Innovations

Econometrics Evaluation of Effects of Bank of Agriculture Financing on Rice Value Chain Development in the South-South, Nigeria.

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Abstract : *This study determined econometrically the effect of Bank of Agriculture financing on rice value chain development in South-South, Nigeria. Specifically, the study describe the socio-economic characteristics of rice value chain actors, ascertain the amount of loan accessed from (2010 to 2020), determine loan repayment performance of rice value chain actors, and evaluate the effects of amount of BOA loan accessed on rice value chain development parameters (capital investments, employment and scale of operation overtime). Data were collected from a list of loan beneficiaries whose loans were due. Purposive and multi-stage random sampling techniques were used for sample selection and a total of one thousand and thirty-six (1,036) respondents were used for the study. Data were collected with the use of well-structured questionnaires and analyzed using simple frequencies, percentages, mean, trend analysis and multinomial logistic regression model. The socio-economic characteristics of the respondents showed that 86% were males and 16% were females. The mean age of the respondents was 39 years. All the rice value chain actors had formal education and had an average household size of 8 persons. The mean experience was 15 years. The total amount of savings mobilized from the rice value chain actors from the period 2010 – 2020 was ₦45,853,083, and the total amount of loan accessed was ₦325,492,590, the total amount expected to be repaid was ₦375,913,395, but the amount repaid was ₦132,143,919 leading to a total loan repayment rate of 35% and a default rate of 65% which is not encouraging to BOA financial evaluation and management. The result of multinomial logistic regression model indicated that the socio-economic characteristics and determinants of rice value actors were statistically significant factors affecting the development parameters of rice value chain (employment generation, scale of operation and capital investment) with a Negalkerte R^2 of 82%. The study therefore recommended that any agricultural financial intervention programme introduced either by government or private entrepreneurs, there is the need for adequate loan administration, monitoring and evaluation and that saving mobilization procedures should be inculcated in the policies and programs to stimulate optimum performance.*

Key words: 1.*development, 2.financing, 3.value chain, 4.econometrics.*

Introduction

Background of Study

Rice is a staple food for some four billion people worldwide, and it provides 27% of the calories in low- and middle-income countries. Based on expected population growth, income growth, and rice acreage decline, global demand for rice will continue to increase from 479 million tons milled rice in 2014 to 536–551 million tons in 2030, with little scope for easy expansion of agricultural land or irrigation except for some areas in Africa and South America (International Rice Research Institute (IRRI), 2016).While rice is an excellent source of calories and some nutrients,

there is considerable scope to improve the nutritional quality of rice-based diets through bio fortification, optimizing processing, and through dietary diversification.

Increasing rice productivity, acceptability, better marketing and rice value chain development are some of the major targets of Nigeria government over the past two decades (Omoare and Oyediran, 2017). Value chain is not a concept. It is the full range of activities required to bring a product or service from conception through the different phases of production, delivery to the final consumers and final disposal after use (Kaplinsky, 2014). Production, processing, marketing, and consumption of rice are becoming topical issues in the rice industry. Due to the global and national attention rice is receiving in recent times; it has been classified as high-value food products. In response, investment in rice production, processing and marketing is receiving a boost among stakeholders. In fact, rice is classified among the top four agricultural imports in Nigeria along with wheat, sugar and fish. It is the most important cereal after wheat and it is widely consumed in one form or the other (Omoare, 2016). Nigeria has been a major consumer and importer of rice in Africa. It has been reported that the country spends over ₦356 billion on yearly importation of rice, out of which about one billion naira is used per day (Akinwunmi, 2012) cited in Oyediran (2016). In a bid to develop the agricultural sector, and achieve the corresponding benefits, Nigerian Government through its institutions has been providing support largely in the form of financial interventions. The focus on financial aid is not surprising since limited finance and credits are some of the major problems faced by the agricultural sector (FAO, 2016). Moreover, agricultural credit is believed to increase agricultural productivity as well as efficiency of land, water, capital, and human resources (Igben and Enimu, 2016).

