DETERMINANTS OF FARM ENTERPRISE CHOICE AMONG FADAMA USERS IN FEDERAL CAPITAL TERRITORY, ABUJA, NIGERIA

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ABSTRACT

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This study examined the determinants of farm enterprise choice among fadama users in Federal Capital Territory, Abuja, Nigeria. Cross sectional data were obtained from 387 fadama users with the aid of structured close-ended questionnaire. Data collected were analyzed using frequency, percentages, means and multinomial logit model. The study found that about 39% of the fadama users are into crop production and about 27% are into agro-processing, 23% preferred livestock farming while only 11% of the fadama users are in fish farming. The result of the multinomial logit model likelihood ratio statistics as indicated by χ^2 statistics was highly significant ($p<0.0000$). The explanatory power of the factors as reflected by Pseudo R^2 was high (0.66), responsible for about 66% of the variations in fadama users' choice of farm enterprise. Gender, education, labour, land ownership status, credits access and off-farm job significantly influence farm enterprise choice at $p<0.01$ and 0.05 level of probability. Lack of storage facilities (3.67), poor access to and control of land for agricultural production (3.65), inaccessibility of farmers to agrochemicals and fertilizers (3.61), price fluctuation of products (3.58) and inadequate farm labour (3.53) are part of the major challenges facing the farmers. Hence, the education and training of fadama users should be emphasised for sustainable livelihood and government should increase institutional supports through provisions of storage facilities, agrochemicals and fertilizers, stabilization of agricultural commodity price and provision of irrigation and drainage equipment at subsidized rates.

Keywords*: fadama, enterprise choice, user group, challenges, Abuja.*

INTRODUCTION

Nigeria is naturally endowed with good arable land, water resources, rich vegetation and favourable climate that support robust agricultural production. For instance, FAO (1995) reported that approximately 61 million hectares of land mass in Nigeria is cultivable while the total renewable water resources is about 280 km3/yr capable of sustaining Nigerian agriculture if properly managed. The Nigerian agricultural sector is dominated by small scale farmers with their associated low productivity. The present low production capacity of Nigerian agriculture has grossly undermined the realization of self-sufficiency of food and alleviation of hunger in the country. In order to ensure the achievement of laudable objective of self-sufficiency in food production is the country, National Fadama Development Project was initiated. The word "Fadama" is a Hausa name for irrigable land usually low-lying and flood plain areas underlined by shallow aquifers and found along Nigeria's river system (National Fadama Development Project, 2009). Fadama, as described by Ibrahim and Omotesho (2011) is a wetland or the seasonally flooded or floodable plains along major savanna rivers and/or depressions on the adjacent low terraces. Fadama areas are typically waterlogged during the rainy seasons but retain moisture during the dry season for food production. The Federal Government of Nigeria between 1993 and 1999 implemented the first National Fadama Development Project (Fadama I). The implementation of fadama I was trial tested in seven northern states which include: Bauchi, Gombe, Jigawa, Kano, Kebbi, Sokoto and Zamfara. As a result of the widespread adoption of the fadama technology in those states, there was significant increase in farmers' income of up to 65% for vegetables, 334% for wheat and 497% for rice (National Fadama Development Project, 2005).

The substantial achievement of Fadama I encouraged the Federal Government to seek for financial support from African Development Fund (ADF) and the World Bank towards the implementation of second National Fadama Development Project (Fadama II). The ADF approved a credit facility of UA 22 million (USD $ 30.8 million) in December 2003 and the Fadama II commenced in June 2004. According to Echeme and Nwachukwu (2010), fadama II was initiated to address some of the factors that militate against the full realization of the potential benefits of agricultural production some of which are poor development of rural infrastructure, storage, processing and marketing facilities. Twelve states which include: Adamawa, Bauchi, Gombe, Imo, Kaduna, Kebbi, Lagos, Niger, Ogun, Oyo, Taraba and Federal Capital Territory, Abuja benefited from the fadama II project. Generally, the objectives of fadama II are to sustainably increase the incomes of fadama users who depend directly or indirectly on fadama resources through empowering communities to take charge of their own development agenda. The National Fadama Development Project (2005) highlighted the main features of fadama II to include empowering the farmers, supporting the provision of market infrastructure, improving the conflict resolution mechanism, supporting rural and non-farm enterprises, focusing on the contribution of women to agriculture, supporting increased food production and efficient management of fadama resources. In addition, Echeme and Nwachukwu (2010) reported that, one of the most important features of fadama II is the privilege the beneficiaries

(fadama users) have to make a choice of the kind of farm enterprise that they want to pursue. National Fadama Development Project (2005) identified the four major farm enterprises under fadama to include: crop production, livestock production, fish farming (aquaculture) and agro-processing.

