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FACTORS AFFECTING LAND ALLOCATION AMONG FOOD CROP FARMERS IN NIGER STATE, NIGERIA

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ABSTRACT

The study examined factors affecting land allocation among food crop farmers in Niger State, Nigeria. Data used for the study were obtained using structured questionnaire administered to 400 randomly selected food crop farmers from three Local Government Areas of the State. The specific objectives of the study were achieved using descriptive statistics and fractional multinomial logit analysis. The result of methods of land acquisition in the study revealed that 58.25% of the farmers acquired their farm land through inheritance, while 9%, 4.75% and 31.25% of the farmers acquired their farm land through land purchase, gift and rent respectively. The findings further that farmers in Niger State generally allocated more land to cereal crops, followed by tuber/root crops and legumes. The results of the agricultural land allocation pattern, income and area cultivated to various crop combination revealed that 67.0% of the farmers practiced mono cropping system of agriculture with the average annual farm income of ₦1,324,311 ranging from minimum of ₦232,500 to maximum of ₦6,250,000. The results of the marginal effect of fractional multinomial logit (FML) analysis showed that, the Wald chi^2 value was 194.82 and this is statistically significant at 1% level of probability. The pseudo R^2 value of 0.5697 also confirmed that all the slope coefficients are not equal to zero. The results further revealed that labour, land ownership, sex, years of farming experience, level of education, extension contact, land ownership and income of the farmers had positive and statistically significant marginal effect on share of land allocated for all the food crops (cereal, legume and root/tuber). Based on findings from the study, it is therefore recommended that the government should create awareness among food crop

farmers through workshops and seminars on market access to farm inputs, labor, and land use, allocation for improved farmer welfare.

Keywords: Land Allocation, Food Crops, FML

INTRODUCTION

The Nigeria agricultural sector is dominated by small-scale resource poor farmers living in the rural areas, with farm holdings of 1 to 2 hectares, scattered over a wide area (Adesiyan et al., 2019). In the agrarian economy, land is central to income and livelihood. According to Index Mundi (2019), the Nigeria agricultural sector is dominated by small-scale resource poor farmers living in the rural areas, with farm holdings of 1 to 2 hectares, scattered over a wide area. In the agrarian economy, land is central to income and livelihood. It further reported that agricultural lands in Nigeria represent estimated 80% of the total land area in the country. However, less than 50% of this acreage is currently under agricultural production. Moreover, food production from the existing cultivable holdings is yet to meet up with Nigeria's population growth. World Population Review (2022) established that Nigeria is the seventh most populated country in the world, with growth rate of 2.6%. Meanwhile, lack of income and livelihood opportunities and continuous work on low wages have limited the participation of landless rural farming households in the social and political processes within their community or at larger levels. These challenges critically reduced the contributions of these households to agricultural production in their areas. Generally, access to land is essential to enable rural poor have equal opportunities created by market. Nzeh et al. (2017) argued that farmers' access to land will enable them take some of the opportunities created by the market According to Kruseman et al. (1996), efficient land utilization and management practices ensure achievement of farm-level objectives in terms of economic viability, food security and risk aversion. Also, Nasikh et al., (2021) posited that optimal land use and resource allocation have to do with the selection of the most suitable crop enterprises, determining the appropriate land allocation for each crop, and selecting the best methods and input combinations to maximize net farm returns. Thus, the need to understand household decision in terms of land resource allocation, given its importance in supporting agricultural production. According to Ganiyu and Akinsola (2025), actualizing the objective of proportional distribution of land tracts among mixed crops emerging on the same plot remains the major task for crop cultivators. Meanwhile, household land

allocation decisions depend on several factors, including institutional, economic, environmental and social factors.

