Impact of International Fund for Agricultural Development (IFAD) Programme on Livelihood of Smallholder Rice Farmers in Benue State, Nigeria

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Abstract
The study investigated the impact of IFAD programme on output, income, and poverty level among smallholder rice farmers in Benue State, Nigeria. The study used a survey design and a sample of 348 smallholder rice farmers who benefited from the IFAD rice value chain programme. The study employed the Generalized Method of Moment (GMM) technique and the logit regression model. The findings of the study reveal that, benefiting from the IFAD rice value chain programme has positive and significant impact on the output and incomes of the beneficiaries in the study area. Also, the findings indicated that, benefiting from the IFAD rice value chain programme has the probability of reducing poverty among the beneficiaries. Based on the findings of this study, the following recommendations are made, First, government at all levels should give the programme utmost priority by regularly and timely paying counterpart fund to ensure the continuity and the sustainability of the IFAD/VCDP in the state. Second, the programme should be upscale to more local government areas in the State to capture more farmers and processors with a view to reducing poverty in the state. Third, to achieve the best value for money under the IFAD/VCDP in the state, the government should increase the tempo of handling the menace of farmers'/herders' crisis in the State and concerted efforts be made to develop the potential irrigation areas in the state to boost dry season farming in the State. Lastly, IFAD should consider including key crops like sesame seed(benniseed) soyabeans and yam in the programme and to allow the smallholder farmers to decide the kind of support they in terms of farming inputs, machineries, fertilizer, or seeds as there need at different locations may be different.

1. Introduction

Globally, agricultural financing has become a very critical component of government expenditure due to the importance of the sectors in the world's economy. Agriculture provides for food mankind; it is a source of employment and income; it provides raw material for industries among other important functions. According to the International Fund for Agricultural Development (IFAD) (2015), over 63% of the world's poor people are involved in agricultural activities. This means that the sector is dominated by smallholder farmers who are resource-poor and are stagnated due to their inability to upscale their production systems. According to the National Bureau of statistics,75% of the Benue population are poor and are engaged in peasant farming (NBS,20219).

It is in view of this systemic constraint despite the overwhelming relevance of the agricultural sector that, the International Fund for Agricultural Development an organ of the United Nations whose mandate is to reduce rural poverty in the world has embarked on smallholder agriculture-led growth programme in the African continent with a view to increasing food production and incomes of small-scale farmers and their households by improving agricultural productivity and post-harvest activities (storage, processing and marketing). This concern is predicated upon the premise that, investments in small-scale agriculture can help revive food production, create jobs, reduce poverty, and ensure food security especially in the African continent (IFAD, 2022).

Nigeria, as an African country is richly endowed with agricultural potentials that have largely remained untapped. The Nigerian agricultural sector is dominated by poor farmers who are faced with productive constraints such as: lack of access to inputs and productive assets, limited access to funds and credit facilities, poor infrastructure, post-harvest challenges, lack of improved seedlings, insecurity problems, insufficient markets for agricultural products, non-availability of agro-industries among other challenges (Obianefo, Okoroji & Obiekwe, 2022). These challenges have made agricultural production in the country to remain low thereby putting the farmers in perpetual penury.

In order to upscale the productive capacity of small-scale farmers and reduce poverty among these groups of farmers in Nigeria, the IFAD in collaboration with the three tiers of government via the Value Chain Development Programme (VCDP) developed a six-year initiative plan from 2015 to 2021initially and was extended to 2024 for improving cassava and rice value chain of small-scale farmers in nine states; namely; Anambra, Benue, Ebonyi, Niger, Ogun, Taraba, Enugu, Kogi and Nasarawa States. The project is production-oriented with the overriding objective to have a direct impact on the productive levels of the target groups, which in turn is expected to lead to increase in the net incomes of the farmers (Ndanitsa, Musa, Ndako & Mohammed, 2020).

In Benue State, the IFAD Value Chain Development Programme (VCDP) covers eight Local Government Areas: namely, Okpokwu, Logo, Gwer East, Guma, Ogbadibo, Gwer West, Kwande and Agatu local government areas. The programme started in the State in 2015 and a total number 17,392 beneficiaries have directly benefited from the programme from 2015 to 2023 for the production and processing of rice and cassava in the state. Expectedly, the programme is supposed to increase the output of these crops and enhance the income of the farmers leading to poverty reduction in the State. However, the Nigerian multi-dimensional poverty 2022 in Benue State showed MPI of 0.312 with 88 percent of people in the rural area being poor and 67 per cent extremely poor and a large segment of the rural population having extremely limited access to basic services. Only 10 percent have access to electricity and less than 8 per cent having access to drinking water. Also, to the best of the researcher's knowledge, empirical studies on the impact of IFAD on poverty reduction in Benue State are limited to provide insight into the impact of the programme in terms of effect on output, incomes, and poverty levels. The study by Orjime, Abaa, Shember & Asomb (2023) only investigated the impact of IFAD rice value chain development programme on rice output and unemployment reduction in Benue State. Though this study attempted to investigate output but did not further investigate the impact on income and poverty levels in the state, hence, the gap this study has sought to fill.

The imperativeness of this study stems from the fact that understanding the impact of the programme on incomes and poverty of the beneficiaries will enable its assessment against its predetermined objectives. It is against this background that this study has investigated the impact of IFAD rice value chain on the output, incomes, and poverty levels of beneficiaries in Benue State. Thus, the specific objectives of this study include:

i. to investigate the impact of the IFAD rice value chain development programme on rice farmers' output in Benue State.
ii. to ascertain the impact of the IFAD rice value chain development programme on rice farmers' income in Benue State; and
iii. to examine the impact of the IFAD rice value chain development programme on the poverty level among the rice farmers in Benue State.

