



Analysis of poverty Dimension among Adopted and Non-Adopted Village Farmers in Northwest Nigeria



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Abstract: *The study examined the intensity of farmers' participation in the NAERLS Adopted Village Programme (AVP) and poverty dimensions among adopted (AVFs) and non-adopted village farmers (NAVFs) in Northwest Nigeria. A multistage sampling technique was used to select 605 respondents comprising 294 AVFs and 311 NAVFs. Structured questionnaires were employed to collect data on socioeconomic characteristics, program participation, and access to livelihood-enhancing resources. Descriptive statistics and the Participation Index were used for analysis. Findings revealed that AVFs had better socioeconomic conditions: 73% had access to credit (compared to 28% of NAVFs), 81% had formal education (vs. 42% NAVFs), and 100% of AVFs belonged to cooperative groups. Participation in AVP activities was moderately high with an average participation index of 0.61, and 67% of AVFs engaged in over 20 AVP-related activities in the last three seasons. About 98.3% of AVFs had regular extension contact, compared to 27.97% of NAVFs. The study recommends scaling up the AVP to cover more rural communities, improving extension coverage, promoting farmer group associations, and facilitating access to tailored credit and mechanization hubs. These strategies are essential to enhance farmer livelihoods, reduce multidimensional poverty, and contribute to SDGs 1, 2, and 8 in rural Nigeria.*

Keywords: Poverty, Dimension, Farmers, Adopted, Non-adopted.

JEL Code: I32, J43,

Introduction

Poverty remains a pervasive challenge in Nigeria, particularly among rural households that depend largely on agriculture for their livelihoods. Despite the country's abundant natural and human resources, a significant proportion of the population especially smallholder farmers remain poor, with limited access to productive resources, markets, and extension services (World Bank, 2022). The northwest region of Nigeria, characterized by high rural population density and reliance on rain-fed agriculture, records some of the highest poverty indices in the country (NBS, 2022).

Technology transfer has over the year been a prominent strategy of the agricultural development in Nigeria; hence, the activities of the National Agricultural Extension and Research Liaison Services (NAERLS) in the adopted villages were geared towards food security and poverty alleviation in Nigeria as a community-based participatory approach by engaging farmer cooperative groups in the target areas (NAERLS, 2023). Poverty is multidimensional, encompassing not only income but also access to basic services, food security, and asset ownership (Alkire & Foster, 2017).

Agricultural improvement is of importance because an increase in agricultural productivity is the powerful catalyst for poverty reduction in rural areas of Nigeria, and its impact can almost be three times more than the growth. In a bid to solve the problem of food production and poverty reduction in the country, the National Agricultural Research Project (NARP) under the World Bank-assisted programme in 1997, introduced the Adopted Villages concept (ARCN, 2022) However, the actual impact of the Adopted Village Programme on poverty alleviation remains underexplored, especially when compared with farmers in non-adopted villages.

Deprivation Theory of Poverty

Deprivation theory of poverty explains poverty as a condition where individuals or households lack the necessary resources, opportunities, or capabilities to meet basic needs. This theory moves beyond just low income and focuses on lack of access to education, health care, decent housing, nutrition, clean water and sanitation. The key concepts in the deprivation theory include: Relative deprivation: When people are poor relative to others in their society, not just in absolute terms. Capability deprivation (Amartya Sen): When people are deprived of basic capabilities like being healthy, educated, and able to participate in society. This theory is closely aligned with multidimensional approaches to measuring poverty (Alkire, et al., 2024).

