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Original Reserch Article

Effect of Anchor Borrowers' Programme on ooverty status of rice farmers in Nigeria

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Abstract

There was no empirical evidence of the causal relationship between formal agricultural loan restructuring via the Anchor Borrowers' Program (ABP) and the poverty rate of Nigerian rice farmers. This study investigated the effect of the ABP on the poverty status of rice farmers in Nigeria. Both descriptive and econometric tools were employed to analyse the data obtained in Kwara State and Niger State.

The results demonstrate that poverty measures (incidence, depth, and severity) of ABP beneficiaries were lower compared with non-beneficiaries in the study areas. The major factors aggravating poverty in the study areas were marital status, years of schooling, farming experience, age, household size and farm size at a 1% level of significance. Results of the Simultaneous Equation Model (SEM) for both states revealed that income, farm experience, marital status, gender, other forms of credit, extension visit, and farm size were significant and positive relationships with the total output while the household size and marital status had negative and positive effects on the respondents' poverty status, respectively.

In conclusion, the beneficiary rice farmers in the study areas are well-served by the ABP. Additionally, rural farmers should receive adequate thought and support from policymakers, the government, and non-governmental groups because doing so could aid the country in escaping poverty. This study recommends that ABP project efforts should be intensified at reducing poverty rates in the study areas using other measures such as income diversification and establishment of small-scale agro-industries. More funds should also be made available for such programmes and they should be extended to other states and rural areas of the country.

Keywords: beneficiaries; FGT; *Oryza sativa;* poverty index; simultaneous equation model

INTRODUCTION

Poverty is so important that it is the first Sustainable Development Goal (SDG) that aims to end all forms of poverty, safeguard the environment, and ensure that every individual life in prosperity and peace by 2030 (World Bank, 2020). Poverty is more prevalent in developing countries than in industrialized countries, and Nigeria is no exception (Ogunniyi et al. 2018). An estimated 91.8 million people in Nigeria are living in extreme poverty and despite all efforts to reduce poverty over the last 25 years, 766 million people, including 385 million children, lived on less than US$ 1.90 per day in 2015 (World Bank, 2021). Although rice is grown in practically all of Nigeria's agro-ecological zones, the area under rice cultivation is still relatively limited, according to Akinbile et al. (2023). In 2009, it

was estimated that over 30.7 million hectares of land were farmed for various crops, with rice accounting for only 7.82 percent of this total (FAO, 2022). As a result, despite its tremendous resources and potential, Nigeria is not among the world's top rice producers (NBS, 2020). Also, credit is one of the major problems among rice farmers in Nigeria. According to Adenuga et al. (2013), rice farming households in Nigeria were multidimensionally poor. They also concluded that the gender of the household head, health, marital status, and membership in associations were identified as the major determinants of multidimensional poverty among rice farming households in Nigeria.

Thus, this study was undertaken to assess the effect of the recently launched ABP on the poverty status of rice farmers in two states in North-Central Nigeria, where rice is the foremost staple food in the country (Ayinde, 2018). The Anchor Borrowers Programme, which was inaugurated by President Buhari and launched by the Central Bank of Nigeria (CBN) on November 17, 2015, and allocated N20 billion for the intervention at a 9% single-digit interest rate, sought to build a relationship between anchor enterprises engaged in processing of essential agricultural commodities and smallholder farmers (SHFs). In order to increase rice productivity and stabilise input, it also aims to create jobs, reduce food imports, and diversify the economy (Chioma, 2016). Smallholder farmers (SHF) on the other hand, deliver their produce to the agro-processor, who pays the cash equivalent to the farmer's account after harvest (Gona et al. 2022). However, the effect on the poverty status of farmers has not been fully explored in the literature, particularly in the North-Central states of Nigeria. The hypothesis includes: There is no significant difference in poverty status between beneficiary and non-beneficiary of ABP farmers in the study areas. Based on these, the following objectives were solved: describe the socio-economic and farm-specific characteristics of the beneficiary and non-beneficiary rice farmers, determine the poverty status of both groups of rice farmers, identify the determinants of poverty among beneficiary rice farmers and analyse the effect of the ABP on the beneficiary rice farmers' total output and poverty status.

