The Economic Livelihood Effect of West Africa Agricultural Productivity Program: A Study of Beneficiary Households in North Central Nigeria

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Abstract
The study evaluated the impact of the West Africa Agricultural Productivity Program (WAAPP) on the economic livelihoods of beneficiaries in the North Central region of Nigeria. There are six states in the North Central geopolitical zone in Nigeria; however, Plateau, Benue, Kwara and Niger have benefited from WAAPP. In this study, only Plateau, FCT and Benue plus FCT were evaluated. Using purposive sampling, the study targeted a population of 216,701 WAAPP beneficiaries across the selected states, from which a sample size of 615 was determined using a survey sample size calculator. Data were analysed using descriptive statistics and a probit regression model. The study revealed that the WAAPP program significantly mitigated poverty in North Central Nigeria by transitioning farmers from traditional practices to modern, technology-driven systems. The drivers of this arise from a transformative leap in labour productivity, increasing output per man-hour and a substantial economic shift, with the increase in annual incomes of beneficiaries. The study concludes that WAAPP has made a meaningful contribution to productivity-led poverty reduction, with lasting benefits when income growth, knowledge transfer, and market integration are jointly strengthened.

Keywords: *Beneficiary Households; Economic Livelihood, Probit Model, North Central, WAAPP*

1. Introduction

Poverty remains one of the most persistent development challenges in Nigeria, with a disproportionate burden borne by rural populations whose livelihoods are closely tied to agriculture. Globally, about 80 percent of the extreme poor reside in rural areas and depend largely on agriculture for survival (United Nations Development Programme [UNDP], 2022; Tyozenda & Ahemen, 2025). In Nigeria, the situation is particularly severe, as over 60 percent of the population experiences multidimensional poverty, with rural communities accounting for the majority of the poor (National Bureau of Statistics [NBS], 2022). These households rely heavily on smallholder farming, yet their incomes remain low, unstable, and insufficient to support basic welfare needs such as nutrition, healthcare, and education (Alkire & Deneulin, 2009; World Bank, 2018).

Agriculture occupies a central position in Nigeria's development framework, contributing significantly to employment and livelihood creation. The sector provides income, food, and employment opportunities for a large share of the population, particularly the poor (World Bank, 2009). However, despite its importance, agricultural productivity and income generation have remained below potential due to structural constraints such as limited access to improved inputs, weak extension services, poor infrastructure, and inadequate financing (Doki & Abu, 2018; Hassan et al., 2019). As a result, many rural households remain trapped in

a cycle of low productivity and persistent poverty. In response to these challenges, regional and international development efforts have increasingly focused on agriculture as a pathway to poverty reduction. One such intervention is the West Africa Agricultural Productivity Programme (WAAPP), initiated under the ECOWAS framework to promote agricultural innovation, improve technology dissemination, and enhance farmers' productivity across participating countries (Kolo, 2012; CORAF/WECARD, 2012). In Nigeria, WAAPP was introduced in 2012 with a focus on improving farmers' access to improved seeds, inputs, training, and extension services, with the ultimate goal of enhancing livelihoods and reducing poverty among beneficiaries (WAAPP, 2020).

While the programme was designed to address key constraints facing rural farmers, the extent to which it has translated into meaningful poverty reduction remains an empirical question. Despite significant investments and implementation efforts, rural poverty continues to persist, raising concerns about whether such interventions have effectively improved household welfare or merely provided short-term support. Evidence suggests that access to improved technologies and inputs does not always guarantee improved livelihoods, particularly where adoption is uneven or institutional bottlenecks limit programme reach. Moreover, past agricultural programmes in Nigeria have often produced limited or short-lived impacts, with benefits dissipating after programme completion. This raises critical questions regarding the sustainability and effectiveness of WAAPP. Has the programme significantly reduced poverty among its beneficiaries? Has it improved income levels in a sustained manner, or has it followed the pattern of earlier interventions with limited long-term impact?

Given these concerns, there is a clear need for a rigorous empirical assessment of WAAPP's contribution to poverty reduction, particularly in North Central Nigeria where agriculture remains a dominant economic activity. This study therefore seeks to examine the extent to which WAAPP has influenced the poverty status of its beneficiaries, providing evidence on whether agricultural productivity interventions can serve as a reliable pathway for improving rural livelihoods and reducing poverty.

