

Effect of adoption of sammaz-75t on the livelihood of maize farmers in Zaria Local Government Area, Kaduna State, Nigeria

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Abstract:

Maize productivity and livelihood outcomes of farmers in Nigeria remain low due to quality of seeds, inadequate farming practices, drought and pests. SAMAZ-75T has been developed to provide higher yields, improved pest resistance and drought tolerance maize variety but the adoption seems is low among farmers due to socio-economic, informational and infrastructural barriers. This study assessed the effect of adopting SAMMAZ-75T on the livelihood of maize farmers in Zaria Local Government Area of Kaduna State due to their prominence in maize production and subsequent adoption of the improved variety. Multistage sampling technique was used to select one hundred and three (103) maize farmers from four villages across two major wards with high maize production intensity. Data were collected using structured questionnaire and was analyzed using both descriptive and inferential statistics, including logistic regression, Pearson correlation, and paired t-tests. Results revealed that the average age of respondents was between 41–50 years, with 98.1% being male and 81.6% married. The mean farm size was 3.13 hectares, and 66.0% of the respondents had access to credit, while 58.3% were members of cooperatives. About 88.3% of the farmers were aware of SAMMAZ-75T, while 58.3% had adopted it. Logistic regression showed that farm size ($p = 0.081$), cooperative membership ($p = 0.090$), and credit access ($p = 0.096$) positively influenced adoption. The adoption of SAMMAZ-75T led to significant improvements in yield increase with a t-value ($p < 0.001$), followed by income ($p < 0.001$) and food security ($p < 0.001$), indicating a strong and statistically significant impact of adoption on farmers' livelihoods. However, several constraints were identified. The most critical among them were lack of government support (88.3%), poor infrastructure (74.8%), and high cost of improved seeds (73.8%). The study concluded that the adoption of SAMMAZ-75T has economically meaningful positive effect on the livelihoods of maize farmers.

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1. Introduction

Maize (*Zea mays L.*), commonly known as corn, is one of the most widely cultivated cereal crops globally and a staple food in many regions. It plays a critical role in food security, providing essential nutrients such as carbohydrates, proteins, and various vitamins, which makes it indispensable in the diets of millions worldwide (Smith, *et al.*, 2018). According to the Food and Agriculture Organization (FAO), maize was the world's most-produced cereal crop in 2022, with global production exceeding 1.1 billion tons, a reflection of its importance in both food and industrial uses (FAO, 2023). The versatility and adaptability of maize have made it a key crop in addressing hunger and poverty (Adams and Baker, 2019).

Nigeria is the largest maize producer in West Africa, accounting for over 35% of the region's total maize output, with an estimated annual production of 12 million tons

(Olawale, *et al.*, 2021). Maize is cultivated in all ecological zones of Nigeria, with the highest production volumes in the northern and central regions. However, the country's average maize yield is approximately 2.4 tons per hectare, which is significantly lower than the global average (FAO, 2022). According to the International Food Policy Research Institute (IFPRI), low yields in Nigeria are due to inadequate access to quality seeds, insufficient use of fertilizers, and limited extension services for smallholder farmers. IFPRI and other organizations emphasize that adopting improved maize varieties could help Nigeria meet domestic demand and reduce reliance on imports (IFPRI, 2021; Ogunniyi and Olagunju, 2019).

Kaduna State is a significant maize-production region due to its favorable climate and abundant farmland. Maize plays a critical role in Nigeria's food security and is a primary income source for millions of smallholder farmers.

However, maize yields across Nigeria, including Kaduna, remain low, averaging about 2.4 to 2.5 tons per hectare, which is significantly below the global average of 5.8 tons per hectare (FAO, 2022; CIMMYT, 2022). Research by the International Institute of Tropical Agriculture (IITA) suggests that the adoption of improved maize varieties, such as SAMMAZ-75T, could help farmers productivity in Kaduna (Ibrahim and Abdullahi, 2022). SAMMAZ-75T was developed to withstand the region's environmental stresses, including pests and drought. The adoption of such varieties has shown the potential to double yields, thereby improving food security and income for maize farmers in Kaduna (IITA, 2022). In response to these challenges, agricultural research institutions, including the Institute for Agricultural Research (IAR) at the Ahmadu Bello University, have developed improved maize varieties, such as SAMMAZ-75T. This variety is specifically designed to withstand local stressors, offering resistance to drought and pests, and the potential for higher yields with minimal inputs.