Tubers crops, vegetables, millets and maize are some of the important crops that are widely cultivated by fadama users due to their significant yield under a well-managed fadama system. For instance, the yield of vegetables per hectare during the dry season when there is abundant sunshine for photosynthesis and regulated water supply is about 300% of that during the rainy season (Aladetoyinbo, 2001). Also, the high water requirement for livestock production, fish farming and agro-processing makes fadama system a rational option for sustainable food production in the country. The farm enterprise choice of the fadama users could be informed by some factors or socio-economic attributes of the farmers. Informed decisions on farm enterprise choice can only be meaningful if those factors that drive fadama users in making farm enterprise choice is empirically investigated. This is important because farm enterprises differ in terms of their cultural values, farm resources requirement and products. Available past research efforts on fadama system in Nigerian agriculture have focussed on the assessment of the impacts of fadama on socio-economic development of farmers in the country. This is evident in the studies of Dauda, *et al.* (2009); Ajayi and Nwalieji (2010); Ibrahim and Omotesho (2011); Umar *et al.* (2012) and Alabi, *et al.* (2014). None of the available studies captured determinants of farm enterprise choice by fadama users in any of the benefitting states in Nigeria. Hence, this study was carried out to fill the existing knowledge gap by investigating determinants of farm enterprise choice among fadama users in Federal Capital Territory, Abuja.

MATERIAL AND METHOD

Study area

The study was carried out in Federal Capital Territory (FCT), Abuja. The FCT covers a land area of about 8000sq km with a total population of 1,405,201 (National Population Commission, 2006). It is bounded in the north by Kaduna State, in the west by Niger State, in the east and southeast by Nassarawa State and in the southwest by Kogi State. The FCT is natural endowed with rolling hills and isolated highlands. The savanna grassland of the north and the middle belt, the richness of tropical rainforest of the south and an equable climate make the FCT rich in good agricultural soils. FCT is one of the areas covered by the National Fadama Development Project (Fadama II) (Dauda, *et al.,* 2009). The project is operated in the fadama resource rich areas of the FCT. These areas are demarcated into 10 fadama development areas (FDAs). They are: Abaji, Gwagwalada, Kuje, Abuja Municipal, Wako-Ashara, Bwari, Karshi, Kwali, Rubochi and Yaba.

Sampling and data collection

There are 1,127 fadama users engaging in crop production, livestock rearing, fish farming (aquaculture) and agro-processing enterprises in FCT, Abuja (National Fadama Development Project, 2014). Random sampling technique was used to select 400 fadama users across the 10 FDAs in FCT, Abuja. In determining the sample size, the Yamane (1967) method was adopted since the actual population of fadama users in FCT can be ascertained. Yamane (1967) provides a simplified formula to calculate sample sizes. A 95% confidence level and level of maximum variability (p = 0.05) was assumed. This formula was used to calculate the sample size for this study and is shown below:

$$n = \frac{N}{1 + N(e)^2} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots .. (1)$$

Where: n = Sample size required
N = Total population
e = allowance error (0.05)
By substituting the parameters;

$$n = \frac{1{,}127}{1 + 1{,}127(0.05)^2} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (2)$$

n = 399.65
Approx. 400 fadama users

After the computation of the sample size by substituting the numbers into the Yamane formula, the obtained sample is 399.65 fadama users. The researchers approximated the sample size to 400 fadama users that constituted the respondents for the study. Hence, simple random sampling was used to select 40 fadama users from each of the 10 FDAs in FCT Abuja totalling 400 fadama users from which data for the study were collected. The data for this study were obtained from primary source through the use of structured questionnaire with close-ended questions. The questionnaire focused mainly on socio-economic characteristics of the fadama users and their preferred farm enterprise in the fadama system. The data for the study were collected in November - December, 2015 with the help of ten extension agents in the study area. Out of the 400 copies of the questionnaire administered and retrieved, 387 copies were considered valid for use for the study.

