



RESEARCH ARTICLE

ECONOMIC IMPACT OF VALUE CHAIN DEVELOPMENT PROGRAMME ON FOOD SECURITY OF RICE FARMERS IN NIGERIA

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ABSTRACT

This study evaluated economic impact of value chain development programme (VCDP) on food security of rice farmers in Nigeria. Data of primary sources were used. A multi-stage sampling technique was used to select a total sample size of 292 rice farmers which comprises of 155 value chain development program beneficiaries and 137 non-beneficiaries. Data were analyzed using the following tools: descriptive statistics, food security index, Logit dichotomous regression model, F-Chow test, and t-test. About 61% and 27% of the beneficiaries and non-beneficiaries of value chain development program were food secured based on head count ratio. The $\frac{2}{3}$ MCFE for beneficiaries and non-beneficiaries were 13203.954 Naira and 4759.605 Naira respectively. Gender ($P < 0.10$), household size ($P < 0.01$), farm experience ($P < 0.10$), access to credit ($P < 0.05$), and labour input ($P < 0.10$), were the significant factors influencing food security among the rice VCDP beneficiaries. The F-Chow test conducted reveals that the VCDP impacted positively on food security of rice farmers. The study recommends that interest rate free loans or low-interest loans should be made available to rice farmers to increase production and food security.

KEYWORDS

Economic Impact, Food Security, Value Chain Development Programme, Rice Farmers, Niger State Nigeria.

1. INTRODUCTION

The sub-Saharan Africa has enormous natural, physical, and human potentials, compared to the developed countries, where the cost of producing food is becoming high and land is scarce. In sub-Saharan Africa for instance, maximizing the potentials of agriculture would yield faster growth in reducing poverty than investment in other sectors, knowing the world population and the increasing demand, as population rises. The international Fund for Agriculture Development (IFAD) in partnership with the Federal Government of Nigeria focused on Value Chain Development Program (VCDP) for the potential economic value of the staple crops if every challenge is removed from planting through harvesting to consumption. Also, to achieve Nigeria's Agricultural Transformation Agenda which aims to increase production, reduce food imports and provide millions of new jobs for young people; the potential of agriculture needs to be adequately harnessed since the sector is seen as an alternative to the oil dependent economy that has not been able to deliver the country from economic, social and other challenges bedeviling the nation (Agbaeze et al., 2015). Value chain can be explained as the set of actors (private, public, and including service providers) and the sequence of value-adding farming activities involved in bringing a product from production to the final or end consumer (Miller and Da Silva, 2014). A value chain can also be describe as the entire range of operations (activities) undertaken by farmers to bring agricultural product from the initial input-supply stage, through various phases of agricultural processing, to its final market destination, and it also includes disposing agricultural products after use (United Nations Industrial Development Organization (UNIDO), 2016). It can be describe as a chain of activities

where agricultural products pass through all activities of the chain in sequence, and at each activity, the product gains some value (Russell and Hanoomanjee, 2012). For instance, rice value chains comprise of all activities that take place at the rural or farm level, which include input supply, and continue through processing, handling, packaging, storage, and distribution. As agricultural products move successively through the different stages, transactions take place between multiple chain agricultural stakeholders, information is exchanged, money changes hands, and value is progressively added. Macroeconomic conditions, standards, policies, regulations laws, and institutional support services (finance, communications, innovation, research, etc.) – which form the value chain environment – are also critical elements affecting the performance of value chains.

Rice is a rich and cheap source of carbohydrate to both human and animals, the demand for rice has risen over the last 4 decades and 80 % of Nigerians consume rice and has become not only a diet but major source of calories for the urban poor (Ojogho and Alufohai, 2010). Rice serves as a major staple crop that cushions the impact of under-nutrition and severe hunger in Nigeria and many other developing or sub-Saharan African (SSA) countries of the world (Nwajieji et al., 2014). Rice generates more revenue (income) for Nigerian farmers than any other cash crop in the country. A report by the Federal Ministry of Agriculture and Rural Development indicated that domestic rice consumption is below per capita need. The national estimates of demand for rice in Nigeria is about 5.2 million tons per annum, where production is estimated at only 3.3 million tons and a deficit of 1.9 million for importation with the attendant drain on the nation's foreign reserve (Onyeneke, 2017).

