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IMPACT OF THE COMMUNITY-BASED NATURAL RESOURCE MANAGEMENT PROGRAMME ON THE POVERTY STATUS OF RURAL HOUSEHOLDS IN EDO AND ONDO STATES, NIGERIA

WASIU OLALEKAN AKINBODE^{*1}, ADEBAYO SIMEON BAMIRE¹, ADEWUMI TITUS ADESIYAN¹, MUYIWA SUNDAY OLATIDOYE¹, NURUDEEN AFOLABI SOFOLUWE²

¹ Department of Agricultural Economics, Obafemi Awolowo University, Ile-Ife, Nigeria

² Department of Cooperative and Rural Development, Olabisi Onabanjo University, Ago-Iwoye, Ogun State, Nigeria

*Corresponding author: wasiu_akinbode@yahoo.co.uk

SUMMARY

The purpose of this study is to examine socioeconomic factors influencing the participation of households in the Community-Based Natural Resource Management (CBNRM) programme and estimate the programme's impact on the poverty status of rural households in Edo and Ondo States, Nigeria. A multi-stage sampling procedure was used to select three hundred and twenty respondents across CBNRM participating and non-participating households. Data were collected according to socioeconomic criteria such as the expenditure on food and non-food items and the CBNRM participation status of the respondents surveyed. The endogenous switching regression model was used as an analytical tool. The following factors were found to exert significant influence on the participation of households in the CBNRM programme: year of schooling ($p < 0.05$), membership in associations ($p < 0.05$), value of disposable assets ($p < 0.1$) and value of household's food expenditure ($p < 0.05$). A coefficient of correlation of 0.1625, obtained for the CBNRM participants, indicates that the CBNRM participants have higher per capita consumption expenditure than a random household by ₦1,369.17. The present study unequivocally demonstrated that participation in the CBNRM programme increased the per capita expenditure of the households considered, positively affecting their poverty status and emphasising the importance of education, household food expenditure, disposable assets and membership in association as determining factors for the CBNRM programme participation.

Key words: community-based, endogenous switching, natural resources, poverty

Abbreviations: ADP - Agricultural Development Programme; ATT - Average Treatment Effect on the Treated; CBARDP - Community Based Agricultural and Rural Development Programme; CBD - Community Based Development; CBNRM - Community Based Natural Resource Management; CBPRP - Community Based Poverty Reduction Projects; CDD - Community Driven Development; EADP - Edo Agricultural Development Programme; FIML - Full Information Maximum Likelihood; IFAD - International Fund for Agricultural Development; LGAs - Local Government Areas; M & E - Monitoring and Evaluation; NBS - National Bureau Statistics; NDDC - Niger Delta Development Commission; NPC - National Population Commission; UNEP - United Nations Environment Programme;

INTRODUCTION

Natural resources constitute the most significant drivers of the rural livelihoods and sustainable development in Africa. They are succinctly referred to as assets that are transformed to produce social and economic benefits, and may be consumed or made unavailable in the process of transformation. Moreover, there is an impactful and

dependency-oriented relationship between the availability and quality of natural resources and the survival of rural households. They are often regarded as the wealth of the community as the community's livelihood depends on their protection and sound use. The social and economic benefits associated with the proper utilization of natural resources may include increased wealth, proper system functioning, and/or enhanced well-being. Natural resources are intricately linked to the livelihoods of most African nations and are the basis of subsistence in many poor communities. They account for 26% of the wealth of low-income countries (UNEP, 2007) and are the mainstay of many developing economies. Therefore, the significance of proper utilization and sound use of natural resources, i.e. the management of natural resources, cannot be overemphasized.

The proper management of natural resources is deemed imperative as it has the potential of yielding vital benefits such as essential goods (namely food, fibre and timber) and life-fulfilling conditions such as aesthetic appeal, serenity, food security, employment generation, increased farm income and improved standard of living. Conversely, the unsound management of natural resources results in low resource productivity, food insecurity, the inability of people to meet standards of wellbeing, and poverty (IFAD, 2012).

