www.jard.edu.pl http://dx.doi.org/10.17306/J.JARD.2023.01595

Journal of Agribusiness and Rural Development

pISSN 1899-5241
eISSN 1899-5772

2(68) 2023, 197–203
Accepted for print: 3.06.2023

EFFECT OF THE ANCHOR BORROWERS' PROGRAMME ON THE FOOD SECURITY OF SMALLHOLDER MAIZE FARMING HOUSEHOLDS IN KWARA STATE, NIGERIA

Babatunde Jaiyeola Ojo[1], Ifeoluwa Temitope Olalere[2]✉, Muhammad Adeiza Bello[3], Julius Bello[3]

[1]Kwara State University, Nigeria
[2]University of British Columbia, Canada
[3]University of Ilorin, Nigeria

Abstract. Many studies over the years have examined the impact of the Anchor Borrowers' Programme on smallholder farmers. However, there seems to be a research gap on the impact of the scheme on the food security status of the target beneficiaries. Hence, the study was conducted to examine the impact of the Anchor Borrowers' Programme on the food security of smallholder maize farming households in Kwara State, Nigeria. The data used for the study was gathered from 120 smallholder maize farming households selected via a two-stage sampling procedure. The study adopted descriptive statistics to examine their socioeconomic characteristics, Propensity Score Matching (PSM) and Average Treatment effect on Treated (ATT) to estimate the homogeneous effect of the scheme on the food security of the households, and to estimate the scheme's heterogeneous impact on household food security, a multiple regression model was used. The research findings revealed that although the scheme improved the food security of the households benefitting from it, the effect varies with the heterogeneity in household characteristics. The outcome of this research informs the development of policy frameworks for improving the delivery system of the scheme and the food security of farming households in the study area.

Keywords: Average Treatment Effect, food security, farming households, Propensity Score Matching, smallholder

INTRODUCTION

Agriculture continues to be Nigeria's most important industry, constituting an average of 24% of the country's GDP from 2013 to 2019 and employing the majority of the country's workforce. (Oyaniran, 2020). However, Nigerian agriculture is characterized by low productivity, indicating that production is dominated by smallholder farmers dwelling in rural areas without capital and knowledge of the best practices (McKinsey Global Institute, 2014). Therefore, improving the productivity, profitability and long-term viability of the smallholder farming system is seen as a pathway out of poverty and important for enhancing agricultural productivity in the country. Previous research (Etonihu et al., 2013; Awotide et al., 2015) demonstrated that boosting agricultural productivity has a major impact on enhancing food security, farm income, poverty reduction, and rural household welfare, all of which contribute to overall economic growth. To this end, improving smallholder farmers' financial inclusion by making credit more available and accessible will allow them to achieve increased agricultural output, which will eventually lead to improved livelihood and food security. This is because agricultural credit has been recognized as a significant tool for

✉Ifeoluwa Temitope Olalere, Faculty of Land and Food System, University of British Columbia, Vancouver, Canada, e-mail: olalere6@student.ubc.ca; https://orcid.org/0000-0002-4295-8941

expanding agribusiness production (Bagchi et al., 2019; Lawal et. al., 2019) because it facilitates the acquisition of modern agricultural inputs such as improved seeds, fertilizers, labor, and equipment.

Providing agricultural financing to smallholder farmers has been a significant component of successive Nigerian government development programmes and strategies (Umeh and Adejo, 2019). This is evident in the government establishing numerous agricultural credit schemes as a path to boosting agricultural growth and achieving food self-sufficiency in Nigeria. Such schemes include the following: the Agricultural Credit Guarantee Scheme Fund (ACGSF), established in 1977, the Special Emergency Agricultural Loans Scheme (SEALS) established in 1984, the Interest Drawback Programme (IDP), established under the ACGSF in 2003 to encourage loan repayment, the Agricultural Credit Support Scheme (ACSS), established in 2006, the Commercial Agriculture Credit Scheme (CACS), established in 2009, and the Nigerian Incentive-Based Risk Sharing system for Agricultural Lending (NIRSAL), established in 2011, which, though not a credit scheme, is intended to encourage farmers to protect their investments from natural disasters, and to promote commercial bank lending with up to 60% interest guarantees.