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1.1 Objectives of The Study

The broad objective is to analyze economic impact of value chain development programme (VCDP) on food security of rice farmers' in Nigeria. The specific objectives are to:

estimate the food security status of rice farmers' beneficiaries and non-beneficiaries of VCDP,

evaluate factors influencing the food security of rice farmers' beneficiaries and non-beneficiaries of VCDP, and

(iii) evaluate the impacts of VCDP on the food security of the rice farmers' beneficiaries.

1.2 Hypothesis of The Study

This study was guided by the following study hypothesis:

Ho₁: There is no significant impact of VCDP on the food security of rice farmers.

Ha₁: There is a significant impact of VCDP on the food security of rice farmers in the study area.

2. METHODOLOGY

This study was carried out in Niger State, Nigeria. It lies between Latitudes 80° to 11°30' North and Longitudes 03° to 07°40' East. It has a total population of 5,556,200 (NPC 2016).

The predominant occupation of the people is farming, crops grown in the state are rice, maize, yam, sorghum, and millet. The target population for this study was all rice farmers that are participants and non-participants in the value chain development programme in Niger State, Nigeria. Purposive sampling method was used to select Niger State because it is one of the State participating in the Value Chain Development Programme (VCDP) initiative of the FGN and the IFAD programme on the improvement of rice and cassava value chain. Multi-stage sampling procedure was adopted in selection of representative samples. First stage, five (5) Local Government Areas were selected. The second stage involves the use of simple random sampling technique employing the use of raffle-draw ballot-box raffle-draw method, this technique was adopted to select the two (2) wards from each of the five (5) Local Governments Areas. In the third stage, systematic sampling techniques was used. Firstly, simple random sampling was used to selects the first respondents, subsequently; systematic sampling will be used to select every nth (3rd) rice farmers participating in the value chain development programme from the list of registered rice farmers obtained from the baseline survey. A total sample size of 292 rice farmers was selected comprising of 155 beneficiaries and 137 non-beneficiaries of Value Chain Development Programme (VCDP). Primary sources were employed to gather necessary data from the sample respondents.

The following tools of analysis were used to achieve stated objectives:

2.1 Descriptive Statistics

Descriptive statistics involves the use of mean, mode, range, frequency distribution tables and percentages, minimum and maximum values and standard deviations.

2.2 Food Security Index

Omonona et al. (2007) stated that a household is defined to be food secure if it obtain at least $\frac{2}{3}$ of the average per capita food expenditure per month of the sample household and may be considered food insecure if the households falls below $\frac{2}{3}$ of the average per capita food expenditure.

$$F_i(X) = \frac{\text{Per Capita Food Expenditure for the } i^{\text{th}} \text{ Rice Farmer}}{\frac{2}{3} \text{ Mean Per Capita Food Expenditure of all Rice Farmers}} \quad (1)$$

Where;

F_i = Food Security Index (Units),

If $F_i \geq 1$ = Food Secure i^{th} Rice Farmer, and

If $F_i < 1$ = Food Insecure i^{th} Rice Farmer.

Additionally, the number of rice farmers who are food secure (insecure)

was estimated by taking the frequency of the rice farmers who are food secure (insecure). The headcount ratio (H) of the food security was estimated to measure the % of the population of the rice farmers that are food secure (insecure). The headcount index (H) formula is stated as;

$$\text{Headcount Index}(H) = \frac{M}{N} \quad (2)$$

Where;

M = Number of Food Secure/Insecure Rice Farmer (Unit) and

N = The Number of Rice Farmer in the Sample (Unit).