Concerns about the threat of poverty have led the Nigerian government to devote considerable attention to alleviating its scourge through various aid programmes, often in collaboration with civil society groups and international donor agencies. The following programmes have been implemented over the past years: Agricultural Development Programme (1975), Operation Feed the Nation (1986), National Directorate for Employment (1987), Family Support Programme (1996), National Poverty Eradication Programme (2001), Special Programme on Food Security (2001), National Fadama I, II and III Development Programmes, Community Based Poverty Reduction Projects (CBPRP), and Community Based Agricultural and Rural Development Programme (CBARDP). Despite all these programmes, the percentage (67.38%) of the population living below the poverty line in Nigeria is still a subject of concern to the government and donor agencies (NBS, 2012).

Every measure of poverty ranks Nigeria at the bottom of the list of nations, marking Nigerian rural areas as extremely poverty-stricken with up to 80 percent of the rural population living below the poverty line (IFAD, 2007). The World Bank (2014) reported that 70 percent of Nigerians survive on less than \$1.25/day. The report revealed that 7 percent of the 1.2 billion poor people in the world are Nigerians, thus ranking them the third poorest nation worldwide. A number of poverty alleviation programmes/schemes have been implemented over the last four decades by the Nigerian government with no visible improvements in the incidence and severity of poverty, especially among the rural households (African Development Bank, 2013; Oyesanmi et al., 2006). These previous government policies and strategies on poverty alleviation were basically supply driven, promoting the top-to-bottom approach, which did not achieve the desired objectives. This might be attributed to the fact that rural people were not involved in the planning, design and implementation of such intervention programmes, thus making the desired transformation elusive to the targeted beneficiaries.

The Community-Based Natural Resource Management (CBNRM) is a CBD/CDD approach to the management of land and other natural resources relevant to the livelihood of communities. The Community Based Natural Resource Management (CBNRM) Programme in Nigeria was a ten-year-old (2005-2015) intervention programme based on the Community-Driven Development (CDD) approach and designed to improve the standards of living and quality of life of poor rural households in the nine member states of the Niger Delta Development Commission (NDDC): Abia, Akwa Ibom, Bayelsa, Cross River, Delta, Edo, Ondo, Imo and Rivers. The programme was aimed at increasing food production, improving institutional capability, encouraging the participation of the community beneficiaries, creating the favourable environment for rural economic growth and, most importantly, enhancing the socio-economic life of rural households through spillover effects, which ultimately alleviate poverty.

The purpose of this study is to determine factors influencing the participation of households in the CBNRM programme and estimate the impact of the CBNRM programme on the poverty status of the households considered in the study area. Accordingly, the outcome of the study will enable policy makers to address the factors determining households' participation in the CBNRM programme, resulting in the further improvement and expansion of the CBNRM programme.

MATERIAL AND METHODS

Area of study

The study was carried out in Edo and Ondo States, Nigeria. The two states were among the pilot states where the CBNRM programme was carried out in the period 2005-2015. Edo State is located in Southern Nigeria and lies between latitudes of 5° 44' and 7° 34' north of the Equator and longitudes of 5° 04' and 6° 45' east of the Greenwich meridian. It is bounded in the east by the Niger, in the west by Ondo State, in the south by Delta State and in the

north by Kogi State. The state occupies a land area of approximately 19,283.9 km² with a population of 3,218,332, a sex distribution of 1,640,461 males and 1,577,871 females and a population density of 166.9/km² (NPC, 2006). The state consists of 18 local government areas, which are divided into three (3) agro-ecological zones namely Edo North, Edo Central and Edo South according to the Edo Agricultural Development Programme (EADP) delineation. The climate of the state is tropical with two distinct seasons: dry and rainy seasons. The former occurs between November and March, whereas the latter starts in April and lasts until October with a brief lull in August. The annual rainfall averages between 800mm-1200mm in the northern parts of the state, whereas a rainfall of 1200mm-1600mm is commonplace in the southern forest belt near the coastal area. Three vegetation belts are discernible from the south to the north of the state: the mangrove swamps along the coast in the south, evergreen forests in the central part of the state, and savannahs in the north. Red and yellow ferralsols are the typical soil type in the state.