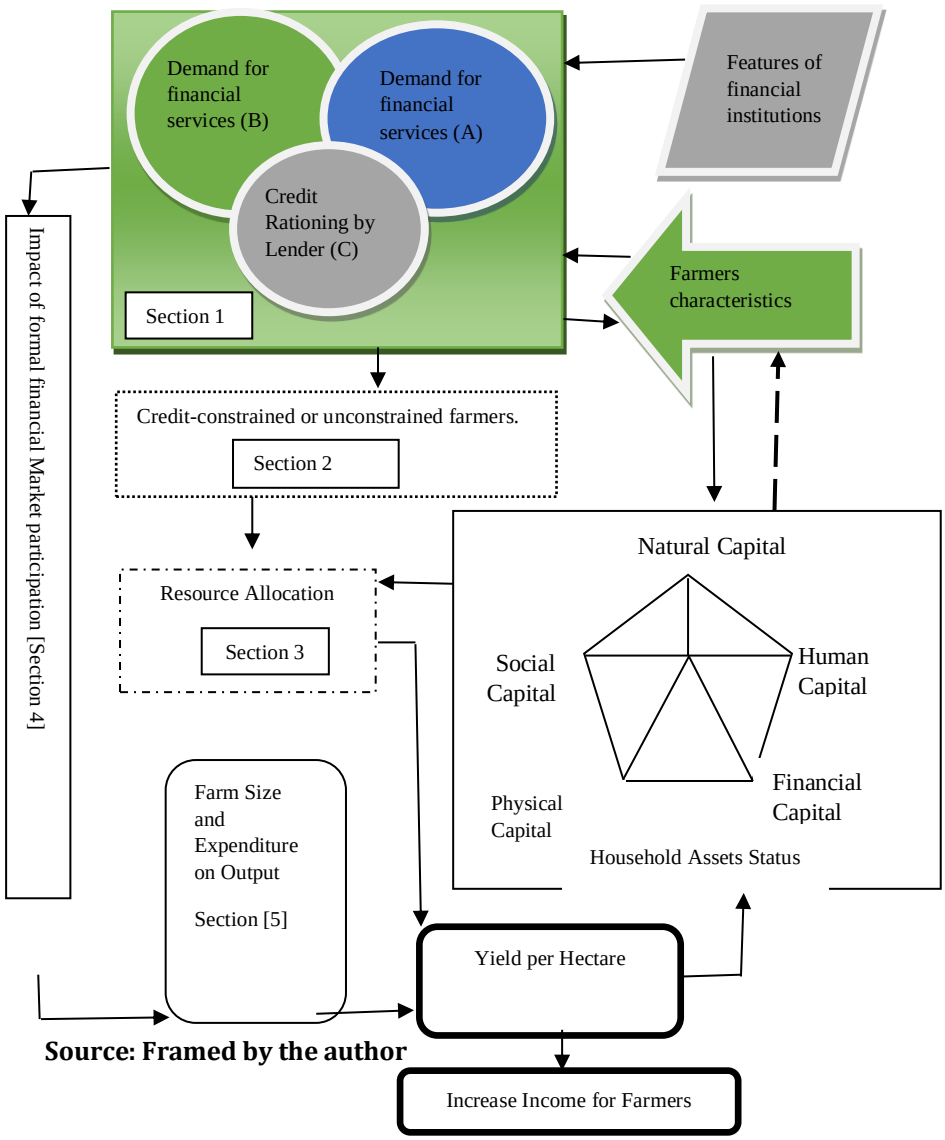
2. Theoretical Issues

Four theories of finance, namely, the delegated monitoring theory, the rational choice theory, information asymmetric theory and transaction cost theory are combined to analyze the demand and supply dimensions that lead to financial access by farmers.

Two theories, the delegated monitoring, and the rational choice theory, explain demand for financial services, while the information asymmetry and the transaction cost theory explain financial intermediation, or the supply side dimension of access to financial services.

To conceptualize the factors that influence access to financial services by farmers and how these credit facilities influence their input usage and productivity, the study dwelt on Stijin (2005), who argued that any investigation of access to financial services should examine both the supply and demand dimensions. According to Stijin (2005), the supply side of access to financial services relates to the availability of financial intermediaries providing services, the conditions under which these services are available, and rationing. The demand side, on the other hand, relates to factors influencing individual decisions to use financial services. Thus, for informal intermediaries, the demand side deals with the decision of the farmer to make use of a creditor or not, while in the case of a formal institution the demand side deals with a farmer's choice of services provided by the formal financial institutions.

Figure 1: Conceptual framework of access to financial services and its impact on farmers



Source: Framed by the author

From figure 1 above, farmers are assumed to be rational; hence, if they can accumulate enough savings to support their production and consumption activities, they do not need to borrow, as credit is associated with cost, and so they are described as credit unconstrained. However, those who are unable to accumulate enough savings need to borrow to augment their equity resources to support their consumption and production activities. Yet, farmers who need credit may ration themselves out of the credit market due to risk and transaction costs, which might be unfavorable to them. This group of farmers are risk-rationed and transaction-cost-rationed (Boucher & Guirkinger, 2007).

Output -income

Farmers who apply for credit and are either refused or offered an amount less than what they have applied for are classified as quantity rationed in line with the theory of information asymmetry and transaction cost theory. Therefore, a farmer's decision to apply for financial services and subsequently rationing by the financial intermediary is assumed to be influenced by institutional attributes and the characteristics of the farmer. The activities within the financial market (Section 1, Figure 1) give rise to two distinct groups of farmers: farmers who are constrained in their access to credit and those farmers who are not constraint. It is conceptualized that farmers who use formal financial services can relieve liquidity constraints for the purchase of inputs and the cultivation of larger areas (Section 4, Figure 1). Therefore, formal financial market participation is conceptualized to have a positive effect on the amount of money the farmer spends on variable inputs, farm size, and, consequently, productivity. This is because farmers who use formal financial services would be able to relieve liquidity constraints for the purchase of inputs and the cultivation of larger areas. Farm productivity is expected to have a spin-off on farmers' access to financial services through asset endowments.

The Change Theory of Development

The change theory of development propounded by the United Nations Children's Fund (UNICEF) (2014). The theory is essentially used for impact assessment studies especially for intervention programmes and policies like the IFAD/VCDP. A 'theory of change' explains how activities are understood to produce a series of results that contribute to achieving the final intended impacts.

It can be developed for any level of intervention such as an event, a project, a programme, a policy, a strategy, or an organization (Rogers, 2014).

A theory of change can be developed for an intervention: i) where objectives and activities can be identified and tightly planned beforehand, or ii) that changes and adapts in response to emerging issues and to decisions made by partners and other stakeholders (Vogel, 2012).

Sometimes the term is used generally to refer to any version of this process, including a results chain, which shows a series of boxes from inputs to outputs, outcomes, and impacts.

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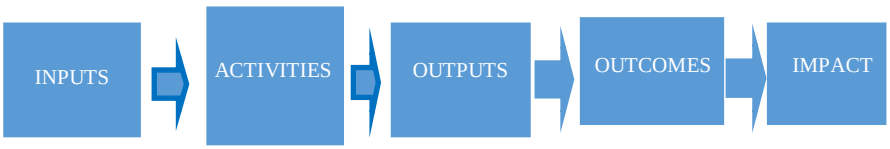

Source: UNICEF, 2014

According to Allen (2011), inputs, activities, output, outcomes, and impact of a change theory can be explained as follows:

Inputs: This has to do with the financial, human, and material resources used in the programme or policy. Under the IFAD/VCDP, farmers are given farm input and cash to undertake their farming activities.

Activities: Activities under the IFAD/VCDP have to do with the farming activities that the farmers engage in using the farm inputs and the cash given to them.

Output: This is concerned with the immediate effects of programme/policy activities or the direct products or deliverables of the programme/policy activities. In the context of the IFAD/VCDP, the number of farmers who have benefitted from the IFAD/VCDP and how much input loans they have received as well as changes in the farmers' output.

Outcome: This has to do with the likely or achieved short-term and medium-term effects of the programme or policy outcome, under the IFAD/VCDP, it has to do with incomes and improvement in the quality of lives of the beneficiaries.

Impact: This is concerned with the positive and negative, primary, and secondary long-term effects produced by a development intervention, directly or indirectly, intended or unintended. Under the IFAD/VCDP, this may be the impact on income and poverty levels of beneficiaries and its impact on the SDGs.

Given the postulates of the change theory, it is deemed appropriate for this impact study because the IFAD/VCDP is an intervention programme which has clear-cut objectives. That is, the broad objective of the IFAD/VCDP is to increase output of smallholder farmers and their incomes and reduce poverty along the value chain.