Estimation procedure

The data collected were analyzed using frequency, percentages, chart, mean and multinomial logit model analysis as below: Mean values were computed on each of the identified challenges facing fadama farmers. On 4-point rating scale, items with mean values within 1.00 – 2.49 are interpreted as 'Not Serious' challenges; items with mean values within 2.50 – 3.49 are interpreted as 'Serious' challenges while items with mean values within 3.50 – 4.00 are interpreted as 'Very Serious' challenges confronting fadama users in agricultural production in FCT, Abuja. Considering the categorical nature of the dependent variable (farm enterprises), multinomial logit model (MNL) was used to estimate the socio-economic characteristics of the fadama users influencing their choice of farm enterprise under the fadama system. Farmers' socio-economic attributes which determine the odds of their choice being in one of the four farm enterprise categories: crop production, livestock production, fish farming and agro-processing.

The multinomial logit model can be estimated with set of coefficients $\beta^{(1)}$, $\beta^{(2)}$, $\beta^{(3)}$ and $\beta^{(4)}$ as follows:

$$\Pr\ (Z = 1) = \frac{\ell x\beta(1)}{\ell x\beta(1) + \ell x\beta(2) + \ell x\beta(3) + \ell x\beta(4)} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3)$$

$$\Pr\ (Z = 2) = \frac{\ell x\beta(2)}{\ell x\beta(1) + \ell x\beta(2) + \ell x\beta(3) + \ell x\beta(4)} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (4)$$

$$\Pr\ (Z = 3) = \frac{\ell x\beta(3)}{\ell x\beta(1) + \ell x\beta(2) + \ell x\beta(3) + \ell x\beta(4)} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (5)$$

$$\Pr\ (Z = 4) = \frac{\ell x\beta(4)}{\ell x\beta(1) + \ell x\beta(2) + \ell x\beta(3) + \ell x\beta(4)} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (6)$$

Multinomial logit model is a choice between three or more alternative response. The model however is unidentified in the sense that there is more than one solution to $\beta^{(1)}$, $\beta^{(2)}$, $\beta^{(3)}$ and $\beta^{(4)}$ that lead to the same probabilities for Z = 1, Z = 2, Z = 3 and Z = 4. To identify the model, one of the $\beta^{(1)}$, $\beta^{(2)}$, $\beta^{(3)}$ and $\beta^{(4)}$ was arbitrarily set to O. That if $\beta^{(3)}$ is arbitrarily set = 0, the remaining coefficients $\beta^{(1)}$, $\beta^{(2)}$ and $\beta^{(4)}$ will measure the change relative to the Z = 4. In other words, this study compared farmers' choice of fishery enterprise (3) with other farm enterprises (1, 2 and 4) being crop, livestock and agro-processing respectively. Therefore, using four category response as used in the model for this study and setting $\beta^{(3)} = 0$, the equation became.

$$\Pr\ (Z = 1) = \frac{\ell x\beta(1)}{\ell x\beta(1) + \ell x\beta(2) + \ell x\beta(3) + \ell x\beta(4)} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (7)$$

$$\Pr\ (Z = 2) = \frac{\ell x\beta(2)}{\ell x\beta(1) + \ell x\beta(2) + \ell x\beta(3) + \ell x\beta(4)} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (8)$$

$$\Pr\ (Z = 3) = \frac{1}{\ell x\beta(1) + \ell x\beta(2) + \ell x\beta(3) + \ell x\beta(4)} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (9)$$

$$\Pr\ (Z = 4) = \frac{\ell x\beta(4)}{\ell x\beta(1) + \ell x\beta(2) + \ell x\beta(3) + \ell x\beta(4)} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (10)$$

The relative probability of Z = 1 to the base category is

$$\frac{\Pr\ (Z=1)}{\Pr\ (Z=4)} = +\ell x\beta(1) \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (11)$$