The Deprivation Theory of Poverty was pioneered by Peter Townsend in 1979, he introduced the concept of relative deprivation, arguing that poverty should not be defined solely by low income, but by the lack of resources to participate in the normal living patterns, customs, and activities of society. This concept laid the groundwork for later multidimensional approaches to poverty, including Amartya Sen's Capability Approach (1980s-1990s) and the Multidimensional Poverty Index (MPI) developed by OPHI and UNDP that reflects the deprivation theory in practical, measurable terms. It captures multiple overlapping deprivations across three key dimensions:

Table 1: Multidimensional Measurement Framework

| Dimension | Indicators |
|------------------|--|
| Health | Nutrition, Child Mortality |
| Education | Years of Schooling, School Attendance |
| Living Standards | Cooking fuel, Sanitation, Drinking water, Electricity, Housing, Assets |

United Nations Development Programme (UNDP). (2023)

Methodology

Northwest Nigeria comprises seven states Kaduna, Kano, Katsina, Kebbi, Jigawa, Sokoto, and Zamfara with a total land area of 217,591 km². Kaduna is the largest state by land mass (46,053 km²), while Kano is the smallest (20,766 km²). The zone is densely populated and primarily agrarian, characterized by short grasses, few trees, and a hot climate with seasonal rainfall and a distinct dry season (Balogun and Damisa, 2019). The study focused on Kaduna, Kano, and Katsina due to their active participation in the Adopted Village Programme (AVP). From Kaduna, five LGAs were purposively selected, excluding Kudan due to its pilot status. Two LGAs were selected from Kano and another two from Katsina, totalling nine LGAs. Two villages were randomly selected from each of Kaduna's five LGAs, while one village each was purposively chosen from the four LGAs in Kano and Katsina. A proportionate random sample

of 26% (294 AVFs) was selected from 1,110 adopted village farmers using Yamane's (1967) formula.

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

where: n = sample size, N = population size, e = level of precision (0.05).

Both descriptive and inferential statistical tools were employed. These included: descriptive statistic,

Level of participation Index

A Participation Index (PI) was also computed by averaging participation levels across all assessed activities. Expressed as thus:

$LP = F_i / F_t$ (where F_i is the frequency of a farmer's participation and F_t is the total number of adopted farmers)

$PI = \sum LP / N$ (where N is the number of assessed activities)

Decision Rule: High Participation: $0.7 \leq LP \leq 1.0$, Moderate Participation: $0.4 \leq LP < 0.6$, Low Participation: $0.0 \leq LP < 0.3$

These metrics help in categorizing farmers' engagement in various programme activities as high, moderate, or low.

MPI

The prevalence of poverty, or the proportion of people (within a given population) who experience multiple deprivations, also known as multidimensional head-count ratio (H) and the equation is written as:

$$H = q/n \dots \dots \dots (1)$$

where q is the number of AVF farmers who are multi-dimensionally poor and

n is the total sample size of the AVF farmers

Multidimensional Poverty Index (MPI)

$$MPI = H \times A \dots \dots \dots (2)$$

where:

MPI = Multidimensional Poverty Index (composite measure of multidimensional poverty)

H = Multidimensional Head-Count Ratio

A = Intensity of Deprivation

The MPI is constructed based on three major dimensions:

Education

Years of schooling (If no household member has completed at least six years of schooling = 1, otherwise = 0); School attendance (If any school-aged child is not attending school = 1, otherwise = 0).

Living Standards

Cooking fuel (If firewood/charcoal is used = 1, otherwise = 0); drinking water (If the household lacks access to improved water sources = 1, otherwise = 0); sanitation (If the household does not have improved sanitation = 1, otherwise = 0); electricity (If the household has no electricity = 1, otherwise = 0). Assets (If the household lacks key assets such as a radio, television, mobile phone, bicycle, or refrigerator = 1, otherwise = 0).

Health: Nutrition (If any member of the household is undernourished = 1, otherwise = 0)

Child mortality (If a child has died in the household = 1, otherwise = 0). Each household (or farmer) is then assigned a deprivation score based on these indicators.

Results and Discussion

Socioeconomic Characteristics of the Farmers

Results in table 1 reveals that majority of both AVF (57.48%) and NAVF (50.80%) fall within the age range of 36–59 years, with mean ages of 40.3 and 41.78 years, respectively. This age bracket signifies a productive and economically active population, suggesting a lower

likelihood of poverty. Farmers in this age range are physically capable and more responsive to agricultural innovations, which can lead to increased productivity and better welfare outcomes. Ogunniyi, Adegbola, and Ojo (2022) noted that middle-aged farmers are more willing to adopt innovations, which can help them escape poverty traps through enhanced yield and income.