Cobb- Douglas Production Theory

The Cobb-Douglas production theory was propounded by Cobb, C. and Douglas, P. in 1928. The Cobb-Douglas and constant elasticity of substitution (CES) are two functions that have been used extensively. It is a mathematical expression that describes a systematic relationship between inputs and output in an economy. These functions play an important role in economic forecasts and policy analysis (Miller, 2008). In general, Cobb- Douglas production theory deals with production activities. It is a production function that specifies how the quantity of output behaves as a function of the inputs used in production. Various specific mathematical forms have been put forward for the production function, but the most used is that developed by Charles Cobb and Paul Douglas in the second quarter of the 20th century. The specification is given as:

$Y = AK^{\alpha}N^{1-\alpha}\ \ 0 < \alpha < 1$……1

Here *Y* represents aggregate output, *K* the capital input, and *N* the labor input (capital and labor being the two "factors of production" in this function). The *A* term represents Total Factor Productivity (TFP for short); you can think of this as a "quality" factor—as opposed to *K* and *N* which are just quantitative. The value of *A* reflects the state of technology as well as the skill and education level of the workforce. All being well, it is expected that, *A* to will gradually increase over time (Box and Cox, 1964).

According to Miller (2008), a particularly important aspect of the production function is the *marginal product of the factors*. Taking first the marginal product of labor (or MPN for short)—that is, the change in output that results when the labor input is varied, holding the capital input and TFP constant. This can be found by taking the first derivative of equation (2) with respect to *N*:

$MPN = \frac{dY}{dN} = (1-\alpha)AK^{\alpha}N^{1-\alpha-1}$……2

$= (1-\alpha)(AK^{\alpha}N^{1-\alpha})N^{-1}$……3

$= (1-\alpha)\frac{Y}{N} > 0$……4

Given that *Y* and *N* must be positive and α is a positive fraction, the marginal product of labor must be positive: a greater labor input leads to the production of more output.

The familiar economic concept of "diminishing returns" leads to expect that the *MPN*, while positive, should be declining as the labor input is increased, holding *K* and *TFP* constant, output should increase but at a diminishing rate. To find whether or not, the Cobb–Douglas function satisfies this condition, the derivative of the *MPN* with respect to *N* is obtained, or in other words, the second derivative of *Y* with respect to *N*

$$\frac{dMPN}{dN} = \frac{d^2Y}{dN^2} = (-\alpha)(1-\alpha)AK^{\alpha}N^{1-\alpha-2} \quad \ldots\ldots 5$$

$$= (-\alpha)(1-\alpha)(AK^{\alpha}N^{1-\alpha})N^{-2} \quad \ldots\ldots 6$$

$$= (-\alpha)(1-\alpha)\frac{Y}{N^2} < 0 \quad \ldots\ldots 7$$

Since the second derivative is negative, it can be said that, it complies with the diminishing returns. This is because all terms in the multiplicative expression are positive apart from the negative–α. Strictly analogous mathematics shows that the Cobb–Douglas function also exhibits a positive but diminishing marginal product of capital, MPK (Miller, 2008).

The Positive MPK is expressed as:

$$MKP = \frac{dY}{dK} = \alpha AK^{\alpha-1}N^{1-\alpha}(AK^{\alpha}N^{1-\alpha})K^{-1} \quad \ldots\ldots 8$$

$$= \alpha\frac{Y}{K} > 0 \quad \ldots\ldots 9$$

Thus, the diminishing return to capital is given as:

$$\frac{dMPK}{dN} = \frac{d^2Y}{dK^2} = (-\alpha)\alpha AK^{\alpha-2}N^{1-\alpha} \quad \ldots\ldots 10$$

$$= (-\alpha)\alpha\frac{Y}{K^2} < 0 \quad \ldots\ldots 11$$

According to Miller (2008), a further point relevant for macroeconomic analysis is, what (if anything) happens to the marginal product of labor when the capital input is increased? And conversely, what happens to the MPK when N increases? In mathematical terms, it refers to the so-called "cross-partial" derivatives, dMPN/dK and dMPK/dN

$$\frac{dMPN}{dK} = \alpha(1-\alpha)AK^{\alpha-1}N^{1-\alpha-1} \quad \ldots\ldots 12$$

$$= \alpha(1-\alpha)(AK^{\alpha}N^{1-\alpha})K^{-1}N^{-1} \quad \ldots\ldots 13$$

$$= \alpha(1-\alpha)\frac{Y}{KN} > 0 \quad \ldots\ldots 14$$

So an increase in capital raises the marginal product of labour. This can be expressed as:

$$\frac{dMPN}{dN} = \alpha(1-\alpha)AK^{\alpha-1}N^{1-\alpha-1} \quad \ldots\ldots 15$$

$$\alpha(1-\alpha)\alpha\frac{Y}{KN} > 0 \quad \ldots\ldots 16$$

So, raising N also raises the MPK. (And it turns out that the two cross partials are identical.) Also note from equations (15) and (16) it should be clear that an increase in Total Factor Productivity, A, will raise the marginal products of both factors.

3. Empirical Literature

Orjime, Abaa, Shember & Asombo (2023) investigated the impact of IFAD rice value chain development programme in rice output and unemployment reduction in Benue state, Nigeria. The study used descriptive statistics and logistics regression for the investigation. Findings showed that IFAD rice value chin development has positively affected unemployment reduction among the value chain participants in Gwer-East, Logo and Okpokwu local governments areas of Benue State. The findings also show that IFAD value chain programme has has positively impacted on rice farm output in the three LGAs.

Obianefu, Okoroji & Obiekwe (2022) examined the effect of input value chain financing on rice farmers' efficiency in IFAD assisted value chain development programme in Awka. The study used descriptive statistics, multi-nominal logistic regression, and data envelopment analysis. Findings revealed that IFAD intervention provides input support loans to the beneficiaries. It was found that, this value chain financing encouraged timely planting and enables farmers to access productive inputs which translate to increase in output and food security.

Enenchi & Ojiagu (2021) investigated IFAD value chain development programme and rice yield among rice farmers' co-operative in Anambra State, Nigeria. The study used OLS estimation technique and it found that IFAD-value chain machines have a positive and statistically significant influence on the rice yield of the beneficiaries.

Sadiq, Singh, Ahmad, Yunsa & Egba (2021) investigated cost efficiency status of rice farmers participating in IFAD/VCD programme in Niger State, Nigeria. The study utilized the cost and return analysis and findings showed that rice production under the IFAD is profitable. The study identified idiosyncratic variables militating against cost efficiency to include poor health status of family members which lead to extra cost incurred in labor substitution and diseconomies of scale due to their small-scale model of production.

Orunye, Tukura, Joseph & Menwo (2021) investigated the impact of IFAD-VCDP programme to rice yield and income among smallholder farmers in Ardo-Kola LGA of Taraba state using a purposive sampling method for data collection for both primary and secondary data. The findings of the study reveal that the IFAD-VCDP programme in Taraba has a positive impact on the rice yield and income of smallholder farmers in the state.

Sadiq, Singh & Ahmad (2020) investigated rice yield differentials between IFAD participating and non-participating farmers in Niger State, Nigeria. The study used profit function and inferential statistics and findings revealed that participating farmers are efficient in managing their enterprises risks owing to low cost of production and high yield. Also, the study found that the programme had an impact on the farmers' productivity both in the short-run and long-run. Furthermore, the decomposition analysis justified the impact of the programme structural difference called participation accounts for more than 92%. Variation in the yield of participating farmers been higher than that of the non-participating farmers, leaving less than 10% to be contributed by measure of endowment difference.