2. Literature Review

2.1 Conceptual Clarification

This section dwell on the conceptual clarifications. The West African Agricultural Productivity Programme, commonly known as WAAPP, can be thought of as a regional response to some of West Africa's most pressing challenges: low agricultural productivity, food insecurity, and slow economic growth. It was established by the Economic Community of West African States (ECOWAS) with significant funding from the World Bank, and its reach now extends across multiple countries in the region (World Bank, 2020). At its heart, WAAPP is about strengthening the systems that support farmers. This means investing in agricultural research, improving extension services, and making sure that improved crop varieties and farming techniques actually reach the people who need them (WAAPP, 2019). It's not just about developing new technologies in isolation it's about creating a pipeline that moves innovation from the lab to the field.

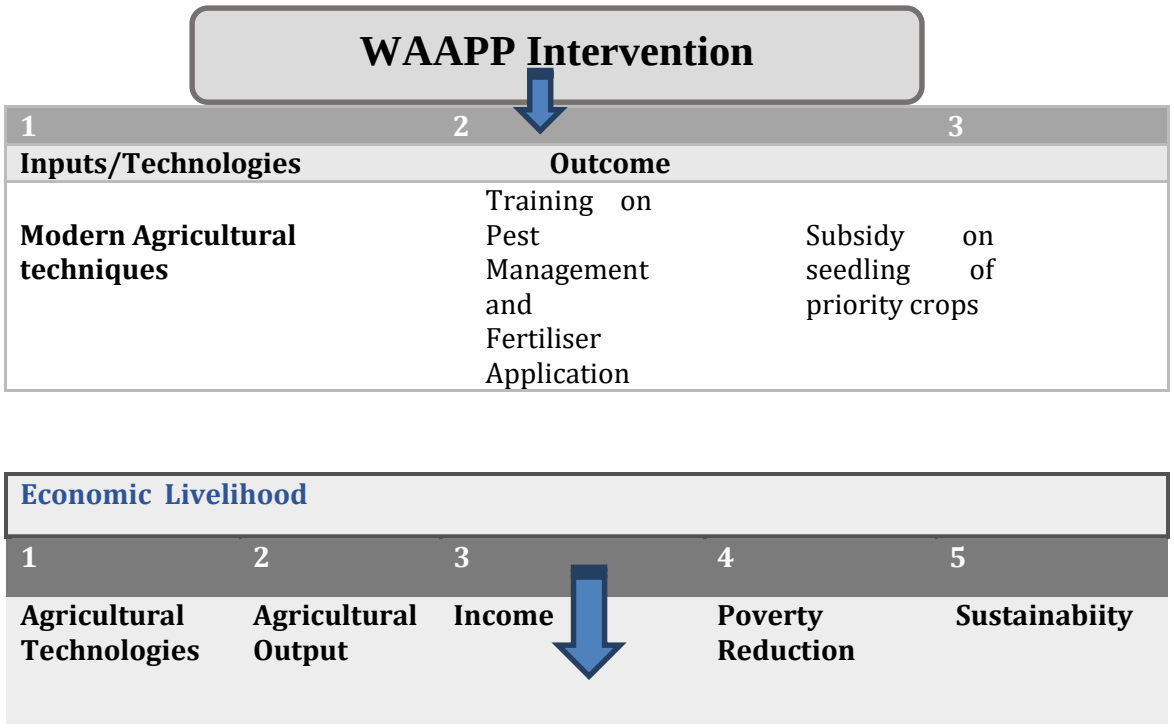
One of the programme's notable initiatives in Nigeria was community-based seed multiplication. The idea was to help rural farmers become more self-sufficient when it comes to seeds. WAAPP-Nigeria invested in producing and supplying foundation seeds for key crops such as cassava, maize, rice, sorghum, and yam to Agricultural Development Programmes (ADPs) across 24 states. Ultimately, WAAPP's development objective aligns with the Country

Assistance Strategies (CAS) of ECOWAS member states. These strategies recognize that increasing agricultural production and fostering regional integration are essential tools for promoting shared growth and reducing poverty. By tackling common agricultural and environmental challenges, WAAPP aims to contribute to a more food-secure and economically resilient West Africa. For the purpose of this study, WAAPP can be understood as a regional initiative led by ECOWAS with primary funding from the World Bank—that has taken root in Nigeria's North Central region. Its mission in this context remains consistent with its broader objectives: to boost agricultural productivity, enhance food security, and promote sustainable farming practices across the states of the region. This understanding aligns with the perspectives of the funding institutions and other key stakeholders (World Bank, 2020; WAAPP, 2019; Girei et al., 2017; FAO, 2021).