Nigeria has embarked on a series of sector specific financial interventions in the form of micro-credit schemes/programs and Development Finance Institutions (DFI) to help improve the productivity and livelihood of the poor who are predominantly rural farmers. (CBN, 2005) Notable among the agriculture specific institutions, was the Nigerian Agricultural Bank (NAB) established in 1973. Through a series of policy changes, restructuring and merger of notable financial institutions in the country, NAB's nomenclature has changed over the years and evolved into the Bank of Agriculture (BOA) limited in 2010. Between December, 2016 and May, 2017, the BOA made over 23 billion naira available for farmers as part of its agricultural development effort (Adeoye and Ugalahi, 2017).

The Bank of Agriculture uses the value chain approach in financing the Agricultural Sector. The value chain finance approach being used as a strategy for developing the rice value chain, involves the flow of funds to the operating units. This happens within the rice value chain in terms of financial services and product and support services that flow to and/or through the value chain to address and alleviate constraints and fulfill the needs of those involved in the chain. This could be a need for finance, a need to secure sales, procure products, reduce risk and/or improve efficiency within the chain and thereby enhancing the growth and development of the chain (Fries, 2007). Rice value chain finance (RVCF) is a comprehensive approach which looks beyond the direct borrower to the linkages in order to best structure financing according to those needs (IFAD, 2012)

Therefore, given the above scenario and the fact that the bank of Agriculture uses value chain finance as a strategy for transforming rice production in order to break the barriers to large scale production of rice in Nigeria, alleviate poverty of small scale rice farmers and improve their livelihood, it becomes imperative and timely to carry out an economic impact assessment of the Bank of Agricultures (BOA's) financing programs on the development of the rice value chain and the perception of rice customers on rice value co-creation in the South-South of Nigeria.

1.3 Objectives of Study

The general objective of the study is to determine econometrically the effect of Bank of Agriculture financing on the development of the rice value chain. The specific objectives are to:

- describe the socio-economic characteristics of rice value chain actors,
- ascertain the amount of loan accessed from (2010 to 2020),
- determine loan repayment performance of rice value chain actors, and
- evaluate the effects of amount of BOA loan accessed on rice value chain development parameters (capital investments, employment and scale of operation overtime)

Hypothesis of the Study: the study is guided by the null hypothesis below:

i. The determinants of BOA beneficiaries have no significant effects on their loan repayment capacity in the study area.

Methodology

Study Area and Sampling Technique:

The study area is the South-South Region of Nigeria. The stratified random sampling technique was used for the study. The sample frame was divided into 3 strata of the rice value chain namely; producers, processors, and marketers. Simple random sampling was used to select a representative sample of all actors participating in the rice value chain. The simple random sampling technique uses the proportionate sampling procedure to select respondents from each stratum, to give equal chance of being selected for the study from the list given by Bank of Agriculture. A total of one thousand and thirty-six (1,036) loan beneficiaries were randomly selected using the Yamane formula in the determination of sample size. Therefore, four states, 18 locations, 374 rice producers, 200 rice processors, and462 rice marketer's household was used for the study. The formula is given as:

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

Where;

n = Sample

N = Population size and;

e= Allowable error (5%)

Data Collection and Data Analysis:

Data were collected from both primary and secondary sources. A structured questionnaire was the main instrument for data collection. The questionnaire was divided according to the specific objectives of the study. Information were solicited on the socio-economic characteristics; on value addition at every stage of the value chain; labour employed; margin, gross net income, access to market and household size while Secondary data were collected from the Bank of Agriculture, libraries, relevant publications and journals from 2010 to 2020. Data was analyzed using, descriptive statistics of percentage, mean, frequency and financial tools. While inferential statistical tool of multinomial logistic regression model was also applied.