Ndanitsa, Musa, Ndako &Mohammed (2020) examined the effect of value chain development programme on small-scale rice farmers in Niger State, Nigeria. The study employed both descriptive and inferential statistics and found that rice production under the IFAD is profitable. Thus, the study concluded that, IFAD had impacted positively the income status of the participating rice farmers in the study area.

Taibat, Bello, Musa & Shehu (2015) investigated impact of IFAD/Community Based Agricultural and Rural Development Programme (CBARDP) on poverty reduction among rural women in Kebbi State, Nigeria. The study used descriptive and inferential statistics and concluded that, IFAD intervention has improved the living standard and reduce poverty of the beneficiaries because of the positive effect it had on their incomes, value of assets and their general well-being and livelihood.

4. Methodology of the Study

Area of the Study

The area of study for this paper is Benue State. Benue State is one of the thirty-six states of the Federation. The State has a population of about 6,141,300 people based on the 2022 census projections (NPC & NBC,2022). Benue State has twenty-three local government areas, and its capital is Makurdi. For administrative purposes, the state is segmented into three geo-political zones, namely, Zone A, Zone B and Zone C, respectively.

Benue State is predominantly an agrarian state with most of the inhabitants being farmers. Given the high level of agricultural activities of the State, it is called the 'Food Basket of the Nation'. The commonly agricultural commodities of the State include yam, rice, cassava, soya-beans, guinea corn, tomatoes, pepper, ginger, sweet potatoes, maize, and groundnuts. For citrus, the State largely produces oranges, mangoes, and cashews.

The agricultural activities of the state are largely self-sustenance, and many have attributed this to challenges which include but not limited to paucity of funds, post-harvest losses, farmers-herders' crisis, communal crashes, poor infrastructural facilities such as roads and electricity among others.

Population of the Study and Sampling Technique

The study's population comprises all the rice farmers who are the direct beneficiaries of IFAD/VCDP in the eight Local Government Areas: namely, Okpokwu, Logo, Gwer East, Guma, Ogbadibo, Gwer West, Kwande and Agatu local government areas from 2019 to 2023. The study has employed a multi-stage sampling procedure. In the first stage, the study purposively selected three local government areas in the state, one from of the geo-political areas. That is, Kwande from Zone A, Gwer West from Zone B and Agatu from Zone C. The choice of these local government areas is because these LGAs have the highest numbers of rice farmers who are the direct beneficiaries of the IFAD/VCDP. That is, Kwande has 1,115; Gwer West has 875; and Agatu has 685. This sums up to a total of 2,675 direct beneficiaries who now constitute the sampling frame.

Using this a sampling frame, Taro Yammene's formula was used in the determination of the optimal sample size for investigation. The formula is stated as:

$$n = \frac{N}{1+N(e^2)} \quad \ldots\ldots 17$$

Where n is the desired sample size, e is the level of significance, N is the study's population which is 2,675 beneficiaries of the IFAD/VCDP in selected LGAs.

Thus, $n = \frac{2,675}{1+2,675(0.05^2)} = 348$

Therefore, the optimal sample size of the beneficiaries of the IFAD/VCDP in the selected LGAs for this study is 348 beneficiaries.

Furthermore, the Boyce's allocation formula was used to determine the proportions of rice farmers in the determined sample size of 348 as follows:

For Kwande $= \frac{1,115}{2,675} \times 348 = 145$ Rice beneficiaries

For Gwer West $= \frac{875}{2,675} \times 348 = 114$ Rice beneficiaries

For Agatu $= \frac{685}{2,675} \times 348 = 89$ Rice beneficiaries.

In the second stage, a cluster sampling procedure was therefore applied to select the determined 348 rice farmers' beneficiaries in the three LGAs. The choice of the cluster sampling technique was deemed most appropriate in this study because the beneficiaries of the IFAD/VCDP are grouped into clusters called Farming Organizations (FOs) also known as cooperatives. Kwande has 81

FOs, Gwer West has 84 FOs and Agatu has 47 FOs. In so doing, 50% of FOs in each LGA was randomly selected. That is, 41 FOs for Kwande, 42 FOs for Gwer West and 24 FOs Agatu. Approximately, 107 FOs were selected for investigation.

In the last stage, random sampling procedure was used to select the direct beneficiaries rice farmers from the selected FOs. For Kwande, the145 direct beneficiaries rice farmers were randomly selected from the 41 sampled FOs; For Gwer West the 114 direct beneficiaries rice farmers were randomly selected from the 42 sampled FOs and for Agatu the 89 direct beneficiaries rice farmers were randomly selected from the 24 sampled FOs using the Microsoft excel inbuilt random sampling mechanism.

Finally, the excel random samples generated were used to trace the locations and contacts of the selected beneficiaries for questionnaire administration. The FOs heads of the various cooperatives immensely assisted in the questionnaire administration.

Analytical Techniques Employed

Various analytical tools are used in this study, first; the model specifications derive from a typical Cob-Douglas production function given as:

$$Y = AK^{\alpha}N^{1-\alpha} \quad \ldots\ldots 18$$

Where Y is the level of Output, K is capital and N is labour and A is technological progress. For empirical utilization of the Cob-Douglas function, the function was linearized by double logarithm transformation. Thus, the log-linear form of the model is given as:

$$LogY = LogA + \alpha LogK + 1 - \alpha LogN \quad \ldots\ldots 19$$

By decomposing K into seedlings (seed), fertilizer (fert), herbicides (Herb), Access to credit (Atc) and machinery (Mech). Similarly, by decomposing labour into Hired labour (Hlab) and Family labour (Fml) and including farm size as a control variable; the model becomes:

$$Ln(output) = \alpha_0 + \alpha_1 \ln(seed) + \alpha_2 lnf(ert) + \alpha_3 \ln(Herb) + \alpha_4 \ln(Atc) + \alpha_5 \ln(mech) + \alpha_6 \ln(Hlab) + \alpha_7 Fml + \alpha_8 fms + \mu_1 \quad \ldots\ldots 20$$

Where α_0 is the constant of the model and μ_1 is the error term.

Furthermore, the IFAD intervention interacted with the variables in model 20 and the model becomes.

$$Ln(output) = \alpha_0 + \alpha_1 \ln(seed) + \alpha_2 \ln(fert) + \alpha_3 \ln(Herb) + \alpha_4 lnAtc + \alpha_5 \ln(mech) + \alpha_6 \ln(Hlab) + \alpha_7 Fml + \alpha_8 fms + \alpha_9 \ln(seed) * (IFseed) + \alpha_{10} \log(fert) * (IFfert) + \alpha_{11} \ln(Herb) * (IFHerb) + \alpha_{12} \ln(Atc) * (Atc) + \alpha_{13} \ln(mech) * (mech) + \alpha_{14} \ln(Hlab) * (IFHlab) + \alpha_{15} \quad (Farms) * (IFFarms) + \mu_2 \quad \ldots\ldots 21$$

Where α_0 is the constant term and μ_2 is the error term.