If this is called the relative likelihood and assume that X and $\beta_k^{(1)}$ are vectors equal to (X_1, X_2..., Xn) and ($\beta_1^{(1)}$, $\beta_2^{(1)}$,….$\beta k^{(1)}$) respectively, the ratio of relative likelihood for one unit change in X_i relative to the base category is then stated as;

$$\frac{\ell x\beta 1(1)x1 + \cdots\ldots\ldots\ldots\ldots\ldots\ldots\beta 1(1)\ (x1+1)\ldots\ldots\ldots\ldots + \beta k(1)xk}{\ell x\beta 1(1)x1 + \cdots\ldots\ldots\ldots\ldots\ldots\ldots\beta 1(1)\ x1\ldots\ldots\ldots\ldots + \beta k(1)xk} \quad \ldots\ldots\ldots\ldots (12)$$

The exponential value of a coefficient is the relative likelihood ratio for one unit change in the corresponding variable (StataCorp, 2003). As pointed out, the dependent variable "farm enterprises" have four possible values; value 1 if farmer choose crop production, value 2 if farmer choose livestock production, value 3 if farmer choose fishery and value 4 if farmers choose agro-processing. The farm enterprise choice of the farmers as either crop production, livestock production, fishery and agro-processing was hypothesized to be function of some socio-economic characteristics of the fadama users as explanatory variables for the multinomial logit model. These hypothesized variables are described in Table 1:

RESULTS AND DISCUSSION

Farm enterprise choice by fadama users in FCT Abuja

The result presented in Figure 1 shows bar chart of the percentage distribution of fadama users by farm enterprise choice. Majority of about 39% of the fadama users are into crop production, about 27% are into agro-processing, 23% preferred livestock farming while only 11% of the fadama users are into fish farming. This finding agreed with the report of International Institute for Tropical Agriculture (IITA) (2002) which showed that crops are widely grown by large numbers of small scale holders across several ecological zones because most crops can be grown under stress condition. Bamiro, *et al* (2012) affirmed that crop production require less labour per unit

output than other major staples. The observed low preference for fish farming by the fadama users could be as a result of some peculiar factors in fish farming. For instance, Olaoye, *et al* (2013) identified some of the challenging factors facing farmers in fish farming to include high cost of quality fish seed, price fluctuation, high cost of fish feed, preservation, storage, processing and lack of technical know-how among farmers.

Table 1: Description of explanatory variables used in the multinomial logit model

Variables	Description
Age	Age of the farmers in years
Gender	1 if male, 0 if female
Education	Number of years of formal education by farmer
Household Size	In number of persons
Farming Experience	Years of faming experience in years
Labour	Number of available farm labourers in persons
Land Ownership	1 if owned the land, 0 if otherwise
Credit Access	1 if Having access to credit, 0 if otherwise
Member of Cooperative	1 if belong to a cooperative society, 0 if otherwise
Farm Scale	1 if commercialize, 0 if subsistence
Off-farm Job	1 if having off farm job, 0 otherwise.

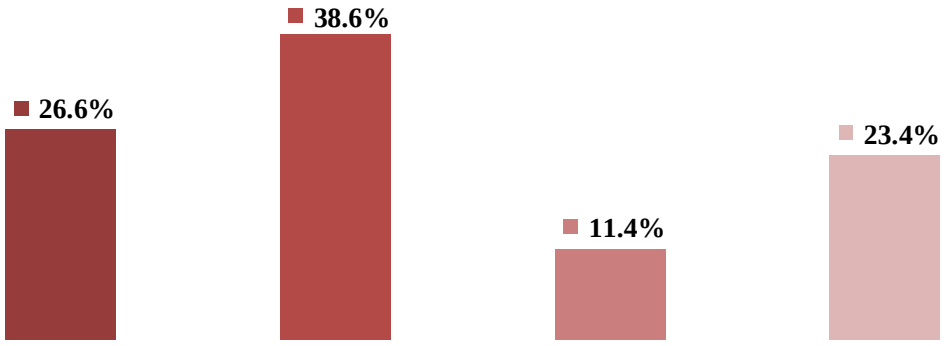

Fig. 1: Distribution of Farm Enterprise Choice by Fadama Users in FCT
Source: Field Survey, 2015