This was used to achieve part of specific objective one (i)

2.3 Logit Dichotomous Regression Model

The probability that the farmers participating in the VCDP will be food secure depends on some factors expressed using a Logit regression model. It is therefore expressed as;

$$F_i = \begin{cases} F_i^* & \text{if } F_i^* \geq 1 \\ 0 & \text{if } F_i^* < 1 \end{cases} \quad (3)$$

F_i^* is therefore expressed as a latent variable that is observed for value greater than zero and censored otherwise. The relationship is expressed thus;

$$F_i^* = X_i\beta + \varepsilon_i$$

Where, $\varepsilon \sim N(0, \delta^2)$. The observed F_i is defined by the following measurement equations.

$$F_i = \begin{cases} 0 & \text{if } F_i^* < 1 \\ F_i^* & \text{if } F_i^* \geq 1 \end{cases}$$

$$F_i^* = \alpha_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \beta_8 X_8 + \beta_9 X_9 + \beta_{10} X_{10} + \mu_i \dots \dots (4)$$

Where,

F_i^* = Food Security Index of the i^{th} Farmer (1, Food Secure; 0, Otherwise),

i = Number of Independent Variables,

α_0 = Intercept,

$\beta_1 - \beta_{10}$ = Regression Coefficients,

X_1 = Gender (1, Male; 0, Otherwise),

X_2 = Marital Status (1, Married; 0, Otherwise),

X_3 = Size of Households (Total Number of Persons),

X_4 = Extension Agent Service Dummy (1, Contact; 0, Otherwise),

X_5 = Farm Experience (Naira),

X_6 = Access to Credit (1, Access; 0, Otherwise),

X_7 = Labour Input (Mandays) ,

X_8 = Age of Rice Farmers (Years),

X_9 = Farm Size (Ha),

X_{10} = Level of Education (0, Non-Formal; 1, Primary; 2, Secondary; 3, Tertiary), and

U_i = Error Term.

This was used to achieve part of specific objective two (ii)

2.4 F-Chow Test

F-chow Test statistics is often used in programme evaluation to determine whether the programme has impacts on different subgroup population. Chow Test is an application of the F-distribution test, if F-chow is greater than the F-Table, then there is a projects impact on the beneficiaries otherwise, there is no impact. The F-Chow test is stated as follows:

$$F * -\text{Chow Test} = \frac{RSS - (RSS_1 + RSS_2) / K}{RSS_1 + RSS_2 / [N_1 + N_2 - 2K]} \quad (5)$$

Where,

RSS = Sum of Square Residual from Pooled Data,

RSS_1 = Sum of Square from the First Group (participants),
 RSS_2 = Sum of Square from the Second Group (Non-Participants),
 K = Total Number of Parameter,
 N_1, N_2 = Number of Observation in Each Group
 This was used to achieve part of specific objective three (iii)

3. RESULTS AND DISCUSSION

3.1 Determinants of Household Food Security Index of Beneficiaries And Non-Beneficiaries Of VCDP

Beneficiaries and non-beneficiaries were classified into food secure and

food insecure groups making use of their per capita food expenditure (MCFE) as shown in Table 1. Household food security following (Omonona et al, 2007) observed that a household is classified as food secure if it obtain at least $\frac{2}{3}$ of the MCFE per month of the sampled households. Therefore, the beneficiaries that spent minimum of N13203.954 on food per month were classified as food secure, and those that spent below this estimated value were classified as food insecure. Also, the non-beneficiaries that spent a minimum of N4759.605 on food per month were classified as food secure, and those who spent below this calculated value were classified as food insecure. This means that for a beneficiary to be considered food secured, he or she should be able to spend four hundred and forty-naira thirteen kobo (N 440.13k) or above on food per day.