Results and Discussion:

Socioeconomic Characteristics of Rice Value Chain Actors in the Study Area: The Result of the Socioeconomic Characteristics of Value Chain Actors is presented in table 1.

Majority of the actors in the rice value chain (producers, processors and marketers) were within the age brackets of 31-40 years which account for 53-8%. This age range represents the economically productive age and has the potentials and could also bring about development to the chain. This is in agreement with FAO (2003). Who stated that 40-49 years is an active age for

Table 1 Distribution of Respondents According to Socioeconomic Characteristics:

Variable		Frequency (N=1,036)	Percentage	Mean/Mode
Age	20-30	215	20.75	
	31-40	557	53.76	39
	41-50	175	16.89	
	51-60	89	8.59	
Gender	Male	866	83.59	Male
	Female	170	16.41	
Marital Status	Single	273	26.35	

	Married	420	40.54	Married
	Divorced	212	20.46	
	Widowed	131	12.64	
House Hold Size	1-5	267	25.77	
	6-10	680	65.64	10
	11-15	69	6.66	
	16-20	20	1.93	
Educational Level	No formal	86	8.30	
	Primary	280	27.03	Primary education
	Secondary	270	26.06	
	Tertiary	400	38.61	
Farming Experience	1-10	298	28.76	11 – 20
	11-20	500	48.26	
	21-30	208	20.08	
	Above 30	30	2.89	
Farm Income(N)	101-200	197	19.02	
	201-300	242	23.36	
	301-400	226	21.81	
	401-500	247	23.84	401- 500
	501-600	86	8.3	
	Above 600	38	3.66	

Source: Field Survey Data, 2021.

farmers. The result also showed that majority of the actors studied were males 83.6% while the remaining 16.4% were female. Although both the male and female are involved in rice production, the males dominate possibly because majority of the female were involved in domestic activities and may not be energetic enough to cope with the rigorous work involved in rice production. About 40.5% of the surveyed value actors were married. Division of labor occurs when the farmer is married thereby reducing the cost of labor and increasing productivity of the rice business. This agrees with the findings of Arene (1992) who concluded in his study that the majority 63.3% of the respondents were married. The modal class for household size was 6-10. This constitutes 65.6 %. This is a clear and obvious indication that majority of the actors had a large household size. This further translates to a reduction in the cash paid out. Majority 91.70% of the farmers had completed primary school, secondary school and tertiary education. The relatively good level of education implies that the value chain actors would be able to take rational decisions concerning finance and its management and whether there is increase in production as a result of BOA financial intervention. The study revealed that majority of the respondents has been in business for more than 12 years. This implies that they should have gathered some good experience and mastery over their choices and decisions especially in respect to loan acquisition to enable them to not only grow their business but also attain sustenance, while the study also revealed that 23.8% of the respondents make income up to ₦401, 000.00- ₦ 500,000.00 from the business.

Access to Credit by Rice Value Chain Actors (2010 – 2020). The distribution of access to credit by rice value chain actors from Bank of Agriculture was based on amount of loan accessed, amount expected to be repaid, amount of savings made, amount of repaid and amount defaulted is presented in the Table 2:

As regards loan managements, acquisition and utilization, the flow of funds from the bank of agriculture to the rice value chain operators follows the loan delivery channel and processes. The depositors/beneficiaries of the loans where ask to deposit savings and provide requirements before accessing their individual or group loans.

Table 2: Financial Performance of BOA loan Beneficiaries from 2010 to 2020 (in N. millions).

States	Amount of loan accessed	Amount expected to repay	Amount saved	Amount repaid	Amount defaulted	% repaid	% default
Edo	85.3	92.8	11.5	31.4	61.4	33.8	66.2
Delta	81.4	91.3	11.1	37.2	54.2	40.7	59.3
Imo	61.1	89.5	9.9	30.5	58.9	34.1	65.9
Rivers	97.8	102.4	13.5	33.0	69.3	32.3	67.7
Total	**325.5**	**375.9**	**45.9**	**132.2**	**243.8**	**35.15**	**64.8**

Source: Field Survey Data, 2021.