MATERIALS AND METHODS

The study areas

The North-Central region served as the site of this study. Six states make up the north-central zone: Benue, FCT, Kogi, Kwara, Nasarawa, Niger, and Plateau States. The agroecological wet savannah, also known as Guinea vegetative savannah, dominates the North-Central zone (NBS, 2020). The North-Central zone's climate is favourable for agricultural operations, with temperatures ranging from 26 °C to 36 °C and relative humidity of 26%. The annual rainfall varies from 1,100 mm in the northern sections to 1,600 mm in the southern regions (Adenuga et al. 2013).

The principal cash crops in the North-Central zone are cotton, cocoa, coffee, kola nut, tobacco, ben seed and palm produce (NBS, 2022). In addition, rice, sorghum, maize and groundnuts remain the highly flourishing arable food crops grown in the North-Central zone (FMARD, 2012). The North-Central zone had the highest number of rice producers in Nigeria between 2008 and 2012. About 34% of domestic rice production came from North-Central alone, with Niger State and Kwara State leading by 9% and 16%, respectively (FAO, 2022).

Sampling technique and sample size

The rice growers for the study were chosen using a multi-stage sampling procedure. The first stage comprised the purposeful selection of agricultural zone B in Kwara State and Zone I in Niger State, due to the prevalence of rice farming activities in the zones. The second stage entailed selecting one-eighth of the LGAs in each zone at random. The third stage featured a systematic random selection of one-fifth of the rice-producing communities from each of the selected LGAs based on the list of registered rice farmers, and the final stage involved a random selection of twenty ABP beneficiaries and non-beneficiaries from each selected community. The analytical techniques used in the study were descriptive (use of percentages) and econometric tools (FGT, Logit regression model, and Simultaneous Equation Model.). While Stata 14 is the software package used to run the analysis.

Foster et al. (1984) presented a composite measure of poverty. This is the poverty gap index, sometimes known as the P-alpha measure of poverty: 1. Let yi be a measure of income, and n be the size of the measure of well-being, which includes *per capita* income or consumption, *per capita* food expenditure or caloric intake, the ratio of income (or expenditure) spent on food, and adult household members' educational levels. If we rank households according to their measure of income and we define households $I = 1, \ldots, q$ as poor and $I = (q + 1), \ldots, n$ as non-poor, the Foster-Greer-Thorbecke poverty measure can be expressed as The FGT poverty indices and represented as follows (Foster et al., 1984):

$$P_{\alpha} = \frac{1}{N}\sum_{i=1}^{n}\left(\frac{z - yi}{z}\right)^{\alpha} \quad \text{eqn (1)}$$

This was fitted for loan beneficiaries and non-loan beneficiaries
where,
N = Total Population (number)
n = Number of rice farmers below the poverty line (number)
y*i*= Per capita expenditure of those classified poor (naira)
Pα = poverty aversion parameter that takes the value 0, 1, 2 (number)
z = poverty line: two-thirds of the average *per capita* expenditure (naira)
and,

$$z = \frac{2}{3}\left[\frac{Total\ Expenditure}{N}\right] \quad \text{eqn (2)}$$

When $\alpha = 0$, the poverty incidence was calculated as follows:

0 —

Poverty incidence also known as poverty head-count refers to the proportion of the total
population of a given group that is poor, based on a given poverty line.
When $\alpha = 1$, the Poverty depth is represented as follows:

$$P1 = \frac{1}{N}\sum_{i=1}^{n}\left(\frac{z - yi}{z}\right)^{1} \quad \text{eqn (3)}$$

The Poverty depth also known as poverty gap refers to the difference between a given poverty line and the mean income of the poor, expressed as a ratio of the poverty line.
When $\alpha = 2$, the Poverty severity is represented as follows:

$$P2 = \frac{1}{N}\sum_{i=1}^{n}\left(\frac{z - yi}{z}\right)^{2} \quad \text{eqn (4)}$$

The Logistic Regression Model

A univariate binary model and a logistic regression model was using to address one of the objectives. Given that the dependent variable is dichotomous: 0 when farmers are not poor and 1 when they are poor, the binomial logistic regression model was utilised. The model is specified as:

$$\text{Prob}(Y_i = 1) = \frac{\exp(X'i\beta)}{1 + \exp(X'i\beta)} \quad \text{eqn (5)}$$