Most AVF (46.26%) and NAVF (48.23%) households had 6–10 members, with an average household size of 9. Large household size can be a double-edged sword: while it offers free family labour, which reduces input costs and improves productivity, it also increases consumption pressure and dependency ratio, which can contribute to multidimensional poverty particularly in the health, education, and living standard dimensions. This is supported by Makka *et al.* (2023), who emphasized that while large households serve as an internal labour force, they can also face higher vulnerability to non-income deprivations such as malnutrition and poor housing. AVF and NAVF farmers show comparable experience levels, with over 46% of both having 11–20 years of experience. Average farming experience stood at 16 years for AVF and 15 years for NAVF. This level of experience contributes positively to household resilience and income stability, key components of both income and multidimensional poverty alleviation. Ogunjobi *et al.* (2024) emphasized that experienced farmers manage risks better, while Anyasi *et al.*, (2023) added that such farmers are better positioned to apply new technologies and improve their overall livelihood. Credit access significantly differentiates the two groups: 62.24% of AVF accessed ₦100,001–₦300,000, while the mean credit accessed by AVF was ₦400,500 compared to ₦250,300 by NAVF (t-value = 5.02). Access to credit enhances income-generating potential, enabling AVF to purchase improved inputs and scale up production. This contributes directly to reducing income poverty and improving living conditions. Osabohien *et al.* (2020) note that access to finance is pivotal in breaking the cycle of poverty by fostering productive investment among small scale farmers in Nigeria. Although both groups are predominantly smallholders (cultivating <5 ha), AVF had a larger average farm size (1.7 ha) than NAVF (1.36 ha), which was statistically significant ($p \leq 0.001$). Larger farm size implies better access to productive assets and higher output potential, a strong indicator of lower asset deprivation in multidimensional poverty assessments. As noted by Adeleye *et al.* (2022), larger landholding improves food security and household welfare.

Table 2: Socioeconomic Characteristics of the Farmers

| Variables | AVF Farmers | | NAVF Farmers | | t-value |
|-----------------------|-------------|------------|--------------|------------|---------|
| | Frequency | Percentage | Frequency | Percentage | |
| Age | | | | | |
| 18-35 | 78 | 26.53 | 94 | 30.23 | -1.50 |
| 36-59 | 169 | 57.48 | 158 | 50.80 | |
| 60≥ | 47 | 15.99 | 59 | 18.97 | |
| Total | 294 | 100.00 | 311 | 100.00 | |
| Mean | 40.32 | | 41.78 | | |
| Std. Dev. | 11.39 | | 12.53 | | |
| Min | 20 | | 20.4 | | |
| Max | 62 | | 65 | | |
| Household Size | | | | | |
| 1-5 | 89 | 30.27 | 102 | 32.79 | 0.66 |
| 6-10 | 136 | 46.26 | 150 | 48.23 | |
| 11-15 | 56 | 19.05 | 49 | 15.76 | |
| 16 ≥ | 13 | 4.42 | 10 | 3.22 | |
| Total | 294 | 100.00 | | 311 | |
| Mean | 9.34 | | | 9.01 | |
| Std Dev. | 6.07 | | | 6.31 | |