Socio-economic factors influencing farmers' choice of farm enterprise

Table 2 presents the determinants of farmers' choice of farm enterprise (crop production, livestock, fish farming and agro-processing) in fadama system using multinomial logit approach. This was estimated by normalizing fish farming (3), which is referred to as the "base outcome" against which comparisons are made in each case. The result of the multinomial logit (MNL) model indicated that socio-economic factors that influenced fadama users' choice of farm enterprises include: gender, education, household size, labour, land ownership, credit access and off-farm job. The likelihood ratio statistics as indicated by χ^2 statistics are highly significant ($p<0.01$). The explanatory power of the factors as reflected by Pseudo R^2 was high (0.66), indicating that the hypothesized variables are actually responsible for about 66% of the variations in fadama users' choice of farm enterprise. In terms of consistency with *a priori* expectations on the relationship between the dependent and the explanatory variables, the model had behaved well. The parameter estimates of the MNL model only provided the direction of the effect of the explanatory variables on the dependent variable (farm enterprises) but did not present the actual magnitude of change or probabilities in the coefficients. Thus, the marginal effect of the MNL result was presented which measure the expected change in probability of choosing a particular farm enterprise with respect to a unit change in an independent variable.

In comparison with fish farming, gender of the fadama users (male 1 and female 0) was significant ($p<0.01$) and positively related with the probability of choosing crop production but was negative and significantly ($p<0.01$) related to the choice of livestock farming and agro-processing. The positive and significant relationship of gender to choice of crop production showed that, male farmers are more likely to prefer crop production under fadama system in the area. On the other hand, the negative and significant effect of gender on livestock and agro-processing implied that female farmers are more likely to prefer livestock production and agro-processing under fadama system than their male counterparts. The result of the marginal effects for gender indicated that one-unit increase in number of male fadama users means an increase in the probability of choosing crop production

enterprise by 0.0812 (8.1%), a decrease in the probability of venturing into livestock farming by -0.0786 (-7.9%) and decrease in the probability of venturing into agro-processing enterprise by -0.0862 (-8.6%). Magogo, *et al.* (2015) on estimating the determinants of choice of marketing outlets for African indigenous vegetables in Kenya found that sex of the household head influence the choice of marketing outlet for farm products. Educational qualification of the fadama users was positively and significantly ($p<0.01$) related to the probability of choosing livestock farming in the fadama system. The result of the marginal impact indicated that one-unit increase in years of formal education of the fadama users will likely lead to 0.1094 (10.9%) increase in the probability of choosing livestock farm enterprise in the fadama system. Ike and Oboh (2010) in a study found that socio-economic characteristics of farmers influencing the choice of production techniques among broiler farmers include household size, education, farm size, cost of feed, cost of medication and access to credit. Although, the result was technically different from that of Okon, *et al.* (2012) who investigated enterprise choice decisions in urban food production in Akwa Ibom State Nigeria and found that educational qualification of the farmers significantly and positively related to choice of some arable crops.

In comparison with fish farming, the probability of choosing crop production was positive and significantly ($p<0.01$) related to household size of the fadama users. Similarly, the probability of choosing agro-processing was also significant ($p<0.05$) and positively related to household size. In other words, the larger the household size, the higher the odds of the fadama users choosing crop production and agro-processing enterprises.

Table 2: Socio-economic factors influencing fadama farmers' choice of farm enterprise