In most of the studies on dynamics of land allocation in farming system, efforts have been concentrated on the determinants of land allocation to specific crops, but this is difficult in a multi-crop system where farmers choose more than two crops. In order to resolve this problem, some studies simply take data from a single or dual-crop production system, ignoring the land allocation to other crops as explanatory variables, which risks simultaneity bias by assuming that farmers have a sequential decision-making process when allocating their land to various crops. To bridge this methodology gap, this study is set to develop a fractional multinomial logit model that can cover inclusion of land allocation to other crops as explanatory variables without the risk of simultaneity bias. Understanding farmers' land allocation decisions is an important step in advancing food security in a country where most farm households are largely subsistent, struggling with food insecurity. Also, in a country where the majority of the population relies heavily on rain-fed agriculture for their livelihoods, it is critical that policymakers understand how and why farmers devote certain shares of their land to growing of certain crops. Therefore, the study provide answer to the question of what are the main determinants of land allocation to food crops for households in Niger State Nigeria?

The aim of this study is to assess the dynamics of land allocation among food crop farmers in Niger State, Nigeria. The objectives are to: examine the household land-size holdings and patterns of land allocation to different food crops; analyse the trends in land ownership and allocation in the study area; and develop econometric model for determinants of the share of land allocation to major food crops in the study area

METHODOLOGY

Study Area

This study was conducted in Niger State, located in the North Central Region of Nigeria. According to Adamu (2018), Niger State is located within Latitudes 8º 12′ to 11º 30′ North and Longitudes 3º30′ to 7º20′ East. The State is bordered to the North by Zamfara State, North West by Kebbi, South by Kogi State, South West by Kwara State, while it is bordered to the North East

and South East respectively by Kaduna State and FCT. The State also shares a common international boundary with the Republic of Benin at Babanna in Borgu Local Government Area. Niger State is located in the middle belt of the country and Guinea Savannah vegetation. It covers a total land area of 76,000 km^2 or about 9% of Nigeria area (Niger State Bureau of Statistics (NBS), 2014). The population of the State in 2006 was 3,950,249 and is projected to be 5,900,257 in 2022 with annual growth rate of 3.4% (NBS, 2022). Niger State has twenty-five Local Government Areas and three agro-ecological zones (NBS, 2014).

Sampling Technique

A multi-stage sampling technique was used to select 400 food crop farmers across the three agricultural zones (Lavun - Zone 1; Chanchaga- Zone 2 and Wushishi - Zone 3) of the State from the updated farmers' profile obtained from Niger State Agriculture and Mechanization Development Agency (NAMDA) using the Yamane formula as used by Ojo *et al*., (2024) and specified in equation (1) at 95% precision level.

$$n = \frac{N}{(1+Ne^2)} \quad (1)$$

Where;

n = Number of samples,

N = Total population and

e = Error tolerance (5%)

Method of Data Collection

Primary data for the study were collected with the use of structured questionnaire and household interview schedule. Data collected include socio-economic characteristics of the farmers (age, farming experience, income, and others), cropping patterns, mode of land acquisition and farm size allocated to crops, production inputs, crop outputs and the constraints faced in land allocation by the farmers.

Analytical Techniques:

Objectives (i) and (ii) were achieved with the use of descriptive statistics such as frequency distribution table, mean and standard deviation. Objective iii was achieved using fractional multinomial logit which combines two variations on the standard logit model: the fractional logit and the multinomial logit. Fractional multinomial logit model is a set of dependent variables that each must range between 0 and 1 and must always, for each observation, add up to 1. It is a multivariate generalization of the fractional logit model proposed by Papke and Wooldridge (1996)

The general form of the equation as used by Adjimoti (2018) is specified implicitly in equation (2)

$Q_{ji} = f(Z_{ji}, P, L_i, A, X, H, Y, R)$ (2)

Where Q is the dependent variable and represents share of land allocated to each crop category. Q will depend on some variables such as inputs (P), labour (L_i), land area available (A_i), household socioeconomic characteristics (H), income (Y) and other variable (R). In this study, three categories of food crops such as cereals, legumes and root/tubers were considered. In practice, many farmers may actually combine two or more crops on the same plot. To determine the share of land allocated to a specific crop, the cropland size was approximated using the seed quantity used by the household. With the seed quantity standard per hectare, the share of land allocated to a specific crop in the context of multi-cropping was estimated.