To model the impact of IFAD on the incomes of the beneficiaries, the study adopted the model of Enenchi & Ojiagu (2021). Accordingly, the income function is specified as:

$$Ln(Income) = f[Ln(output), Ln(price), Ln(Cseed), Ln(Clab), Ln(Cfert), Ln(Cherb), Ln(Transc), farms) \quad \ldots\ldots 22$$

Where *Income* is the income of the farmers;

output is the output of rice; *price* is the average price of rice; $Cseed$ is the cost of seedlings; $Clab$ is the cost of labour; $Cfert$ is the cost of fertilizer; $Cherb$ is the cost of herbicides; $Transc$ is the transport cost of the farm produce and $farms$ is the farm size.

The stochastic form of the model is stated as follows:

$$Ln(income) = \alpha_0 + \alpha_1 \ln(output) + \alpha_2 \ln(price) + \alpha_3 \ln(Cseed) + \alpha_4 \ln(Clab) + \alpha_5 \ln(Cfert) + \alpha_6 \ln(Cherb) + \alpha_7 \ln(Transc) + \alpha_8 fms + \mu_3 \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 23$$

Where α_0 is the constant term and μ_3 is the error term.
Furthermore, the IFAD intervention interacted with the variables in model 23 and the model becomes.

$$Ln(income) = \alpha_0 + \alpha_1 \ln(output) + \alpha_2 \ln(price) + \alpha_3 \ln(Cseed) + \alpha_4 \ln(Clab) + \alpha_5 \ln(Cfert) + \alpha_6 \ln(Cherb) + \alpha_7 \ln(Transc) + \alpha_8 fms + \alpha_9 \ln(output) * (IFoutput) + \alpha_{10} \ln(price) * (IFprice) + \alpha_{11} \ln(Cseed) * (IFCseed) + \alpha_{12} \ln(Cfert) * (IFCfert) + \alpha_{13} \ln(Cherb) * (IFCherb) + \alpha_{14} \ln(Farms) * (IFFarms) + \mu_4 \ldots\ldots\ldots\ldots\ldots\ldots 24$$

To analyze the poverty dynamics among the beneficiaries, the Foster, Greer and Thornbecke (FGT) index and a logit regression model was used to ascertain whether benefiting from the IFAD rice value chain programme has the probability of reducing poverty among the beneficiaries.

The FGT Index: This index was brought to limelight by Foster, Greer and Thornbecke in 1984. The index incorporates the poverty headcount ratio, poverty gap and the depth of poverty (Anyanwu, 1997). The headcount ratio which measures the proportion of people below the poverty line is given as:

$H = \frac{Q}{N}$……25

Where H is value of the headcount ratio to be computed. It is expected to range from 0 to 1; the closer H to 1, the higher the number of beneficiaries is below the determined poverty line.
Q is the number of beneficiaries of the IFAD below the poverty line, and N is the total number of beneficiaries of the IFAD investigated in the study.

Poverty gap which measures the dispersion of the peoples' mean income level from the poverty line is expressed as:

$P_\alpha = \frac{1}{N} \sum_{j=1}^{N} (\frac{Z - Y_I}{Z})^\alpha$……26

Where P_α is the poverty gap, Z is the determined poverty line for the study, Y_i is income level of the ith beneficiary in poor category, α the FGT parameter value which is expected to range from 0, 1 and 2 and, N denotes the number of beneficiaries of the ABP studied (Oyedeji, and Adebayo, 2013).

Logit Regression Model

A logit model is a qualitative binary regression type that is widely used for poverty investigations. Studies such as Yusuf, Adesanoye and Awotide (2008), Imran, Shahnawazi and Abo (2009) and Akighir, Ngutsav, and Asom (2011) have used this model to investigate various poverty related issues. Traditionally, the endogenous variable is binary in nature, "1" connotes that the household is poor and "0" connotes that household is not poor.

The general form of the logit regression model is expressed as;

$ln\left[\frac{P_i}{1-P_i}\right] = Z = \alpha + \beta X_i + \mu$----------27

Z = Represents binary qualitative variable classifying households into poor and non-poor;
X_i = Represents the specific characteristic of the households under investigation; and
μ = is the residual of the logit model.
In this study, the logit regression model is specified as;

$pov = f(Edu, fexp, loan, inifad, cfarms, intifad, modep)$---------28

Where:
pov= poverty level of the households estimated in line with the World Bank poverty line of 1.9 dollars. Using the average of N1,500 per $ per day, any beneficiary whose income is below N2,850 per day, he/she is considered poor and any beneficiary whose income is above N2,850 per day is considered non-poor. Thus, for poor rice farmers, the value of "1" is assigned and for non-poor rice farmers, the value of "0" is assigned respectively.

Edu is the educational attainment level of the beneficiary, Fexp is the years of farming of the beneficiary, Loan is the amount of loan a beneficiary has collected from the financial institution, Inifad is income earned from the activities of IFAD, Cfarms is change in farm size because of IFAD intervention. Intifad is the interest rate charged by financial institutions for IFAD loans, and Modep is the mode of payment of the IFAD's loan by the beneficiary. The econometric form of model 24 is stated in equation 28 as.

$$pov = \alpha_0 + \alpha_1 edu + \alpha_2 fexp + \alpha_3 loan + \alpha_4 inifad + \alpha_5 cfarms + \alpha_6 intifad + \alpha_7 modep + \mu \quad --29$$

α_0= is the intercept of the mode.
α_1- α_7 = are the estimated parameters of model 29. Model 29 was estimated using the maximum likelihood estimation technique.

6. Empirical Results

In this study, 348 copies of the questionnaire were distributed but only a total of 342 copies of the questionnaire retrieved were valid representing 98.8%, while the invalid rate was only 1.2%. Thus, the data analysis in this study is based on the 342 valid questionnaires retrieved.

Socio-Economic Characteristics of the Beneficiaries

The Socio-Economic characteristics of the beneficiaries are presented in the following table.

Table 1: Socio-Economic Attributes of the Beneficiaries

Variables	Frequency	Percent
Sex		
Male	180	52.63
Female	162	47.37
Total	342	100.00
Age		
18-30	87	25.44
31-45	176	51.46
46 and above	79	23.10
Total	342	100.00
Educational Attainment		
No formal Education	0	0
Primary Education	12	3.51
Secondary Education	202	59.06
Tertiary Education	128	37.43
Total	342	100.00

Source: Field Survey, 2023

Table 1 reveals that 52.63% of the beneficiaries are male and 47.37% of the beneficiaries are female. This implies that benefiting from the IFAD rice value chain does not depend on gender, since both the male and female sex are fairly represented. Also, it is evident from the table that 25.44% of those who benefited from the IFAD are aged 18 -30 years and 51.46% are aged 31 – 45 years and those

who are 46 years and above constitute 23.10% of the sampled beneficiaries. This suggests that those who benefited from the programme have a minimum of 18 years. This may be because of legal implications. Finally, table 1 also reveals that 3.51% of the beneficiaries have attended primary school as their highest educational level and 59.06% of the beneficiaries have attended secondary school as their highest educational level, while 37.43% of the sampled beneficiaries have various higher educational certificates as their highest educational certificates. This implies that all the sampled beneficiaries have acquired formal education with most of the beneficiaries having secondary school certificates as their highest qualification. This, therefore, suggests that the programme aims at poverty alleviation in the state.