2. Methodology

Zaria Local Government Area is one of the 23 LGAs in Kaduna State, Nigeria. It is geographically located in the northern region of the state, approximately 80 kilometers north of Kaduna City, the state capital (Britannica, 2022). Zaria covers an area of approximately 563 square kilometers and lies between latitudes 11°4'N and 11°13'N and longitudes 7°42'E and 7°49'E (The World Countries, 2022). Strategically located within the Sudan Savanna ecological zone, Zaria is characterized by fertile soils and favorable climatic conditions that support agricultural activities, particularly the cultivation of maize and other crops (Haruna and Murtala, 2021; Britannica, 2022).

The population of Zaria Local Government Area is estimated at approximately 601,300 as of 2022, based on projections from the National Population Commission, using an average annual growth rate of 3.2%, which aligns with demographic trends, observed in northern Nigeria. This growth rate was applied to the 2006 census figure of 406,990, which indicated an almost equal gender distribution, reflecting the balanced demographic structure of the area (NPC, 2006; Kaduna State Bureau of Statistics, 2022). Zaria's population is characterized by diverse ethnic groups, predominantly Hausa and Fulani, who significantly influence the region's socio-economic framework.

2.1 Sampling procedure and sample size

A multi stage sampling technique was adopted for this study. In the first stage, purposive sampling procedure was used to select two wards with high concentration of maize farmers from the study area. In the second stage, from the two wards, two villages were selected due to the high volume of maize production making a total of four villages. In the third stage, Taro Yamane formula was used to select a sample size of 103 maize farmers from a sample frame of 139 farmers obtained from a list of registered maize farmers gotten from Kaduna State Agricultural Development Project. Following that, proportionate sampling was then use to get the individual sample size per village.

Table 1: Sampling frame and sampling size

LGA	Wards	Villages	Sample frame	Sample size
Zaria	Basawa	Ugwan	52	39
		Maiwasa	34	24
		Ugwan Rimi		
	Tudun wada	Layi Mora	25	19
		Sabon Layi	28	21
		Total	139	103

2.2 Method of data analysis

Both descriptive and inferential statistics were employed for the analysis of the data obtained. Descriptive statistics such as tables; percentages, means and chart were used to achieve objective I while and (to describe the socio-economic characteristics of the maize farmer in the study area.

3. Result and discussion

3.1 Socio-economic characteristics

Table 2 revealed that the age distribution of respondents, showing that the majority (38.8%) fall within the 41–50 years category, with a mean age index of 3.22. This indicates that maize farming in the study area is predominantly managed by middle-aged individuals. This finding aligns with Nwalieji and Ajani (2018), who noted that farmers within this age group are more likely to adopt agricultural innovations due to their balance of energy and experience. While older farmers may possess more land and experience, they are often less receptive to change; younger farmers, though more adaptable, may lack the capital and access to land necessary for large-scale adoption.

Table 2 also shows a heavy male dominance in maize farming, with 98.1% of respondents being men. This confirms the trend observed by Bashir et al. (2019) in northern Nigeria, where agricultural activities, especially in cereal production, are male-dominated due to socio-cultural norms and the physical demands of farming. Table 2 further revealed that the majority of respondents (81.6%) are married. Marital status can influence household labor dynamics and willingness to take risks associated with adopting new technologies. Married individuals often benefit from family labor and support systems, which can enhance farm productivity (Idris et al., 2021). In terms of educational attainment, Table 2 shows that 28.2% of respondents had tertiary education, while 48.5% of the respondents had either primary or secondary education. The mean educational level was 9.05 years. Education is critical to technology adoption, as literate farmers are better positioned to understand the benefits and application techniques of improved varieties such as SAMMAZ-75T. This observation is consistent with Yusuf et al. (2020), who found a positive relationship between education and innovation adoption among farmers.

