Analysis of Net Off-Farm Income Determinants Among Smallholder Rice Farmers in Anambra State, Nigeria

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Abstract
*The study examined the analysis of net off-farm income determinants among smallholder rice farmers in Anambra State**.** Specifically it described socio-economic characteristics, determinants of off-farm income among smallholder rice farmers, socioeconomic characteristics that influences off farm income and constraints associated with off-farm income in the study area. Multistage sampling procedure involving purposive and random sampling methods were used to select two agricultural zones, four LGAs, eight communities, thirty (30) smallholder rice farmers and two hundred and forty (240) respondents for the study. Structured questionnaire was used to collect data and were analyzed using descriptive statistics, probit model, multiple regression analysis and 3-scale Likert. Findings showed that majority of the farmers had no access to credit due to bottleneck activities and collateral requirements in obtaining the loan from most financial institution. From the analysis of probit regression model, ten variables were inputted into the analysis only three, the coefficients of age, marital status and household size were significant at 1% level of profitability, gender, access to credit, farm size, farming experience, farm income and hours spent in the farm were not significant. Significant determinants of net off-farm income earned by the farmers were age, gender, farm size, access to credit, farm income and household size. Most perceived constraints were high cost of transportation, unavailability of off farm work, poor extension services and lack of capital to expand farm business. Government should of necessity address the issue of fuel subsidy removal which has a gross effect on the movement of farmers and extension officers should be made available in the State to address relevant issues among the stakeholders were recommended.*

Keywords: *Net Income, Determinants, Rice Farmers*

Introduction

Nigeria is one of the sub-Saharan African Counties of which agriculture was the back bone of her economy before the oil boom of 1970s, and still remain her major source of food and accounts for about 35% of merchandised export, 75% of employment (Gbughemobi, Meludu and Nkamigbo, 2021 and Uchelu, Isibor, Nkamigbo and Okonkwo-Emegha, 2023). Agriculture is an engine room for sustaining growth of Nigeria economy and still remains the main stay of her economy by

providing food for teeming population, creates jobs as well as wealth, raw material for the industrial sector and foreign exchange earnings Isibor and Nkamigbo (2019). Off farm activities is the participation farmers in remunerative work outside the participants own farm. It plays essential role in sustainable development and poverty reduction particularly in rural area. that It is a means for reducing rural-urban income gap, poverty reduction, slowing down rural-urban migration, building local industry, improvement of food security status, provision of off-season income, reducing risk at the advent of declining agricultural output, absorbing surplus labour for youths and women augment farm production in the face of credit and liquidity constraints; increasing farm households' income Bezu, Barrett and Holden (2012). The off-farm sector is of importance to the rural economy because of its production linkages and employment effects, while the income it provided to households could represent a substantial and sometimes growing share of farm capital. The income obtained from off-farm activities doubles as risk minimization and household income stabilization strategies in both developed and developing countries (Briggeman, 2011). Ogbanje, Chidebelu and Nweze (2014b) found that off-farm income share of household income constituted 50.28% of household income of small-scale farmers in North-Central Nigeria. Rice is the primary staple food for most of the populace in Nigeria, especially the rural area, with about 6% of global rice consumption, Africa accounts for about 4% of the world production making the continent the second largest consuming and producing region (Abdul-Gafar and Yu, 2016 as cited by Uchelu, Nkamigbo and Okonkwo-Emegha, 2023). According to Uba (2003) (as cited by Ggbughemobi et al, 2021), about 70% of Nigeria feeds on rice, while 30% of their cereal-based diets are also from rice.