Livelihoods on the other hand has been defined as the combination of capabilities, assets both material and social and activities that people draw on to make a living (Conway and Chambers, 1991). This definition emphasizes that livelihoods extend beyond mere income generation to encompass the full range of resources and strategies people utilize to sustain their well-being. Handicap International (2017) on the other hand offers a more straightforward definition tha economic livelihood is simply the methods and means people use to make a living. As Islam and Ryan (2016) point out, the concept revolves around resources land, crops, food, knowledge, finances, social relationships and how these connect with the political, economic, and socio-cultural fabric of a community. The UN-ESCAP (2008) echoes this, emphasizing that livelihoods are not static; they involve the ability to cope with unexpected events while strengthening future capabilities. Building this, Scoones (2023), expanded the concept by arguing that economic livelihoods extend beyond income generation to include reducing vulnerability, improving overall well-being, and ensuring sustainability across generations. Adger et al. (2023) defined economic livelihood as the capacity of individuals and communities to pursue their livelihood strategies while adapting to climate-related risks and transitioning towards low-carbon practices. Earlier, Chamber and Conway, (1992) conceptualized economic livelihood as the capabilities, asset (stores, resources, claims and access) and activities required for a means of living.

In the context of this study, economic livelihood referred to how individuals or households sustain themselves, encompassing their economic, social, and environmental well-being. It includes the capabilities, assets, and activities that enable them to meet basic needs, improve their quality of life, and achieve their aspirations, all of which are deeply influenced by income levels, poverty dynamics, and productive output. Poverty, for instance, constrains access to resources and opportunities, limiting livelihood choices, while income determines the ability to invest in assets or adopt new technologies that enhance productivity. Output, whether agricultural or otherwise, reflects the tangible results of livelihood strategies, directly affecting economic resilience. Meanwhile, the adoption of technical innovations - such as improved farming techniques or digital tools - can amplify productivity and income, but its accessibility often hinges on socioeconomic disparities. Sustainability ensures that these livelihood strategies do not deplete environmental or social resources, safeguarding long-term well-being. These interconnected factors - poverty, income, output, technical adoption, and sustainability - is essential for measuring economic livelihood accurately.

The conceptual Framework of WAAPP and Economic Livelihood in North Central region of Nigeria.



Source: *Author's Construction*
Figure 1 Schema Diagram of WAAPP and Economic Livelihood

The CIPP model was developed by Daniel Leroy Stufflebeam and his colleagues in the 1960s as a practical way to assess the value of programs. Rather than looking at outcomes alone, it encourages evaluators and stakeholders to ask meaningful questions at every stage before a project begins, while it's unfolding, and after it ends. In essence, it frames evaluation as a careful and systematic inquiry into a program's true worth (Stufflebeam, 2003). Each part of the model serves a distinct purpose. Context evaluation, for instance, helps identify the needs and opportunities present in a given environment (Stufflebeam & Shinkfield, 2007). Input evaluation, on the other hand, focuses on the resources available to achieve program goals whether human, social, physical, or natural (Khuwaja, 2001). Process evaluation then examines whether those resources are being used effectively and in ways that support the program's objectives. Finally, product evaluation looks at the results: it measures and interprets what has been achieved, considering not just outcomes, but their significance and overall value. This study draws on the CIPP model as a guiding framework to assess how WAAPP has contributed to improving economic livelihoods in Nigeria's North Central region.

2.2 Theoretical Framework

This study is anchored on the traditional production theory, which explains agricultural output as a function of inputs such as land, labour, and capital. However, the rigid assumptions of the theory, such as perfect competition and static technology, fail to account for the real-world constraints in North Central Nigeria, including market imperfections, institutional weaknesses, and technological gaps. While the theory posits that output increases with input optimisation, the agricultural sector in the study area remains largely subsistence-based due

to low capital formation, poor infrastructure, and limited access to modern technology, reinforcing the vicious cycle of poverty (Nurkse, 1953). This cycle perpetuates low productivity, minimal savings, and stagnant investment, trapping smallholder farmer households in persistent poverty with little surplus for capital accumulation, a condition directly measured in this study by the poverty status (POV) of WAAPP beneficiaries.

Despite these challenges, structural changes have emerged, including gradual shifts from traditional tools to hybrid seeds, mechanization, and agrochemicals driven by initiatives like WAAPP, Agricultural Development Programmes (ADPs), and research institutions. Yet, critics argue that technological adoption remains uneven, hindered by policy inconsistencies, unequal resource distribution, and weak extension services. The supply-side theory further highlights how low productivity restricts capital formation, but it overlooks structural barriers such as land tenure systems (predominantly inherited and family land in this study), credit inaccessibility, and global market pressures that constrain farmers' upward mobility.