| | | | | | |
|---------------------------|------------|--------|------------|--------|------|
| Min | 2 | | 2 | | |
| Max | 20 | | 20 | | |
| Farming Experience | | | | | |
| 1-10 | 116 | 39.46 | 111 | 35.69 | 0.65 |
| 11-20 | 137 | 46.59 | 164 | 52.73 | |
| 21-30 | 29 | 9.87 | 25 | 8.04 | |
| 31-40 | 10 | 3.40 | 7 | 2.25 | |
| 41≥ | 2 | 0.68 | 4 | 1.29 | |
| Total | 294 | 100.00 | 311 | 100.00 | |
| Mean | 16 | | 15.35 | | |
| Std. Dev | 13.05 | | 11.51 | | |
| Min | 1 | | 1 | | |
| Max | 38 | | 44 | | |
| Credits | | | | | |
| 1-100,000 | 15 | 5.10 | 92 | 29.58 | 5.02 |
| 100,001-300,000 | 183 | 62.24 | 140 | 45.02 | |
| 300,001-500,000 | 66 | 22.46 | 53 | 17.04 | |
| >500,000 | 30 | 10.20 | 26 | 8.36 | |
| Min | 100,000 | | 50,000 | | |
| Max | 2,000,000 | | 550,000 | | |
| Mean | 400,500 | | 250,300 | | |
| Std Dev | 865,544.14 | | 385,951.21 | | |
| Farm Size | | | | | |
| 0.1-1.9ha | 97 | 33.0 | 28 | 58.90 | 3.29 |
| 2.0-3.9ha | 174 | 59.18 | 311 | 9.00 | |
| Total | 23 | 7.82 | 1.36 | 100.00 | |
| Mean | 294 | 100.00 | 1.22 | | |
| Std Dev | 1.70 | | 1 | | |
| Min | 1.32 | | 6 | | |
| Max | 0.5 | | | | |
| | 5.0 | | | | |

Sources: Field Survey, (2022)

Level of Farmers Participation in NAERLS Adopted Village Programme

Table 2 shows high farmer participation in key AVP components especially input support, capacity building, and technology adoption. Access to agrochemicals (77%), fertilizers (70%), and improved seeds/breeds (78%) reveals strong engagement. This is critical in agricultural production mostly in some northern part of the country. This is consistent with Afolabi *et al.*, (2022) who reported yield increases of 30-50% from the use of improved inputs among crop farmers. Similarly, Mapiye & Dzama (2024) also linked such support to enhanced productivity and poverty reduction. Capacity-building participation varies: goat production (79%), financial literacy (72%), and crop production management (75%) recorded high levels; record keeping (63%) and income-generating activities (68%) were moderate, while sheep (25%), aquaculture (20%), and rabbitry (15%) were low. Livestock training, especially goat farming, was more appealing. High financial literacy participation (72%) suggests improved financial management, vital for sustainability. Farmers' adoption of agrochemical use (70%), fertilizer application (70%), and agronomic practices (72%) was high, matching strong input support. However, mechanization participation was low (27%), indicating continued reliance on manual labour due to high costs and equipment scarcity. Crop variety adoption was moderate (63%), possibly reflecting low awareness or hesitancy in adopting new varieties in the region. According to Yusuf & Alabi, (2023), low participation level of mechanization is a major constraint to scaling up production among the small-scale farmers in Nigeria. Credit linkage had moderate participation (60%). Though essential for farm investment, Adegbite & Olanrewaju (2023) noted that collateral demands and high-interest rates limit access. Market linkage participation was low to moderate (40%), showing limited outreach and persistent challenges. Afolabi *et al.* (2022) noted poor market access weakens farmers' bargaining power

and increases post-harvest losses. Social responsibility participation sanitation (50%) and group farming (45%) was moderate, while culvert rehabilitation (20%) was low. This shows better participation in production activities than in community-based initiatives.