To further the previously established schemes, the Federal Government of Nigeria through the Central Bank of Nigeria (CBN) established the Anchor Borrowers' Programme (ABP) in 2015. This scheme was established specifically to boost local production of agricultural products especially rice, wheat, maize, and sugar, reduce the voluminous importation of food that can be produced within the country, create jobs, conserve foreign reserve, and alleviate poverty among smallholder farmers by helping them to scale from subsistence to a commercial level of production. In order to achieve these core objectives, this programme was designed to: establish a network to link smallholder farmers to local large-scale processors, regarded as anchor companies, increase the capacity of the anchor companies involved in the network to harness potentials, increase institutional lending to the agricultural sector, and promote the financial inclusion of smallholder farmers.

Several studies have investigated the impact of the Anchor Borrowers' Programme on agricultural productivity (Ayinde et al., 2018; Kara et al., 2019; Abdulmumin, 2020). However, based on the knowledge of the researchers, no existing study has established the impact of the Anchor Borrowers' Programme on the food security of farmers. As a contribution to this research gap, the present study investigates the impact of the Anchor Borrowers' Programme on the food security of smallholder maize farming households in Kwara State, Nigeria. Specifically, this study aimed to examine the socioeconomic characteristics of the smallholder maize farming household in the study area and estimate the impact of the ABP scheme on smallholder maize farming households' food security in the study area.

METHODOLOGY

Study area

The research was conducted in Kwara State, Nigeria. The state is known in the country to be the border between northern and southern Nigeria. It is bordered on the west by the Republic of Benin, and on the north by Niger State. It also connects the states of Oyo, Osun, and Kogi to the southwest, southeast, and east, respectively. The state is comprised of sixteen Local Government Areas (LGAs), partitioned into four agricultural zones – A, B, C, and D by the state's Agricultural Development Project (ADP). Agriculture is the primary occupation of the people in the state and is engaged in primarily by the rural population.

Sampling procedure and data collection

Ifelodun, Offa, and Oyun Local Government Areas (LGAs) in Kwara State were purposely chosen for the study because they accounted for over 70% of maize farmers who benefited from the Anchor Borrower's Programme in the state. The data used to carry out this study was collected from maize farmers using a well-structured questionnaire. The sampling frame comprising a list of beneficiaries of the ABP scheme was obtained from the All-farmers Association of Nigeria (AFAN), Kwara State chapter, and using a snowballing sampling technique, the non-beneficiaries were selected. The respondents for the study were chosen using a two-stage selection technique. The first stage entailed selecting 65 beneficiaries at random from the sample frame provided by the AFAN. In the second stage, 65 maize farming households with farmers that are non-beneficiaries of the ABP scheme were selected through referrals from previously identified farmers. A total of 130 respondents were interviewed. However, owing to the incomplete information provided by 10 of the respondents, only 120 respondents were deemed useful for the study.

Analysis technique

Descriptive statistics, per capita food expenditure, Propensity Score Matching (PSM), Average Treatment on the Treated (ATT), and multiple regression were used for this study. Descriptive statistics was used for examining the socioeconomic characteristics of the respondents, per capita food expenditure was used as a proxy measure of food security, PSM and ATT were used to estimate the scheme's homogeneous effect on household food security, and a multiple regression model was used to evaluate the scheme's heterogeneous effect on household food security.

Measurement of food security

Per capita food expenditure is an indicator for measuring food security. Household food security can be quantified using household expenditure because food security and household expenditure are correlated (Rizov et al., 2015; Russell et al., 2018). In some previous studies (Adebayo et al., 2016; Szabo et al., 2016), per capita food expenditure was employed as a bivariate measure of food security to classify households as food-secure or food-insecure, based on whether they spent more than 75 percent of their income on food. Some other past studies (Mishra and Ray, 2009; Nguyen and Winters, 2011) have also adopted per capita food expenditure as a continuous measure of household food security. For the study, we used the per capita food expenditure as a continuous proxy measure of household food security. Per capita food expenditure is estimated as follows:

$$\text{PP\_FH} = \sum_i^n \frac{H_{FE}}{HHsize}$$

Where:

PP_FE – per capita food expenditure

H_{FE} – household food expenditure

HHsize – household size

n – number of observations

Propensity score matching (PSM)

The Propensity Score Matching (PSM) approach is a statistical technique for determining the treatment effect of programmes or policies (Muhaimin et al., 2020). This effect is estimated by calculating the covariance of the treatment. The PSM estimates the effect of a covariate in a binary treatment group.