Edo State has about 37 forest reserves such as Okomu, Urhionigbe and Gele Gele, covering about 597, 557 ha. Mineral resources found in the state include crude oil, natural gas, limestone, gold, marble etc. Agriculture is the mainstay of the state's economy. The major food crops grown are cassava, yam, maize, rice and plantain, whereas rubber, timber, and oil palm are the most important cash crops.

Ondo State is located in the south-western part of Nigeria and lies between latitudes of 5° 45' and 8° 15' north of the Equator and longitudes of 4° 45' and 6° 15' east of the Greenwich meridian. The state covers a total land area of approximately 14,798 km² with varying physical features such as hills, lowlands, rivers, creeks and lagoons. It is bounded in the north by Ekiti and Kogi States, in the east by Edo State, in the west by Osun and Ogun States, and in the south by the Atlantic Ocean. It is made up of 18 Local Government Areas (LGAs) and a total population of 3,640,877, with a male to female sex ratio of 100:98 and a population density of 233.9/km² (according to the National Population Commission (NPC, 2006).

The state has three distinct ecological zones; the mangrove forest to the south, the rain forest in the middle and the forest savannah to the north. The climate is tropical with two distinct seasons, the rainy season, (April-October) and dry season (November-March) with slight variations from year to year. The annual rainfall varies from 1,150mm in the northern areas to 2,000mm in the southern areas with the mean number of rainy days of between 160 and 180 while the mean relative humidity is between 70-80%. The mean annual temperature is about 27.8°C and the mean daily temperature is 26°C. The State generally enjoys luxuriant vegetation. The vegetation consists of coastal forest and mangrove swamp forest in the south, moist lowland forest in the middle and the forest savannah in the north.

The people of Ondo State engage in farming, trading, logging, fishing, crafting and public service, but are predominantly smallholder farmers cultivating both cash and food crops. The cash crops cultivated in the state include cocoa, kolanut, plantain, bananas, oil palm, coffee, cashew, rubber and timber. The food crops cultivated in Ondo include maize, yam, cassava, rice, and cocoyam. The state has abundant mineral resources ranging from kaolin, bitumen, quartzite and coal to crude oil and natural gas. Moreover, the state's forest reserves cover about approximately 2,986.16 km², boasting 9 tourist centres.

Sampling procedure, sample size and data collection methods

A multi-stage sampling procedure was used to select respondents in Edo and Ondo States, Nigeria. In the first stage, two CBNRM programme participating and non-participating Local Government Areas (LGAs) were purposively selected in each state to obtain eight LGAs. The second stage entailed employing a random sampling technique to select two communities in each LGA to obtain sixteen communities. In the third stage, a simple random sampling technique was used to select twenty households in each community to obtain a total of three hundred and twenty households (160 participants and 160 non-participants) as the sample size. However, after removing the missing observations for some variables due to no response and incomplete responses, three hundred and fifteen households (159 participants and 156 non-participants) were used for the final data analysis, which corresponds to 98.4% of the expected households.

The present study utilized the primary data collected using a structured and pretested questionnaire administered to the household head. The data collected included household socioeconomic and demographic characteristics, assets endowment, expenditure on food and non-food items, economic activities, wealth and income, access to basic infrastructures and agricultural services, and participation status of the respondents. The study data were collected in the 2016 agricultural production year using the interview method with the assistance of Agricultural Development Programme (ADP) Extension Officers, Monitoring and Evaluation (M & E) Officers of the CBNRM Programme Support Office, and Local Government Agricultural Officers in each state.

Analytical Technique

The endogenous switching regression (ESR) model was employed as an analytical tool in the study. The model was used to determine the factors influencing the likelihood of household's participation in the CBNRM programme and estimate the impact of the programme on the household's poverty status.