| Table 1: Food Security Status of Rice Farmers in the Study Area | | | | | | | | | |
|---|-------------------|---------------|-----------|------------------|---------------|----------|-----------------|---------------|----------|
| | Non-Beneficiaries | | | Beneficiaries | | | Combined | | |
| Food Security Status | Food Secure | Food Insecure | Total | Food Secure | Food Insecure | Total | Food Secure | Food Insecure | Total |
| Percentage | 27.01 | 72.99 | 100 | 61.29 | 38.71 | 100 | 33.22 | 66.78 | 100 |
| Frequency | 37 | 100 | 137 | 95 | 60 | 155 | 97 | 195 | 292 |
| Monthly Expenditure on Food | | | | | | | | | |
| Sum (Naira) | 353068.5 | 625030.2 | 978098.77 | 2763499 | 306420 | 3 069919 | 3011575 | 1036443 | 4048017 |
| Mean (Naira) | 3530.685 | 16892.71 | 7139.41 | 17829.02 | 1976.903 | 19805.93 | 31047.16 | 5315.092 | 13863.07 |
| Head Count Ratio (H) | 0.27 | 0.73 | | 0.61 | 0.39 | | 0.33 | 0.67 | |
| 2/3 Mean Per Capita Food Expenditure | 4759.605 | | | 13203.954 | | | 13863.07 | | |
| Source: Field Survey (2020) 650 Naira = 1 USD | | | | | | | | | |

Table 1 further showed that 61.29% of the beneficiaries were food secured, while only 27.01% of the non-beneficiaries were food secured. This further implies that the program had an impact on the food security of the rice farmers. Based on the headcount ratio, 61% of the beneficiaries had their MCFE equal or above N13203.954, while 39% of the beneficiaries had their MCFE below N13203.954. The MCFE monthly of beneficiaries that were food secured beneficiaries was N17829.02. This result is higher than N2694.95 (N86.93/day) reported in the Kano State of Nigeria and also higher than N3513 (N117.10/day) observed by in Oyo State, Nigeria; but lower than N14498.67 reported by Iorlaman et al. (2014) in Benue State, Nigeria by (Irohibe and Agwu, 2014; Olabisi and Olawamiwa, 2014;).

3.2 Determinants of Food Security Status Among Beneficiaries of VCDP.

The results presented in Table 2 showed that out of the eleven (11) predictor variables included in the Logistic regression model, the coefficients of household size ($P < 0.01$), farm experience ($P < 0.10$), access to credit ($P < 0.05$), and labor input ($P < 0.10$) were the statistically significant factors influencing food security status among the rice value chain program beneficiaries. The positive sign on a parameter indicates an increase in likelihood or probability of food security status, while the negative sign of coefficient implies decreases in the likelihood or probability of food security (food insecurity).

| Table 2: Maximum Likelihood Estimates (MLE) of the Logit Model | | | | |
|---|-------------|----------------|----------|-----------------|
| Variables | Coefficient | Standard Error | t-value | Marginal Effect |
| Gender (X_1) | 0.71 | 0.68 | 1.84* | 0.082 |
| Marital Status (X_2) | 0.11 | 0.43 | 0.25 | 0.012 |
| Household Size (X_3) | -0.63 | 0.12 | -5.41*** | -0.073 |
| Extension Services (X_4) | 0.45 | 0.58 | 0.79 | 0.052 |
| Farm Experience (X_5) | 0.04 | 0.03 | 1.83* | 0.004 |
| Access to Credit (X_6) | 0.24 | 0.62 | 2.39** | 0.028 |
| Labour Input (X_7) | -0.02 | 0.01 | -1.82* | -0.003 |
| Age (X_8) | 0.03 | 0.04 | 0.77 | 0.003 |
| Farm Size (X_9) | -0.10 | 0.31 | -0.34 | -0.012 |
| Education Level (X_{10}) | 0.32 | 0.28 | 1.15 | 0.037 |
| Constant | 4.33 | 1.69 | 2.57 | |
| Chi Square = 93.69*** | | | | |
| Log Likelihood = -56.61 | | | | |
| Pseudo R ² = 0.45 | | | | |
| *** - Significant at (P≤0.01), ** - Significant at (P≤0.05), * - Significant at (P≤0.10) | | | | |
| Source: Author (2020) | | | | |

Maximum Likelihood Estimate shows that the Log-Likelihood was -56.61, while the Chi-Square value was 93.69 and was significant at 1% levels of

probability. This implies that the overall effects of the predictor variables were statistically significant. The coefficient of determinations (Pseudo R-

Square) was 0.45 (45%). This signifies that 45% of the variations in the food security index (i.e. dependent variable) was explained by the predictor variables included in the regression model. Household size (X_3) and Labour input (X_8) were negative and significant at 1% and 10% probability levels respectively. Farm experience (X_5) and access to credit facilities (X_6) had positive coefficients and were significant at 10% and 5% probability levels respectively.

