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Estimating the Multidimensional Poverty among Rice Producers in North Central, Nigeria

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ABSTRACT

This study investigated the multidimensional poverty among rice producers in North Central, Nigeria. A simple random sampling approach was employed. Data were collected from 200 rice growers (100 per state) through a validated questionnaire. The analysis analysesutilized were descriptive statistics, multidimensional poverty indices (MPI), Logit regression, and t-test statistics to address four objectives: describing the socio-economic and farm-specific characteristics, estimating the poverty indices, evaluating the dimensional contributions to MPI, and identifying the predictors of multidimensional poverty. The results revealed that 70.07% of rice growers are multidimensional poor, with an MPI of 0.4701, driven by deprivations in standard of living (42.4%), health (33.7%), and education (23.9%), respectively. The significant predictors of poverty include education, household size, farming experience, and food expenditure ($p < 0.05$), while age and credit access were non-significant. The t-test confirmed the rice farming's profitability, with mean returns (₦1,357,090) significantly exceeding costs (₦577,140.23) per hectare ($t = 29.52$, $p < 0.05$). These findings reject the null hypotheses that rice growers are not multidimensional poor, also that the socio-economic factors do not significantly influence poverty status, and rice farming is not profitable. The high poverty incidence underscores the need for targeted interventions addressing the living standards, health, and education, alongside enhancing access to inputs and markets to sustain profitability. Policy recommendations include improving rural infrastructure, promoting education, and supporting financial inclusion to alleviate multidimensional poverty among rice producers.

Keywords: Multidimensional Poverty, Headcount Ratio, Intensity of Poverty, Rice Producers, Logistic Regression Model, Nigeria.

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INTRODUCTION

Poverty is a multifaceted phenomenon that transcends income deprivation, encompassing a range of non-monetary deprivations that limit individuals' capabilities to achieve a dignified standard of living (Sen, 1997; Alkire & Foster, 2011). The multidimensional poverty approach, developed by Alkire and Foster (2011), provides a robust framework for understanding poverty as a composite of overlapping deprivations across dimensions such as health, education, and living standards. Unlike traditional unidimensional measures that rely solely on income or consumption thresholds, the Multidimensional Poverty Index (MPI) aggregates deprivations in multiple indicators, weighted by their relative importance, to capture both the incidence and intensity of poverty (Alkire et al., 2015). For example, a household may have sufficient income but lack access to clean water, adequate sanitation, or education, rendering it multidimensional poor. This approach is particularly relevant in developing countries like Nigeria, where poverty manifests in diverse forms, including limited access to healthcare, low educational attainment, and inadequate infrastructure (Adeoti, 2014; Abubakar, 2021). The MPI's adaptability allows researchers to tailor indicators to local contexts, such as rural agricultural communities where access to productive resources like land, irrigation, and credit is critical (Adepoju, 2018). By identifying the specific dimensions contributing to poverty, the MPI enables policymakers to design targeted interventions that address the root causes of deprivation (Alkire & Robles, 2016).

In Nigeria, multidimensional poverty is a pervasive challenge, particularly in rural areas where agriculture serves as the primary livelihood for over 60% of the population and contributes approximately 41% to the Gross Domestic Product (GDP) (National Bureau of Statistics [NBS], 2019). The North Central region, including Nasarawa and Niger States, is a key agricultural zone, yet it grapples with high levels of multidimensional poverty driven by limited access to education, healthcare, and basic infrastructure (Ogunniyi et al., 2018). According to the 2018 Nigeria Demographic and Health Survey, rural households in the North Central region face significant deprivations in electricity access, sanitation, and educational attainment, with approximately 65% of households classified as multidimensional poor (Abubakar, 2021). These deprivations are particularly acute among smallholder farmers, who constitute the majority of Nigeria's agricultural workforce but face systemic constraints such as inadequate access to inputs, poor market linkages, and vulnerability to climate variability (Aminu et al., 2022). Addressing multidimensional poverty in this context requires a nuanced understanding of how socio-economic and farm-specific factors interact to perpetuate deprivation among specific agricultural subsectors, such as rice production.