Specification of the endogenous switching regression model

The ESR model is a programming model that consists of two stages. The first stage of the ESR model, which is the selection equation, uses the probit model to investigate the socioeconomic characteristics of households influencing the probability of their participation in the CBNRM programme. This selection equation is expressed as follows:

$$\text{prob}(D = 1) = \text{prob}(U^*(\pi) > 0) = g(Z_k \beta_k) + \mu_i \quad \text{and} \quad \mu_i : N(0,1) \quad (1)$$

where D takes the value of 1 for the participants and 0 otherwise, Z_k is the vector of explanatory variables (namely gender, education, age, marital status, household size, farm size, farming experience, households assets, food expenditure, extension contact, occupational status and membership in association), β_k is the vector of parameters to be estimated and μ_i is the random error term with zero mean and a unit variance.

The second stage of the ESR model, which is the outcome equation, estimates the impact of the CBNRM programme on the poverty status of the households considered. The poverty function was specified as:

$$\ln \pi_M = \delta_{0M} + \sum_{j=1}^J \alpha_{jM} X_{jM} + \varepsilon_M \quad M=P,N \quad (2)$$

where π represents the per capita consumption expenditure, X_j represents gender, education, age, marital status, participation, household size, farm size, farming experience, households assets, extension contact, occupational status and membership in association, $\ln$ denotes the natural logarithm, $M=P$ stands for participants, $M=N$ stands for non-participants, δ and α are parameters to be estimated and ε is the error term for the regression.

The empirical model of the selection equation, i.e. the first stage of the ESR model, was specified as follows:

$$Y_1 = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \dots + \beta_{12} X_{12} \quad (3)$$

where,

X_1 = Gender of the household head (1 if male, 0 otherwise)

X_2 = Age of household head (years).

X_3 = Education of the household head (years).

X_4 = Marital status (1 if married, 0 otherwise).

X_5 = Household size (number).

X_6 = Farm size (ha)

X_7 = Farming experience (years)

X_8 = Assets (₦)

X_9 = Extension access (1 if yes, 0 otherwise)

X_{10} = Occupation status (1 = agriculture, 0 otherwise)

X_{11} = Households' food expenditure (₦)

X_{12} = Membership in association (1 if yes, 0 otherwise) and the dependent variable Y_1 = participation status (1 = participation, 0 otherwise) and β s are the parameter coefficients to be estimated.

The empirical model relative to the outcome equation, i.e. the second stage of the ESR model, was specified as follows:

$$Y_2 = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \dots + \beta_{12} X_{12} \quad (4)$$

where,

X_1 = Gender of the household head (1 if male, 0 otherwise)

X_2 = Age of household head (years).

X_3 = Education of the household head (years).

X_4 = Marital status (1 if married, 0 otherwise).

X_5 = Household size (number).

X_6 = Farm size (ha)

X_7 = Farming experience (years)

X_8 = Assets (₦)

X_9 = Extension access (1 if yes, 0 otherwise)

X_{10} = Occupation status (1 = agriculture, 0 otherwise)

X_{11} = Households' food expenditure (₦)

X_{12} = Membership in association (1 if yes, 0 otherwise) and the dependent variable Y_2 = per capita consumption expenditure of household and β s are the parameter coefficients to be estimated.

RESULTS AND DISCUSSION

Factors influencing the participation of households in the CBNRM programme

The full information maximum likelihood (FIML) estimates of the probit model of socioeconomic factors influencing the household's participation in the CBNRM programme in the study area is presented in Table 1. The goodness-of-fit measures indicate that the estimated model fits the data reasonably well and show that the parameter estimates were statistically significant. The entire model was significant at the 1% level of probability. The number of years spent in school, membership in association, value of household's disposable assets and value of household's food expenditure were found to be statistically significant in influencing the likelihood of household's participation in the CBNRM programme in the study area.