Table 2, shows the summary of credit evaluation and performances of beneficiaries of bank of Agriculture under rice value chain for the period 2010 – 2020. The Table showed a relatively steady decrease in loan repayments performance among rice value chain operators averaging 35.2%. The mean loan default rate of 64.8% was very high suggesting a negative attitude of rice value chain operators towards repayments of loan. The Table reveals that 65% of loan expected to be paid were defaulted thereby depriving others meaningful borrowers from having access to bank of agriculture loan. Igben and Enimu (2016) study of individual farmer's beneficiaries of Nigerian Agricultural Credit and Rural Development Bank (NACRDB) loan in cross-river, Nigeria, reported a mean percentage loan repayment of 69.2% among beneficiaries. Eyo, Otu and Sampson (2008) reports that loan recovery rate among formal and informal group members in Akwa-ibom, Nigeria was 84%.According to Olomola (2000), the repayments status of group loan is usually higher compared to individual loan as group loan are tied to social characteristics and homogeneous nature of members.

The likelihood effects of amount of loan accessed and socio-economic variables on rice value chain development parameters (capital investment, employment and scale of operation): The rice value chain development parameters include capital investment, employment generation and scale of operation. To capture the effects of the bank of agriculture loan accessed on rice value chain actor's development parameters, the multinomial logistic regression model was used. Group 3 (Capital Investment) is the reference group. The estimated coefficients for each of the determinants therefore reflect the effect of the explanatory variables (X_i) on the likelihood of beneficiaries developing a particular parameter relative to the reference group.

The estimation of the multinomial logit (MNL) model was undertaken by normalizing one category which is referred to as the 'reference state' or the 'base category', in this analysis the base category is capital investment. The result of the multinomial model indicates that different socio-economic, farm/marketing specific and institutional factors affect the rice value chain development. Following Enimu, Onome, Okuma and Achoja (2022) the coefficients of the reference group were recovered by using the formula: Y_3-(Y_1+Y_2). The Y_s are the qualitatively dependent variables representing each group for each explanatory variable, the negative sum of the parameters for group one or two is the parameters of the reference group.

Table 3: shows the multinomial logit model for the determinants of amount of loan accessed among rice value chain actors on the rice value chain development parameters. Table 3 shows that the entire slope coefficients are significantly different from zero therefore it shows that the variables are heterogeneous. The slope coefficient is the B_s that is the coefficient value of the explanatory variables. Hence the null hypothesis is rejected. The Negalkerte R^2 of 0.818 showed that the explanatory variables were collectively significant in explaining the classification of rice value chain actors into the three different groups hence, an R^2 of 0.818 in this study represents a relatively good fit for the estimated model.

This implied that the included variables were able to explain about 82% of the total variations of the explanatory variable for rice value chain actors. The estimated model gives an overall percentage correct prediction of 96.7%. Hence the classification percentage was 96.7. The results of the estimated equation in the model as

contained in Table 3 shows that the set of significant explanatory variables varies across the groups in terms of level of significance.

Table 3: results of estimated multinomial logistic regression model on effects of amount of loan accessed and socio-economic variables on rice value chain development parameters:

VARIABLES	GROUP 1 Employment generation	GROUP 2 Scale of operation
Amount of loan accessed	.000	0.000
	(.001)***	(.001)**
Age	-.446	-.417
	(1.189) $_{ns}$	(1.176)$_{ns}$
Household size	-.000	-.000
	(.001)*	(.001)**
Education	.061	.269
	(.602)**	(.580)$_{ns}$
Distance	-.758	-.024
	(.2.038) $_{ns}$	(2.180)***
Sex	.073	.030
	(.496)*	(.512)***
farm size	.000	.000
	(.000)***	(.000)$_{ns}$
Household Income	.500	.024
	(1.738)*	(1.751)***
loan supervision	.194	.100
	(.915)*	(.875)**
interest charged	1.358	.542
	(6.909)**	(6.513)***
Disbursement lag	.000	.000
	(.000)***	(.000)***
Access to information	.000	.000
	(.000)***	(.000)***
Extension contact	.000	.000
	(.000)$_{ns}$	(.000)***
Amount repaid	1.615	-2.769
	(6.385)***	(6.699)$_{ns}$
Constant	5.025	20.660
	(138.42)***	(2085.73)***

Source: data analysis, 2021.