Household size (X_3) had negative coefficient and was significant at ($P < 0.01$). This shows that a unit increase in household size will lead to a 0.073 marginal increase in food insecurity. This means that as the household size increases, food security decreases (increase in food insecurity). An increase in family size signifies an increase in household food expenditure, especially, in a situation where many of the other household members do not generate any income but only depend on the household head, the likelihood (probability) that food security would reduce as household size increased is high. This agrees with the findings of Place et al. (2003). Access to credit facilities (X_6) had positive coefficient and was significant at a 5% probability level. A unit increase in access to credit will lead to a 0.028 marginal increase in food security of the beneficiaries.

Credit is an important means of investment and households who have access to credit facilities can invest in preferred businesses and earned more income resulting in an increased financial capacity and purchasing power of the beneficiaries, thus reducing the risk of food insecurity. Farm experience (X_5) had positive coefficient and was significant at a 10% probability level. A unit increase in farm experience will lead to a 0.004 marginal increase in food security of the beneficiaries.

3.3 F-Chow Test

3.3.1 Analysis of the Significant Impact of VCDP on Food Security of Rice Farmers

Table 3 reveals the F-chow-test analysis between impact of VCDP on food security of rice farmers. Based on the findings of this study, the hypothesis which states that there is no significant impact of VCDP on food security of rice farmers was rejected, while the alternative hypothesis which states that there is a significant impact of VCDP on food security of rice farmers was accepted. This implies that the VCDP had impact positively on the food security of rice farmers.

Table 3: F-Chow – Test Analysis of Impact of Value Chain Development Program on Food Security of Rice Farmers.

| Group Sample | R ² | Residual Sum of Square | N | K | F-Cal | F-Tab | Prob |
|-------------------|----------------|------------------------|-----|---|---------|-------|--------|
| Pooled | 0.0572 | 772.4954 | 292 | 3 | 5.82*** | 1.96 | 0.0007 |
| Participants | 0.0651 | 131.8941 | 155 | 3 | 3.50*** | 1.96 | 0.0170 |
| Non- Participants | 0.0573 | 603.7946 | 137 | 3 | 2.79*** | 1.96 | 0.0485 |

***, Significant at 1% level of Probability

Source: Field Survey (2020)

4. CONCLUSION AND RECOMMENDATIONS

This research study has established that the F-Chow test conducted shows that the VCDP impacted positively on the food security status of rice farmers. About 61% and 27% of VCDP beneficiaries and non-beneficiaries were food secured. Two-third per capital food expenditure for VCDP beneficiaries and non-beneficiaries were 13203.954 Naira and 4759.605 Naira respectively. Household size, farm experience, access to credit, and labor input were found to be the statistically significant factors influencing food security among the rice value chain program beneficiaries. The policy implications and recommendations from this study include:

- (i) The policy implications of these findings emphasized the integration of rice farmers into the value chain development program to achieve food security and increase their net farm incomes.
- (ii) Provision of extension officers to train rice farmers on new technologies, innovation, and new research findings.
- (iii) Rice farmers should be provided with credit facilities at low interest rate with no collateral securities. This will enable the farmers improve productivity and hence net farm income.
- (iv) Rice farmers should be provided with farm inputs and improved varieties of rice. This will increase rice production and hence net farm income.
- (v) Herdsmen and farmers' clashes' was a major constraint faced in rice production, hence the Governments are hereby enjoined to provide adequate security for farmers.

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