Table: 3 Level of participation in the adopted village programme.

| Component | Activities | Freq | Proportion (0-1) | Level |
|-------------------------------|---|------|------------------|----------|
| Input Support | Provision of Agrochemicals | 226 | 0.77 | High |
| | Provision of Fertilizers | 206 | 0.70 | High |
| | Provision of Improved Seed/Breeds | 230 | 0.78 | High |
| Capacity Building | Goat Production | 232 | 0.79 | High |
| | Record Keeping | 184 | 0.63 | moderate |
| | Livestock Production | 196 | 0.67 | High |
| | Income Generating Activities | 200 | 0.68 | High |
| | Sheep Production | 74 | 0.25 | Low |
| | Poultry Production | 147 | 0.50 | Moderate |
| | Aquaculture | 59 | 0.20 | Low |
| | Rabbitry | 44 | 0.15 | Low |
| | Financial Literacy | 211 | 0.72 | High |
| | Crop Production Management | 221 | 0.75 | High |
| | Bee Keeping | 29 | 0.10 | Low |
| Farm Tech/ Innovations | Application of Agrochemicals | 207 | 0.70 | High |
| | Fertilizer Application/Imp Soil Fert | 206 | 0.70 | High |
| | Tractors and Other Farm Implements | 80 | 0.27 | Low |
| | Spacing and Method of Planting | 198 | 0.67 | High |
| | Crop Variety | 186 | 0.63 | High |
| | General Agronomic Practices | 212 | 0.72 | High |
| Faci Support | Linkage with Credit Institutions | 177 | 0.60 | Moderate |
| | Linkage with Produce Market | 95 | 0.32 | Low |
| | Linkage with Input Supply | 198 | 0.67 | Moderate |
| | Participation in Joint Field Days | 103 | 0.35 | Low |
| | Participation in Farmer Exchange Visits | 74 | 0.25 | Low |
| Comm Soc Resp. | Sanitation | 147 | 0.50 | Moderate |
| | Group Farming | 132 | 0.45 | Moderate |
| | Tree Planting | 118 | 0.40 | Moderate |
| | Culvert Rehabilitation | 59 | 0.20 | Low |

Source: Field Survey, (2022) Low (0.0-0.3), Moderate (0.4-0.6), High (0.7-1.0)

Poverty Dimension of AVF and NAVF Farmers

Poverty is a multidimensional issue that extends beyond income deprivation to include deficiencies in education, health, and living standards (Alkire, Roche and Vaz, 2017). The Multidimensional Poverty Index (MPI) assesses poverty through three dimensions: education, health, and living standards, each comprising multiple indicators. The key MPI metrics include the headcount ratio (H), which measures the proportion of the population identified as multidimensionally poor; depth (A), which reflects the intensity of deprivation; and severity (MPI score), which combines incidence and intensity. Results in table present the poverty status of farmers in Adopted Village farmers (AVF), who benefit from agricultural intervention programme, with those in Non-Adopted Villages (NAVF), who do not. The

results in table 4.10, figure 2; 3 and 4 reveals the positive impact of agricultural programme on poverty reduction.

Education plays a crucial role in determining poverty levels by influencing employment opportunities, income levels, and overall quality of life (Dia *et al.*, 2023). The MPI analysis shows significant differences between AVF and NAVF. Specifically, 17.7% of AVF were deprived in years of schooling compared to 35.7% of NAVF, suggesting that agricultural interventions contribute to higher educational attainment by increasing household income (NBS, 2022). Similarly, children's schooling deprivation was lower among AVF (21.1%) than NAVF (39.2%), indicating that participation in agricultural programs enhances financial capacity, allowing more children to attend school and reducing intergenerational poverty (Loison, 2015). These findings demonstrate the role of agricultural programmes in promoting education and fostering long-term poverty reduction. Health deprivation significantly impacts productivity and overall well-being. The MPI evaluates health poverty based on access to hospitals and nutrition. Access to hospitals was limited for 14.3% of AVF compared to 42.8% of NAVF, indicating that AVF had significantly better healthcare access. This advantage may be attributed to increased household income from the adopted village programme, enhancing the ability to afford medical services according to (Alkire *et al.*, 2022).