Based on pre-intervention factors, the propensity score is a statistical conditional probability for treatment groups (Rosenbaum and Rubin, 1983). Mathematically:

$P(X) = P_T\{D = 1|Z\} = \mathcal{E}\{D|Z\}$

where:

D – is a binary variable denoting two treatment groups, D = 1 represents beneficiaries, and D = 0 represents the non-beneficiaries,

Z – is a measure of the pre-intervention scheme. The conditional distribution of Z, given P(X) is homogenous for both beneficiaries and non-beneficiaries.

Average treatment effect on treated (ATT)

Once the Propensity score had been estimated, the ATE on the treated groups, which is the effect of the ABP on the beneficiaries, was estimated as follows:

$$\text{ATT} = E\{T_\alpha|T_i = 1\} = E\{Y_{1i}|T_i = 1\} - E\{Y_{0i}|T_i = 1\}$$

where:

T_i – represents the treatment status of maize farmer, *i* – and can take two values $T_i = 1$ if the household head is a beneficiary, and $T_i = 0$ if the household head is a non-beneficiary

$Y_{1i} = 1$ is the per capita food expenditure of the household if the household head is a beneficiary, and $Y_{0i} = 0$ if the per capita food expenditure of the household if the household head is a non-beneficiary

E – is the expectation operator and T_α is the treatment effect.

Multiple regression model

This was used to estimate the ABP scheme's varied impact on family food security. The explicit functional form of the model is given as:

$$Y = \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \beta_8 X_8 + \mathcal{E}$$

where, *Y* is the dependent variable which represents the per capita food expenditure in naira, and $X_1 - X_8$ are the independent variables, denoted as follows:

X_1 – age of household head,

X_2 – gender of household head,

X_3 – educational attainment of household head,

X_4 – household size,

X_5 – farming experience of household head,

X_6 – cooperative membership,

X_7 – farm size,

X_8 – household income,
α – constant,
$\beta_1 - \beta_8$ – parameters to be estimated and
$\mathcal{E}$ = error term

RESULTS AND DISCUSSION

Descriptive statistics of the respondents

Table 1 describes the socioeconomic characteristics of smallholder maize farming households, according to ABP beneficiary status. The findings show that most of the farmers are youthful and productive, with an average age of 47.7 for beneficiaries and 47.9 for non-beneficiaries, respectively. The result also shows that the majority of the farmers are male, representing 71.7% and 66.7% of the beneficiaries and non-beneficiaries respectively. This is an indication that females are less involved in maize production in the study area. This is in tandem with the findings of Abdulaleem et al. (2019) who reported that women accounted for 23.7% of the farming population in their study. This finding may also be attributed to the gender issues involved in the accessibility of productive resources by women in agriculture. According to Botreau and Cohen in the Oxfam 2019 report, female-headed rural households have less access than male-headed rural households to a wide range of essential productive assets and services needed for improved rural livelihoods, such as livestock, fertilizer, improved seed varieties, mechanical equipment, extension services, and agricultural education. Furthermore, the result shows that the beneficiaries and non-beneficiaries have an average of 10 and 9 years of formal education, respectively. The benefitting and non-benefitting households have an average household size of 6 members. The result also reveals that both groups are experienced with an average of 16.3 and 18.6 years of farming experience for beneficiaries and non-beneficiaries, respectively. This indicates that the farmers are not new to maize production and therefore have the knowledge of the practices needed to improve farm productivity. Furthermore, most of the farmers are members of cooperative organizations, accounting for 65% of beneficiaries and 60% of non-beneficiaries, respectively. This suggests that the farmers may have access to information that can enhance their production. In terms of farm size, the two groups cultivate less than 2 hectares. Berdegué and Fuentealba (2011), in their review of the smallholder farming system, described the system as any farm operation on land less than 2 hectares. However, the average land holding of the beneficiaries of the ABP scheme exceeds that of non-beneficiaries. In addition, the beneficiaries had a higher farm income than the non-beneficiaries of the ABP scheme. The larger landholding and higher farm income of the beneficiaries may be an indication of the positive impact of the ABP scheme on the livelihood status of the farmers.