Materials and Method

The Study area for this research is Anambra State. Nigeria. The State is bounded by Delta State to the West, Imo State to the South, Enugu State to the East and Kogi State to the North. It has an estimated population of 6,358,311 million people (Wikipedia.org/wiki Anambra State Population, 2022) which stretches over about 60 kilometers between surrounding communities. Anambra State lies on the longitude 6220°N and 7021°E and latitude of 5038°N and 6930°E (Wikipedia, 2022). Anambra State population is estimated to be growing at an average of 2.84% annually. The population density of Anambra State currently is rated at 992.1p/Km (Wikipedia, 2022). Anambra State comprised of 21 Local Government Area, and four (4) Agricultural zones (AZs) – Aguata, Anambra, Awka and Onitsha. The State is embedded by five (5) major rivers and their tributaries. These are River Niger, Anambra River, Ezu River, Idemmili River and Ulasi River. However, there are smaller streams like Oyi, Nkisi and Obizi. The State experiences dry season from late October to early May and has at least 6 dry months in the year and rainy season occurs from April to November. The annual rainfall ranges from 1400 mm in the Northern part to 2500 mm in the Southern part of the State with temperature of 25°C - 35°C. Anambra State is occupied by the Igbo ethnic group who by nature are farmers, fishermen, craftsmen and traders and also it is known for production and marketing of several raw materials and agro-products in different parts of the State. Some of the crops produced and marketed in the State include rice, yam, oil palm, cassava, cocoyam, maize, cucumber, mango, vegetables and different varieties of fruit trees, among others and livestock such as fish, goat, sheep, poultry and cattle. Anambra State has several daily markets both in rural and urban areas where agricultural products are sold. The major rice producing areas

in the state are Anambra East and West, Orumba North and South, Awka North and Ayamelum Local Government, farmers in Anambra State cultivate the following rice varieties: FARO-40, 44 among others but the popular variety cultivated by the farmers is FARO- 44 rice variety. Other off-farm jobs done by farms in the State are civil servants, trading, tailoring, welding, soap making, aluminum window works, electrical works, brick laying, carpentry and so on.

Population and sampling Techniques

The population of the study consisted of 20,056 (Twenty thousand and fifty-six) registered farmers in Anambra State (Agricultural Development Programme (ADP) 2022) which is the sample frame. Anambra State comprises of four zones: Awka, Anambra, Aguata and Onitsha zones. A Multi-stage and random sampling procedure were used to select respondents for the study.

Stage I: Two agricultural zones were purposively selected from the four agricultural zones of the State. This is as a result of their intense participation and popularity in rice production among others in the State, namely Aguata and Anambra zones.

Stage II: Two Local government were randomly selected from each of the selected two agricultural zones making it a total of four LGAs. Aguata (Orumba North and Orumba South) and Anambra Agricultural zone (Ayamelum and Anambra East LGAs).

Stage III: Two communities were purposively selected from each of the four LGAs (based on their popularity in rice production) making it a total of eight communities for the study.

These communities include Omogho and Ajali in Orumba North LGA, Aguleri Otu and Nando in Anambra East LGA, Omor and Omasi in Ayamelum LGA and Ezira and Ogboji in Orumba South LGA, totaling eight (8) LGAs.

Stage IV: Thirty (30) rice farmers (respondents) were randomly selected each from the already selected LGAs making a total of two hundred and forty (240) respondents for the study which is the sample size.

Table 3.1 Sample of the Zones /LGA, Blocks, Circles and Respondents.

Zones	Local Govt Areas	Communities	GPS Coordinates	Respondents.
Aguata Zone	Orumba North	Omogho	$6^0$023N , 7.144E	30
		Ajali	6.2971^{0}N, 7.1339^{0}E	30
	Orumba South	Ezira	5.9965^{0}N, 7.2194^{0}E	30
		Ogboji	$6^0$01^{1}02N, $7^0$15^{1}107E	30
Anambra Zone	Anambra East	Aguleri Out	6.3333N, 6.8833E	30
		Nando	6.3114^{0}N, 6.9075^{0}E	30
	Ayamelum	Omor	6.5056^{0}N, 6.9753^{0}E	30
		Omasi	6.6354^{0}N, 7.0283^{0}E	30
Total : 2 Agric Zone	4 LGAs	8 Communities		240 Respondents

Source: Field Survey, 2023.

Model specification

Multiple Regression Model

The model was used to measure the determinants of off-farm income among smallholder rice farmers. Socio-economic characteristics (SEC) of the respondents namely age (AGE), gen (GEN), farm size (FS), education (EDU), marital status (MRS), household size (HHS), hours spent on farm (HSOF), access to credit (AC), Farm income (FI), farming experience (FEXP).The regression model is specified as follows;

$T = \beta_o + \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \beta_4X_4$ ------- $\beta_{10}X_{10} + e_1$

Where DOOFI = Determinants of off-farm income among small holder rice farmers (dependent variable)

β_o= constant term

$\beta_1 - \beta_9$ = regression coefficients

X_1 = age in years.