Rice production is a cornerstone of Nigeria's agricultural economy, contributing to food security, income generation, and employment, particularly in states like Nasarawa and Niger, which are major rice-producing hubs in the North Central region (FAO, 2014; Ugwuja & Adebayo, 2023). Nigeria is one of the largest rice producers in West Africa, yet it remains a net importer due to low productivity, post-harvest losses, and limited access to modern farming technologies (Ojo & Baiyegunhi, 2020). Smallholder rice farmers in Nasarawa and Niger States face numerous challenges, including inadequate irrigation facilities, limited access to credit, and high input costs, which exacerbate their economic vulnerability (Adebayo et al., 2018). These challenges are compounded by socio-economic factors such as large household sizes, low educational levels, and gender disparities, which restrict farmers' ability to escape poverty (Oyewunmi & Obayelu, 2020). Moreover, environmental risks such as erratic rainfall and flooding, prevalent in the North Central region, disproportionately affect rice farmers reliant on rainfed agriculture, further entrenching multidimensional poverty through reduced yields and income instability (Ogunniyi et al., 2017).

Recent studies have underscored the importance of examining multidimensional poverty among specific agricultural groups to inform evidence-based policy interventions. For instance, Adepoju (2018) found that multidimensional poverty among rural Nigerian

households is predominantly chronic, with education and asset ownership being the primary contributors to poverty severity. Education enhances farmers' ability to adopt productivity-enhancing technologies and access information, reducing poverty likelihood (Ojo & Baiyegunhi, 2020). Household size is a critical driver, as larger households face greater resource constraints, increasing deprivations in health and living standards (Ogunniyi et al., 2018). Access to credit and extension services also plays a pivotal role, though its impact varies depending on availability and utilization (Adebayo et al., 2018).

Similarly, Aminu et al. (2022) demonstrated that socio-demographic factors, such as age, household size, and access to extension services, significantly influence the multidimensional poverty status of arable crop farmers. However, there is a notable research gap concerning the multidimensional poverty among rice producers in Nasarawa and Niger States, despite their critical role in Nigeria's rice value chain. Existing studies on rice production in Nigeria have largely focused on productivity, value chain inefficiencies, and market access (Ugwuja & Adebayo, 2023; Ojo & Baiyegunhi, 2020), with limited attention to the multidimensional poverty profiles of rice farmers. This gap is particularly significant in Nasarawa and Niger States, where rice production is a major livelihood activity, yet farmers face intersecting deprivations that hinder sustainable development.

Despite the economic significance of rice production, there is a paucity of research focusing specifically on the multidimensional poverty dynamics of rice producers in Nasarawa and Niger States. For instance, while Ogunniyi et al. (2017) examined environmental risks and their impact on rural farmers, they did not disaggregate findings by crop type or region, leaving a gap in understanding the specific poverty profiles of rice producers. Similarly, Alkire and Robles (2016) highlighted the adaptability of the MPI for context-specific studies but noted a lack of crop-specific analyses in Nigeria's agricultural sector. This gap is critical, as rice producers face unique challenges, such as high post-harvest losses and reliance on rainfed systems, which exacerbate multidimensional poverty (Ugwuja & Adebayo, 2023). The literature also underscores the profitability of rice farming as a potential pathway out of poverty, though its impact on non-income deprivations is less clear. Ugwuja and Adebayo (2023) reported that rice farming in the North Central region is economically viable, but variability in returns due to market fluctuations and input costs limits its poverty-reducing potential. Adepoju (2018) argued that income from agriculture alone is insufficient to address multidimensional poverty unless accompanied by improvements in health, education, and living standards. This suggests a need for holistic interventions that integrate agricultural development with social services to achieve sustainable poverty reduction.

This study addresses these gaps by estimating the multidimensional poverty among rice producers in Nasarawa and Niger States, examining socio-economic and farm-specific characteristics, poverty indices, dimensional contributions, and predictors of poverty status. By applying the Alkire-Foster methodology and Logit regression, the research provides a comprehensive analysis of how deprivations in health, education, and living standards interact with socio-economic factors to perpetuate poverty among rice farmers. The findings contribute to the literature by offering crop-specific insights into multidimensional poverty, informing evidence-based policies to enhance the well-being of rice producers in Nigeria's North Central region.

Objectives of the Study

The main aim of this research was to estimate the multidimensional poverty among rice producers in Niger and Nasarawa States, Nigeria. Specifically, the objectives were:

(i) describe the farm-specific and socio-economic features of rice growers,

(ii) estimate the poverty indices among rice growers,

(iii) estimate the multidimensional poverty indices among rice growers,

(iv) evaluate the predictors affecting the multidimensional poverty status among rice growers

Hypotheses of the Study

The research was guided by the following hypotheses stated in null-form:

HO_1: The rice growers are not multidimensionally poor.