To assess the impact of interventions like WAAPP on economic livelihood, this study employs the CIPP (Context, Input, Process, Product) evaluation model, which systematically examines context, inputs, processes, and outcomes. Within this framework, poverty status (POV) serves as the core product indicator, while WAAPP's provision of improved inputs (INPW), agricultural technologies (TEC), and assets (ASS) represent key inputs. The process dimension is captured through beneficiaries' access to extension services and their adoption behaviours, and the context is defined by the socio-economic characteristics of farming households in North Central Nigeria (e.g., age, farming experience, household size). Nevertheless, integrating production theory, the vicious cycle of poverty, and the CIPP model provides a multi-dimensional approach to evaluate how improved technology via WAAPP can disrupt poverty traps, boost output, and enhance farmers' livelihoods.

2.3 Empirical Review

Several studies establish that agricultural funding and productivity play a central role in improving welfare outcomes. For instance, Gomina et al. (2024), using stratified random sampling and Spearman’s rank correlation, found a strong positive relationship between agricultural funding and both poverty reduction and economic growth, suggesting that targeted financial support in agriculture can translate into improved livelihoods. Similarly, Umar, Rotimi, and Kolawole (2023), employing an ARDL framework after confirming cointegration, showed that increases in agricultural output significantly improve per capita income, reinforcing the idea that productivity gains are a key pathway through which agriculture affects welfare.

This positive relationship is further supported by time-series and macro-level studies byOyakhilomen and Zibah (2014) and Anowor, Ukweni, and Ezekwem (2013) who found that agricultural production exerts a strong and significant influence on economic growth and livelihood improvement. In the same vein, Oboh and Adeleke (2016), using the Engle–Granger approach, highlighted agriculture’s capacity for job creation and inclusive growth. However, not all findings are uniformly positive. Studies by Onuoha, Sakanko, Baba, and Adesanya (2023) reported that agricultural value chains had an inverse effect on economic livelihood in both the short and long run, suggesting that structural inefficiencies within value chains can limit the welfare benefits of agricultural expansion.

At the micro and household level, evidence points to the critical role of technology, inputs, and productivity in shaping welfare outcomes. Ainembabazi et al. (2018), using panel household data and quantile treatment effects, found that agricultural technologies

significantly reduce the probability of being poor. Similarly, Amare et al. (2016), using nationally representative Nigerian panel data, showed that agricultural productivity is positively linked to household consumption growth, although this effect is stronger among non-poor households. Iheke and Arikaibe (2012) further demonstrated that households engaged in agricultural intensification are less likely to be poor, while Etim and Udoh (2013) identified farm income, farm size, and access to credit as key drivers of improved livelihoods.

Beyond productivity, institutional and structural factors also shape outcomes. Abro, Alemu, and Hanjra (2014) emphasised that agricultural growth alone is insufficient for poverty reduction, advocating a "growth-plus" approach that combines productivity improvements with asset protection and market access. Similarly, Benfica, Cunguara, and Thurlow (2018), using an economy-wide simulation model, found that increased agricultural spending does not automatically translate into national growth targets, highlighting the importance of efficiency and complementary policies. At the community level, Nnadi et al. (2013) showed that extension services play a vital role in improving livelihoods by enhancing farmer knowledge and participation in high-income activities. Akinbile, Oyebode, and Sobiye (2012) further revealed that different extension models yield varied outcomes, with some improving living standards and others enhancing access to finance. Gava et al. (2021), using a mixed-methods approach, found that cooperatives improve farmers' working conditions and market access, although broader structural factors such as climate variability, household characteristics, and market conditions continue to influence poverty outcomes.

Despite this rich body of literature, most studies focus either on aggregate agricultural output, general productivity, or broad rural development outcomes, with limited attention to programme-specific interventions such as WAAPP and their direct impact on beneficiaries' livelihoods. In particular, there is insufficient empirical evidence linking WAAPP's integrated components such as input provision, technology transfer, and extension services to measurable changes in poverty and economic welfare at the household level, especially in North Central Nigeria. This study seeks to address this gap by providing a focused, programme-based evaluation of WAAPP's contribution to poverty reduction and livelihood improvement among its beneficiaries.

3. Methodology

3.1 Research Design

The study adopted a cross-sectional survey design to examine the impact of the West Africa Agricultural Productivity Programme (WAAPP) on beneficiaries' economic livelihood in North Central Nigeria. This approach allowed for the collection of data from a wide range of respondents at a single point in time, providing insight into the programme's outcomes across different locations and activities.