The dependent variable is a dichotomous variable depicting the farmer's status. It takes the value of (one) 1 if the farmer is poor and (zero) 0 if otherwise. The independent variables are the socio-economic characteristics. The explicit logit model is expressed as:

$$\ln[p/(1-p)] = b_0 + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + b_5X_5 + b_6X_6 + \\ + b_7X_7 + b_8X_8 + b_9X_9 + u\ (logistic) \quad \text{eqn (6)}$$

The hypothesised independent variables are:
Y_i = poverty status of the respondents (1 = poor, 0 = non-poor)
i = 1, … ,10
The variables included in the model are:
X_1 = Age of household head (years)
X_2 = Household head formal education (years)
X_3 = Gender of household head (1 = male, and 0 = otherwise)
X_4 = Farm size (ha)
X_5= Farm experience (years)
X_6 = Marital status (Married = 1, otherwise = 2)
X_7 = Household size (number of persons)
X_8 =Cooperative membership (yes = 1, No = 2)
X_9 = Access to credit facility (yes = 1, No = 2)
X_{10} = Extension access (number of visits)
U = Error term
β_1–β_9 = The coefficients for the respective variables in the logit function

Simultaneous Equation Model (SEM)

This calculator simulates the intricate interaction between poverty, total output, and the ABP. The method used for model estimation is the Generalised Least Squares – GLS method. The GLS estimator is more efficient than the OLS estimator. This is a consequence of the Gauss-Markov theorem, since the GLS estimator is based on a model that satisfies the classical assumptions but the OLS estimator is not. The simultaneous equation for the model is given as:

Model 1: ABP and Economic Variables

$$Zt = f(Out_t, P_t) \quad \text{eqn (7)}$$

Model 2: POVERTY and Economic Variables

$$Pt = f(Z_t, Out_t,) \quad \text{eqn (8)}$$

where Z_t represents ABP (dummy); Out_t represents rice yield in kg, and P_t represents poverty which is measured by head count ratio in percentage.

RESULTS AND DISCUSSION

Socio-economic and demographic characteristics of farming households in both states

Data on the socio-economic characteristics of the rice farmers were described using descriptive statistics, and presented in Tables 1 and 2. The findings revealed that married males dominated rice production in Kwara State (93.04 %) while (83.26%) in Niger State. Male domination in rice production confirmed that men are in charge of the fundamental agricultural production tasks. A similar result of no female or a relatively small number of females engaging in rice farming has been reported in previous studies (Oloyede et al. 2020: Salisu et al. 2022 and Belewu et al 2023). The vast majority of the beneficiaries in Kwara State have a mean age of 32 years and the non-beneficiaries' mean age was 43 years while the mean age for beneficiaries and non-beneficiaries in Niger State was 41.21% and 46.31% years, respectively, which means they were relatively in middle and active productive age. The findings were consistent with the reports of Nosiru et al. (2014) and Belewu et al. (2023) which concluded that farmers with an age range between 30–50 years have a high likelihood of earning higher incomes as they are at the peak of their active years. Most of the beneficiary (45.83%) and non-beneficiary rice farmers (39.09 %) have at least secondary education in both states. This indicates that more farmers in study areas are educated, and are more likely to implement agricultural innovations. Also, most of the respondents have mean household sizes of 7.22 and 8.41 for both beneficiaries and non-beneficiaries in Kwara and Niger States, respectively. The amount of available family labour is usually proportional to the size of the cultivated farm because it was discovered from this study that most of the respondents make use of their family members as labour on the farm. To lower the cost of production in traditional agricultural production, the average farmer exhausts all sources of labour within his family before employing other labour.

In Kwara State, the majority of rice farmers have an average farming experience of 14.75 years for beneficiaries and 20.55 years for non-beneficiaries while Niger State has 20.75 years for beneficiaries and 25.55 years for non-beneficiaries, see Table 1 and 2. This indicates that farming is an age-long venture for both groups of farmers. Most of the beneficiaries (3.38 ha) and non-beneficiaries (2.01 ha) rice farmers in Kwara State and Niger State beneficiaries (3.01) and non-beneficiaries (3.36) have an average of less than 5 hectares of farmland. This revealed that rice farmers are still operating on a small scale in the study areas and they are in serious need of this intervention in order to lift them from their subsistence farming level. This result supports the conventional wisdom that between 2 and 5 ha falls into the category of small-scale farmers. This is in line with the findings of Ayinde et al. (2013) who reported that the majority of rural households operate small farms. Membership in an agricultural organisations has the tendency of enhancing the skills of farming households and improving food security (Salami et sl. 2017). About 73.48% of the sampled farmers are members of farm organisations with all beneficiaries (100%) belonging to farm organisation in both states. This is because farm organisation is an important criterion for rice farmers' eligibility and access to the loan intervention.