HO_2: There is no significant difference between socio-economic predictors and multidimensional poverty among rice growers

HO_3: Rice farming is not profitable in the area.

Materials and Methods

This research was carried out in North Central, Nigeria (Figure 1). The purposive sampling approach was utilized to select Niger and Nasarawa States because rice is predominantly grown in the two states. A simple random sampling approach was utilized to select 200 rice growers within the two states. The design was employed because it avoids elements of bias in selecting the respondent. Secondly, the sampling approach gives the probability for every grower have equal chance of being selected. The disadvantages of the simple random sampling approach were under-representation of certain sub-groups, time-consuming, difficulty accessing lists of the full population, the process may cost individuals a substantial amount of capital, cumbersome, sample selection bias can occur, and challenging when the population is heterogeneous and widely spread. The sample frame of rice producers approximately 400 respondents. The total sample number consists of 100 rice growers selected from each of the two states, respectively. Primary data from cross-sectional sources were utilized based on a well-planned questionnaire that was subjected to validity and reliability tests.

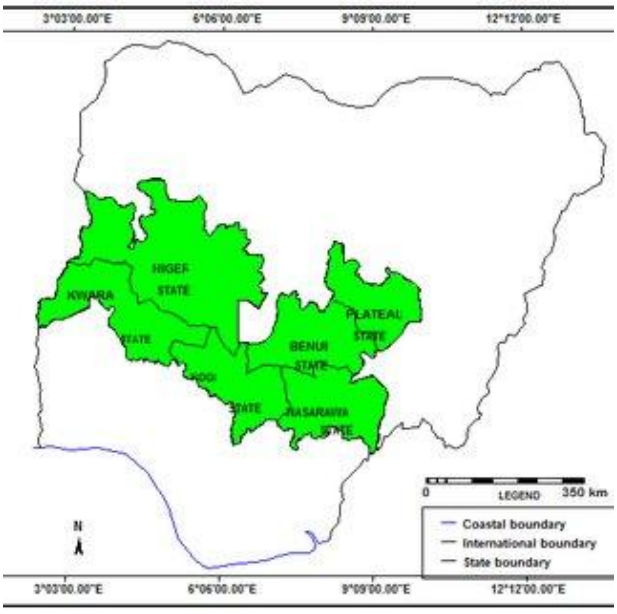

Figure 1: Map of North Central showing Niger and Nasarawa States, Nigeria

The data obtained were analyzed using descriptive statistics, headcount ratio, intensity of poverty, multidimensional poverty index, Logit regression model, and t-test statistics.

Logit Dichotomous Regression Model (PDRM)

The model following Israel and Hakim (2015) is explicitly stated as:

$$W_i = \alpha_0 + \sum_{i=1}^{k} \alpha_k X_{ij} + \cdots \alpha_n X_n + \mu_i \quad (1)$$

$$W_i = \alpha_0 + \alpha_1 X_1 + \alpha_2 X_2 + \alpha_3 X_3 + \alpha_4 X_4 + \alpha_5 X_5 + \alpha_6 X_6 + \mu_i \quad (2)$$

$$W_i = \begin{cases} 1, & Poor \\ 0, & if\ Otherwise \end{cases}$$

Where,

W_i = The Dependent Variable, (1, If Poor; 0, Otherwise)

α_0 = Constant Term

α_1 - α_6 = Regression Coefficients

X_1 = Age (Years)

X_2 = Education Level in Years

X_3 = Household Size (Number)

X_4 = Experience in Rice Farming (Years)

X_5 = Food Expenditure (Naira)

X_6 = Access to Credit (1, if the respondent has used formal credit; 0, otherwise)

μ_i= Error Term

Total Weighted Deprivation Score (C)

The weighted deprivation scores of these indicators (Table 1) are computed as:

$$C_i = w_1 I_1 + w_2 I_2 + w_3 I_3 + w_4 I_4 \dots\dots w_n I_n \dots\dots\dots (3)$$