This is also in accordance with the studies of Oyekale (2022), which emphasized that Agricultural programs contribute to improved health awareness and access to healthcare services in rural areas. Nutrition deprivation affected 24.8% of AVF compared to 28.3% of NAVF, suggesting that AVF experienced better food security. These implies that participation in adopted village programme contributes to better health outcomes, ultimately reducing poverty severity. This improvement is likely due to diversified farm incomes, which provide households with the financial capacity to afford more nutritious diets (Carletto *et al.*, 2016); this is consistence with Ogundele *et al.* (2023) that food security and its quality improve with better farming practices and market access. Living standards encompass essential infrastructure and resources that contribute to overall well-being. The MPI evaluates these through access to electricity, sanitation, water, cooking fuel, housing, and asset ownership. Electricity access deprivation was significantly lower among AVF (6.8%) compared to NAVF (39.2%), indicating that increased incomes from agricultural interventions enhance access to electricity (Oseni *et al* 2021). Sanitation and water deprivation were also markedly lower among AVF (10.5% and 8.5%) compared to NAVF (35.7% and 28.3%), suggesting that agricultural programs facilitate access to improved infrastructure (Ogunniyi *et al.*, (2022).

Similarly, cooking fuel and housing deprivation affected a smaller proportion of AVF (12.5% and 10.5%) than NAVF (31.8% and 35.7%), emphasized the improved affordability of better living conditions. Furthermore, asset ownership deprivation was significantly lower among AVF (6.8%) compared to NAVF (39.2%), demonstrating that the adopted village programme empowered farmers to accumulate productive assets essential for long-term poverty alleviation (Barrett *et al.*, 2019). Adepoju and Oyewole (2022) posited that asset accumulation is a key factor in breaking the cycle of poverty, as it enhances resilience against economic shocks. The significantly lower asset deprivation among adopted village farmers suggests that participation in extension programs enables farmers to make long-term investments in housing, transportation, and farm equipment, ultimately improving their overall living conditions. These findings reinforce the impact of the Adopted Village Programme in enhancing living standards, ultimately reducing the depth and severity of multidimensional poverty.

