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Effect of socio-economic factors on farmers participating in agricultural transformation support program in Kano-Jigawa staple crop processing zone of Nigeria

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Abstract:
The study examined the impact of the ATASP-1 program's policies on the socio-economic conditions and profitability of sorghum farming among beneficiaries in the Kano-Jigawa sorghum production region, as well as the obstacles they encounter in agriculture. This region was specifically selected because of the widespread practice of sorghum cultivation, which is among the main crops supported by the ATASP-1 program. Data collection for this analysis was conducted through questionnaires distributed to 132 farmers, consisting of 66 program participants and 66 non-participants. The results of the analysis reveal that the program had a positive impact on the farmers' earnings, highlighted by a significant difference in income levels following the implementation of the program. Additionally, the program favorably influenced various factors such as farm sizes, farming experiences, and the adoption of advanced agricultural technologies. The multiple regression analysis indicated that the age coefficient (0.083) positively and significantly contributed to the performance of the ATASP-1 program. Likewise, the educational level coefficient (0.089), farm size (0.0747), and farming experience (0.077) were found to significantly impact the profitability of the ATASP-1 crop production initiative. The main challenges recognized in the region included poor record-keeping practices and several physical and climatic factors. The study concludes that the ATASP-1 program has substantially reduced farming operation costs, increased yields, and enhanced the incomes of participating farmers, while suggesting improvements in road infrastructure for better market access and agricultural inputs, ensuring adequate capital availability, and providing improved extension services to mitigate potential revenue losses.

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1. Introduction

Nigeria is abundant in natural resources and has significant agricultural potential. The agricultural sector is a crucial part of the economy, providing substantial opportunities for job creation, improving food security, and reducing poverty. However, this potential remains largely untapped, resulting in a decline in the agricultural sector's performance both locally and in global markets over the years (Federal Ministry of Agriculture and Rural Development, FMARD, 2011). Although Nigeria is a prominent agricultural producer in the region, it also ranks as West Africa's largest importer of staple foods. Despite the predominance of the oil sector, agriculture continues to play an important role in Nigeria's economic development. The agricultural sector accounts for roughly 36.5% of the country's gross domestic product and employs nearly 45% of the workforce (FMARD, 2014).

Sorghum is one of the main crops cultivated in Nigeria, along with cassava, yams, rice, maize, millet, a range of vegetables, groundnuts, cocoyam, sesame seeds, and melon seeds (FAO, 2018). Food crops like sorghum are vital for ensuring food security, fulfilling household consumption needs, and providing feed for livestock. Thus, the cultivation of these crops is essential for meeting the dietary requirements of rural households in Nigeria (Ibrahim, Adeola, and Ibrahim, 2016; Sani and Oladimeji, 2017).

Nigeria is the leading producer of sorghum in Africa and ranks second globally, producing 6.9 million metric tons, coming third in harvested area at 4.8 million metric hectares, but only 64th in yield at 1.1923 metric tons per hectare (FAOSTAT, 2018). Nonetheless, almost all production takes place on a subsistence level. Sorghum serves as a vital food crop in numerous northern and

southern regions of Nigeria. When compared to other major cereal crops, it exhibits resilience to adverse growing conditions. Some early-maturing sorghum varieties need less than two months of rainfall to produce grain, and the species showcases considerable genetic diversity with favored cultivars for different uses (Elferik and Schierhorn, 2016).

In 2012, the Government of Nigeria (GON) launched the Agricultural Transformation Agenda (ATA) initiative aimed at greatly reducing food imports by boosting the production of five key crops: rice, cassava, sorghum, cocoa, and cotton. This initiative seeks to restore agriculture to its former pivotal role in Nigeria's economy while tackling rural poverty, youth unemployment, and excessive dependence on imported food. Furthermore, it serves as a blueprint for Nigeria to replicate the agriculture-driven economic successes of countries like Brazil, Thailand, China, Malaysia, Indonesia, Kenya, and Malawi. The AfDB supported the implementation of the Agricultural Transformation Agenda Support Program Phase-1 (ATASP-1) in 2015, which acts as a foundational program for the Agricultural Transformation Agenda (ATA) and is currently active across four Staple Crop Processing Zones (SCPZs). The program's specific developmental objectives include improving food and nutrition security, generating employment opportunities, and enhancing the incomes and shared wealth of participating beneficiaries sustainably through the rice, sorghum, and cassava value chains. The Zones include states such as Anambra and Enugu (Adani-Omor Zone), Niger (Bida-Badegi Zone), Kano and Jigawa (Kano-Jigawa Zone), and Kebbi and Sokoto (Kebbi-Sokoto Zone). At present, the program is providing interventions in over 200 rural communities across 33 LGAs in the seven participating states.