Where, I_i= 1, if the rice growers are deprived of the indicator, and I_i= 0 otherwise

w_i = The weight attached to indicators

$$\sum_i^n w_i = 1 \dots\dots\dots\dots\dots\dots\dots\dots\dots (4)$$

A poverty cut-off (k) It was defined in order to identify those rice growers who are multidimensional poor. Applying Alkire and Foster's (2011) method, the (k) was set at 0.33 but could also take values of 0.5 and 0.7

Headcount Ratio

The headcount ratio is the proportion of the population who are multidimensional poor. The headcount ratio, according to Bidyadhar and Sanjay (2015), is stated as:

$$H = \frac{n}{t} \dots\dots\dots\dots\dots (5)$$

Where,

H = Headcount Ratio

n = Number of Multidimensionally Poor

t = The Total Population

The Intensity of Poverty

The breadth of deprivation captures the average weighted count of deprivations experienced by the multidimensional poor. The intensity of poverty (A) is computed following Olarinde et al. (2020) as:

$$A = \frac{\sum_i^n C}{n} \dots\dots\dots (6)$$

Where,

C = The Total Weighted Deprivations Experienced by the Poor

n = Number of Multidimensionally Poor

The Multidimensional Poverty Index (MPI)

The multidimensional poverty index (MPI) is the product of the headcount ratio (H) and the intensity of poverty (A). It is also referred to as the adjusted headcount ratio. The total weighted deprivation score ranges from 0 to 1, and a household was identified as non-poor if the weighted indicators is < 0.33, multidimensional poor if the weighted indicator of poverty ranges from > 0.33 to < 0.50, but severely poor of the multidimensional poverty index is ≥ to 0.50 of the weighted indicators. The Multidimensional Poverty Index, following Rukwe et al. (2023), is computed as:

$$MPI = H \times A \dots\dots\dots\dots\dots (7)$$

In evaluating multidimensional poverty, three dimensions of poverty have been selected, namely, health, education, and living standards. The three dimensions are made up of 10 indicators. People are considered multidimensional poor if they live in a household that is deprived in one-third or more of the ten indicators. Each indicator is equally weighted within its dimension. The components, indicators, and the weight for each indicator are shown in Table 1.

Indicator Weights

The Multidimensional Poverty Index (MPI) identifies overlapping deprivations at the household level across the

three dimensions. The MPI weights the normative assessment that achievements in education, health, and living standards are equally weighted. Having equal weights across the dimensions is considered to ease the interpretations of the index for policy purposes (Alkire and Santos, 2013). The weights are equally distributed across dimensions (1/3 each), and within dimensions across indicators (Indicators are equally weighted within their corresponding dimensions) as shown in Table 1.

Table 1. Components, Indicators, and Weights Used in Estimating the Multidimensional Poverty Index (MPI)

S/N	Dimension	Indicators	Deprivation Cut-Off	Weights
1	Education	Years of Schooling	A household is deprived if it is not an eligible household The member has completed six years of schooling	$\frac{1}{6}$
		School Attendance	A household is deprived if any school-aged child is not attending school up to the age at which He/she would complete class 6	$\frac{1}{6}$
2	Health	Nutrition	A child is considered deprived if there is he/she cannot eat three times a day throughout a year.	$\frac{1}{6}$
3	Standard of Living	Electricity	A household is deprived if it does not have access to electricity.	$\frac{1}{18}$
		Cooking Fuel	A household is deprived if it cooks using solid fuel such as dung, agricultural crop, shrubs, wood, charcoal, or coal.	$\frac{1}{18}$
		Sanitation	A household is deprived if it does not have access to improved sanitation facilities.	$\frac{1}{18}$
		Drinking Water	A household is deprived if it does not have access to improved drinking water.	$\frac{1}{18}$
		Housing	A household is deprived if it has inadequate housing materials for its roof, walls, or floor. If households are living in a non-corrugated, uncemented, mud or thatched floor.	$\frac{1}{18}$
		Assets	A household is deprived if it does not own more than one of: radio, television, bicycle, telephone, computer, refrigerator, or car. etc	$\frac{1}{18}$

Source: UNDP (2024)

The t-Test of Difference Between Means

This is stated thus:

$$t = \frac{\overline{X}_1 - \overline{X}_2}{\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}} \qquad (8)$$