	Regression coefficients			Marginal effects		
Variables	Crop (1)	Livestock (2)	Agro-Proc.(4)	Crop (1)	Livestock (2)	Agro-Proc.(4)
Age	0.0750	1.6192	0.0344	0.0288	0.0851	0.0588
	(0.013)	(0.152)	(0.663)	(0.072)	(1.070)	(0.623)
Gender	1.7776	-1.7927	-2.1821	0.0812	-0.0786	-0.0862
	(2.832)***	(3.232)***	(3.028)***	(2.720)***	(2.954)***	(2.682)**
Education	0.0755	1.7823	0.1061	0.0656	0.1094	0.0807
	(0.674)	(4.120)***	(0.715)	(0.663)	(4.132)***	(0.303)
Household size	1.1465	0.6396	0.3784	0.0115	0.7663	0.0185
	(3.951)***	(0.930)	(2.770)**	(3.430)***	(0.893)	(2.458)**
Experience	0.2210	1.1405	-0.0416	0.0883	0.0810	-0.0643
	(0.533)	(0.083)	(0.752)	(0.043)	(0.759)	(0.750)
Labour	1.1821	-8.1272	6.8528	0.0670	0.0189	0.1087
	(2.201)**	(1.018)	(3.301)***	(2.235)**	(0.076)	(3.298)***
Land ownership	2.3045	0.9545	1.1032	0.0821	0.0055	0.0215
	(3.201)***	(1.233)	(0.223)	(3.218)***	(1.230)	(0.300)
Credits access	1.2539	2.0199	0.9785	0.0939	0.0587	0.0954
	(3.826)***	(0.963)	(2.103)**	(4.021)***	(0.381)	(2.113)**
Cooperative	0.9432	1.4850	3.2045	0.0328	0.0655	0.0501
member	(1.157)	(0.023)	(0.294)	(1.155)	(0.020)	(0.087)
Farm scale	0.8942	0.3821	0.6453	0.0293	0.0452	0.0934
	(1.085)	(1.234)	(0.064)	(1.480)	(1.312)	(0.057)
Off-farm job	-0.5874	1.8540	0.9842	-0.0719	0.0863	0.0067
	(2.043)**	(2.795)***	(0.364)	(2.051)**	(2.545)***	(0.363)
CONSTANT	13.8880	10.5351	11.9440			
	(5.021)***	(4.170)***	(4.323)***			

Note: Fish Farming (3) is the Base Outcome; *** denotes significant at 1%; ** denotes significant at 5%; *denotes significant at 10%.
Figures in parenthesis () are z-ratios; Number of obs = 387; Wald chi-square (χ^2)(24) = 252.63. Prob > χ^2 = 0.0000; Pseudo R^2 = 0.6612
Log pseudo likelihood = -186.7950
Source: Field Survey, 2015

In relation to household size, the result of the marginal effects indicated that a unit increase in number of people in the household means an increase in the probability of choosing crop production enterprise by 0.0115 (1.2%), and increase in the probability of venturing into agro-processing enterprise by 0.1854 (1.9%). Okon *et al,* (2012) investigated enterprise choice decisions in urban food production in Akwa Ibom State Nigeria and found that household size was significantly but negatively related to choice of production of pepper relative to some arable crops.

In comparison with fish farming, the probability of choosing crop production was positively and significantly ($p<0.05$) related to farm labour. Correspondingly, the probability of choosing agro-processing was highly significant ($p<0.01$) and positively related to farm labour. By implication, fadama users with steady farm labour may likely choose crop production and agro-processing farm enterprises. As regards farm labour, the result of the marginal effects showed that one-unit increase in number of labourers in the household indicates an increase in the probability of choosing crop production enterprise by 0.0670 (6.7%), and increase in the probability of choosing agro-processing enterprise by 0.1087 (10.9%). The findings supported the report of Bamine, *et al,*

(2002) that large family size was associated with greater labour force for timely execution of farming activities. In addition, Nandi, *et al*, (2011) found that large household size impacted positively on cassava production (crop production). Land ownership status of the fadama users was positively and significantly ($p<0.01$) related to the probability of venturing into crop production. The result of the marginal effects indicated that a unit increase in number of fadama users that owned their farm lands will likely lead to 0.0821 (8.2%) increase in the probability of choosing crop production enterprise in the fadama system.

Access to credit was significant ($p<0.01$) with positive effect on the probability of choosing crop production. The probability of choosing agro-processing was also significant ($p<0.05$) and positively related to access to credit. By implication, fadama users with increase access to credit are likely to choose crop production and agro-processing instead of livestock farming. The result of the marginal effects showed that an additional unit of farmers access to credit will result in probability of choosing crop production enterprise by 0.0939 (9.4%), and increase in the probability of choosing agro-processing enterprise by 0.0954 (9.5%). The findings of the study supported that of Ojo *et al*, (2013) where the authors also found that income, farm size and output had positive and significant effect on farmer's choice of an enterprise.

In comparison with fish farming, the probability of choosing crop production was negative and significantly ($p<0.05$) related to off-farm job. On the other hand, off-farm job was positive and significantly ($p<0.01$) related to the probability of choosing livestock farming. The result of the marginal effects indicated that an additional increase in farmers' involvement in off-farm jobs will result into -0.0719 (-7.2%) decrease in the probability of choosing crop production enterprise. Similarly, result of the marginal effects showed that an additional increase in farmers' involvement in off-farm jobs will result into 0.0863 (8.6%) increase in the probability of livestock farming in the fadama system. The findings of the study of Magogo, *et. al* (2015) showed that off-farm income and marketing costs influence the choice of marketing outlet for farm products.