Staple Crops Processing Zones are initiatives designed to foster Agro-based spatial development aimed at consolidating agro-processing activities within areas that have significant agricultural potential. This approach seeks to boost productivity by integrating the production, processing, and marketing of specific commodities, with the potential of achieving Special Economic Zones status. These zones are equipped with shared facilities specifically designed to enable agricultural producers, processors, aggregators, and distributors to function in proximity, which reduces transaction costs and facilitates the sharing of business development services, ultimately enhancing productivity and competitiveness. By offering essential infrastructure such as energy, water, roads, and ICT in rural areas with significant agricultural potential, these initiatives draw investments from private Agro-industrialists and entrepreneurs, thereby fostering economic and social development in these rural regions. (Toda, 2015). An Agro-Processing Hub refers to a designated area of land that is centrally governed, developed, subdivided, and dedicated to supporting businesses and stakeholders engaged in agro-processing and related activities within the surrounding production zone (FAO, 2017).

To summarize, a Staple Crops Processing Zone should be implemented according to a national action plan focused on agricultural transformation, targeting areas with high agricultural potential and constructing the necessary infrastructure to attract private investments in agro-processing and related agricultural production. This initiative must be supported by policies and regulations that encourage public-private partnerships and foster a conducive business environment. These policies and regulations are vital for the successful execution of the SCPZ program. (Toda, 2015).

This study's primary goal is to evaluate how the program has influenced the socio-economic conditions of sorghum farmers within the Kano-Jigawa Sorghum production zone as part of the agricultural transformation agenda support program phase-1 for farmers located in the staple crop processing zone in Nigeria. The Program's main objective, which is to sustainably increase the income of its beneficiaries, is achieved by funding investments in productive assets and community infrastructure, enhancing the capabilities of State and Local Governments to provide effective services, and promoting inclusive and environmentally sustainable management of natural resources.

1.1 Problem Statement

The agricultural sector in Nigeria encompasses forestry, livestock, fishing, and both food and cash crops like yams, cassava, maize, cocoa, groundnut, and oil palm. The nation possesses a wealth of natural resources essential for agricultural development, including ample land availability, human resources, and forestry assets. Nigeria's total land area is roughly 98.3 million hectares, of which 71.2 million hectares (72.4%) can be cultivated, yet only 34.2 million hectares (34.8%) are currently in use. As stated by Bakare (2013), rural Nigeria is categorized into seven agroecological zones: the semi-arid region in the north; the savannah found in the northern and central regions; a small highland area in the middle and southern regions; a broader transition area of savannah derived from forest that overlaps the southern and central regions; mangroves in the Niger Delta; freshwater swamps also in the Niger Delta; and lowland rainforests in the south. The agroecological conditions alongside technological resources fundamentally shape production systems. Two principal production systems prevail in these zones: (i) the traditional production system, present throughout the country, consisting of landholdings of fewer than 2 hectares (Obinyan, 2000) that focus primarily on food crops for personal consumption, and (ii) the improved irrigation production system, which includes enhanced small-scale irrigation utilizing low-lying or waterlogged areas for both crop and livestock production, as well as large-scale mechanized and/or commercial irrigation farming systems.

Numerous studies have shown that agricultural production in Nigeria remains dominated by smallholder farms (Onugu, 2008; Obinyan, 2000; Ijere and Mbanasor, 2000). The socioeconomic characteristics associated with staple crops significantly impact agricultural output. Factors such as farmers' age, access to credit, gender, farm size, educational background, and farming experience can influence food production. It is reported that half of the world's population relies on subsistence agriculture (Obinyan, 2000). Given the critical importance of

agricultural production for ensuring food security and its essential role in the socioeconomic development of the nation, as indicated by its contributions to GDP, along with the inability of domestic supply to meet domestic demand, it becomes imperative to investigate the socioeconomic elements that affect agricultural production to enhance food supply.

1.2 Objectives of the study

The primary aim of this research is to evaluate how the program has affected the socio-economic conditions of sorghum farmers in the Kano-Jigawa Sorghum production area as part of the Agricultural Transformation Agenda Support Program Phase-1 for farmers in Nigeria's staple crop processing zones.