The explicit form of the equation (3) is specified as follows:

$$E\left(\frac{Q}{W}\right) = \beta_o + \beta_1 fert + \beta_2 Lab + \beta_3 Land + \beta_4 Sex + \beta_5 Age + \beta_6 HHSize + \beta_7 Fexp + \beta_8 Edu + \beta_9 Cred + \beta_{1o} Ext + \beta_{11} Lown + \beta_{12} Dism + \beta_{13} Inc \quad (3)$$

Where $E\left(\frac{Q}{W}\right)$= share of land allocated to each crop category

Fert = Fertilizer (kilogram)

Lab = Labour (man-day)

Land = Land area (Hectares)

Sex = Gender of the farmer (Dummy: 1 =male, 0 = female)

Age = Age of the farmer (year)

HHsize = Household size (number)

Fexp = Farming Experience (years)

Edu = Education of the farmer (years)

Cred = Amount of credit received (Naira)

Ext = Extension visits per year (number)

Lown = Land ownership (1 = own, 0 = otherwise.]

Dism = Distance to the nearest market (kilometer)

Inc = Income (Naira)

β_1 to β_2 = parameters to be estimated

RESULTS AND DISCUSSION

Mode of Land Acquisition

The result of methods of land acquisition in the study area is presented in Table 1. The result revealed that most of the farmers (56.41%) acquired their farm land through inheritance, while 8.72% of the them acquired their farm land through outright purchase. These two land acquisition modes confer the property ownership right on the farmers which can help them in taking easy decisions on allocating the land for different crop production. This finding is line with the findings of Edet *et al*., (2011) who reported that land inheritance and outright purchase of land provide land ownership right to the farmers which gives them the liberty to allocate land for different crop production. The study further revealed that 4.60% and 30.27% of the farmers acquired their farm land through gift and rent respectively. This imposes limited right on farmers, which can hinder the farmers in putting such land to more productive use than it should. The land limited right can cause farm land to be multi-cropped each year which can lead to increase in the rate of land degradation if no standard practice of land management is carried out.

Table 1: Distribution of respondents based on mode of land acquisition

Mode of land acquisition	Frequency*	Percentage
Inheritance	233	56.41
Purchase	36	8.72
Gift	19	4.60
Rent	125	30.27

* = multiple response allowed

Source: Field Survey, 2024

Land Use Share Allocation

The results of land allocation for production of different food crops in the study area are presented in Table 2. The results revealed that the overall mean land allocated to food crops by farmers was 4.42 hectares ranging from 0.5 to 24 hectares with mean land allocation of 3.34, 0.35 and 0.73 hectares to cereal crops, legumes and roots/tubers respectively. This finding implies that farmers in Niger State generally allocated more land to cereal crops, followed by tuber/root crops and legumes. The reason could be attributed to the presence of vast fertile arable land in Niger State. Also, Table 3 presents the results of the combination of food crops grown in the study area. The results revealed that 68.5% of the sampled farmers planted either of maize, rice and sorghum which confirms that cereals are the most grown crops in the study area, while 6.5% and 24.75% of the

farmers planted cowpea (legume) and cassava/yam (root/tuber) respectively. This result agrees with the finding of Ismaila *et al*., (2010) who reported that cereals were the most grown crops in Niger State

Table 2: Distribution of respondents based on land use share allocation

Variable	Number	Mean	Standard Deviation	Minimum	Maximum
Cereal (Ha)	400	3.34	2.34	0.3	12
Legume (Ha)	400	0.35	0.18	0.2	3.5
Root/Tuber (Ha)	400	0.73	0.23	0.5	21
Total Farm Size (Ha)	400	4.42	3.49	0.5	24