Household poverty status of respondents

The FGT poverty index was used to determine poverty condition of farming households in the states using three indicators: prevalence of poverty (Po), poverty depth (P1), and poverty severity (P2). The poverty prevalence indicates the percentage of the households falling below the poverty line; poverty depth is the amount by which the poor fall below the poverty line; and severity of poverty is the sum of the square of poverty depth divided by the number of poor households in the sample. The result of poverty indices among the respondents in the study areas is shown in Table 3. The result revealed that the prevalence of poverty among rice farming households in Kwara State was 0.300 for beneficiaries and 0.325 for non-beneficiaries, representing 30% and 32.50% of the farming households, respectively. In Niger State, the prevalence of poverty was 0.355 for beneficiaries and 0.393 for non-beneficiaries, representing 35.50% and 39.30% of the rice farming households, respectively. This reflects the percentage of the rice farmers that fell below the poverty line. This implies that the occurrence of poverty is relatively high among non-beneficiary rice farmers in the two states. This finding is in line with Umeh and Adejo (2019) who reported that the most poverty-susceptible group of respondents is the rice farmers who do not get access to agricultural credit exhibiting 63% poverty incidence. The poverty gap (P_1) index shows the proportion of the resources that the poor need to attain the poverty line. The result also revealed that the poverty gap/depth (P_1) in Kwara State was 0.076 for beneficiaries and 0.104 for non-beneficiaries, representing 7.6% and 10.4% of the population, respectively. It implies that an average rice farmer would require 7.6% beneficiaries and 10.4% non-beneficiaries of the resources that let them come out of the poverty trap. This actually indicates how far

Table 1. Socio-economic characteristics of Kwara State farming households

Socio-economic characteristics Variable	ABP Beneficiaries (N = 120)		ABP Non-beneficiaries (N = 110)		Pooled sample (N = 230)	
	Freq	Percent	Freq	Percent	Freq	Percent
Age of HH head(years)						
<=30	63	52.50	45	40.91	108	82.57
31–40	34	28.33	8	7.27	42	37.48
41–50	12	10.00	38	34.55	52	22.61
51–60	9	7.50	15	13.64	24	10.43
≥60	2	1.60	4	3.64	4	1.74
Mean	**32**		**43**		**28.7**	
Gender						
Male	111	92.50	103	93.64	214	93.04
Female	9	7.50	7	6.36	16	6.96
Educational level						
No Formal Education	4	3.33	3	2.72	7	3.04
Adult Education	4	3.33	26	18.18	30	13.04
Primary Education	41	34.17	18	16.36	59	25.65
Secondary Education	55	45.83	43	39.09	98	42.61
Tertiary Education	12	10.00	15	13.64	27	11.74
Quranic Education	4	3.33	11	10.00	15	6.52
Marital Status						
Single	15	12.50	2	1.81	17	7.39
Married	98	81.67	105	95.45	203	88.26
Widowed	7	5.83	3	2.72	10	4.35
HH Size						
<=5	46	38.33	45	40.91	91	39.57
6–10	54	45.00	50	45.45	104	38.33
>10	20	16.67	15	13.64	35	15.22
Mean	**7.22**		**7.22**		**7.05**	
Farm Exp (years)						
<=5	8	6.67	17	15.45	25	10.87
6–15	81	67.50	37	33.64	118	51.30
16–25	16	13.30	10	9.09	26	11.30
26–35	5	4.16	37	33.64	42	18.26
>35	10	8.30	9	8.18	19	8.26
Mean	**14.75**		**20.55**		**15.10**	
Farm Size(ha)						
<=5	118	98.33	80	72.72	198	86.09
6–10	2	1.67	30	27.27	32	13.91
Mean	**3.38**		**2.01**		**2.72**	
Group Membership						
Member	120	100	49	44.55	169	73.48
Non-member	0	0	61	55.45	61	26.52
Land tenure						
Leasehold	5	4.17	2	1.82	7	3.04
Customary	14	11.67	15	13.64	29	12.61
Freehold	17	14.17	21	19.09	38	16.52
Rented	59	49.17	47	42.73	106	46.09
Borrowed	10	8.33	8	7.27	18	7.83
Community land	5	4.17	7	6.36	12	5.22
Gift	3	2.50	2	1.82	5	2.17