Table 1 also shows that farm size has an average of 3.13 hectares and most farmers operated either 2 hectares (28.2%) or 3 hectares (24.3%). According to Oluwatayo and Ojo (2022), large farm sizes typically correlate with higher levels of adoption of improved seed varieties due to the ability to spread risk and leverage available resources

more effectively. It also shows that the majority (41.7%) of the respondents had 5–10 years of experience, with an average experience index of 2.21. Farming experience is crucial in shaping a farmer’s perception and openness to innovation. Onu and Madukwe (2018) argued that experienced farmers are more confident in adopting new technologies, especially after observing prior benefits. With regard to access to credit, Table 2 revealed that 66.0% of respondents had access to credit facilities. Access to

financial resources is known to significantly influence technology uptake (Nwachukwu, *et al.*, 2023). Nevertheless, the table also shows that 43.7% of the respondents reported having no credit source. Among those with access, the primary sources were commercial banks (28.2%) and microfinance institutions (20.4%), indicating a continuing challenge in the reach and availability of formal credit channels in rural areas.

Table 2: Socioeconomic characteristic of maize farmers

Variable	Category	Frequency	Percentage (%)
Age	20-30	5	4.9
	31-40	20	19.4
	41-50	40	38.8
	51-60	24	23.3
	61-70	13	12.6
	71-80	1	1.0
	Mean		
Gender	Male	101	98.1
	Female	2	1.9
Marital Status	Single	9	8.7
	Married	84	81.6
	Widowed	10	9.7
Educational Level	No Formal/Qur’anic Education	24	23.3
	Primary Education	26	25.2
	Secondary Education	24	23.3
	Tertiary Education	29	28.2
	Mean		
Farm Size (ha)	1	9	8.7
	2	29	28.2
	3	25	24.3
	4	20	19.4
	5	20	19.4
	Mean		
Farming Experience	Less than 5 years	23	22.3
	5–10 years	43	41.7
	11–15 years	29	28.2
	More than 15 years	8	7.8
	Mean		
Access to Credit	Yes	68	66.0
	No	35	34.0
Coop Membership	Yes	60	58.3
	No	43	41.7
Primary Occupation	Yes (Farming)	62	60.2
	No	41	39.8
Credit Source	None	45	43.7
	Commercial Banks	29	28.2
	Microfinance Banks	21	20.4
	Bank of Agriculture	2	1.9
	Neighbours	5	4.9
	Others	1	1.0

Table 2 also revealed that 58.3% of the respondents belonged to cooperative societies. Cooperative membership can enhance technology adoption by providing access to inputs, credit, training, and market information. Adewale et al. (2020) found that farmers in cooperatives are more likely to adopt improved agricultural practices such as hybrid seeds. As revealed by Table 2, about 60.2% of the respondents considered farming as their primary occupation. This suggests a strong dependence on farming as a livelihood source. According to Eze et al. (2021), full-time farmers are more likely to

adopt productivity-enhancing innovations like SAMMAZ-75T, as their income and welfare are directly tied to agricultural output.

3.2 Effect of adoption of SAMMAZ-75T among maize farmers

The most notable impact was on yield improvement, with a mean score of 0.94 (SD = 0.235), and a highly significant t-value of 40.608 ($p < 0.001$). This result indicates that the vast majority of farmers experienced substantial yield gains after adopting the SAMMAZ-75T

variety. This finding supports prior studies that underscore the role of improved maize varieties in enhancing productivity and profitability (Mignouna et al., 2019). Table 3 also revealed that income levels significantly increased following adoption, with a mean of 0.83 (SD = 0.373) and a t-value of 22.716 ($p < 0.001$). Similarly, food security improved significantly (mean = 0.83, SD = 0.382), with a t-value of 21.947 ($p < 0.001$). These findings suggest that adoption of the variety not only boosted economic outcomes but also helped stabilize access to food, consistent with Adeola and Awoyinka (2020), who reported that improved varieties positively affect farmer livelihoods.

Increased household size was another notable effect (mean = 0.82, SD = 0.390), with a significant t-value of 21.236 ($p < 0.001$). This could reflect improved living standards that allowed for larger or more secure household arrangements, in line with studies like Yusuf and Salihu (2019) that link agricultural success with improved household welfare. Furthermore, Table 3 indicates material asset acquisition following adoption. The purchase of

motorcycles (mean = 0.63, SD = 0.485; $t = 13.209$, $p < 0.001$) and clothing (mean = 0.66, SD = 0.476; $t = 14.077$, $p < 0.001$) showed strong positive effects. Ownership of smartphones (mean = 0.65, SD = 0.479; $t = 13.778$, $p < 0.001$) also increased, reflecting improved social capital, communication, and access to agricultural information.