Where,

$\overline{X}_1$= Mean of Values in Group 1

$\overline{X}_2$= Mean of Values in Group 2

s_1^2, s_2^2 = Standard Deviation in Group 1 and Group 2

$n_1 n_2$= Number of Observations in Group 1 and Group 2

Results and Discussion

The Multidimensional Poverty Indicators and Socio-Economic Features of Rice Growers

Table 2 presents the socio-economic and farm-specific characteristics of rice growers. The mean household size of 12 members (SD = 4.21) indicated large households, which is consistent with rural Nigerian agricultural communities where extended family structures are common (Adepoju, 2018). Large household sizes can strain resources, increasing the likelihood of multidimensional poverty due to higher dependency ratios and increased expenditure on food and basic needs (Ogunniyi et al., 2018). The average age of respondents was 41 years (SD = 9.69), suggesting that rice farming is dominated by middle-aged individuals who are likely in their productive years but may face constraints in adopting modern technologies due to limited education (mean = 6.02 years, SD = 2.91). This low educational attainment aligns with the findings of Aminu et al. (2022), who noted that limited education among Nigerian farmers restricted access to information and innovation, perpetuating poverty. The mean farming experience of 12 years (SD = 5.64) indicated considerable expertise, which could enhance productivity but may not translate to poverty reduction without access to complementary resources like credit (Ojo & Baiyegunhi, 2020). The mean food expenditure (0.351, SD = 0.09) suggested constrained financial resources consuming a significant portion of income, a common feature among multidimensional poor households (Olarinde et al., 2020). The poverty dimensions (education, health, and standard of living) have a mean deprivation score of 0.56 (SD = 0.10), indicating significant deprivations across these dimensions.

Table 2. The Multidimensional Poverty Indicators and Socio-Economic Features of Rice Growers

Variables	Description of Variables	Mean	SD
Household Size	Number of family members provided for by the household head	12	4.21
Age	Age of the respondent in years	41	9.69
Education	Number of years spent in school	6.02	2.91
Experience	Number of years spent in rice farming	12	5.64
Food Expenditure	Total amount spent on food items in Naira	0.351	0.09
Poverty Dimensions	$\frac{1}{3}$ = Education, $\frac{1}{3}$ = Health, $\frac{1}{3}$ = Standard of Living	0.56	0.10

Source: Field Survey (2024), SD-Standard Deviation

Table 3 presents the multidimensional poverty indicators and socio-economic characteristics of rice growers. The gender distribution showed that 79% of respondents are male, reflecting the male-dominated nature of rice farming in Nigeria, where men typically control productive resources like land and credit (Oyewunmi & Obayelu, 2020). The mean marital status indicated that 81% of respondents are married, which may influence household responsibilities and resource allocation, further impacting poverty status (Abubakar, 2021). Approximately 31% of respondents have access to formal credit, underscoring the limited financial inclusion among rice farmers, a key barrier to escaping multidimensional poverty (Adebayo et al., 2018). The cash savings (51%) suggested constrained financial resources, with food expenditure consuming a significant portion of income, a common feature among multidimensionally poor households (Olarinde et al., 2020). The overall poverty status suggested that 71% of rice growers are multidimensional poor, aligning with national estimates that highlight the prevalence of multidimensional poverty in Nigeria's rural areas (NBS, 2019). These findings addressed the first objective of describing the socio-economic and farm-specific features of rice growers and provided a baseline for understanding the multidimensional poverty profile in the study area.

Table 3. The Multidimensional Poverty Indicators and Socio-Economic Characteristics of Rice Farmers (Categorical)

Variables	Frequency	Percentage
Gender		
Male	158	79.00
Female	42	21.00
Marital Status		
Married	162	81.00
Single	28	14.00
Divorced	10	5.00
Access to Formal Credit		
Yes	62	31.00
No	138	69.00
Cash Savings		
Yes	102	51.00
No	98	49.00
Poverty Status		
Poor	142	71.00
Non-Poor	58	29.00
Total	200	100.00

Source: Field Survey (2024)

The Multidimensional Poverty Status of Rice Producers

Table 4 presents the multidimensional poverty indices (MPI) of rice producers, revealing a high prevalence of multidimensional poverty. The multidimensional headcount ratio (H = 0.7007) indicated that 70.07% of rice growers are multidimensional poor, rejecting the null hypothesis that rice growers are not multidimensionally poor. This high incidence of poverty is consistent with studies in rural Nigeria, where multidimensional poverty affected over 65% of rural households, driven by deprivations in health, education, and living standards (Abubakar, 2021; Adepoju, 2018). The intensity of poverty (A = 0.6710) showed that, on average, poor rice growers experience deprivations in 67.1% of the weighted indicators, reflecting the severity of their poverty. The MPI, calculated as the product of H and A (MPI = 0.4701), indicated a significant poverty burden, comparable to findings by Alkire et al. (2015), who reported high MPI values in Nigeria's North Central region.