X_2 = farm size (FS)

X_3 = education level (EDU)

X_4 = marital status, (single = 0, married=1and widow/divorce) (MRS)

X_5 = household size (measured by the number of people living under one roof) (HHS)

X_6 = hours spent on farm (HSOF)

X_7 = access to credit (AC)

X_8 = farm income (FI)

X_9 = Farming experience (measured in years) (FEXP)

X_{10} = Gender (male =0, female =1) (GEN)

e = error term

It is implicitly represented thus;

$DOOFI = \beta_0(AGE_1, FS_2, EDU_3, MRS_4, HHS_5, HSOF_6, AC_7, FI_8, FEXP_{9,\ldots\ldots} B_n)$.

The explicit form is thus represented as;

Linear Form:

$DOOFI = \beta_0 + \beta_1AGE + \beta_2FS_2 + \beta_3EDU_3 + \beta_4MRS_4 + \beta_5HHS_5 + \beta_6HSOF_6 + \beta_7AC_7 + \beta_8FI_8 + \beta_9FEXP_9 + GEN_{10} + e_1$

Semi Log Form:

$DOOFI = \beta_0 + \beta_1LogAGE_1 + \beta_2LogFS_2 + \beta_3LogEDU_3 + \beta_4MRS_4 + \beta_5HHS_5 + \beta_6HSOF_6 + \beta_7AC_7 + \beta_8FI_8 + \beta_9FEXP_9 + GEN_{10} + e_1$

Double Log Form :

$LogDOOFI = \beta_0 + \beta_1LogAGE_1 + \beta_2LogFS_2 + \beta_3LogEDU_3 + \beta_4MRS_4 + \beta_5HHS_5 + \beta_6HSOF_6 + \beta_7AC_7 + \beta_8FI_8 + \beta_9FEXP_9 + GEN_{10} + e_1$

Exponential Form :

$LogDOOFI = \beta_0 + \beta_1LogAGE_1 + \beta_2LogFS_2 + \beta_3LogEDU_3 + \beta_4MRS_4 + \beta_5HHS_5 + \beta_6HSOF_6 + \beta_7AC_7 + \beta_8FI_8 + \beta_9FEXP_9 + GEN_{10} + e_1$

To examine the constraints associated with off-farm income, this study used a 3-point likert scale after Ayoade, Ibrahim & Ibrahim, 2009). The 3-point scale will be weighted in order of importance.

Never involved: 1 – 1.99
Sometimes involved: 2 – 2.90
Always involved: > 2.90

Results and Discussion

Socio-economic characteristics of the respondents

Socioeconomic characteristics of the farmers in Table 1 indicates that majority of the farmers are within the age limit of 41-50 years. This implies that the farmers are relatively young. The finding is in tandem with Osuafor (2015) who stated that the farmers belong to the active labour force and are expected to take appropriate decision towards income diversification of farm activities so as to achieve maximum output. The result of gender indicates that females (59.1%) are more in off farm income generation than male. This may be as a result that female are more concern with the daily activity and up keep of the family now there is serious economic crisis in the Country. This supports the findings of Effiong, Effiong and Udo (2015) and Ekpunobi, Nwigwe and Nkamigbo (2020) who reported female dominance in cassava production in their study areas. This is contradicts the findings of Gbughemobi et al. (2021) who reported that rice farmers in their study were mostly male (60.3%) while the rest 39.7% were female. The report on marital status indicates that there is high percentage of married folks (43.33%). This implies that the children of the married folks do assist their parents in off farm activities to generate more revenue to the family more than the singled. The result also indicates that the farmers in the study area have one form of education or the other. This implies that the farmers are enlightened and are ready to adapt to changes in off-farm activities in generating income to their family. This is contradicts Nkamigbo and Okeke (2013) who reported that more than 60% of farmers in their study area had no formal education. The result on access to credit indicates that majority of the farmers had no access to credit due to bottleneck activities and collateral requirements in obtaining the loan from most financial institution. This has led to self-sponsorship and other activities that will generate income and revenue to the family thus off-farm activities. The result of household size indicates that 5-8 persons living together had 53.75%. This implication of this is that large family serves as family labour to achieve family gain and profit in off-farm activities in the study area. This corroborates Ekpunobi et al. (2020) who reported that 7-8 persons living together in their study area had 42.3% which serves as a tool for expansion on their activities. The result of the analysis of farm size shows that less than 10 plots had 16.25%, 10-20 plots had 62.91% and 21-30 plots had 20.83%. This implies that majority of the rice farmers that engage in off farm income activities had over 10 plots of rice farms. They engage in these activities for fund for their farms and left over for their families and other needs. From the result of analysis of farming experience shows that farmers with less or equal to 5 years are 24.58%. 5-10 years had 51.25% and 15 years and above had 8.33%. The implication of this is that younger farmers engage more in off farm income generating activities more than farmers who had spent many years in rice farming. This maybe as a result that age is longer on their part or they have acquired more financial resources to assist their personal farms and other family needs. The result of analysis of hours spent on the farm revealed that farmers who spent less than 6 hours working on the farm had 36.25% while above 6 hours had 63.75%. The implication of this is that majority of farmers spent much hours on their trade in