Socio-economic characteristics Variable	ABP Beneficiaries (N = 120)		ABP Non-beneficiaries (N = 110)		Pooled sample (N = 230)	
	Freq	Percent	Freq	Percent	Freq	Percent
Means of Transport						
Trekking	40	33.30	30	27.27	70	30.43
Car	10	8.30	6	5.45	16	6.96
Motorcycle	14	11.60	6	14.54	30	13.04
Public Transport	56	46.60	58	52.72	114	49.57
Extension Visit						
10–20	25	20.83	85	77.27	110	47.83
21–30	95	79.16	25	22.72	120	52.17
Mean	**15.66**		**8.22**		**12.10**	

Source: Field Survey, 2020

Table 2. Socio-economic characteristics of Niger State farming households

Socio-economic characteristics variable	ABP Beneficiaries (N =120)		ABP Non-beneficiaries (N = 110)		Pooled sample (N = 230)	
	Freq	Percent	Freq	Percent	Freq	Percent
Age of HH head (years)						
<=30	14	11.97	12	10.91	26	11.45
31–40	62	52.99	35	31.82	97	42.73
41–50	18	15.38	25	22.73	43	18.94
51–60	18	15.38	30	27.27	48	21.15
≥60	5	4.27	8	7.27	13	5.73
Mean	**41.21**		**46.31**		**43.68**	
Gender						
Male	109	93.16	80	72.73	189	83.26
Female	8	6.84	30	27.27	38	16.74
Educational level						
No Formal Education	20	17.09	55	50.00	75	33.04
Adult Education	5	4.27	5	4.55	10	4.41
Primary Education	12	10.26	25	22.73	37	16.30
Secondary Education	48	41.03	17	15.45	65	28.63
Tertiary Education	32	27.35	8	7.27	40	17.62
Quranic Education	0	0	0	0	0	0
Marital Status						
Single	7	5.98	0	0	7	3.08
Married	105	89.74	110	100	215	94.71
Widowed	5	4.27	0	0	5	2.20
HHSize						
<=5	20	17.09	24	21.82	44	19.38
6–10	72	61.54	69	62.73	141	62.11
>10	25	21.37	17	15.45	42	18.50
Mean	**8.65**		**8.15**		**8.41**	
Farm Exp (years)						
<=5	1	0.85	0	0	1	0.44
6–15	53	45.30	34	30.91	87	38.33
16–25	41	35.04	25	22.72	66	29.07
26–35	8	6.84	34	30.91	42	18.50
>35	14	11.97	17	15.45	31	13.66
Mean	**20.75**		**25.17**		**22.89**	

Socio-economic characteristics variable	ABP Beneficiaries (N =120)		ABP Non-beneficiaries (N = 110)		Pooled sample (N = 230)	
	Freq	Percent	Freq	Percent	Freq	Percent
Farm Size(ha)						
<=5	98	83.76	95	86.36	193	85.02
6–10	19	16.24	15	13.63	34	14.98
Mean	**3.01**		**3.36**		**3.18**	
Group Membership						
Member	117	100	25	22.73	142	62.56
Non-member	0	0	85	77.27	85	37.44
Land tenure						
Leasehold	3	2.56	8	7.27	11	4.85
Customary	14	11.97	56	50.91	70	30.34
Freehold	20	17.09	4	3.64	24	10.57
Rented	56	47.86	4	3.64	60	26.43
Borrowed	11	9.40	30	27.27	41	18.06
Communityland	5	4.27	0	0	5	2.20
Gift	2	1.71	4	3.64	6	2.64
Purchase	6	5.13	4	3.64	10	4.41
Means of Transportation						
Trekking	15	12.82	5	4.54	20	8.81
Car	8	6.84	6	5.45	14	6.17
Motorcycle	74	63.25	31	28.18	105	46.26
PublicTransport	20	17.09	68	61.81	88	38.77
Extension Visit						
10–20	53	45.30	43	39.09	96	42.29
21–30	64	54.70	67	60.91	131	57.71
Mean	**30.56**		**20.35**		**25.92**	