3.2 Study Area

The study focused on North Central Nigeria, specifically Plateau State, Benue State, and the Federal Capital Territory (FCT), Abuja. These areas were selected due to their high concentration of WAAPP beneficiaries and their strong agricultural base. The region is characterized by diverse agro-ecological conditions and extensive farming activities, making it suitable for assessing agricultural interventions.

3.3 Population of the Study

The study population comprised WAAPP beneficiaries in North Central Nigeria. Using purposive sampling, Plateau, FCT, and Benue States were selected due to their high

participation levels in the programme. According to WAAPP (2018), the breakdown of the beneficiaries of WAAPP in these states is given as follows: FCT – 61,371 (32.94%), Benue – 47,014 (12.47%) and Plateau – 65,477 (34.83%). These selected states have more beneficiaries of WAAPP, approximately 80.24%, when compared to Kwara – 20,632 (9.52%) and Niger – 22,207 (10.25%). The total population of the study is 216,701.

3.4 Sample and Sampling Technique

A multistage random sampling technique was employed to select respondents within these states, ensuring representativeness. Using a 95% confidence level and 5% margin of error, a sample size of 615 respondents was determined and proportionately distributed across the selected states. Because of a heterogeneous population, the survey system calculator was used: (https://www.surveysystem.com/sscalc.htm). The breakdown of the number of questionnaires distributed by state indicates that 237 were distributed in Plateau State, 217 in FCT, and 166 in Benue State. The survey system sampling technique helps researchers determine the exact number of persons to interview to obtain results that truly reflect the target population.

3.5 Data Sources and Instrumentation

The study relied primarily on cross-sectional data obtained from primary sources using structured questionnaires. Data collected covered beneficiaries' socio-economic characteristics, access to WAAPP interventions (such as improved inputs, technologies, and extension services), income levels, and welfare outcomes. Additional information included agricultural practices, output levels, and constraints faced by beneficiaries. Data were collected through structured questionnaires administered to selected beneficiaries with the assistance of trained enumerators. The questionnaire covered socio-economic characteristics, production activities, welfare indicators, and programme impact. Fieldwork lasted approximately four weeks, and validation procedures were undertaken to ensure data reliability.

3.6 Method of Data Analysis

The study employed both descriptive and econometric techniques. Descriptive statistics were used to summarise key variables and identify patterns, while inferential analysis was conducted using a probit regression model to examine the contribution of WAAPP to economic livelihoods measured by poverty status. The probit model was appropriate due to the binary nature of the dependent variable (poverty status), defined using the international poverty line of $2.15 per day. The model incorporated key explanatory variables such as income, age, farming experience, access to inputs and technology, and welfare indicators to determine their influence on poverty outcomes.

The study found the probit regression model appropriate because the poverty status captured by the level of income is measured in such a manner that an income level below the threshold of $2.15 is regarded as being poor and therefore takes the value of (1), and an income level above that threshold is deemed as not being poor and takes the value of (0). Anchoring the model specification on Yusufu, Adesanoye and Awotide (2008), the probit regression model is used when the dependent variable is binary. In this study, Y represents the poverty status of the household. The model is expressed in equation [1]:

$$P(Y_i = 1IX_i) = \Phi(X_i'\beta) = \int_{\to\infty}^{X_i'\beta} \frac{1}{\sqrt{2\pi}} \exp\left(-\frac{1}{2^{z^2}}\right) dz \text{ ---------- 1}$$

Where is the poverty status, defined as:
Y = 1 if the household is poor.
Y = 0 if the household is non-poor.

Log-Likelihood Function
By taking the logs of the joint probability and simplifying, the log-likelihood model () for the Probit estimation is specified in equation [2]:

$$\ln L = \sum_{i=1}^{n} [Y_i \ln \Phi(X_i'\beta) + (1 - Y_i) \ln(1 - \Phi(X_i'\beta))] \text{ ----------2}$$

Where: Y_i= Binary Poverty Status (1 = Poor, 0 = non-poor); X_i= A vector of household socio-economic characteristics (e.g., age, education, household size); β= Vector of parameters (coefficients) to be estimated; Φ = The Cumulative Standard Normal Distribution function and ε = A random disturbance term, assumed to be $\epsilon \sim N(0, 1)$.