Classification percentage = 96.7; -2 log likelihood = 5291.776; Cox and Snell = .817; Chi-square = 1756.891; Nagelkerte R^2 = .818; Macfadden = .249; Significant at .000; *, **, * = significant at 1%, 5% and 10% probability level, ns = not significant, figures in parenthesis are b-coefficients while brackets are standard error, the Wald criterion represent significance level.**

This implied that the included variables were able to explain about 96.7% of the total variations of the explanatory variable. The estimated model gives an overall percentage correct prediction of 96.7%. In terms of consistency with *a priori* expectation in the relationship between the dependent and the independent variables the model appeared to have performed well.

Amount of loan accessed: amount of loan accessed was significant and positively related to the probability of the rice value chain actors utilizing the BOA financial intervention on the development parameters of employment generation and increase scale of operation compare to the base category capital investment. This implies that as the financial intervention increases, rice value chain development increases vice versa. The marginal effect indicates that a percentage increase in the financial intervention from BOA will lead to a marginal percentage increase in the development parameters. This result is in conformity with *a priori* expectation and studies by Okpukpara (2005).

Extension contact: extension contact significantly and positively correlated with employment generation and scale of operation as compared with the based category. This means that a one unit increase in extension contact services would increase the rice value chain development parameters in the study area. This result support the innovation theory and also suggest that the rice value chain actors in the study area have improve the value chain development parameters probably because of their personal conviction as a result of advice received from extension personnel. Previous studies have found positive influence of extension contact on development of agriculture. The result also conforms to *a priori* expectation and study by Enimu, Onome, Okuma and Achoja (2022).

Age of The Household Head: Age was significant and negatively related to the probability of the rice value chain actors utilizing employment generated and scale of operation compared to capital investment at five percent this implies that as the age of the rice value chain actor's increases, the effects of BOA financial intervention decreases. The marginal effects or magnitude of change of 1.5% and 32.1% were observed for employment generation and scale of operation respectively. The result is in conformity with *a priori* expectation and work done by Omoare (2016) who reported a negative and significance relationship between age of farmers and credit utilization.

Household Size: The result shows that there is a negative and significant relationship between household size on the rice value chain actor's financial intervention and its effects on the development parameters. This implies that the larger the household size the lower the likelihood of the financial intervention affecting the development parameters. Based on the results of the marginal effect, a unit increases in the number of economically active house hold decrease the likelihood of developing the rice value chain among rice value chain actors in the study area. The result conforms to *a priori* expectation and work done by Olomola (2000), who reported that increase in household size leads to fund diversion to non- farm household needs thereby causing very high loan default.

Educational Status: Educational level of the household head has a significant and positive correlation with rice value chain development among the rice value chain actors. Education increases the likelihood and affects rice value chain development capability. This implies that an increase in the years of schooling of the household head will have a marginal increase in the likelihood of using financial intervention for rice value chain development. .Education is expected to impact positively on the development parameters and they are expected to be more informed and knowledgeable at set goals. The result conforms to *a priori* expectation and work by Eyo and Enimu (2015).

Farm size: The model results shows that farm size has a positive and statically significant association with BOA financial intervention among rice value chain actors' development parameters. This implies that rice value chain actors with large farm size tend to gain more compare to those with the small farm size. Based on the marginal effects, a unit increase in the farm size will lead to an increase in the development parameters. The result conforms to *a priori* expectation and also in agreement with Afolabi (2010).