order generate much fund. Also farmers who work for other farmers prefer bargaining as a whole than daily pay. This makes them spent much time than necessary to finish the work at their own pace and also to make ends make and make more fund. From the result of farm income by the farmers, farmers who made less or equal₦50, 000 monthly had a percentage of 36.25% while 63.75% belongs to farmers who made ₦50, 000 and above. This implies that majority of the farmers makes reasonable amount of money in the off farm income generating activity in the study area.

Table 1: Socioeconomic characteristics of off- farmers N=240

VARIABLES	FREQUENCY	PERCENTAGES
Age		
≤ 20	21	8.75
21-30	54	22.5
41-50	95	39.58
51 and above	70	29.16
Total	**240**	**100**
Gender		
Male	98	40.83
Female	142	59.16
Total	**240**	**100**
Marital Status		
Single	47	19.58
Married	104	43.33
Widow/Divorced	89	37.08
Total	**240**	**100**
Educational Status		
0-6	55	22.91
7-12	159	66.25
13-18	26	10.83
Total	**240**	**100**
Access to credit		
Yes	09	3.75
No	231	96.25
Total	240	100
Household Size		
1-4	89	37.08
5-8	129	53.75
9 and above	22	9.16
Total	**240**	**100**
Farm size		
≤ 10 plots	39	16.25
10-20 plots	151	62.91
21-30 plots	50	20.83

Total	240	100
Farming Experience		
≤ 5 years	59	24.58
5-10	123	51.25
10-15	38	15.83
More than 15 years	20	8.33
Total	**240**	**100**
Hours Spent		
≤ 6 hours	87	36.25
Above 6 hours	153	63.75
Total	**240**	**100**
Farm income		
≤ **(₦)**50,000 monthly	99	41.25
Above (₦)51,000.00	141	58.75
Total	**240**	**100**

Source, field survey, 2023.

Determinants of off-farm income among smallholder rice farmers

The result of the Probit regression done to estimate the determinants of off-farm income among smallholder rice farmers is presented in Table 2. Probit regression is predicted as follows: Use * = 6.976 + 0.088Age + 0.1766Gen- -0.119Edu --1.530MRS -0.317Acces to credit - 0.304HHS -0.036FS -0.001FEXP -0.220HoW+ 0.000FI. From the analysis, ten variables were inputted into the analysis only three - the coefficients of Age, Marital status and Household size were significant at 1% level of profitability. Others (seven variables) gender, access to credit, farm size, farming experience, farm income and hours spent in the farm were not significant. The coefficient of age (0.0088) was positive and significant at 1% level of probability. This implies that increase in the age of farmers will increase their ability to make more income from off-farm by 8.0%. This was expected based on *a-priori* expectation as farmer's age increases their ability to make more income increase. The coefficient of marital status was negative and significant at 1% probability level. This implies that married farmers with children tends to make more income from off-farm income than unmarried who has less or no children. The coefficient of hours spent of work was negative and significant at 1% probability level. This implies that farmers who spent less time in some work makes more income than some farmers who spent much time without making much impact.