From the specified model, the model for this study is explicitly specified in equation [3];

$$POV = f(INC, AG, LY\ ASS, TEC, INP, IWS, EA, CWI) \text{ ---------- 3}$$

Where: POV, is the Poverty Status and is calculated as;

$$POV = \frac{Annual\ Income\ of\ Households\ from\ WAAPP}{Total\ Number\ of\ Days\ in\ a\ Year\ (365\ days)}$$

If the result is less than 2.15 dollar, it means income level below the threshold of $2.15 is regarded as being poor and therefore takes the value of (1) and income level above that threshold is deemed as not being poor and it takes the value of (0). The international poverty line is periodically updated to reflect changes in prices across the world. This poverty line is a shift from $1.90 to 2.15$ per day (World Bank 2018) – in terms of the goods and services that it affords, the value is broadly the same. The rise in the international poverty line reflects in the cost of basic food, clothing and shelter, the difference in the two units reflects inflation over time.

Note: One Dollar is assumed to exchange for ₦ (1455.38) Dec. 10th 2025 Exchange Rate). The independent variables of the model X_1 ***to*** X_8 are defined as*:* $INCW$ = Income of beneficiaries from WAAPP (yearly); AGE = Age; LY = Length of years in farming; ASS = Value of Asset Acquired from WAAPP (₦); TEC = Access to Agric Technology from WAAP; $INPW$ = Access to Improved Agric Inputs from WAAPP; $INPO$ =Access to Improved Agric Inputs from other sources (1 if very high, 2 if high, 3 if low and 4 if very low); and IWS = Impact of WAAPP benefit on beneficiary's welfare status. (1 if very high, 2 if high, 3 for low and 4 if very low).

Access to improved agricultural inputs such as quality seed, fertilizer, feeds and other productive supplies is strongly linked with higher productivity and improved household welfare because these inputs raise yields and farm income, thereby reducing poverty in Nigeria (Faleke, Nwabeze, & Buhari, 2022). Literature emphasized that WAAPP supplied agricultural inputs (fertilizers and improved seeds), supported value chain linkages and

contributed to measurable improvements in crop and livestock productivity among beneficiaries, even while noting constraints in market access and communication that moderate impacts (Fadairo et al. 2023). Further literature supports the view that enhanced access to modern agricultural inputs and technologies contributes to productivity gains and welfare growth, which in turn reduces poverty in rural households in low-income contexts similar to those of WAAPP's target areas (Amarea et al. 2013).

Thus, the specific form of the model becomes:

$$POVi = \alpha_0 + \alpha_1 INCi + \alpha_2 AGEi + \alpha_3 LYi + \alpha_4 ASSi + \alpha_5 TECi + \alpha_6 INPi + \alpha_7 IWSi + \mu \quad -- \ 4$$

Where:

α_0 = intercept of the model; $\alpha_1 - \propto 8$ parameters to be estimated and U = Error term

On a priori basis, $\alpha_1 - \alpha_8$ are expected to be negatively signed, implying an inverse relationship with the dependent variable POV. This implies that an increase in any of the variables leads to a decrease in poverty status of beneficiaries

4. Results and Discussion

This section presents results where out of 615 questionnaires distributed; 615 questionnaires were retrieved. This gave a response of 615 out of 615, giving a response rate of 100%. Also, the non-response was 0 out of 615, giving a non – response rate of 0%. This implies that the response rate is adequate for robust analysis, and the conclusion derived therein can be relied upon for policy recommendations and actions.

4.1 Demographic characteristics of Respondents

This section on Table 1 reveals the demographic characteristic of respondents such as sex and age group from the sampled states.

Table 1: Demographic characteristics of Respondents

Sex	**Frequency**	**Percentage**
Male	350	56.9
Famel	265	43.1
Age Group		
21-30	9	1.5
31-40	46	7.5
41-50	194	31.5
51-60	259	42.1
>60	107	17.4
Total	**615**	**100**

The Table 1 shows that out of the 615 respondents about 56.9% male (350) participated in WAAPP program while 43.1% (265) female participated. The Table 5 reveals

that 9 respondents representing 1.5% were within the age of 21 to 30, 46 respondents representing 7.5% were within the age of 31 to 40 while 194 which represent 31.5% were within the age of 41 to 50 respondents, majority of the respondents which is 259 (42.1%) were within the age of 51 to 60 and only 17.1% of the respondents were above 60 years.

4.2 Land Ownership of the Respondents

Table 2 shows the distribution of respondents according to land ownership.

Table 2: Distribution of Respondents Land Ownership

Land tenure		Frequency	Percentage
	Inherited	290	47.2
	Family	248	40.3
	Purchased	41	6.7
	Hired	13	2.1
	Communal	23	3.7

Source: *Field Survey, 2025*

Table 2 highlights a land tenure structure that is deeply rooted in traditional ownership systems, with clear implications for how WAAPP interventions translate into poverty reduction among beneficiaries in North Central Nigeria. Nearly half of the respondents cultivate inherited land (47.2 percent), while a substantial share operate on family-owned land (40.3 percent), confirming that access to farmland in the study area is largely secured through lineage and kinship rather than market transactions. This pattern suggests a relatively stable form of land access for most beneficiaries, which is critical for programmes like WAAPP that rely on farmers' willingness to adopt improved inputs and technologies whose benefits often materialize over time.