The results obtained show that the number of years spent in school is a statistically significant variable that increases the probability of household's participation in the CBNRM programme. It was positively signed and significant at the 5% probability level. This expected outcome is consistent with the studies conducted by Nwaobiala (2014), Nandi et al. (2014) and Lhing (2014), which revealed that education influences participation in programmes relative to poverty reduction. The greater the number of years spent in school, the more educated the household head is and the more likely they are to diagnose and observe the benefits of development programmes such as the CBNRM programme.

Membership in associations was found to be a statistically significant parameter (at the 1% probability level), increasing the household's probability of participation in the CBNRM programme in the study area. Access to information is one of the benefits of being a member of farmers' associations. Access to the information about new technologies and development programmes enhances the acceptability of such technologies and programmes. This finding is consistent with the *a priori* expectation and the results of Abebaw & Haile (2013) and Issa et al. (2013). Therefore, extension services are to encourage farmers to form associations that would enable access to valuable information, capacity buildings, resources and improved farm inputs (Issa et al., 2013; Iheke, 2010).

The total value of disposable assets was found to be statistically significant (with a probability level of 10%) in reducing the likelihood of household's participation in the CBNRM programme. The higher the value of disposable assets, the lower the probability of household's participation in poverty alleviation programmes. These results are consistent with the *a priori* expectations and the results of Thibbotuwawa et al. (2012) and Gebrehiwot & Van der Veen (2015). However, Lhing (2014) argued the positive effect of assets on the participation of households in the microfinance programme in Myanmar.

The total amount spent on household's food consumption was found to be in a positive correlation with the household's participation in the CBNRM programme (with a statistical significance of 1%). This result suggests that the more a household spends on food consumption, the higher the likelihood of participating in any development intervention programme.

Table 1. Estimates of factors influencing the participation of households in the CBNRM programme (Probit)

Variables	Coefficient	Standard error	P-value
Gender	-0.26657	0.17999	0.139
Age	0.00701	0.01369	0.608
Year of schooling	0.05603**	0.01985	0.005
Household size	-0.02221	0.04247	0.601
Membership	0.56271***	0.15193	0.000
Occupational status	-0.08742	0.18651	0.639
Farm size	0.02940	0.03692	0.426
Marital status	0.07735	0.10726	0.471
Experience	0.02282	0.01512	0.131
Extension access	0.06503	0.15544	0.676

Assets	-3.40e-06*	1.76e-06	0.053
Food Expenditure	0.00035***	8.32e-06	0.000
Constant	-2.31220	0.61541	0.000
LR chi2(12)	52.02		
Prob > chi2	0.0000		
Log likelihood	-186.5887		
R ²	0.56		

Legend: ***=1% significance, ** = 5% significance, *=10% significance; Source: Data analysis, 2017

Effects of socioeconomic variables on the household's per capita expenditure

The full information maximum likelihood (FIML) estimates of the endogenous switching regression model revealed the relationship between the household's socioeconomic variables and the household's per capita expenditure for the CBNRM programme participants and non-participants considered (Tab. 2). The results obtained show that the number of years spent in school and the total value of disposable assets increase the per capita expenditure of CBNRM programme participants. The two variables were positively signed and statistically significant at the 5% level of significance. Conversely, the household's per capita expenditure decreases significantly in the female-headed households participating in the CBNRM programme. This may be attributed to the size of the household considered. The variable was negatively signed and statistically significant at the 5% level of significance.

The results obtained relative to the importance of the number of years spent in school for the household's participation in the CBNRM programme are consistent with the results of Ogundari & Aromolaran (2013), who assessed the impact of education on household's welfare according to the household's per capita expenditure. Moreover, Lhing (2014) also reported the positive effect of assets on the per capita expenditure of the CBNRM programme participants in his study on the impact of microfinance on the welfare of households in Myanmar.