The breakdown showed that 70.07% of respondents are multidimensionally poor, while 29.93% are non-poor, highlighting the heterogeneity in poverty status among rice growers. This aligns with the studies of Ogunniyi et al. (2018), who noted that rural farmers in Nigeria face varying degrees of deprivation depending on access to resources and socio-economic factors. The MPI results addressed the second and third objectives of estimating poverty indices and multidimensional poverty indices, confirming the utility of the Alkire-Foster methodology in capturing the breadth and intensity of poverty among rice producers (Alkire & Foster, 2011). The high poverty incidence suggests that interventions targeting rice farmers must address multiple dimensions simultaneously to achieve sustainable poverty reduction.

Table 4. The Multidimensional Poverty Indices of Rice Growers

Variables	Value
Multidimensional Headcount Ratio (H)	0.7007
Intensity of Poverty (A)	0.6710
Multidimensional Poverty Index (MPI)	0.4701
Multidimensional Poor	70.07%
Multidimensional Non Poor	29.93%

Source: Field Survey (2024)

The Contributions of Dimensions to the Multidimensional Poverty Index

Table 5 illustrates the contributions of the three poverty dimensions—education, health, and standard of living—to the MPI. The standard of living dimension contributed the most (42.4%), followed by health (33.7%) and education (23.9%). The dominant contribution of standard of living aligns with findings by Rukwe et al. (2023), who identified deprivations in electricity, sanitation, drinking water, housing, and assets as major drivers of multidimensional poverty in rural Nigeria. The high contribution of standard of living is likely due to the lack of access to electricity (a key indicator) and poor housing conditions, which are prevalent in Nasarawa and Niger States (Abubakar, 2021). The significant

contribution of health (33.7%) reflects deprivations in nutrition and child mortality, which is consistent with the work of Olarinde et al. (2020), who noted that rural households in Nigeria often face challenges in accessing adequate nutrition due to low agricultural productivity and high food prices.

Education's contribution (23.9%) is notable but lower, suggesting that while low educational attainment is a concern, it is less severe compared to living standards and health deprivations. This finding corroborates the studies of Adepoju (2018), who found that education contributes less to MPI in rural Nigeria compared to other dimensions but remains critical for long-term poverty alleviation. These results address the third objective of evaluating the contributions of dimensions to the MPI, providing insights into the specific areas where interventions can have the greatest impact. For instance, improving access to electricity and sanitation could significantly reduce the standard of living deprivation, while nutrition programs could address health-related poverty.

Table 5. The Contributions of Dimensions to the Multidimensional Poverty Index

Variables	Percentage
Education	23.9
Health	33.7
Standard of Living	42.4

Source: Field Survey (2024)

Factors Affecting Multidimensional Poverty Status among Rice Producers

Table 6 presents the results of the Logit regression model, which evaluated the predictors of multidimensional poverty status among rice producers, addressing the fourth objective and the second null hypothesis that there is no significant difference between socio-economic predictors and multidimensional poverty. The model is statistically significant ($\chi^2(6) = 67.38$, $p < 0.01$), with a pseudo-R^2 of 0.7202, indicating a good fit. Four variables—education, household size, experience in rice farming, and food expenditure—are significant predictors of multidimensional poverty status at various levels ($p < 0.01$ or $p < 0.05$).

The education variable (coefficient = 0.2290, $p < 0.01$) is highly significant, indicating that higher educational attainment reduces the likelihood of being multidimensionally poor. This aligns with the research conducted by Aminu et al. (2022), who found that education enhances farmers' ability to adopt productivity-enhancing technologies and access information, thereby reducing poverty. Household size (coefficient = 0.0460, $p < 0.05$) is positively associated with poverty, suggesting that larger households face greater resource constraints, increasing deprivation (Ogunniyi et al., 2018). Experience in rice farming (coefficient = 0.0480, $p < 0.01$) has a positive effect, indicating that more experienced farmers are less likely to be poor, possibly due to better farm management practices (Ojo & Baiyegunhi, 2020). Food expenditure (coefficient = 0.1620, $p < 0.01$) is also significant, with higher expenditure associated with reduced poverty, as it reflects greater household resources (Olarinde et al., 2020).