Analysis of the Impact of IFAD on the Output of the Beneficiaries

Using the Generalized Method of Moment (GMM), output models were estimated, and the results are presented in Table 2. The choice of GMM is because of the Instrumental Variable Approach inherent in the GMM. Similarly, it enables to ascertain the intervention and caused effect impact of IFAD on output and income of smallholder farmers.

Model 1 estimated the input factors and the output of the beneficiaries and model 2 estimated the output and input factors as well as interacted IFAD/VCDP intervention effect with the input factors of the beneficiaries to ascertain the impact of IFAD on the output of the farmers. In model 1, seedlings have positive but statistically insignificant effects on the output of the rice farmers. Fertilizer has a positive and statistically significant relationship with the output of rice farmers. This suggests that a 1% increase in the fertilizer used will increase the rice output by 0.23%.

The use of herbicides and access to credit have a positive and statistically insignificant relationship with the output of the rice farmers, while machines used have positive and statistically significant effect on the output of rice. That is, a 1% increase in the use of machines will increase the rice output by 2.84%.

Similarly, family labour and hired labour both have a positive and statistically insignificant relationship with the rice output of the farmers.

Table 2: Estimated Output Models

Dependent Variable: Ln(Output)

Variable	Model 1	Model 2
Constant	1.3331**	2.1792**
	[0.0224]	[0.0521]
Ln(seed)	0.0189	0.1189
	[0.1142]	[0.2856]
Ln(Fert)	0.2281**	1.4531**
	[0.0422]	[0.0317]
Ln(Herb)	1.3726	0.3124**
	[1.2001]	[0.0115]
Ln(Atc)	0.0304	1.7920**
	[0.1288]	[0.0089]
Ln(Mech)	2.8410**	0.3467
	[0.2811]	[0.0119]
Fml	0.0986	2.5678**
	[0.6229]	[0.1654]
Ln(Hlab)	0.1682	0.4781
	[0.2479]	[0.3667]
Farms	0.8244**	1.6921
	[0.2319]	[1.4110]
Ln(seed)*Ln(IFseed)		0.7369**
		[0.1832]
Ln(fert)*Ln(IFfert)		1.3789**
		[0.1975]
Ln(Herb)*Ln(IFHerb)		0.8723**
		[0.3679]
Ln(Atc)*Ln(IFAtc)		2.7834**
		[0.6891]
Ln(Mech)*Ln(IFMech)		4.9935**
		[0.6729]
Ln(Hlab)*Ln(IFHlab)		0.9674**
		[0.3368]
Farms*(IFFarms)		0.9809**
		[0.1369]
R-Squared	0.4214	0.7891
Adjusted R-Squared	0.4009	0.7711
J-Statistics	6.3448	14.891
Prob (J-Stat)	0.0456	0.0000
Durbin-Watson Stat	1.9840	2.0091

Source: Author's Estimation using E-views 10

**means 5% level of significance

Farm size has a positive and statistically significant relationship with the output of the rice farmers. This implies that a 1% increase in the farm size cultivated will lead to 0,84% increase in the rice output of the farmers. Model 1 has the R-Square adjusted value of 0.400 which suggests that the input factors included in the model have explained variation in the rice output by 40%. The J-statistics is statistically significant which suggests strong joint effect of the input factors on the rice output of the farmers. The Durbin-Watson statistics value of 1.9840 is approximately 2.00 which suggests the absence of the problem of autocorrelation in the model.

In Model 2, which estimated the interactive effects of IFAD intervention on the rice output of the farmers, seedlings, machine used, and farm size have positive relationship with rice output but are statistically not significant. Conversely, table 2 shows that fertilizer used, herbicides, access to credit and family labour have a positive and statistically significant relationship with the rice output of the farmers. The implication of this is that a 1% increase in fertilizer, herbicides, access to credit and family labour will lead to an increase in the farmers' rice output by 0.29%, 0.31%, 1.79% and 2.57%, respectively.

Furthermore, interacting IFAD invention effect with the input factors in model 2 revealed that, both input factors have exerted positive and statistically significant effect on the farmers' rice output. That is, a 1% increase in seedlings distribution under the IFAD rice value chain will increase rice output by 0.74%. This finding is in line with the findings of Sadiq et al (2020) and Enenchi & Ojiagu (2021) who found that IFAD seedlings have increased rice yield of the beneficiary farmers. Also, the result indicated that a 1% increase in fertilizer distribution under the IFAD rice value chain will lead to a 1.38% increase in the farmers' rice output by 0.87%. The finding corroborates the finding of Enenchi & Ojiagu (2021) and Sadiq et al (2021) who found that IFAD fertilizer distribution has enhanced rice production among beneficiary farmers. Similarly, the results showed that, a 1% increase in herbicides used under the IFAD rice value chain has increased rice yield of the farmers by 0.87%.

Again, table 2, reveals that a 1% increase in access to credit through the IFAD rice value chain has increased rice yield by 2.78%. Also, a 1% increase in machines used under IFAD rice value chain has increased rice production by 5.00% and the finding corroborates the finding of Enenchi & Ojiagu (2021) who found that, the use of machines such as threshing machines, water pump, farm weeding machines and knapsack sprayers under the IFAD rice value chain have increased rice production in Anambra State.

Nevertheless, the findings have indicated that, a 1% increase in hired labour financed under the IFAD rice value chain has increased the yield of rice by 0.97% and a1% increase in the farm size financed under the IFAD value chain will increase the output of rice by 0.98%. This finding is in tandem with the findings of Sadiq et al (2021) who found that increased in farm sizes of farmers due to the invention of the IFAD value chain has improved the rice production level of the beneficiary farmers.

Model 2 has the R-Squared adjusted value of 0.7711 which suggests that the determinants of income included in the model have explained variation in the rice farmers' incomes by 77.11%. The J-statistics is statistically significant which suggests very strong joint effect of the determinants of income on the income of rice farmers. The Durbin-Watson statistics value of 2.0091 is approximately 2.00 which suggests the absence of the problem of autocorrelation in the model.

Analysis of the Impact of IFAD on the Income of the Beneficiaries

Using the Generalized Method of Moment (GMM) income models were estimated, and the results are presented in the following table.

Table 3: Estimated Income Models

Dependent Variable: Ln(Income)

Variable	Model 1	Model 2
Constant	4.8920**	3.4792**
	[0.1289]	[1.2116]
Ln(output)	3.2319	1.8241
	[2.6672]	[1.2885]
Ln(price)	1.61125	0.9817**
	[1.3991]	[0.2311]
Ln(Cseed)	-0.4912	-5.1662**
	[0.3885]	[1.9943]
Ln(Clab)	2.4489	-0.8917
	[1.9350]	[1.1169]
Ln(Cfert)	-0.8119**	-2.7981**
	[0.3238]	[0.8110]
Ln(Cherb)	-0.4997**	-0.9947**
	[0.1182]	[0.2844]
Ln(Transc)	-3.8561	-0.7359**
	[2.9967]	[0.3667]
Farms	1.5917	2.1182**
	[1.3389]	[0.8911]
Ln(output)*Ln(IFoutput)		3.5660**
		[0.9721]
Ln(price)*Ln(IFprice)		0.8476**
		[0.28130]
Ln(Cseed)*Ln(IFCseed)		-0.6492**
		[0.2109]
Ln(Clab)*Ln(IFClab)		-0.5882**
		[0.1866]
Ln(Cfert)*Ln(IFCfert)		-9.8440**
		[3.6892]
Ln(Cherb)*Ln(IFCherb)		-4.9862**
Farms*(IFFarm)		0.8107**
		[0.3998]
R-Squared	0.3918	0.8911
Adjusted R-Squared	0.3833	0.8782
J-Statistics	5.9220	38.9681
Prob (J-Stat)	0.0498	0.0000
Durbin-Watson Stat	2.1420	1.9881

Source: Author's Estimation using E-views 10.