Source: Field Survey, 2020

Table 3. Household poverty status of the respondents

Poverty Indices	KWARA STATE			NIGER STATE		
	Beneficiaries	Non-Beneficiaries	Pooled	Beneficiaries	Non-Beneficiaries	Pooled
Poverty Incidence(P_0)	0.300	0.325	0.317	0.355	0.393	0.374
Poverty Depth (P_1)	0.076	0.104	0.093	0.114	0.133	0.127
Severity of Poverty (P_2)	0.026	0.049	0.039	0.047	0.061	0.056

Source: Source: Field Survey, 2020

away an individual farmer is from the poverty line. In Niger State, 0.114 were beneficiaries and 0.133 were non-beneficiaries, representing 11.4% and 13.3% of the population, respectively. It claimed that a typical rice farmer would need to earn 11.4% beneficiaries and 13.3% non-beneficiaries of the resources that enabled them to escape the poverty trap and also determine how much is needed to get out of poverty for this study. The poverty severity index in Kwara State was 2.6% for beneficiaries and 4.9% for non-beneficiaries, while in Niger State it was 4.7% for beneficiaries and 6.1% for non-beneficiaries, which implies that the extent of the effect of poverty among the poor rice farmers was based on the poverty line since poverty severity focuses on the distribution of the poor below the poverty line. This finding compared fairly well with available national statistics that put the poverty incidence in the North Central areas in 2020 at 40% (World Bank, 2021). Without any doubt, poverty is a rural phenomenon, with almost 35% of rice farm households in North-Central areas of Nigeria living below the poverty line.

Determinants of poverty among rice farmers

Factors that contributed to poverty among rice farmers in the research areas were assessed using a Logit model estimate. The findings revealed that the model (regression line) matches the data reasonably based on

Table 4. Determinants of poverty among the respondents

Poverty Status	Kwara State		Niger State	
	Coefficient	Z	Coefficient	Z
Age (yrs)	1.062*	1.810	0.009	0.322
HH size	–0.587***	–7.262	–0.341***	4.890
Marital status	–0.119***	–2.821	0.224	0.312
Yr of Schooling	–0.003***	–2.610	–0.647**	–2.131
Pry Occupation	0.600	0.941	0.455	0.532
Farm Exp(yrs)	–0.754**	–2.432	–0.003	–0.090
Farm Size(ha)	–3.770*	–1.901	–0.390***	–2.812
Grp Member	–0.033***	–2.660	–2.898*	–1.654
Constant	4.183**	2.382	0.108***	3.650
Log-likelihood		–94.467		–121.185
No of observations		230		227
LR Chi²(9)		105.68		63.34
Prob > Chi²		0.0000		0.0000
Psuedo R²		0.3587		0.2072

Source: Field Survey, 2020
***significant at 1%, **significant at 5%, *significant at 10%

the maximum log-likelihood estimates of the Logistic regression model as presented in Table 4. The research produced a chi-square value of 105.68 and 63.34, respectively, which was significant at 1% ($p < 0.01$) and is indicative of a good fit for the estimated model, i.e., the null hypothesis that all the independent variables are equal to zero, is rejected. The pseudo-R^2 was 0.36 and 0.21, respectively, and the log-likelihood was –94.467 and –121.19, indicating that the model had explanatory power for Kwara and Niger States. This also suggested that the estimates of the stated explanatory variables explain variation in poverty status, implying that the model as described explained significant non-zero changes in factors impacting poverty among rice farmers in the study areas.

Age, marital status, years of schooling, household size, farming experience, farm size, and group memberships all have a role to play in determining poverty among rice farmers in Kwara and Niger States of Nigeria. Age had a significant positive impact at 5% which implies that as age advances, farmers are more likely to be poor. As a result, a unit increase in the respondents' age will result in a 1.062 increase in the poverty level in Kwara State.