Meanwhile, car ownership (mean = 0.32, SD = 0.469) and spending on school uniforms (mean = 0.44, SD = 0.498) also improved significantly ($t = 6.934$ and 8.896 respectively, $p < 0.001$), though to a lesser extent. These findings suggest gradual progress in mobility and educational investments. Finally, the "Other" category, covering miscellaneous livelihood improvements, showed a moderate but significant effect (mean = 0.23, SD = 0.425; $t = 5.567$, $p < 0.001$).

In summary, Table 2 highlights that the adoption of SAMMAZ-75T had a comprehensive and statistically significant positive effect on the livelihoods of maize farmers, spanning productivity, income, food security, household welfare, and asset accumulation.

Table 3: Effect of adoption of SAMMAZ-75T among maize farmers

Variable	Mean	Std. Deviation	Std. Error Mean	t-value	Sig. (2-tailed)
High yield	0.94	0.235	0.023	40.608	0.000
Increase in income	0.83	0.373	0.037	22.716	0.000
Improved food security	0.83	0.382	0.038	21.947	0.000
Increased household size	0.82	0.390	0.038	21.236	0.000
Car	0.32	0.469	0.046	6.934	0.000
Motorcycle	0.63	0.485	0.048	13.209	0.000
Clothes	0.66	0.476	0.047	14.077	0.000
Smartphone	0.65	0.479	0.047	13.778	0.000
School uniform	0.44	0.498	0.049	8.896	0.000
Other	0.23	0.425	0.042	5.567	0.000

4. Conclusion

This study assessed the effect of the adoption of SAMMAZ-75T on the livelihood of maize farmers in Zaria Local Government Area of Kaduna State. The study specifically sought to describe the socio-economic characteristics of maize farmers in the study area to determine the effect of adoption of SAMMAZ-75T among maize farmers in the study area. The socio-economic analysis revealed that the majority of maize farmers were male (98.1%) and within the economically active age group, particularly between 41 and 50 years of age. Most respondents were married (81.6%), with varying levels of education 28.2% had tertiary education, while 25.2% and 23.3% had primary and secondary education, respectively. The average farm size was 3.13 hectares, and a significant number of respondents (41.7%) had between 5 and 10 years of farming experience. Access to credit was reported by 66.0% of the respondents, and 58.3% were members of cooperatives. Farming was the main occupation for 60.2% of the farmers. Furthermore, the effect of SAMMAZ-75T adoption on farmers' livelihoods was statistically significant across a range of livelihood indicators. Adoption led to increased yield (mean = 0.94), improved income (mean = 0.83), enhanced food security (mean = 0.83), and improved household conditions. Farmers also reported increased access to assets such as motorcycles, smartphones, clothes, and other livelihood

indicators with statistically significant t-values ($p < 0.001$). These improvements collectively affirm the positive effect of adoption on rural welfare.

Recommendations

In light of the findings of this study, the following recommendations are made to enhance the adoption and benefits of SAMMAZ-75T: Firstly, the government and agricultural development agencies should intensify efforts to improve access to improved seeds by subsidizing their costs and ensuring their availability through local distribution networks. Given that high seed cost and limited availability were major constraints, targeted interventions in seed supply chains are necessary. Secondly, extension services should be strengthened in both reach and capacity. More extension agents should be deployed, and regular training sessions and field demonstrations organized to educate farmers on the agronomic and economic benefits of SAMMAZ-75T. Thirdly, cooperative societies should be supported and encouraged, as they were shown to significantly influence adoption. These groups can serve as platforms for knowledge sharing, input distribution, and financial support. Fourthly, the government should address infrastructural challenges such as poor road networks and limited storage facilities to facilitate access to markets and reduce post-harvest losses. These improvements will make maize farming more profitable and sustainable.

Finally, training programs should be organized to improve farmers' understanding of all beneficial attributes of SAMMAZ-75T, including early maturity and disease resistance, which were found to have lower levels of awareness.

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