**means 5% level of significance

Model 1 estimated the determinants of income of the beneficiaries and model 2 estimated these determinants as well as interacted the IFAD/VCDP intervention effect with the determinants to ascertain the impact of IFAD on the incomes of the farmers. In model 1, rice output and the price of rice have positive but statistically insignificant effects on the incomes of the rice farmers. The cost of seedlings as an input factor has a negative but statistically insignificant relationship with the income of rice farmers. Conversely, the cost of herbicides and fertilizer as input factors have negative and statistically significant relationship with the incomes of the rice farmers. This suggests that a 1% reduction in the cost of these input factors will increase the income of the farmers by 0.81% and 0.50%,

respectively. Again, the findings revealed that, the transport cost of moving the goods from the farm gate to the market has negative but statistically insignificant relationship with the incomes of the farmers, while the farm size has positive but statistically insignificant relationship with the incomes of the farmers.

Model 1 has the R-Square adjusted value of 0.3918 which suggests that the determinants of income included in the model have explained variation in the income of rice farmers by 39.18%. The J-statistics is statistically significant which suggests strong joint effect of the input factors on the rice output of the farmers. The Durbin-Watson statistics value of 2.1420 is approximately 2.00 which suggests the absence of the problem of autocorrelation in the model.

In Model 2, which estimated the interactive effects of IFAD intervention on the income of rice farmers, the results indicated that output of rice has a positive relationship with the income of rice farmers, but it is not statistically significant. Also, the price of rice has a positive and statistically significant relationship to the incomes of the rice farmers. The implication of this is that a 1% increase in the price of rice will lead to an increase in the rice farmers' income by 0.98%.

Furthermore, interacting IFAD invention effect with the determinants of income in model 2 revealed that, the cost of seedlings, cost of fertilizer and the cost of herbicides are all inversely related with the incomes of rice farmers. That is, a 1% reduction in the cost of seedlings due to IFAD rice value chain intervention will increase rice farmers' incomes by 5.17%. Also, the result indicated that a 1% reduction in the cost of fertilizer distributed due to the IFAD rice value chain intervention will lead to an increase in rice farmers' incomes by 2.80%. Similarly, the results showed that, a 1% reduction in the cost of herbicides due to the IFAD rice value chain intervention has increased rice farmers' incomes by 0.99%.

Again, the results indicated that there is a negative and statistically significant relationship between the cost of transportation of goods from farm gate to market and the farmers' incomes. This implies that a 1% reduction in the cost of transportation due to the IFAD rice value chain intervention will lead to an increase in rice farmers' incomes by 0.74%. Also, the results showed that there is a positive relationship between farm size and rice farmers' incomes. That is, a 1% increase in farm size due to IFAD rice value chain will lead to an increase of rice farmers' incomes by 2.12%.

Nevertheless, the findings have indicated that, interacting farmers' output with the IFAD financed rice output has a positive and statistically significant relationship with the rice farmers' incomes. This implies that a 1% increase in rice output financed under the IFAD rice value chain has increased the rice farmers' incomes by 3.57%. This finding is in tandem with the findings of Ndanitsa et al (2020) who found that increased farmers' output due to the intervention of the IFAD value chain has positively improved the incomes of participating farmers' incomes in Niger state, Nigeria.

Similarly, interacting the price of rice with the IFAD rice price has positive and statistically relationship with the incomes of the rice farmers in the study area. This suggests that a 1% increase in rice price financed under the IFAD rice value chain has increased the rice farmers' incomes by 0.85%. Again, the findings have revealed that, interacting the cost of rice seedlings with the IFAD financed seedlings has a negative and statistically significant relationship with the rice farmers' incomes. This implies that a 1% reduction in the cost of seedlings of rice due to the IFAD rice value chain has increased the rice farmers' incomes by 0.65%. The finding corroborates the finding of Enenchi & Ojiagu (2021) who found that, with the distribution of improved seedlings under the IFAD rice value chain have increased rice production and incomes of rice farmers in Anambra State.

Similarly, by interacting the cost of labour with the IFAD financed labour has a negative and statistically significant relationship with the rice farmers' incomes. This implies that a 1% reduction in the cost of labour of rice farming due to the IFAD rice value chain has increased the rice farmers' incomes by 0.59%. Furthermore, the findings of the study have indicated that, by interacting the cost of fertilizer with the IFAD financed fertilizer has a negative and statistically significant relationship with the rice farmers' incomes. This implies that a 1% reduction in the cost of fertilizer due to the IFAD rice value chain has increased the rice farmers' incomes by 9.84%. The finding is in line with the finding of

Enenchi & Ojiagu (2021) who found that, with the distribution of fertilizer under the IFAD rice value chain have increased rice production and incomes of rice farmers in Anambra State.

Furthermore, interacting the farm size with the IFAD sponsored farm size is positively related with the income of rice farmers in the study area. This suggests that, a 1% increase in the farm size under the IFAD rice value chain has increased the rice farmers' incomes by 0.81%.

Model 2 has the R-Squared adjusted value of 0.88 which suggests that, the determinants of income included in the model have explained variation in the rice farmers' incomes by 88.00%. The J-statistics is statistically significant which suggests very strong joint effect of the determinants of income on the income of rice farmers. The Durbin-Watson statistics value of 1.9881 is approximately 2.00 which suggests the absence of the problem of autocorrelation in the model.

Assessment of Poverty Level Among Rice Farmers under the IFAD Rice Value Chain

To assess the poverty level among the rice farmers given their participation in the IFAD/VCDP, the FGT index and the logit regression model were utilized. The World Bank poverty line of US$1.9 per day per person was employed. The average official exchange rates of N720 per dollar for before participation in IFAD and N1,500 per dollar for during participation were used. Thus, the poverty line of N1,368 per day and N499,320 as poverty line per annum. Also, N2,850.00 was computed as the poverty line per day and N1,040,250 as poverty line per annum given the beneficiaries participation in the IFAD rice value chain. Table 3 shows the FGT indices of the beneficiaries before and during the IFAD.