The variables such as male-headed household, household size, farm size and farming experience were found to be statistically significant for the CBNRM programme non-participants. Although the male-headed households and farm size variables had a 5% level of significance, the household size and farming experience variables were significant at 10%. This means that these statistically significant variables increase the household's per capita expenditure in the case of the CBNRM programme non-participants. Lhing (2014) also reported the positive effect of the male-headed household and household size on the per capita expenditure of the household. Nevertheless, the results obtained suggest that the effect of socioeconomic variables on the per capita expenditure of the household differs across the CBNRM programme participating and non-participating households.

The ESR model results show that the estimated coefficient of correlation between the selection equation (namely the participation function) and the outcome equation (namely the per capita expenditure function) of 0.1625 for the CBNRM programme participants is positive and significantly different from zero. Statistically, this implies that the CBNRM programme participants have higher per capita consumption expenditure than the random households considered. The corresponding correlation between the selection equation and the outcome equation of -0.690 for the CBNRM programme non-participants is negative and significantly different from zero. The result suggests that the households which do not participate in the CBNRM programme have less consumption expenditure than the random households considered. Furthermore, the participation of such households in the CBNRM programme would increase their per capita expenditure, thus reducing the poverty in the study area.

Table 2. The switching regression model estimates of the per capita expenditure of the households considered

Explanatory variables	Non-participants (n = 156)	Participants (n = 159)
Gender	0.2160** (0.0941)	-0.4482** (0.0068)
Age	-0.0049 (0.0063)	-0.0044 (0.0067)
Year of Schooling	-0.0019 (0.0281)	0.0975** (0.0288)
Marital Status	-0.0683 (0.0556)	0.0268 (0.0552)
Household size	0.0355* (0.0211)	-0.0071 (0.0208)
Farm Size	0.0344** (0.0149)	0.0127 (0.0495)
Farming Experience	0.0123* (0.0066)	-0.0024 (0.0077)
Assets	-0.0849 (0.0571)	0.0531** (0.0283)
Extension Access	-0.0292 (0.0823)	-0.0612 (0.0764)
Membership in Association	-0.0353 (0.2555)	-0.0646 (0.0558)
Constant	1.856 (0.8327)	0.6093 (0.6832)
sigma0	0.5257*** (0.0543)	
rho_0	-0.6907*** (0.1239)	

sigma1	0.4751*** (0.0290)
rho_1	0.1625*** (0.0104)
Legend: Note: ***=1% significance, **=5% significance, *=10% significance, the figures in parentheses are standard errors; Source: Data analysis, 2017	

Estimated average treatment effect

Table 3 shows the estimated average treatment effect on the per capita expenditure of the CBNRM programme participating households. The ATT results show that the per capita expenditure of the CBNRM programme participants is higher by ₦1,369.17 than if they did not participate in the programme. This implies that participation in the CBNRM programme exerts a positive effect on the poverty in the study areas as it raises the household's consumption expenditure level. However, this increase in the per capita expenditure of the CBNRM programme participating households may largely be due to the support received within the programme. Such finding is consistent with the results of Ito et al. (2012) and Ahmed & Mesfin (2017), who examined the impact of agricultural cooperative membership on the household's poverty according to the per capita consumption expenditure per adult equivalent.

Table 3. Estimated average treatment effect on the per capita expenditure of the CBNRM programme participating households

Per Capita Expenditure	Treated	Std. error
ATT $E((Y_1 - Y_2) D = 1)$	1369.168***	358.6301
Legend: *** = 1% significance		

CONCLUSION

This study employed the endogenous switching regression (ESR) model, which takes into account the selection bias associated with the endogeneity of programme participation and self-selection problem. The results obtained indicate that the participation of a household in the CBNRM programme is influenced by a number of statistically significant factors such as the number of years spent in school, membership in associations, the total value of household's disposable assets and the amount spent on household's food consumption. Furthermore, the household's participation in the CBNRM programme was found to increase the per capita expenditure of the CBNRM programme participating households, which could ultimately result in reducing the poverty of households in the study area through the extensive implementation of the CBNRM programme.

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