Table 2: Determinants of off-farm income among smallholder rice farmers

Parameter	**Coefficient**	**Std.Error**	**Wald**	**Odd ratio**	**95% Confidence interval Lower**	**Upper**
(Intercept)	6.976	2.960	5.56			
Age	0.088	0.036	5.588***	1.092	1.017	1.172
Gender	0.176	0.710	0.06	1.192	0.297	4.791

Education	-0.119	0.095	1.56	0.888	0.737	1.071
Marital status	-1.530	0.606	6.38***	0.217	0.066	0.710
Access to credit	-0.317	0.708	0.20	0.728	0.182	2.916
Household size	-0.304	0.127	5.70***	0.738	0.886	0.947
Farm size	-0.036	0.043	0.71	0.964	0.861	1.049
Farming experience	-0.001	0.076	0.00	0.999	0.574	1.159
Hours of work	-0.220	0.171	1.66***	0.802	1.000	1.121
Farm income	0.000	0.000	0.85	1.000		1.001
LR test			31.08***			
Obs.	**240**					

Sources, Field survey, 2023. *, **, ***(significant @ 10%, 5% and 1% respectively)

Socioeconomic characteristics that influences off-farm income among the small holder rice farmers.

Table 3 shows the output of four functional forms of the regression model for predictors of actors in. off-farm income among the small holder rice farmers. The result indicated that output of the linear form gave the best result in terms of number of significant predictors, signs and sizes of the predictors as well as the value of F-statistics, R^2 and R^2 adjusted and was chosen as the lead equation. The coefficient of multiple determination (R^2) 76.0 meant that 76% of the variation in the income of the actors in off-farm smallholder rice farmers was explained by the variations in the independent variables while the remaining 24% was due to error. These confirms to overall significance of the regression analysis. The regression equation is given as: OFI = **-0.001182AGE-0.01451GEN+0.00635MRS+0.00109EDU+0.00022FS+0.06225HHS+0.01462HSOF+0.01088AC+0.002865FI+0.00034FEXP.**

Out of ten independent variables included in the model age, gender, farm size, access to credit, farm income and household size statistically and significantly influenced the net income earned by the farmers. The remaining four (education, farming experience, marital status and hours spent in farm) were not significant. The coefficient of age was significant at 1% level of probability but negatively related to net off-farm income. The negative association with age indicates the preference of the younger generation for off-farm jobs over agricultural wage labour. This confirms report of Rahman (2021) who reported that younger generation tilts towards off –farm income generation activity. This is at variance with the report of Isibor and Nkamigbo (2019b) who found a positive influence of age on the net marketing returns. The coefficient of gender was significant at 5% level of probability but negatively related to net off-farm income. This implies that off farm income activity is gender based as more female are into the activity than their male

counterparts. The female farmers see the activity as an enterprise to generate more income to carter for their families as most of the family up keep are left in the hands of the female in the study area.

The coefficient of farm size had positive and statistically significant at 1% probability level. This implies that the farmers who had their farm land increases tends to make more returns in off farm than those with less. They become more serious in their off farm income generation to fund their farm for greater revenue. This is in agreement with Okeke, Nkamigbo and Chukwuji (2013). The coefficient of household size had positive and statistically significant at 1% probability level. This implies that as the household size increases, income from off-farm income increases. The children of these farmers do assist their parents in off-farm activities that generate more income to the family. The coefficient of access to credit had positive and statistically significant at 5% probability level. This implies that farmers who had access to credit do make more income in off farm activities. They fund their off -farm income generation more than their counterparts for maximum input.

Table4. 3: Socioeconomic characteristics that influences off-farm income among the small holder rice farmers.