Age (coefficient = 0.0981, $p = 0.921$) and access to credit (coefficient = 0.0270, $p = 0.728$) are not significant, suggesting that these factors do not strongly influence multidimensional poverty in this context. The insignificance of credit access is surprising, given its importance in other studies (Adebayo et al., 2018), and may reflect limited utilization or accessibility of formal credit among rice farmers. These findings reject the second null hypothesis, confirming that socio-economic predictors significantly influence multidimensional poverty status, and provide actionable insights for policy interventions targeting education and household size management.

Table 6. The MLEs (Maximum Likelihood Estimates) of the Logit Regression Model

Variables	Parameters	Coefficient	Standard Error	$P > \|Z\|$
Constant	α_0	2.705***	0.3920	0.000
Age	α_1	0.0981	0.1001	0.921
Education	α_2	0.2290***	0.0401	0.000
Household Size	α_3	0.0460**	0.0455	0.895
Experience	α_4	0.0480***	0.0073	0.000
Food Expenditure	α_5	0.1620***	0.0253	0.000
Access to Credit	α_6	0.0270	0.0268	0.728
Diagnostic Statistics				
LR$_{\chi^2}$ (6)	67.38***			
Pseudo R^2	0.7202			
LLF (Log Likelihood)	-136.90			
Prob $>_{\chi^2}$	0.00000***			

Source: Field Survey (2024),
*Significant at ($P < 0.10$)., **Significant at ($P < 0.05$)***Significant at ($P < 0.01$).

The t-Test of Difference Between Costs and Returns in Rice Farming per Hectare

Table 7 presents the t-test results comparing costs and returns in rice farming per hectare, addressing the third null hypothesis that rice farming is not profitable in the study area. The mean cost of rice production is ₦577,140.23 (SD = ₦304,804.51), while the mean return is ₦1,357,090 (SD = ₦678,428.85). The t-calculated value (29.52) exceeds the t-table value (1.96) at the 5% significance level, rejecting the null hypothesis and confirming that rice farming is profitable in Nasarawa and Niger States. The substantial difference between returns and costs indicated a positive net return, and is consistent with the studies of Ugwuja and Adebayo (2023), who reported that rice farming is a viable income-generating activity in Nigeria's North Central region when farmers have access to adequate inputs and markets. However, the high standard deviations suggest variability in costs and returns, likely due to differences in access to irrigation, inputs, and market prices (Ojo & Baiyegunhi, 2020). This variability underscores the need for interventions to stabilize input costs and improve market access to ensure consistent profitability. The profitability of rice farming contrasts with the high multidimensional poverty incidence (Table 4), suggesting that while rice farming generates income, it does not necessarily translate to reductions in non-income deprivations, such as health and living standards (Adepoju, 2018). These findings highlight the importance of addressing multidimensional poverty holistically, beyond income-focused interventions.

Table 7. The t-Test of Difference Between Costs and Returns in Rice Farming per Hectare

Variable	Estimates (Number)
Costs	577,140.23
Returns	1,357,090
Standard Deviation Cost	304,804.51
Standard Deviation Returns	678,428.85
t-Calculated	29.52
t-Table	1.96

Source: Field Survey (2024)

Conclusion

The study's findings lead to the rejection of all three null hypotheses, providing critical insights into the multidimensional poverty dynamics among rice producers in Nasarawa and Niger States, Nigeria. First, the hypothesis that rice growers are not multidimensionally poor is rejected, as 70.07% of respondents are multidimensionally poor, with an MPI of 0.4701, driven by significant deprivations in standard of living (42.4%), health (33.7%), and education (23.9%). This confirms the pervasive nature of non-income

deprivations among rice farmers, aligning with national trends of high rural poverty (Abubakar, 2021). Second, the hypothesis that there is no significant difference between socio-economic predictors and multidimensional poverty is rejected, as education, household size, farming experience, and food expenditure significantly influence poverty status ($p < 0.05$), highlighting the role of socio-economic factors in shaping poverty outcomes (Aminu et al., 2022). Third, the hypothesis that rice farming is not profitable is rejected, with a significant difference between returns (₦1,357,090) and costs (₦577,140.23) per hectare ($t = 29.52$, $p < 0.05$), indicating economic viability despite high variability (Ugwuja & Adebayo, 2023). These findings underscore the need for integrated interventions addressing infrastructure, health, and education, alongside agricultural support to enhance profitability and reduce multidimensional poverty. By targeting the specific dimensions and predictors identified, policymakers can develop evidence-based strategies to improve the well-being of rice producers in Nigeria's North Central region. The following recommendations were made based on the findings.