Figure 1:
Comparison of poverty head count for AVF and NAVF Farmers

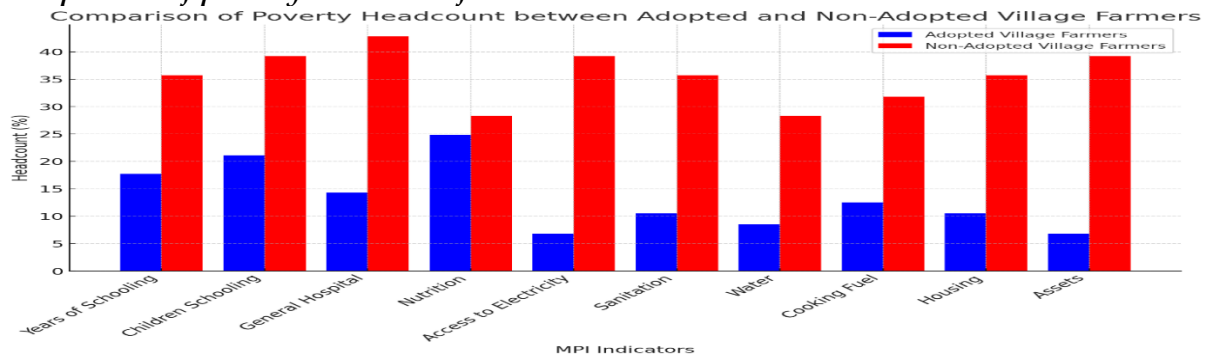


Figure 2:
Comparison of MPI Indicators Between AVF and NAVF Farmers

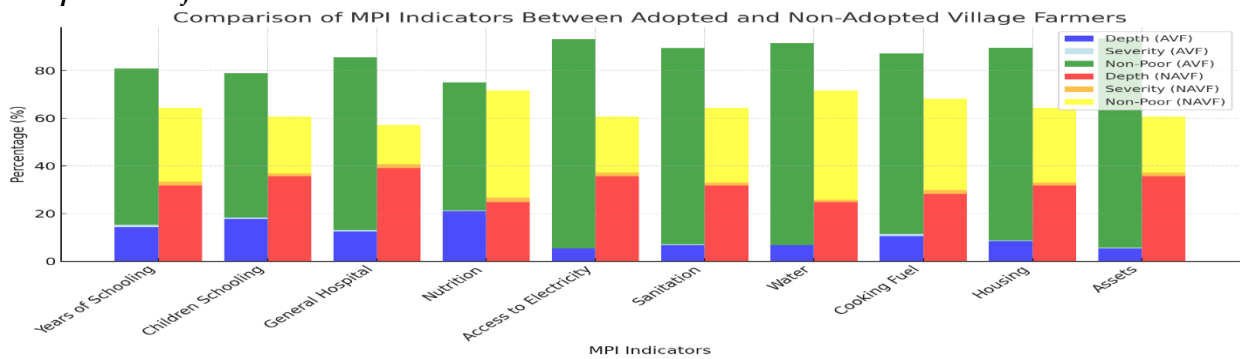
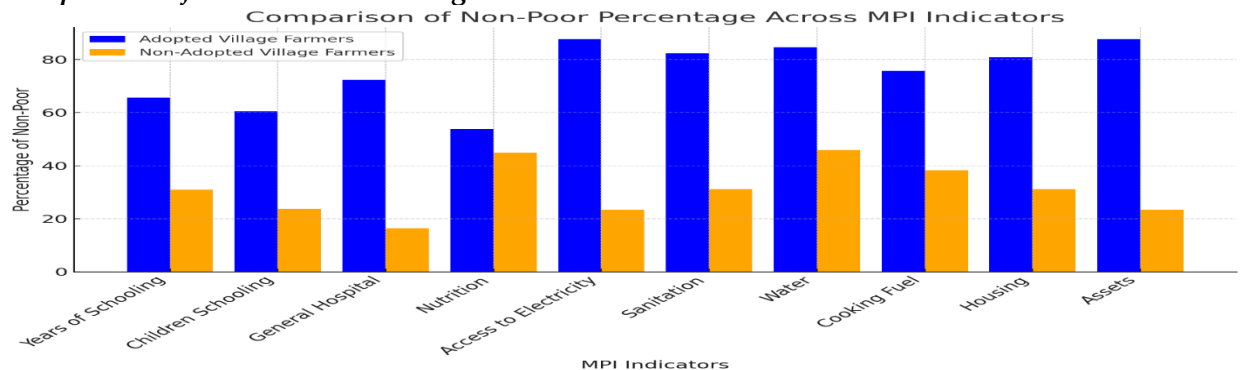


Figure 3:
Comparison of Non-Poor Percentage Across MPI Indicators.



Conclusion and Recommendations

The study revealed a clear disparity in poverty dimensions between Adopted Village Farmers (AVFs) and Non-Adopted Village Farmers (NAVFs) in Northwest Nigeria. Out of 605 respondents, 294 were AVFs while 311 were NAVFs. Analysis showed that only 24.8% of AVFs were multidimensionally poor, compared to 54.3% of NAVFs, indicating a significant poverty reduction impact from the NAERLS Adopted Village Programme (AVP). AVFs had higher access to education (91.2%), health services (88.4%), and extension services (98.3%) compared to NAVFs who reported 62.7%, 59.5%, and 27.97% access respectively. AVFs also reported better access to clean cooking energy (48.3%) and improved agricultural inputs (82.5%).

To consolidate the gains of the NAERLS Adopted Village Programme (AVP), the following actions are recommended: nationwide scale-up with region-specific adaptations is recommended. Strengthening agricultural extension is crucial, as 98.3% of AVFs received regular support compared to only 27.97% of NAVFs. Integrating adult education and farmer

training will address knowledge gaps, while improving access to credit and inputs through microfinance and cooperatives will boost productivity. With 100% AVF participation in farmer groups, peer learning should be harnessed to support NAVFs. Lastly, investing in rural infrastructure and climate-resilient technologies is vital for reducing post-harvest losses and enhancing adaptive capacity.

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