Source: Field Survey, 2024

Table 3: Distribution of respondents based on various crops combination

Type of Crops Combination	Frequency	Percentage
Maize	97	24.25
Rice	62	15.50
Yam	86	21.50
Cowpea	27	6.75
Maize -Rice	53	13.25
Maize-Rice-Sorghum	62	15.50
Yam-Cassava	13	3.25

Source: Field Survey, 2024

Agricultural land Allocation Pattern

The results of the agricultural land allocation pattern, income and area cultivated of various crop combination are presented in Table 4. The results revealed that 67.0% of the farmers allocated farm land for mono cropping system with an average annual farm income of ₦1,324,311 ranging from minimum of ₦232,500 to maximum of ₦6,250,000. Other form of cropping system agricultural land was allocated to by the sampled farmers in the study area was mixed cropping system with two crop combination (66.0%) and three crop combination systems (66.0%). This implies that some of the farmers in the study area adopted different crop diversification strategies to fully utilize highly fragmented agricultural land and thus attempted to reduce risks and uncertainties in their operations. The finding also indicates that farmers with three crop combination realized more annual farm income than those that practiced two crop combination mixed cropping. This corroborates the finding of Edet *et.al*., (2011), that mixed cropping with more crop combination s

enhances more income to farmers. The results further revealed that, in the study area, average of 4.54, 3.81 and 4.53 hectares of land were allocated to mono cropping and mixed cropping (two crops and three crops combination) system, respectively.

Table 4: Distribution of income and area cultivated based on various crop combinations

Enterprise	Freq. (%)	Mean area of land (Hectare)	Mean annual Farm income (₦)	Minimum annual farm income (₦)	Maximum annual farm income (₦)
Mono-cropping	268 (67.0%)	4.54	1,324,311	232,500	6,250,000
Two crops-combination	66 (16.5%)	3.81	1,232,247	220,500	2,562,500
Three crops-combination	66 (16.5%)	4.53	1,323,792	463,000	6,220,000

Source: Field Survey, 2024

Summary Statistics of Independent Variables in Multinomial Fractional Logit Analysis

The summary statistics of the variables for the multinomial fractional logit analysis is presented in Tables 5a and 5b. It include the sample mean and the standard deviation for each of the variables. The findings showed that the mean income of ₦1,309,035 was obtained from an average of 4.42 hectares of land cultivated by sampled farmers. Furthermore, it was revealed that the average man-day of labour, fertilizer(kg), age of farmers, years of farming experience, household size and years of schooling were 56.98, 105.65, 47.60, 17.81, 6.00 and 9.07 respectively. The results also revealed that 80% of the farmers were male and only 14.75% of the farmers had access to credit facilities.

Table 5a: Summary Statistics of Independent Variables in Multinomial Fractional Logit Analysis

Variable	Number	Mean	Standard Deviation	Minimum	Maximum
Labour (Manday)	400	56.98	25.19	37	130
Fertilizer (kg)	400	105.65	56.34	25	300
Total farm land available (Ha)	400	4.42	3.49	0.5	24
Age (year)	400	47.60	8.46	28	62
Farming experience (year)	400	17.81	12.88	4	30
Household size	400	6.00	2.00	1	13
Education (years)	400	9.07	5.59	0	17
Distance to market (km)	400	5.49	4.23	0.15	8.2
Income (Naira)	400	1,309,035	656,571.3	220,500	6,250,000

Source: Field Survey, 2024

able 5b: Summary Statistics of Dichotomous Independent Variables in Multinomial Fractional Logit Analysis

Variables	Options	Frequency	Percentage
Sex	Male	320	80.00
	Female	80	20.00
Land Ownership	Yes	66	16.50
	No	334	83.50
Access to credit	Yes	59	14.75
	No	341	85.25