In particular, this study aims to:

a. Analyze how the socio-economic characteristics of program beneficiary farmers impact the profitability of crop enterprises among participants in the region.
b. Assess the profitability of sorghum farming per farmer in the zone.
c. Identify the key challenges faced by sorghum farmers in the region.

1.3 Hypotheses

The hypotheses for the study are:

Ho1: There is no significant difference in the total land and farm inputs utilized by program beneficiaries' farmers compared to non-program beneficiaries' farmers in the ATASP-1 - 1 program.

Ho2: The ATASP 1 program does not have a significant effect on the socio-economic status of staple crop farmers in the region.

2. Methodology

2.1 Area of the study

The research was conducted in the Staple Crop Processing Zone (SCPZ) of ATASP-1 located in Kano-Jigawa. This zone features specific agro-ecological characteristics and agronomic practices utilized by the beneficiaries and non-beneficiaries of the Program, which comprise farmers, farmers' cooperatives, commodity processors, private sector players, and registered Small and Medium Enterprises (SMEs), as well as input suppliers and service providers within the staple crop processing area.

2.2 Population of the study, sample size, and sampling procedure

The study population consists of both program beneficiaries and non-program beneficiary farmers from two selected communities in Kano and Jigawa States. A multi-staged sampling method was employed to decide the sample size for the study. This process was executed in four phases. As stated by Chukwuemeka (2002), multi-stage sampling is essentially a blend of various sampling methods. The initial stage required the stratification of respondents into three value chain categories: farmers, processors, and fabricators. In the second stage, a random sampling method was utilized to select 66 farmers who are Program beneficiaries, along with 66 non-beneficiaries, resulting in a total of 132 respondents from the zone. For each of the two communities, 66 sorghum farmers were randomly chosen, consisting of 33 ATASP-1 beneficiaries and 33 non-beneficiaries. Consequently, a total of 132 farmers constituted the sample size. Data collection was carried out using a structured questionnaire aimed at the targeted value chain participants in the area, facilitated by trained Extension Agents (EAs). The socio-economic attributes of the sorghum farmers were examined, focusing on the situation before the beneficiaries of the ATASP support program, Phase 1, and the non-beneficiaries. This investigation aimed to assess the profitability of the sorghum enterprise per farmer in the region regarding sorghum production and the socio-economic well-being of the farmers. Objective three was analyzed using descriptive statistics, while farm budgeting and multiple regression analysis were employed for the analysis of objectives one and two. Data were gathered based on the assessed socio-economic variables of the farmers.

2.2 Analytical techniques

The analytical methods used in this study comprised both descriptive and inferential statistics. The inferential statistics included farm budgeting and multiple regression analysis.

$$\boldsymbol{n} = \frac{N}{(1+Ne^2)} \quad (1)$$

Where n = Sample size, N = Population size, and e = level of precision

2.3 Farm budgeting technique

The farm budgeting method was applied to assess the costs, returns, and net revenue for value chain actors. According to Oluwasola (2012), the farm budget serves as a comprehensive physical and financial plan for operating the farm over a specific timeframe. The farm budget approach is represented mathematically in equations 2 and 3:

$$NFI = GI - TC \quad (2)$$

Where NFI = Net farm income (₦), GI = Gross income (₦) and TC = Total cost of production (₦). GM = Gross Margin; it is defined as the difference between gross income (GI) and total variable cost (TVC).

$$GM = GI - TVC \quad (3)$$

Where GM = Gross Margin (₦/ha), GI = Gross Income, also referred to as the total value of production; it equals the total physical product multiplied by the unit price of the product and TVC = Total Variable Costs; these are costs associated with variable inputs which can be allocated to specific enterprises and fluctuate based on output, including expenses for labor, fertilizer, and seeds.

2.4 Multiple regression model

A multiple regression analysis was conducted to identify the factors affecting the profitability of crop enterprises among participants in the ATASP-1 Program within the area.

The multiple regression equation is formulated as

$$Y = a + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + b_5X_5 + b_6X_6 + b_7X_7 + b_8X_8 + e \quad (4)$$

Here, Y represents Profit (N), a denotes the constant, b1 to b8 are the estimated coefficients and e is the error term. X1 indicates Age (Years), X2 represents Farming experience (Years), X3 refers to Household size (number of persons), X4 signifies Educational level (years), X5 indicates Extension contact (number of contacts), X6 signifies Farm size (ha), X7 denotes the Adoption of improved technology (dummy variable: 1 for adopt, 0 for not adopt) and X8 signifies the Cost of production (N).