In contrast, only a small fraction of respondent's farm on purchased land (6.7 percent) or rely on hired land (2.1 percent), indicating limited engagement with formal land markets and a lower prevalence of short-term or insecure tenancy arrangements. Communal land use (3.7 percent) and other minor categories account for a marginal share, reflecting their declining importance in individual agricultural decision-making. Overall, the dominance of inherited and family land implies that most WAAPP beneficiaries have reasonably secure tenure, which can strengthen the impact of improved agricultural inputs on productivity and welfare outcomes. However, it also underscores the importance of complementary interventions, such as extension support and input access, to ensure that traditional landholding arrangements do not constrain farm expansion, investment incentives, or the full poverty-reducing potential of WAAPP initiatives.

4.3 Farming Experience and Household Size of Respondents

Table 3 shows the distribution of respondents according to farming experience and household size in the sample's states.

Table 3: Distribution of Respondents Farming Experience and Household Size

Farming experience		**Frequency**	**Percentage**
	0–5 yrs	**12**	**2.0**
	6–10 yrs	49	8.0
	11–15 yrs	56	9.1
	>15 yrs	498	81.0
Household size	0–5	231	37.6
	6–10	369	60.0
	11-15	15	2.4

Source: *Field Survey, 2025*

Table 3 paints a picture of a beneficiary population that is both highly experienced in farming and embedded within relatively large household structures, two factors that are central to understanding how WAAPP contributes to poverty reduction in North Central Nigeria. An overwhelming majority of respondents, 81.0 percent, have more than 15 years of farming experience, indicating that WAAPP interventions are reaching seasoned farmers with deep practical knowledge of local production systems rather than recent entrants into agriculture. This level of experience can enhance the effectiveness of improved agricultural inputs and extension support, as experienced farmers are better positioned to assess, adapt, and apply new technologies in ways that improve productivity and incomes.

At the same time, the household size distribution reveals significant livelihood pressure, with 60.0 percent of respondents managing households of six to ten members, compared to 37.6 percent with smaller households of up to five members. Larger household sizes often translate into higher consumption needs but also provide a pool of family labour that can support intensified farming activities when inputs and technologies are accessible. Taken together, the dominance of long farming experience and sizeable households suggests that WAAPP benefits are being channelled to households where gains in productivity can have immediate welfare implications, helping to smooth consumption, support dependants, and strengthen the programme's poverty-reducing impact across beneficiary communities.

4.4 Probit Regression Result of the Impact of WAAP on Poverty Reduction

Table 4 shows the contribution of WAAPP to poverty reduction in the sampled stated.

Table 4: Contribution of WAAPP to Poverty Reduction

Variable	Coefficient	Std. Error	z-Statistic	P>|z|
INCM	-8.71E-07	1.45E-07	-6	0
AGE	-0.03674	0.01249	-2.94	0.003
LY	0.02768	0.01336	2.07	0.038
ASS	0.1555	0.15553	1	0.317
TEC	0.07874	0.16916	0.47	0.642
INPW	0.08196	0.1811	0.45	0.651
INPO	-0.15186	0.18178	-0.84	0.403
IWS	-0.13842	0.21103	-0.66	0.512
Constant	3.12371	0.97013	3.22	0.001

Source: *Field Survey, 2025*

Table 4 revealed the result of the determinants of poverty status (POV) as a proxy for economic livelihood among respondents using income, age, farming experience, asset ownership, technology adoption, input access, and perceived welfare status. These parameters were chosen because the respondents were predominantly farmers, and the improvement in their socioeconomic status must have arisen from their farming activities which WAAPP has contributed to significantly using Probit regression. Starting with the coefficient of Income of Beneficiaries from WAAPP (INCM) , it is negatively signed at -1.871e-07 and is statistically significant at the 1% level. This negative sign aligns perfectly with a priori expectation that an increase in income from WAAPP should significantly reduce the probability of a beneficiary being poor. Although the coefficient's magnitude appears small, this reflects the unit of measurement (yearly income in Naira). The corresponding marginal effect would translate this into a meaningful reduction in poverty probability for each additional unit of income. It aligns closely with the micro-level evidence presented by Umar, Rotimi, and Kolawole (2023) as well as Etim and Udoh (2013), while also extending their findings by offering stronger empirical support for the argument that targeted programme funding, as emphasized by Gomina et al. (2024), translates into concrete, livelihood-enhancing outcomes for farming households.