(i) Enhance Rural Infrastructure: Invest in electricity, sanitation, and clean water facilities in Nasarawa and Niger States to address the 42.4% contribution of standard of living to multidimensional poverty, improving living conditions, and reducing deprivations.

(ii) Promote Educational Access: Expand access to formal education for rice farmers and their households, as education significantly reduces poverty likelihood ($p < 0.01$), enhancing productivity and resource management.

(iii) Improve Financial Inclusion: Strengthen access to formal credit through microfinance and cooperative schemes, addressing the non-significant impact of credit ($p = 0.728$) to enable investments in inputs and technologies.

(iv) Address Health Deprivations: Implement nutrition and healthcare programs targeting the 33.7% health deprivation contribution, focusing on reducing malnutrition and child mortality among rice-farming households.

(v) Stabilize Agricultural Returns: Develop market linkages and storage facilities to reduce variability in rice farming returns, ensuring consistent profitability and supporting income-based poverty reduction.

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تقدير الفقر متعدد الأبعاد بين منتجي الأرز في شمال وسط نيجيريا

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ملخص

هدفت هذه الدراسة إلى بحث الفقر متعدد الأبعاد بين منتجي الأرز في شمال وسط نيجيريا. استُخدم أسلوب العينة العشوائية البسيطة. جُمعت البيانات من 200 مزرعة أرز (100 مزارع من كل ولاية) من خلال استبانة مُدقَّقة. استُخدمت في التحليل الإحصاءات الوصفية، ومؤشرات الفقر متعدد الأبعاد، وتحليل الانحدار اللوجستي، واختبار t الإحصائي لتحقيق أربعة أهداف: وصف الخصائص الاجتماعية والاقتصادية والخاصة بالمزارع، وتقدير مؤشرات الفقر، وتقييم مساهمات الأبعاد في مؤشر الفقر متعدد الأبعاد، وتحديد العوامل المؤثرة في الفقر متعدد الأبعاد. وكشفت النتائج أن 70.07% من مزارعي الأرز يعانون من فقر متعدد الأبعاد، حيث بلغ مؤشر الفقر متعدد الأبعاد لديهم مدفوعا بانخفاض 0.4701، مستوى المعيشة (42.4%)، والصحة (33.7%)، والتعليم (23.9%) على التوالي. وتشمل العوامل المؤثرة الهامة في الفقر: التعليم، وحجم الأسرة، والخبرة الزراعية، والإنفاق على الغذاء ($p < 0.05$)، بينما لم يكن للعمر والحصول على الائتمان تأثير يُذكر. أكد اختبار t ربحية زراعة الأرز، حيث تجاوز متوسط العائدات (1,357,090 نايرا) التكاليف (577,140.23 نايرا) للهكتار الواحد بشكل ملحوظ ($t = 29.52$، $p < 0.05$). وترفض هذه النتائج الفرضيات الصفرية التي تنص على أن مزارعي الأرز ليسوا فقراء متعددي الأبعاد، وأن العوامل الاجتماعية والاقتصادية لا تؤثر بشكل كبير على وضع الفقر، وأن زراعة الأرز غير مربحة. ويؤكد ارتفاع معدل الفقر على الحاجة إلى تدخلات موجهة تعالج مستويات المعيشة والصحة والتعليم، إلى جانب تعزيز الوصول إلى المدخلات والأسواق لضمان استدامة الربحية. وتشمل التوصيات السياسية تحسين البنية التحتية الريفية، وتعزيز التعليم، ودعم الشمول المالي لتخفيف حدة الفقر متعدد الأبعاد بين منتجي الأرز.

الكلمات الدالة: الفقر متعدد الأبعاد، نسبة عدد الفقراء، شدة الفقر، منتجو الأرز، نموذج الانحدار اللوجستي، نيجيريا.

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