oil palm (oil seed) is produced primarily for cash by MSFHs, but for food by SSFHs.

iii. All seven starch/sugar crops and six vegetable crops are primarily cultivated for cash by both MSFHs and SSFHs.

iv. Other crops cultivated primarily for markets by both SSFHs and MSFHs are pineapple, water melon (arable fruit), Bambara (arable nut), and groundnut (oil seed).

v. All four cereal crops are primarily cultivated for food by both MSFs and SSFs in the study area.

vi. Other crops cultivated primarily for food by both SSFHs and MSFHs are ginger, beans/cowpeas, and soya beans.

vii. Banana (arable fruit) and melon (oil seed) are cultivated primarily as commercial crops by SSFHs, but as food crops by MSFHs.

viii. MSFHs take a greater share of food crops produced to the market compared to SSFHs, that is, the degree of food crop commercialisation is higher with MSFHs than SSFHs.

5.2 Assessment of degree of market orientation

i. Farm households, on average, irrespective of scale of operation, allocate 77 per cent of their farmland to the cultivation of crops for the market.

ii. The MOI for MSFHs who operate over 20ha is slightly higher at 78.5 per cent when compared with 77 per cent for MSFHs who operate on less than 20ha.

iii. The MOI for farmers in Ogun State is 89.2 per cent and 64.9 per cent for those in Kaduna State.

iv. MSFHs in Ogun State are more market oriented than MSFHs in Kaduna State.

5.2 Drivers of market orientation

1. Farm households that operate larger-sized farms tend to allocate a larger proportion of their farmland to crop production for sale to the market. The proportion of farmland allocated to crops produced primarily for sale increases by 0.005 per cent for every 1 per cent increase in the size of farm land operated. This suggests a positive influence of scale of operation on crop commercialisation in the study area.

2. MSFHs who have access to land markets allocate 2.5 per cent more of their crop land to crops produced for sale relative to those without access. In other words, crop commercialisation is enhanced by improvements in land markets in the study area, especially among MSFHs.

3. MSFHs who have access to extension services tend to allocate about 2.9 per cent more of their farmland to crops cultivated for sale compared with those who do not have access to extension services.

4. Access to all-weather roads increases market orientation for both SSFHs and MSFHs.

5. MSFHs and SSFHs who have access to an established marketplace are more market oriented than those who do not have such access.

6. MSFHs who have access to agro-dealer services are more market oriented than those

who do not have such access, as is the situation in Ogun State.

7. MSFHs who use 'only family labour' tend to allocate less land to crops meant for sale compared with those who used some degree of hired labour. In other words, MSFHs who have no access to hired labour are less market oriented, as is the situation in Kaduna State.

5.3 Conclusion

The results of this study support the following major conclusion.

i. Larger farms tend to allocate more land to commercial crops or crops primarily produced for sale in the market. This implies that encouraging the growth of MSFs, especially with respect to the '*stepping up*' of SSFs to MSFs, could potentially enhance the process of agricultural commercialisation in Nigeria.

ii. Improved access to land markets, hired labour, agro-input markets, extension services, all-weather roads and established markets, drive decisions to allocate more land to crop production for sale in the market.

iii. These observed drivers of market-oriented land allocation have stronger influences among MSFHs compared with SSFHs. This might imply that MSFs would be potentially more responsive to policies addressing these identified drivers.

iv. Policies aimed at promoting agricultural commercialisation among farm households in Nigeria may need to focus in part on these identified access factors.

v. Encouraging the growth of MSFs may potentially promote increased responsiveness of the farm sector to policies aimed at increasing the allocation of productive farmland to market-oriented crops in Nigeria.

5.4 Policy implications of study

1. Promoting the growth of MSFs might be a veritable pathway for enhancing the process of agricultural commercialisation in Nigeria.

2. Improvements in access to land markets would potentially increase crop commercialisation, in Kaduna State.

3. Improvements in extension service provision could potentially increase agricultural commercialisation among MSFHs in both Ogun and Kaduna states.

4. Development of an all-weather rural road network would enhance agricultural commercialisation in both Ogun and Kaduna states.

5. Product market access remains an important factor for market orientation of households, implying market infrastructural development policies would enhance the process of agricultural commercialisation in both Ogun and Kaduna states.

7. Policies that improve the access of MFSHs to agro-dealers would potentially enhance the process of agricultural commercialisation in Nigeria.

8. Policies that increase access to hired labour by MSFHs through the promotion of better functioning labour markets would potentially enhance agricultural commercialisation, especially in Kaduna State.

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ENDNOTES

1 https://oshlookman.wordpress.com/2018/05/01/kaduna-the-untapped-gold-of-the-northern-nigeria/

2 The Central Bank of Nigeria, in line with its developmental function, established the Anchor Borrowers' Program. The programme was launched on 17 November 2015. The focus is to create a linkage between smallholder farmers and anchor companies involved in the processing of selected agricultural commodities. Major aspects of the programme include provision of farm inputs in kind and cash (for farm labour) to smallholder farmers, to boost production of these commodities, stabilisation of the input supply chain to agro-processors, and the reduction of the country's negative balance of payments on food. At harvest, smallholder farmers supply their produce to the agro-processor (anchor) which pays the cash equivalent to the farmer's account.

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