Predictor	Exponential	Linear	Double log	Semi log
CONSTANT	4.08098(67.51)	3.06095(31.65)	9.05(0.63)	43640(12.00)
AGE	0.00698(0.18)*	-0.01182(-0.60) ***	0.0391(12.70)	0.57360(14.39)*
GEN	0.01058(0.59)	-0.01451(0.50) **	7.28(1.62) *	1108(-0.78)
MRS	0.001090(0.46)*	0.00635(1.43)	3.19(0.02)	0.0491(12.69)**
EDU	0.000565(0.102)	0.001091(0.7)	9.03(0.000)	3628(0.78) ***
FS	0.00234(21.10)*	0.00022(11.55)***	3.19(0.02) **	56.59(8.42)*
HHS	0.000623(13.24)	0.06225(0.16) *	0.000624(6.38)	0.4543(1.04)
HSOF	394(0.19)	0.01462(0.70)	4.51(0.78)	0.00321(-0.23)
AC	278(11.44)	0.01088(0.90) **	1.62(0.22) **	0.05069(1.61)
FI	2922(1.36)	0.002865(-109) *	2.25(0.052)	0.000618(13.38)
FEXP	3556(0.36)	0.00034(9.38)	0.05(0.43)	-0.1087(0.14)
R^2		88.5	80.1	70.9
	69.7			
ADJ. R^2	53.0	78.2	71.0	65.8
F-Statistic	53.00	134.15	102.50	93.20

Key Note: * = significant at p<0.10, **= significant at p<0.05, * = significant at p,0.01.**
Field survey, (2023).

Constraints associated with off-farm income

The information about the constraints to off-farm income generating activities among the smallholder rice farmers in the study area is presented in Table 4.6. The information was subjected to a 3 Point Likert Scale to determine the mean threshold of off-farm income of rice farmers. The mean threshold of less than 2.5 and above was said to be a major constraints to the smallholder rice farmers. Thus based on the 14 items of constraints to off farm income captured, only 7 had a mean threshold of 2.5 and are; high cost of transportation, unavailability of off-farm work, poor extension services, lack of capital to expand farm business, variability of weather, lack of required

skills and age of the farmer. From the analysis, the major constraint in the study area borders on transportation due to increase in the pump price of fuel. This is in agreement with Nkamigbo, Ugwumba and Okeke (2019) who reported high cost of transportation in marketing of watermelon in the study area.

Table 4: Constraints to off-farm income.

Sn.	Constraints	Mean	Std. Dev.	Decision
1	High cost of labour.	2.40	1.0956	Semi Unfavourable
2	Unavailability of off-farm work.	2.58	1.1176	Unfavourable
3	Poor extension services.	2.56	1.1482	Unfavourable
4	Lack of capital to expand farm business.	2.52	1.0745	Unfavourable
5	Government policies and Regulations.	2.43	1.1144	Semi Unfavourable
6	Migration of youths to the urban areas.	2.49	1.1425	Semi Unfavourable
7	Lack of required skills.	2.51	1.1240	Unfavourable
8	Variability of weather.	2.52	1.1202	Unfavourable
9	Lack of collateral to secure loan.	2.49	1.1498	Semi Unfavourable
10	Lack of inadequacy of land.	2.40	1.1345	Semi Unfavourable
11	Low returns from farming.	2.49	1.0746	Semi Unfavourable
12	Price fluctuations	2.46	1.1083	Semi Unfavourable
13	High cost of transportation.	2.60	1.1008	Unfavourable
14	Age of the farmer.	2.50	1.0746	Unfavourable
	Grand mean	**2.49**	**1.11**	

Field, survey (2023), multiple responses.

Summary and conclusion

There is a dominance of female gender in the enterprise. This may be as a result that female are more concern with the daily activities in up keep of the family more now there is a serious economic crisis in the country. The result of probilt regression model revealed that only coefficients of age, marital status and household size were significant at 1% level of probability. Out of ten independent variables included in the model age, gender, farm size, access to credit, farm income and household size statistically and significantly influenced the net income earned by the farmers. The remaining four (education, farming experience, marital status and hours spent in farm) were not significant. High cost of transportation, unavailability of off-farm work and poor extension services were perceived as the major constraints in the study area. Thus, net determinants of off-farm income among small-holder rice farmers in Anambra State is a profitable venture in the study area given the positive values of probit and multiple regression analysis models. The farmers were efficient in the enterprise and the level of income would improve if adequate measures are taken by government to address the off farm constraints in the study area.

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