Source: Field Survey, 2024

3.5 Determinants of Land Allocation to Food Crops in the Study Area

The results of the marginal effect of fractional multinomial logit (FML) analysis showing the factors affecting land allocation to food crops in the study area are shown in Table 6. The data analysis started first with finding a maximum likelihood (ML) fit of fractional multinomial logit, upon which, the marginal effects of the independent variables on land shares were calculated from the FML fit. The results in Table 6 showed that, the Wald chi^2 value was 194.82 and this is statistically significant at 1% level of probability. This test confirms that all the slope coefficients are significantly different from zero. The pseudo R^2 value of 0.5697 also confirmed that all the slope coefficients are not equal to zero. In other words, the explanatory variables are collectively significant in explaining the land allocation to food crops decisions by farmers in the study area. The results in Table 6 further revealed that labour, land ownership, sex, years of farming experience, level of education, extension contact, land ownership and income of the farmers had positive and statistically significant marginal effect on share of land allocated for all the food crops (cereal, legume and root/tuber) in this study. This implies that an increase in these explanatory variables led to marginal increase in the share of land allocated to production of cereal, legume and root/tuber crops in the study area. This finding is in line with the findings of Ng'elenge and Damas, (2023), Mponela *et al.* (2011), and Adebayo *et al*, (2020), who reported that the availability of farm labour, increase in number of male farmers, land availability and ownership of land were among the factors that influenced land allocation to various crops in their study area.

Table 6: MFL marginal effect of factors affecting land allocation to food crops production

	Cereal Land Share		Legume Land Share		Root/Tuber Land share	
Variable	dy/dx	P>z	dy/dx	P>z	dy/dx	P>z
Labour	0.0035***	0.002	0.0023**	0.050	0.0033***	0.000
Fertilizer	0.0068**	0.042	-0.0055	0.105	0.0059	0.264
Land availability	0.0289***	0.000	0.0002**	0.023	0.0180***	0.000
Sex	0.0713**	0.020	0.0673**	0.042	0.0185**	0.031
Age	-0.0154	0.647	0.0007	0.642	0.0017	0.128
Household size	-0.0071	0.508	-0.0031	0.483	-0.0007	0.849
Farming experience	0.0081*	0.060	0.0011**	0.032	0.0003***	0.005
Education	0.0004**	0.011	0.0015**	0.041	0.0005***	0.043
Access to credit	-0.0109	0.850	0.0233	0.406	0.0031	0.879
Extension Contact	0.0041***	0.000	0.0021**	0.035	0.0002**	0.032
Land ownership	0.0021**	0.024	0.009**	0.043	0.0087**	0.016
Distance to market	-0.033*	0.088	-0.0022***	0.004	0.0004**	0.028
Income	0.0074***	0.005	0.0017**	0.019	0.0006**	0.041

* = Significant @10% ** = significant@ 5% ***significant @ 1%.
Number of Observation = 400, Pseudo R^2 = 0.5697, Wald chi^2 (13) =194.82 Prob > chi^2 = 0.0000
Source: Data Analysis, 2024

SUMMARY, CONCLUSION AND RECOMMENDATIONS

The study examined factors affecting land allocation among food crop farmers in Niger State, Nigeria. The result of methods of land acquisition in the study area revealed that most of the farmers acquired their farm land through inheritance which confers the property ownership right on the farmers which can help them in taking easy decisions on allocating their land for different crop production. Also, the results of land allocation for production of different food crops in the study revealed that farmers in Niger State generally allocated more land to cereal crops, followed by tuber/root crops and legumes. The results of the agricultural land allocation pattern, income and area cultivated to various crop combination showed that farmers in the study area adopted different agricultural diversification strategies to fully utilize highly fragmented agricultural land and thus attempted to reduce risks and uncertainties in their operations. The finding also indicated that farmers with three crop combination realized more annual farm income than those that practiced two crop combination mixed cropping. The results of the marginal effect of fractional multinomial logit analysis revealed that labour, land ownership, sex, years of farming experience, level of education, extension contact, land ownership and income of the farmers had positive and statistically significant marginal effect on share of land allocated for all the food crops (cereal, legume and root/tuber) production in the study area. Based on the study findings, it is therefore

recommended that the government should create awareness among food crop farmers through workshops and seminars on market access to farm inputs , labour, and land use, allocation for improved farmer welfare.

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