Average Distance to Credit Source: The coefficient of distance to credit source was significant and negatively related to the development parameters. This implies that the longer the distance to credit source by the rice value chain actors the lower the effects of the financial intervention on the development parameters. Based on the marginal effect, a unit increase in the distance to credit source will lead to a unit decrease on the development parameters of the rice value chain actors. The results is in conformity to *a priori e*xpectation which states that distance discourages savings and amount of loan received which invariably affects agricultural production and

productivity. Okpukpara (2005) was of the opinion that loan management activities should encourage shorter distances and that catchment/agent banking should be encouraged for improve performance among rural farmers.

Household Income: The sign from the result for this variable is consistent with *a priori* expectation which is statically significant at different probability levels for the development parameters. The likelihood of an improvement in the development parameters will increase with a unit increase in household income. This implies that a unit increase in household income will directly result in an increase in the development parameters all things been equal in the study area and vice versa. The results confirm to studies by Arene (1992).

Sex of Household Head: Sex of household head was significant at different levels of probability among rice value chain actors and negatively related to the development parameters. This implies that as you move from 1 (male) to 0 (female) more male headed household have high probability of utilizing their financial intervention on the development parameters among the rice value chain actors. This indicates that the higher the number of male headed households the higher the effects of the financial intermediation on the development parameters vice versa. This is obvious because the rice value chain business is dominated by male in the study areas. The result conforms to *a priori* expectation and studies by Afolabi (2010).

Loan Supervision: Loan supervision has a positive coefficient at different levels of probability among rice value chain actors. This implies that the more loans were supervised the more rice value chain actors utilizes their financial intervention on the development parameters. When the loan agents (bank officials) visit the loan beneficiaries there is a higher probability that they will effectively deploy the loan than when they are not visited, the marginal effects result indicates that a unit increase in number of visits by financial agents will lead to an increase in the performance of the development parameters. This result is in conformity with *a priori* expectation and studies by Okulegu, Onwe and Okoro (2014).

Interest Charged: Interest charged on loan is significant at different probability levels and negatively related to rice value chain development parameters. This implies that an increase in the interest charged will lead to a decrease in the development parameters. The marginal effect analysis indicates that a unit increase in interest rate will lead to a unit decrease in the utilization and performance of the financial intervention. This result is in conformity with *a priori* expectation and work by Afolabi (2010).

Disbursement lag: Disbursement lag which is the time interval between loan application and loan disbursement was significant and negatively related to the rice value chain development parameters compare to the based category. This means that a unit increase in disbursement lag to rice value chain actors will lead to decrease in the development parameters. The result is in conformity with *a priori* expectation and studies by Eyo and Enimu (2015), who reported a negative correlation between disbursement lag and loan performance.

Conclusion and Recommendation:

The need to access the effect of bank of agriculture in rice value chain in relation to agribusiness performance called for this research investigation. The analysis of financial inclusiveness and effect on the performance of agro entrepreneurs in South-South States of Nigeria was the main thrust of the study. The following conclusions were drawn from the study. Majority of the agribusiness entrepreneurs own and operate accounts with formal financial institutions (commercial banks). The most preferred bank account owned and operated was a savings account. Based on the findings of this study, the following recommendations are proffered towards improving the performance indicators of rice value chain and the activities of bank of agriculture in the South-South region in particular and Nigeria in general: Credit institutions should explore ways of simplifying lending procedures to ensure timely disbursement of loans to rice value chain actors. They should also consider ways to reaching more of rural rice value chain actors by streamlining the bureaucratic and cumbersome nature of loan procedures. The group membership loan procedures have proved to be very effectives in actualizing higher performance and loan repayment rates

among various micro-credit institutions, it is therefore recommended that the BOA should adopt the group method of loan administration to ensure optimum loan recovery and improved rice value chain development.

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