Table 3: Challenges of fadama users in production in the Study Area

Major challenges of fadama users in production	Mean	Rmks	Ranking Order
Lack of storage facilities	3.67(0.54)	VS	1
Poor access to and control of land for agricultural production	3.65(0.60)	VS	2
Inaccessibility of farmers to agrochemicals and fertilizers	3.61(0.53)	VS	3
Price fluctuation of products	3.58(0.56)	VS	4
Insufficient knowledge of credit source to support farming.	3.56(0.60)	VS	5
Inadequate irrigation and drainage equipment	3.54(0.68)	VS	6
Inadequate farm labour.	3.53(0.61)	VS	7
High cost of available farm labour.	3.43(0.73)	S	8
Lack of access to supporting facilities in the fadama system	3.42(0.63)	S	9
High cost of improved crop varieties	3.30(0.87)	S	10
Lack of access to credit support groups, e.g cooperatives	3.22(0.76)	S	11
Low financial capacity of the farmers.	3.21(0.74)	S	12
High cost of farm inputs	3.06(0.85)	S	13
Poor technical know-how of the fadama users	3.05(0.90)	S	14
Inadequate institutional support from government	2.89(0.81)	S	15
Pest and diseases problems	2.85(0.88)	S	16
Lack of collateral security required to secure loan	2.74(0.94)	S	17
Lack of extension visits to the farmers.	2.43(0.86)	NS	18
Rough topography of the farm land	2.34(0.97)	NS	19
Unpredictable weather condition	2.32(0.93)	NS	20
Poor road network	2.30(0.92)	NS	21
Lack of steady transport facilities for farm products	2.27(0.96)	NS	22
Theft of farm products	2.25(0.97)	NS	23

Note: VS = Very Serious; S = Serious; NS = Not Serious; Figures in parenthesis () are standard deviations.
Source: Field Survey, 2015.

The results in Table 3 showed that items 1 to 7 had their mean values that ranged from 3.53 to 3.67 which are within the boundary limit of 3.50 – 4.00 on 4 point rating scale. This implied that the 7 identified items are Very Serious challenges facing fadama users in agricultural production in FCT Abuja. The challenges with their mean values in order of severity include: lack of storage facilities (3.67), poor access to and control of land for agricultural production (3.65), inaccessibility of farmers to agrochemicals and fertilizers (3.61), price fluctuation of products (3.58), insufficient knowledge of credit source to support farming (3.56), inadequate irrigation and drainage equipment (3.54), and inadequate farm labour (3.53). The findings of this study supported that of Okunlola (2009) who the challenges of farmers in production to include high cost of inputs, transportation, and insect pests and disease infestations as major constraints to their production. Similarly, Ani, *et al,* (2013) also identified challenges confronting farmers as lack of finance, lack of processing facilities, sourcing for labour, transportation problems and inadequate storage facilities which are inconformity with the result of the present

study. The result in the table further revealed that items 8 to 17 had their mean values ranged from 2.74 to 3.43 which fell within the boundary limit of 2.50 – 3.49 on 4-point rating scale. These indicated that the 10 identified items are serious challenges affecting fadama users in agricultural production in the area.

CONCLUSIONS

The study identified gender, education, labour, land ownership status, credits access and off-farm job as determinants of farm enterprise choice among fadama users in FCT. Abuja. The challenges confronting the fadama users in their farming activities include lack of storage facilities, poor access to and control of land for agricultural production, inaccessibility of farmers to agrochemicals and fertilizers, price fluctuation of products and inadequate farm labour among others. Based on these findings, the study recommended that education and training of fadama users should be paramount for sustainability of the fadama users. Labour and credit access as part of the major challenges of the farmers should be addressed by relevant government agencies through improved supply of farm machineries and low interest farm credits. There should be increased institutional supports to the farmers through government provisions of storage facilities, agrochemicals and fertilizers, stabilization of agricultural commodity price and provision of irrigation and drainage equipment at subsidized rates.

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