The –0.587 and –0.341 coefficients of household size were significant and adversely associated with the probability of poverty status at 1%. This implies that the larger the household size, the lower the level of poverty by 59% and 34% in Kwara and Niger States, respectively. This is in line with the findings of Ogundari et al. (2017). This is affirmed by the fact that a larger household size is more likely to generate larger income and, hence reduce poverty significantly.

At 1% and 10% probability levels, the coefficients of educational level were found to be negatively significant, with odds of –0.003 and –0.647. This implies that the higher formal education led to lower poverty among rice farmers in Kwara and Niger States, respectively. With an odd ratio of –0.119, the degree of poverty was inversely related to married status, which was adversely significant at the 1% probability level. As a result, there is a chance that marital status reduces poverty by –0.119 among rice farmers in Kwara State, because the more farmers get married, the more likely their family members will be used as farm labour, and therefore their poverty level will decrease in the long run. In addition, the coefficient of farming experience is negative and significant at a 5% level in Kwara State, showing an inverse relationship between the level of poverty among rice farmers and their faming experience. The implication of this result is that a rice farmer with good farming experience is less likely to be poor than rice farmers with less farming experience.

In Kwara and Niger States, the coefficient of farm size was negatively signed and significant at 10% and 1%, respectively. This implies that any increase in farm size led to an increase in productivity, which in turn led to a reduction in poverty. The finding of this study agrees with the findings of Asante et al. (2014) who reported that the size of productive farmland correlated with the poverty status of rural farmers. The explanation for this is that the more rice farmers obtain productive

Table 5. Simultaneous Equation Modelling for Niger State rice farmers

Independent Variables	Output	Poverty Status
	Coefficient	Coefficient
Age of HH head (years)	.0032 (1.28)	.0035(1.11)
Gender	.1201***(2.97)	–.0161(–0.13)
Household size	–.0042(–0.89)	–.1354***(–15.69)
Marital Status	.2176***(6.47)	.1303**(2.04)
Year of Schooling of Household head	–.0030(–1.14)	.0056 (1.27)
Farm experience (years)	.0056**(2.07)	.0041(–1.05)
Farm size (ha)	.0319**(2.08)	–.0141(–0.58)
Income(₦)	.9808***(29.04)	–
Other forms of credit	.0516 ***(3.16)	–
Land tenure	–.0121(–1.17)	–
Extension visits	.0050** (1.97)	–.00432(1.01)
_cons	–3.507***(–8.21)	9.413***(23.31)

Source: Field Survey 2020
Figure in parentheses are the t-values *** significant at 1% level. ** significant at 5% level and * significant at 10% level.

Table 6. Simultaneous Equation Modelling for Kwara State rice farmers

Independent Variables	Output	Poverty Status
	Coefficient	Coefficient
Age of HH head (years)	.0032(1.28)	.0032(0.99)
Gender	.121***(2.97)	–.0176(–0.14)
Household size	–.0042–(0.89)	–.1359***(–15.85)
Marital Status	.2175***(6.47)	.1300**(2.02)
Year of Schooling of Household head	–.0030–(1.14)	.0055(1.26)
Farm experience (years)	.0057**(2.07)	–.0042(–1.02)
Farm size (ha)	.0329**(2.08)	–.0156(–0.64)
Income	.9809***(29.04)	–
Other forms of Credit	.0516***(3.16)	–
Land tenure	–.0121 (–1.17)	–
Extension visits	.0051**(1.97)	–.0032(1.34)
_cons	–3.517***(–8.21)	9.498(22.61)

Source: Field Survey 2020
Figure in parentheses are the t-values *** significant at 1% level. ** significant at 5% level and * significant at 10% level

farmland, the less rice farmers fall below the poverty level.

Cooperative membership has a significant negative impact on the poverty status of respondents at 1% and 10% in Kwara and Niger States, respectively. This means that in Kwara and Niger States, respectively, an increase of one unit in association membership lowers the likelihood of poverty by –0.033 and –2.898. This result supports the *a priori* expectation because membership in a cooperative, particularly a rice farmers' association, provides many competitive advantages in terms of risk reduction due to effective access to relevant information, low or no-interest credit sources, and other important less subsidized inputs required to boost productivity (Ogundipe et al. 2019).