3. Results and discussion

3.1 Presentation of empirical findings

The socioeconomic factors influencing the profitability of crop enterprise among beneficiaries in Kano - Jigawa zone are shown in Table 1.

Table 1: Socioeconomic Factors influencing the profitability of crop enterprise among beneficiaries

Variables	Kano-Jigawa (n=66)
Constant	0.038 (3.147)***
Age	0.083 (1.691)*
Farming experience	0.077 (2.822)**
Household size	0.041 (2.497)**
Educational level	0.089 (2.997) **
Extension contact	0.055 (1.955)*
Farm size	0.0747 (3.024)***
Adoption of improved technology	0.087 (3.811)***
Cost of production	-0.093 (-3.701)***
F-value	68.141*
R^2	0.813

Note: Values in parentheses are T-statistics

***Significant at P<0.001, **Significant at P<0.01 and *Significant at P<0.05, NS= Not Significant

3.2 Factors affecting crop enterprise profitability among beneficiaries

A multiple regression analysis was conducted to identify the factors that impact the profitability of crop enterprises among beneficiaries of the ATASP-1 Program in the Kano-Jigawa region. The socio-economic factors selected as independent variables included the age of farmers, household size, education level, farming experience, farm size, production costs, extension contact, and the adoption of improved technology. To compare and thoroughly evaluate the essential parameters, four linear forms were applied to the data. The national linear regression model was identified as the primary equation due to its alignment with econometric and significant criteria, such as the R2 magnitude (0.937), F-ratio (114.305, P<0.01), the number of significant variables, and its agreement with a priori expectations, as shown in Table 1. The regression coefficients for multiple determinations indicated an R2 of 0.813 for Kano-Jigawa, signifying that 81.3% of the variability in profits generated by farmers from crop enterprises in Kano-Jigawa was explained by the variables included in the model. The F-value was significant at the P<0.05 level, confirming a good fit of the regression model in the region. The coefficient for age (0.083) was positive and statistically significant (P<0.05) in the Kano-Jigawa zone. This suggests that there is a positive relationship between farmers' ages and the profits gained from crop production in the area. This situation implies that middle-aged farmers tend to be more skilled compared to younger farmers, thereby meeting the a priori expectation. This finding aligns with Ja'afar-Furo et al. (2011), who noted that a person's energy level influences their capacity to take risks and diversify livelihood strategies, which also resonates with the findings of Konja, Mabe, and Alhassan (2019), who reported that younger and more physically active farmers make better rational decisions that positively impact productivity.

The farming experience of ATASP-1 Program beneficiaries also exhibited a positive coefficient (0.077) and was statistically significant (P<0.01) in the Kano-Jigawa zone. This indicates that an increase in farming experience correlates with a rise in the output of the farmers, thus leading to higher profits. This is valid because farmers with greater experience are likely to have better knowledge regarding resource combinations. This outcome aligns with a priori expectations because crop farmers with extensive experience are known to achieve higher yields due to enhanced resource use efficiency. Such farmers are technically, economically, and allocatively more efficient compared to those with less experience, which corresponds with the findings of Oladimeji and Abdulsalam (2013) and Sani et al. (2017), who posited that farming experience is expected to influence production efficiencies due to skill accumulation, noting that the longer an individual remains in a specific job, the better their performance tends to be. The coefficient for household size (0.041) reflects a positive and statistically significant relationship (P<0.01) within the Kano-Jigawa region. This suggests that the size of a household positively impacts the outputs produced by farmers in the area. It indicates that the household members play a crucial role in providing labor, which enhances the Sorghum yield and profit margins. Contrary to common assumptions, a larger household size can effectively supply the necessary labor for the farming activities, thereby lowering costs as family labor does not incur expenses Lowder, *et al.,* (2014), and Ojeleye (2015) argued that the sheer number of individuals in a household isn't necessarily indicative of their capacity for productive agricultural work. This capacity can be influenced by several significant aspects, including age, gender, education level, and health conditions. Education serves as a form of social capital that positively affects a household's capability to make informed and effective production decisions. In this investigation, education was represented as years of schooling, which was anticipated to have a positive correlation with efficiency. The coefficient associated with education level was found to be positive (0.089) and statistically significant (P<0.01) in the Kano-Jigawa region. This suggests that a higher educational attainment correlates with increased profits for the beneficiaries. Education cultivates a labor force that is more skilled and better able to adapt to the evolving