Table 1. Socioeconomic characteristics of the respondents based on ABP beneficiary status

Variables	Description	Beneficiaries (N = 60)		Non-beneficiaries (N = 60)	
		mean	std. dev	mean	std. dev
AGE_HEAD	Age of Household head (years)	47.7	15.38	47.9	14.96
GEND_HEAD	Gender of household head (male = 1, female = 0)	0.717	0.487	0.667	0.548
EDUC_HEAD	Years spent in school by household head	10.1	4.31	8.8	4.75
HHSIZE	Number of household members	6.5	2.45	6.3	2.84
FARMEXP	Years of experience in maize production	16.3	10.2	18.6	11.3
COOP_MEMSHP	Membership of cooperative organization (1 = yes, 0 = otherwise)	0.65	0.48	0.60	0.48
FARMSIZ	Size of the farm used for maize production (hectares)	1.86	0.787	1.42	0.774
FARM_INC	Farm income of the farmer (in Naira)	392,925.7	153,856.3	295,563.8	136,332.9

Source: field survey, 2019.

Table 2. Result of the estimated effect of the ABP scheme on the households' per capita food expenditure

Variable	PSM method	Treated	Control	ATT	Std. Err.	t-test
Per capita food expenditure	Radius Matching	60	60	8604.5	1017.92	3.58***

***Indicates significance at 1% level.
Source: field survey, 2019.

Effect of the Anchor Borrowers' Programme on the food security of the smallholder maize farming household

Table 2 shows the PSM result of the Anchor Borrowers Programme's effect on the agricultural household's per capita food expenditure. The Anchor Borrowers Programme has a positive and statistically significant effect (at 1% alpha level) on the per capita food expenditure of smallholder farming households, according to the results of the Radius Matching estimator. The Anchor Borrowers Programme generated an increase in the annual per capita food expenditure of the households by ₦8,600 per production cycle.

The ABP scheme estimated the effect on the smallholder farm households' income from maize production (Table 2) and assumes a homogenous treatment effect among the beneficiaries of the scheme. However, this treatment does not have the same effect for all beneficiaries, given that they differ in their socioeconomic characteristics. Table 3 shows the heterogeneous treatment effect among the smallholder farm households using the multiple regression to describe the extent to which the treatment on per capita food expenditure varies among the beneficiaries.

The results in Table 3 present the multiple regression estimates of the heterogenous effect of ABP scheme on households' food expenditure per capita among beneficiaries of the scheme. The semi-log functional form was selected because it satisfies the econometric and statistical criteria (highest value of R^2). The value of R^2 is given as 0.672, indicating that the explanatory variables account for 67.2% of the total variation in the heterogenous

Table 3. Multiple regression estimates of the heterogenous effect of ABP on food security among beneficiaries

Variables	Linear	Double-log	Semi-log	Exponential
Constant	0.447 (0.161)	0.335 (0.024)	–0.691 (0.103)	–8.203 (13.513)
Age	–0.034** (2.215)	–0.051** (3.519)	–0.042** (1.208)	–0.062 (7.134)
Gender	–0.791 (3.034)	–0.643 (1.120)	–0.836 (0.353)	–0.444 (3.714)
Education	0.473 (2.311)	0.157 (0.781)	0.246 (1.941)	0.825 (6.782)
Household size	–1.129** (5.737)	–0.564** (4.724)	–0.507*** (3.262)	0.816 (1.417)
Farming experience	0.518 (8.214)	0.221 (1.129)	0.150 (2.240)	0.547 (0.723)
Cooperative membership	0.992 (2.319)	1.114 (0.487)	1.113 (0.497)	0.318 (10.643)
Farm size	0.404** (3.733)	0.287*** (2.451)	0.302*** (1.552)	0.169* (4.715)
Household income	0.537*** (1.355)	0.310*** (1.157)	0.251** (0.377)	(0.673) (4.222)
R^2	0.449	0.653	0.672	0.543
Adjusted R^2	0.431	0.627	0.666	0.524
F-Ratio	7.239	7.530	8.013	7.821