Table 4: The FGT Index of Beneficiaries of the IFAD Rice Value Chain

FGT Index	Before IFAD	During IFAD
P_0	0.72	0.66
P_1	0.45	0.38
P_2	0.32	0.28

Source: Author's Calculations

Table 3 shows the P_0 values of 0.72 and 0.66 which are the poverty headcount ratios for before and during the IFAD rice value chain, respectively. The headcount ratios of 0.72 and 0.66 suggest that 72 per cent of the beneficiaries of the IFAD were living below the poverty line of US$1.9 per day and having benefited from the IFAD, 66 per cent of the beneficiaries were living below the poverty line. This implies that benefiting from the IFAD has taken only 6 per cent of the beneficiaries out of poverty. This means that the beneficiaries now have access to the basic necessities of life such as food to eat, clothes to wear, medication and shelter to live in. The 6 per cent may be due to exchange rate changes and inflation rate in the country. The table also shows P_1 values of 0.45 and 0.38 for before the IFAD and during the IFAD, respectively. The P_1 which is the poverty gap measures the mean distance of the income of poor households from the poverty line. Thus, the poverty gap values of 0.45 and 0.38 suggest that before benefiting the IFAD, 48 per cent of the households, their income levels were away from the poverty line. Having benefited from the IFAD 38 per cent of the beneficiaries' income levels were away from the poverty line. The implication is that IFAD has brought some beneficiaries' income levels closer to the poverty line. Again, Table 3 shows the P_2 values of 0.32 and 0.28 for before the IFAD and during the IFAD, respectively. The P_2 which measures how severe the poverty situation is, suggests that before benefiting from the IFAD, the severity of the poverty of the beneficiaries was 32 per cent and having benefited from the IFAD, the severity reduced to 28 per cent. This implies that benefiting from the IFAD has reduced the severity of poverty among the beneficiaries by 4 per cent.

The beneficiaries were further classified into three poverty levels on the bases of their income before and during the IFAD in relation to the World Bank's poverty line of US$1.9 Per day. Beneficiaries whose income falls below one-third of the annual poverty line of N346,750 i.e. 1/3(N1,040,250) were considered core poor, while those whose income falls between the 1/3 and 2/3 of the poverty line (i.e. N346,750-N693,500) were considered moderately poor. For those whose incomes were greater than the 2/3 poverty line (i.e. N693,500) were considered non-poor. This was done in line with the study of Aye and Oji (2009). The classification is shown in table 4.

Table 5: Classification of Beneficiaries by Poverty Levels

Poverty Level	Number of Beneficiaries	Percentage
Core Poor	208	60.82
Moderately Poor	112	32.75
Non-Poor	22	6.43
Total	**342**	**100.00**

Source: Author's Calculations

From Table 5, it is evident that most of the sampled beneficiaries are core poor even with the introduction of the IFAD rice value chain. The estimation reveals that 60.82% of the beneficiaries are core poor and 32.75% of the beneficiaries are moderately poor; while only 6.43% of the beneficiaries are none poor. The implication is that, the IFAD rice value chain programme has not significantly impacted on the poverty levels of the beneficiaries in the State. Though, IFAD intervention has positively impacted on the output and incomes of the beneficiaries but increase in exchange rate has dragged many beneficiaries into the poverty trap.

Furthermore, the logit regression model was estimated, and the results are presented in the following table.

Table 6: Logistic Regression Model Result

Variable	Coefficient	Std Error	Z	Probability
Edu	0.3234	0.0235	13.7617	0.0000
Fexp	-0.9346	0.3678	-2.5411	0.0351
Loan	-0.4789	0.2231	-2.1466	0.0472
Inifad	-3.1562	2.2235	-1.4195	0.0728
Cfarms	-0.7469	0.3468	-2.1537	0.0421
Intifada	-0.5117	0.2687	-1.9044	0.0582
Modep	0.3689	0.2169	1.7008	0.0651
Cons	13.6892	2.9841	4.5874	0.0000
LR chi2 (7) =	11.7982		Prob > Chi2 =	0.0289
Log Likelihood =	128.9134		Pseudo R^2 =	0.5891

Source: Author's Estimations Using STATA 13

The results of the logit regression model have shown that the level of education is positively related with the poverty level of the beneficiaries of the IFAD rice value chain. This finding negates the *a priori* expectation. Again, results of the logit regression model have indicated that, farming experience of the rice farmers is inversely related with the poverty level of the beneficiaries. This suggests that the longer a farmer in rice farming business, benefiting from the IFAD rice value chain has the probability of reducing his/her poverty level. This may in part be attributed to his/her farming skills which may result in efficient utilization of the farm inputs for enhanced productivity.

Furthermore, the amount of loan obtained under IFAD rice value chain is inversely related with the poverty levels of the beneficiaries. This may be ascribed to the fact that, increase in the amount of credit collected by the farmers under the IFAD rice value chain has the tendency of increasing the productivity of the farmers leading to increase in the income levels and consequently consumption levels of the farmers which eventually lead to increase in the standard of living. Also, the income from the IFAD rice value chain is inversely related to the poverty levels of the beneficiaries. This implies that, increase in incomes due to IFAD intervention has the likelihood of poverty reduction among the beneficiaries.

Again, the result of the model has revealed that the change in the farm size as a result of the IFAD rice value chain intervention (cfarm) is inversely related with the poverty levels of the

beneficiaries. This may be attributed to the fact that, the supply of inputs under the IFAD rice value chain has the probability of increasing the amount of land cultivated by the beneficiaries and other things being equal, this will in turn increase output and income levels of the beneficiaries; increased income of the beneficiaries presupposes increase in consumption and the standard of living of the beneficiaries.

Similarly, the interest rate charged on loans under the IFAD rice value chain programme (intifad) has a negative relationship with the poverty levels of the beneficiaries. This may be because the interest rate charged under the IFAD rice value chain is low and as such, it will not significantly increase the amount of loan that a beneficiary has to repay as loan services. This affords the beneficiaries the opportunity to use the proceeds from farming activities to enhance their consumption levels. Furthermore, the mode of payment of the IFAD loans (modep) is reversely related with the poverty status of the beneficiaries. This may be because a convenient mode of payment under the IFAD rice value chain places the beneficiaries in a better position to repay the loan and use the balance of the proceeds from the farming activities to augment their consumption levels leading to increase in their welfare. Overall, the findings are in line with the findings of Taibat, Bello, Musa & Shehu (2015) who found that, IFAD intervention has improved the living standard and reduce poverty of the beneficiaries because of the positive effect it had on their incomes, value of assets and their general well-being and livelihood of rural women in Kebbi State.

The pseudo R^2 value of 0.5891 has shown the model performs well in terms of explaining variations in the poverty levels of the beneficiaries, while LR chi2 value of 11.7982 is statistically significant with the probability value of 0.0289. This suggests that the joint effect of the explanatory variables in explaining the poverty level among the beneficiaries is robust.

7. Conclusion and Recommendations

Based on the findings, the study has concluded that, IFAD rice value chain programme has impacted positively on the output and incomes of the rice farmers who have benefited from the programme in terms of inputs, seedlings, and credit grants. The programme has the probability of reducing poverty among the beneficiary rice farmers in the study area. Thus, based on the findings of this study, the following recommendations are made to enhance the impact of IFAD/VCDP in the state.

First, government at all levels should give the programme utmost priority by regularly and timely paying counterpart fund to ensure the continuity and the sustainability of the IFAD/VCDP in the state.

Second, the programme should be upscale to more local government areas in the State to capture more farmers and processors with a view to reducing poverty in the state.

Third, to achieve the best value for money under the IFAD/VCDP in the state, the government should increase the tempo of handling the menace of farmers'/herders' crisis in the State and concerted efforts be made to develop the potential irrigation areas in the state to boost dry season farming in the State.

Lastly, IFAD should allow the beneficiaries in different locations to decide the kind of support they need in terms of machinery/equipment, seedlings, inputs, fertilizer, and others instead of restricting them to same items in all locations as their needs may differ from one location to another. Similarly, IFAD should consider including key crops like sesame seed (benniseed) soyabeans and yam in the programme in view of their commercial value both in the local and international market.

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