economy. It helps unearth natural talents and entrepreneurial abilities among farmers. Furthermore, education enhances farmers' capabilities to comprehend and evaluate new agricultural techniques, resulting in higher crop yields and productivity (Mugwe et al., 2012). This aligns with the research by Irhobie and Agwu (2014), which assessed the food security circumstances among farming households in rural Kano State, Nigeria, indicating that many farmers have some form of education, thus contributing to a relatively high literacy rate in the region. An educated farmer is better equipped to handle instructional manuals regarding inputs and machinery utilization. Extension contact refers to the application of scientific findings and fresh knowledge to farming practices through educational initiatives for farmers. The realm of extension encompasses diverse communication and learning activities organized by agricultural professionals for farmers. In this study, agricultural extension contact was quantified by the frequency with which farmers received instruction from extension agents. The coefficient for extension contact was positive (0.055) and significant at ($P<0.05$). This conveys that an increase in the frequency of extension contacts will lead to greater technology adoption, aligning with prior expectations. Extension services are the primary conduit for disseminating agricultural innovations from research to farmers. This corresponds with Jafaar (2016), who asserted that extension services are vital for enhancing productivity and efficiency among farmers. The coefficient related to farm size was positive (0.0747) and significantly ($P<0.001$) linked to the profits earned by beneficiaries from crop production. This implies that farm size is positively associated with income levels from farming activities. Thus, any expansion in farm size will result in increased output, leading to higher profits. This finding is consistent with the research conducted by Adzawla, Fuseini, and Donkoh (2013), which indicated that farmers with larger farms demonstrated greater efficiency compared to those with smaller plots. Therefore, any increase in farm size will contribute to heightened output, ultimately generating more revenue and profit for the farmer. The findings are consistent with those of Muzari et al. (2012), who discovered a positive correlation between income and the output of farmers participating in the Agip-Green River Program in Rivers State, Nigeria. The coefficient for the adoption of improved technologies promoted by the Program was positive (0.087) and statistically significant ($P<0.001$). This suggests that an increase in the adoption of improved technologies will result in a corresponding rise in profits for farmers across various zones. This aligns with the results of Yohanna et al. (2019), who observed that the annual income of ATASP-1 participating farmers in the Sokoto-Kebbi zone was significant at 5%, indicating that ATASP-1 farmers with higher incomes are better positioned to utilize improved services, which can help mitigate the constraints and challenges related to adopting new farming technologies. The coefficient for the total cost of crop production per hectare was negative (-0.093) and significant at $P<0.001$. This negative effect implies that an increase in total production costs will lead to a decline in the profitability of the crop enterprise in the Kano-Jigawa zone.

Table 2: Profitability of sorghum enterprise per farmer

Sorghum	Kano-Jigawa (n=66)		Kano-Jigawa (n=66)		Total (n=132)
	ATASP-1	%	Non-ATASP-1	%	
Total Cost (₦)	75,302.0	47.03	84,821.0	52.97	160,123.0
Output (Mt/ha)	2.67	59.33	1.83	40.67	4.5
Unit Price (₦)	88.0	48.89	92.0	51.11	180
Income (₦)	142,296.0	53.43	124,016.0	46.57	266,312.0
Profit	66,994.0	63.09	39,195.0	36.91	106,189.0

3.3 Evaluation of sorghum enterprise profitability

Table 2 provides an analysis of the profitability for sorghum farmers in the Kano-Jigawa zone. The findings indicate that the overall cost of producing sorghum was N 75,302.0 per hectare; for beneficiaries, it was N 84,821.0 per hectare, and for non-beneficiaries, with beneficiaries and non-beneficiaries accounting for 47.03% and 52.97% of the total cost, respectively. Furthermore, farmers achieved total outputs of 2.67Mt/ha for beneficiaries and 1.83Mt/ha for non-beneficiaries, representing 59.33% and 40.67% of the zonal total output, respectively. Additionally, the unit price of sorghum per kilogram varies in the region, priced at N 88.0/Kg for beneficiaries and N 92.0/Kg for non-beneficiaries. The data reveal that the income of sorghum farmers differs in the zone, with beneficiaries earning N 142,296.0 per hectare and non-beneficiaries earning N 124,016.0 per hectare. This indicates that beneficiaries of the Program generated higher income and profit compared to non-beneficiaries. However, the disparity in farmers' income may result from the adoption of innovative technologies and financing investment in productive assets and community infrastructure promoted by the Program.