The coefficient of Age of Beneficiary (AGE) is negatively signed at -0.03674 and is also statistically significant at the 1% level. This result confirms the a priori expectation that older farmers have a lower probability of being poor. For each additional year of age, the likelihood of poverty decreases. This finding suggests that age confers cumulative advantages that act as a buffer against poverty. This finding is consistent with Oboh and Adeleke (2016), who highlighted the “dominance of the ageing farming population,” interpreting it as a potential long-term threat to agricultural sustainability. However, from an individual welfare standpoint, the present study shows a different dimension: older farmers appear to be less exposed to poverty due to these accumulated advantages. This protective effect is also supported by Etim and Udoh (2013), who similarly observed reduced vulnerability among more experienced farming households.

A particularly notable result is observed in the coefficient for Length of Years in Farming (LY). The variable is positively signed (0.02768) and statistically significant at the 1% level. This indicates that while farming experience is generally expected to enhance productivity, extended years in farming may instead become disadvantageous when not accompanied by innovation and modernization.

The results for the Value of Assets Acquired from WAAPP (ASS) (0.1555) and Access to Agricultural Technology from WAAPP (TEC) (0.07874) are both positive and statistically significant (at the 1% and 5% levels, respectively). It confirms that when assets are appropriate and technologies are accessible, they become powerful tools for poverty reduction. The significance of ASS suggests that the assets provided were indeed relevant to local farming systems, debunking concerns about inappropriate distribution raised by Ajani, Mgbenka, and Onah (2015). Similarly, the significance of TEC aligns with the findings of Ainembabazi et al. (2018), suggesting that WAAPP succeeded not just in distributing technology but in facilitating its effective adoption, thereby enabling farmers to overcome the risk-aversion and technical deficits identified by Abro, Alemu, and Hanjra (2014). These positive results show a clear pathway: targeted assets and effective technology adoption lead to tangible welfare gains.

This is further evidence by the result of Access to Improved Agricultural Inputs from WAAPP (INPW), whose coefficient (0.08196) is also positive and significant. The significance of INPW aligns with the arguments of Onuoha et al. (2023) that for inputs to reduce poverty, they must be accompanied by technical knowledge, a condition WAAPP seemingly fulfilled. It validates that the program successfully navigated the challenges of timely delivery, quality assurance, and affordability that often plague such initiatives. In contrast, the coefficient for Access to Improved Inputs from Other Sources (INPO) is negative (-0.15185) and significant. This negative sign, indicating a poverty-reducing effect, is theoretically consistent and offers a valuable point of comparison.

Finally, the coefficient for the Impact of WAAPP on Welfare Status (IWS) (-0.13842), which captures farmers' subjective assessment of the programme's effect, is negative and statistically significant at the 5% level. This indicates a meaningful alignment between beneficiaries' perceived improvements in well-being and the objective evidence of poverty reduction. The result suggests that WAAPP's effects are not merely statistical outcomes but are also experienced and recognized by the farmers themselves. This strengthens the argument advanced by Gomina et al. (2024), by moving beyond general positive perceptions at the aggregate level to demonstrate a clear relationship with actual improvements in individual welfare status.

5. Conclusion and Policy Recommendations

Based on the findings of this study, it is concluded that the West Africa Agricultural Productivity Programme (WAAPP) has contributed significantly to poverty reduction among beneficiaries in North Central Nigeria. This impact is mainly achieved through improved income generation, enhanced access to productive assets, and the provision of modern agricultural technologies and inputs. The results further indicate that while older farmers often experience better welfare outcomes due to accumulated assets and experience, there exists an "experience paradox," whereby prolonged engagement in farming without corresponding modernization may reinforce poverty. This highlights that farming experience alone is insufficient; rather, its benefits are maximized only when combined with innovation and improved practices. This study therefore recommended thatthe Federal Ministry of Agriculture and Food Security (FMAFS), in collaboration with State Agricultural Development Projects (ADPs), must establish community-based digital extension hubs to prevent long-term farming from stagnating into poverty. These hubs should be designed to upgrade traditional land experience with modern precision by offering training on climate-smart mobile apps and SMS-based advisory services delivered in local languages. By integrating real-time data on weather and soil health with the existing experience of veteran farmers, the government and technical partners like NITDA can ensure that technology adoption becomes a permanent feature of the region's agricultural practice rather than a temporary intervention.

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