Structural Effect of ABP on the farm output and poverty status

For farming households in both states, out of the exogeneous variables fitted for output, income is very significant ($p = 0.01$) and the coefficient has a positive sign (Tables 5 and 6) which indicates that the farmers that received more income have a tendency of getting larger output than the farmers without such income. This is in line with the study of Ayinde et al. (2018), where income and output are correlated. Gender is also a variable that significantly explains the variation in total output at a 1% level with a positive coefficient. This indicates that male farmers have the privilege of more productive hours in farming than female farmers. Farm size has a positive significant effect of 5%, indicating that

Table 7. Test for hypothesis (Ho_1)

Location	Group	Means	Std.Err	Std. Dev	T-test
Niger State	Beneficiaries (1)	0.547	0.046	0.478	1.655**
	Non-beneficiaries (0)	0.655	0.046	0.500	
Kwara State	Beneficiaries (1)	0.617	0.045	0.488	1.480*
	Non-beneficiaries (0)	0.709	0.044	0.456	

Source: Field Survey 2020
degrees of freedom = 225 for Niger and 228 for Kwara ,. *** significant at 1% level. ** significant at 5% level and * significant at 10% level

farmers with larger productive farm sizes produce more than farmers with smaller acreage. The findings are consistent with those of Salami et al. (2017), who found that farm size is positively connected with output. The sign of the coefficient of marital status is positive and significant at 1%, indicating that married farmers have a tendency to get higher output than single farmers. To lower the cost of production in traditional agricultural production, the average farmer exhausts all sources of labour within his family before employing external labour. Farm experience has a significant positive effect on farm output. This suggests that based on their prior production experience, farmers tend to produce more. At a 1% probability level, access to other forms of credit was significant and had a positive impact on the respondents' output. This indicates that the more farmers have access to credit, the higher is the likelihood to produce more. The extension visitation with positive sign at 5% indicates that the higher the number of visits by extension agent to farmers, the higher the chances to increase their production, because extension agents always train rural farmers new techniques, it can lead to increase in the production.

However, in the poverty model, the household size has a significant negative impact on poverty status at 1% which suggests that their poverty status is probably going to decline with each additional unit in their household. This is in line with the findings of Nosiru et al. (2014).

Marital status was positively significant at a 5% level of probability. This implies that an increase in marital status will lead to a 0.130 increment in the log-likelihood of the respondents being poor. The explanation is that married farmers will have an increment of household member numbers which leads to more pressure on them as their demand will increase and much of their income will be expended on responsibilities associated with their large family sizes, which may increase the likelihood of the respondents being poor.

Testing of hypothesis

The null hypothesis stated earlier in this study has been verified and the following conclusion was drawn based on the findings of the study:

There was a significant relationship in poverty status between beneficiaries and non-beneficiaries of ABP rice farmers (t-value = 1.655 $p < 0.5$ in Niger) and (t-value = 1.480* < 0.1 in Kwara) States. The study rejected the null hypothesis in favour of the alternative, meaning that there is a correlation between the Anchor borrowers' programme and poverty status of beneficiaries among rice farmers in the study areas. Gona et al. (2022) in a study on the effect of agricultural programmes on small-scale crop farming: the case of growth enhancement scheme in Kwara State, Nigeria, noted that government intervention had some positive impact on the activities of the beneficiary farmers. From the study, it was discovered that poverty has a significant effect on beneficiaries of ABP respondents as shown in Table 7.

Conclusion

The study found that age, marital status, years of schooling, household size, farming experience, farm size, and group memberships are the primary drivers of poverty among rice farmers in the studied areas. According to the findings of this study, poverty rates are higher among ABP non-beneficiaries than beneficiaries in both states. In general, the ABP has a good impact on rice farmers in the studied locations.

The hypothesis also revealed that there was a significant difference in poverty status between beneficiaries and non-beneficiaries of ABP rice farmers in the two states.

This study recommends that ABP project efforts should be intensified at reducing poverty rates in the study areas using other measures such as income diversification and establishment of small scale agro-industries. More funds should also be made available for such programme and the programme should be extended to other states and rural areas of the country.

CONFLICT OF INTEREST

Regarding the research, writing, and publication of this paper, the authors acknowledged no conflicts of interest.

ETHICAL COMPLIANCE

When conducting this research and writing the publication, all the ethical guidelines were observed.

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