The profitability analysis of sorghum production highlights that non-beneficiary farmers realized the lowest profit in the zone at N 39,195.0/ha, representing 36.91%, while the highest profit was recorded for program beneficiaries at N 142,296.0/ha, accounting for 63.09% of the total income observed in the region. The average return on investment per hectare (return per naira invested) was N 1.88 for program beneficiaries and N 1.46 for non-beneficiaries. This suggests that for every ₦ 1 invested in sorghum production, beneficiaries earned a profit of 88 kobo, whereas non-beneficiaries earned 46 kobo. Consequently, sorghum production proved profitable for both groups of respondents in the study area. This aligns with the findings of Mohammed et al. (2015) regarding the economic viability of on-farm sorghum-legume strip cropping systems in Kano State, Nigeria,

which supports that sorghum cultivation is indeed profitable.

The data imply that, on average, sorghum farmers who are program beneficiaries achieved greater profitability compared to their non-beneficiary counterparts. The variation in profit levels among sorghum farmers may stem from differences in capital sources and the quantity of farm inputs utilized in the region. Another contributing factor may be the enhanced farm outputs observed, likely due to superior farming techniques learned, which positively affected their yields and revenues.

Table 3: The major challenges faced by the sorghum farmers in the study area

Constraints	Kano-Jigawa (n=132)
Knowledge:	**Frq(%)**
Insufficient awareness	10(7.6)
Poor understanding of technology (GAP) requirements	18(13.6)
Poor record-keeping	38(28.8)
Environmental	
Human factors	30(22.7)
Physical/Climatic factors	36(27.3)
Social:	
Socio-cultural (Religious belief/Tradition)	9(6.8)
shortage of labour,	10(7.6)
insufficient networking with stakeholders,	21(15.9)
Conflict	26(19.7)
Long distance to market	10(7.6)
Low prices for farm produce	23(17.4)
High transport cost	13(9.8)
Lack of market/demand for product	20(15.1)
Extension services:	
Unavailability of extension services	6(4.5)
Lack of effectiveness	55(41.7)
Long distance to the extension workers	5(3.8)
Others:	
Problem of pests and diseases	10(7.6)
Poor road network	13(9.8)
Inadequate capital	8(6.1)
Inadequate land	15(11.4)
Inadequate large export market	20(15.1)

3.4 Constraints experienced by sorghum farmers in the study area

The challenges hindering wealth creation among beneficiaries are outlined in Table 3. The findings indicate that the majority (28.8%) of farmers struggle with the issue of poor record keeping, while 13.6% face challenges due to a lack of understanding of technology (GAP) requirements. Additionally, 7.6% of farmers reported insufficient awareness of improved technology across different regions. Also, 22.7% and 27.3% of farmers identified human factors and physical/climatic factors as constraints, respectively. Moreover, 19.7% of the farmers raised concerns regarding conflicts, and 17.4% complained about low prices for their agricultural products across regions. Furthermore, 41.7% of farmers pointed out the lack of effectiveness of extension services as a significant constraint. Other barriers affecting wealth creation among ATASP-1 beneficiaries across regions include pest and disease issues (7.6%), poor road infrastructure (9.8%), insufficient capital (6.1%), inadequate land availability (11.4%), and a lack of adequate export markets (15.1%).

4. Conclusion

The study's findings led to the following conclusions. The results from the Kano – Jigawa Zone indicate that program beneficiaries experienced higher income levels compared to non-beneficiaries. Nevertheless, the disparity in farmers' income may be attributed to the support provided by ATASP-1, the adoption of innovative technologies promoted, and financing investment in productive assets and community infrastructure by the program. Additionally, the increase in farm output can be attributed to the improved farming techniques that beneficiaries likely acquired, which positively impacted their yields and revenue in the area. This suggests that factors such as age, household size, and years of farming experience contribute to an increase in farmers' output, leading to higher profits. Farmers with greater experience are generally more skilled in effectively utilizing their resources.

Acknowledgment

The study suggests that initiatives should be undertaken to develop road infrastructure for easier access to markets and agricultural inputs, ensure adequate funding, improve the availability of extension services, and encourage farmers to establish cooperatives to pool their resources and enhance their operational scale.

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