*, **, and, *** represent sig. level of 10%, 5% and 1%, respectively.
Source: field survey, 2019.

effect of ABP in the fitted model. The result reveals that the effect of the ABP scheme on household food security is not the same among the beneficiaries. The findings reveal that the age of the household head and the size of the household have a negative association with per capita food expenditure and are statistically significant at 5%. This implies that the ABP scheme improves food security more among households with a younger household head as well as households with a smaller household size. This agrees with the findings of Onasanya and Obayelu (2015), who reported that the age of the household head has a negative coefficient, suggesting that households with younger heads were more likely to be innovative, engaged in multidimensional livelihood strategies and, consequently, more food-secure than their elderly counterparts. The result also shows that farm size, household size, and household income are positively associated with per capita food expenditure and statistically significant at 1%, implying that the ABP scheme is likely to improve food security more among households with a larger farm size and a higher household income. This is in consonance with the findings of Chepkirui et al. (2014) and Tefera and Tefera (2014) that farm size allocated to food crops had a positive effect on food security among small-scale farmers in Kenya and Ethiopia, respectively.

CONCLUSION AND POLICY IMPLICATION

The study investigated how the Anchor Borrowers' Programme affects the food security of smallholder maize farming households in Kwara State, Nigeria. It can be concluded from the study that the ABP scheme has had a positive impact on the food security of the farmers and their households benefitting from it. However, the food security effect of the scheme is more improved in benefitting farming households with younger farmers, a smaller household size, and a higher household income. Thus, taking into account that the positive impact of the scheme on food security is not the same among the benefitting farming households, given the heterogeneity in household characteristics, the study suggests that to augment the scheme's delivery system, extension agencies, through facilitators, should be provided to monitor the activities of the farmers benefitting from the scheme. This will ensure that the credit provided through the scheme generates a more consistent beneficial outcome in terms of productivity, farm income, and food security. Furthermore, this study recommends that the federal government should consolidate the benefits of the Anchor Borrowers' Programme in the study area and extend more credit facilities to maize farmers.

FUNDING

The study was funded by the authors.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

REFERENCES

Abdulaleem, M.A., Oluwatosin, F.M., Ojo, O.S. (2019). Effect of maize production among small holder farmers in Southwest Nigeria. Asian J. Agric. Exten. Econ. Soc., 30(4), 1–10.

Abdulmumini, A.B. (2020). Assessment of anchor borrowers financial scheme on rice farmers productivity in Lavun Local Government Area of Niger State. Fudma J. Manag. Sci., 1(1), 111–123.

Adebayo, O., Olagunju, K., Kabir, S.K., Adeyemi, O. (2016). Social crisis, terrorism and food poverty dynamics: evidence from Northern Nigeria. Int. J. Econ. Fin. Iss., 6(4), 1865–1872.

Awotide, B.A., Abdoulaye, T., Alene, A., Manyong, V.M. (2015). Impact of access to credit on agricultural productivity: Evidence from smallholder cassava farmers in Nigeria (No. 1008-2016-80242).

Ayinde, O.E., Fatigun, O., Ogunbiyi, K., Ayinde, K., Ambali, Y.O. (2018). Assessment of Central Bank Intervention on Rice Production in Kwara State, Nigeria: A case-study of Anchor Borrower's Programme. Paper presented at 30th International Conference of Agricultural Economists. Vancouver, British Columbia, Canada.

Bagchi, M., Rahman, S., Shunbo, Y. (2019). Growth in agricultural productivity and its components in Bangladeshi regions (1987–2009): an application of bootstrapped data envelopment analysis (DEA). Economies, 7(2), 37.

Berdegué, J., Fuentealba, R. (2011). Latin America: The state of smallholders in agriculture. IFAD Conference on New Directions for Smallholder Agriculture, 24-25 January 2011. Rome: International Fund for Agricultural Development (IFAD).

Botreau, H., Cohen, M. (2019). Gender inequalities and food insecurity. Oxfam International. Retrieved from:

https://oxfamilibrary.openrepository.com/bitstream/handle/10546/620841/bp-gender-inequalities-food-insecurity-150719-en.pdf

Central Bank of Nigeria (2015). Developments in the External Sector. External Sector Committee Reports, 3rd Quarter, 3(1), p. 6.

Chepkirui, B.R., Mwangi, J.G., Kibett, J.K. (2014). Effects of farm size under food crops on food security among small-scale farmers in Kakamega Central Sub-County, Kenya. Int. J. Adv. Res., 2(10), 592–599.

Etonihu, K.I., Rahman, S.A., Usman, S. (2013). Determinants of access to agricultural credit among crop farmers in a farming community of Nasarawa State, Nigeria. J. Dev. Agric. Econ., 5(5), 192–196.

FAO (Food and Agriculture Organization). (2011). Global food losses and food waste – extent, causes and prevention. Rome. Retrieved from: https://www.fao.org/3/i2697e/i2697e.pdf

FAO (Food and Agriculture Organization). (2012). Maize, rice and wheat area, world. Retrieved from: http://www.fao.org/docrep/013/am053e/am053e00.pdf

Kara, A.H., Shamsudin, M.N., Mohamed, Z., Latiff, I.B., Seng, K.W.K. (2019). Technical efficiency and production risk of rice farms under Anchor Borrowers Programme in Kebbi State, Nigeria. Asian J. Agric. Exten. Econ. Soc., 31(4), 1–12.

Lawal, A.I., Olayanju, T.M.A., Ayeni, J., Olaniru, O.S. (2019). Impact of bank credit on agricultural productivity: empirical evidence from Nigeria (1981–2015). Int. J. Civil Eng. Technol. (IJCIET), 10(2), 113–123.

McKinsey Global Institute (2014), Nigeria's Renewal: Delivering Inclusive Growth in Africa's Largest Economy, McKinsey & Company, London.

Mishra, V., Ray, R. (2009). Dietary diversity, food security and undernourishment: the Vietnamese evidence. Asian Econ. J., 23(2), 225–247.

Muhaimin, A.W., Toiba, H., Retnoningsih, D., Yapanto, L.M. (2020). The impact of technology adoption on income and food security of smallholder cassava farmers: empirical evidence from Indonesia. Int. J. Adv. Sci. Technol, 29(9), 699–707.

Nguyen, M.C., Winters, P. (2011). The impact of migration on food consumption patterns: The case of Vietnam. Food Pol., 36(1), 71–87.

Onasanya, O.A., Obayelu, O.A. (2016). Determinants of food security status of maize-based farming households in Southern Guinea Savannah Area of Oyo State, Nigeria. Turk. J. Agric. Food Sci. Technol., 4(5), 411–417.

Oyaniran, T. (2020). Current state of Nigeria agriculture and agribusiness sector. Poster presented at the AfCFTA Series II Agriculture & Agribusiness Workshop. Retrieved from: https://www.pwc.com/ng/en/assets/pdf/afcfta-agribusiness-current-state-nigeria-agriculture-sector.pdf

Rizov, M., Cupak, A., Pokrivcak, J., (2015). Food security and household consumption patterns in Slovakia. LICOS Discussion Paper, No. 36.

Rosenbaum, P.R., Rubin, D.B. (1983). The central role of the propensity score in observational studies for causal effects. Biometrika, 70(1), 41–55.

Russell, J., Lechner, A., Hanich, Q., Delisle, A., Campbell, B., Charlton, K. (2018). Assessing food security using household consumption expenditure surveys (HCES): a scoping literature review. Publ. Health Nutr., 21(12), 2200–2210.

Szabo, S., Hossain, M., Adger, W.N., Matthews, Z., Ahmed, S., Lázár, A.N., Ahmad, S. (2016). Soil salinity, household wealth and food insecurity in tropical deltas: evidence from south-west coast of Bangladesh. Sust. Sci., 11(3), 411–421.

Tefera, T., Tefera, F. (2014). Determinants of households food security and coping strategies for food shortfall in Mareko District, Guraghe Zone Southern Ethiopia. J. Food Sec., 2(3), 92–99.

Umeh, J.C., Adejo, M.A. (2019). Assessment of central bank of Nigeria's anchor borrowers' programme effects on rice farmers in Kebbi state, Nigeria. Paper presented at the 6th African Conference of Agricultural Economists, Abuja, Nigeria.