International Journal of Global Affairs, Research and Development (IJGARD), Vol.4, No.1, 2026, 170-181, ISSN 2992-2488

CONSTRAINTS OF DIVERSIFICATION AMONG SMALL-SCALE MAIZE (*Zea mays*), FARMERS IN KADUNA STATE, NIGERIA: IMPLICATIONS FOR FOOD SECURITY POLICY

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ABSTRACT

Diversification in agricultural production and income sources is often promoted as a strategy for boosting the resilience and reducing the vulnerability of smallholder farmers in developing countries. This study explores the diversification activities pursued by smallholder maize farmers in Kaduna State, Nigeria, as well as the constraints they face in expanding these pathways. Utilising a multistage sampling procedure, data was collected from four hundred and five (405) smallholder maize farmers and data was analyzed using descriptive statistics such as frequency, mean, standard deviation, charts, and percentages. The study established that the three most critical constraints associated with livelihood diversification were a lack of credit facilities (94.4%), a poor asset base (83%), and a lack of awareness and training facilities (67.1%). The major perceived potentials for intervention in livelihood diversification activities among maize farmers in the study area were contract farming (94.1%), social support (92.8%), temporary wage employment (89.9%), government relief such as agricultural support programmes (71.9%), and minimum investment (77.5%). The study concludes that lack of credit, limited assets, inadequate training, risk aversion, and limited non-farm opportunities hinder farmer efforts. Diversification strategies like contract farming, social support, temporary work, government assistance, and low-investment activities hold promise. Hence, maximize these benefits, it is recommended to prioritise rural infrastructure development, expand microfinance to increase access to credit, and strengthen extension services to offer tailored training in diverse farming practices, value-added, and financial management. Also, encourage participation in cooperatives or farmer associations to build collective power and address common challenges.

Keywords: Smallholder farmers, Maize, Diversification, Constraints, Potentials

1.0 INTRODUCTION

Maize (Zea Mays L) reigns supreme as a staple crop in Nigeria, particularly for smallholder farmers in Kaduna State. Yet, their overdependence on monoculture maize production creates a precarious situation rife with challenges (Abdullahi *et al*., 2016; Akpeni *et al*., 2020). Smallholder maize farmers in Kaduna State, Nigeria, face significant challenges due to their reliance on monoculture and limited access to resources. This exposes them to risks associated with pests, diseases, volatile markets, and climate change, hindering their income potential and overall well-being (Nkonde *et al.*, 2015; Abdullahi *et al.*, 2016; Chete, 2019; Akpeni *et al.*, 2020). Diversification presents a promising strategy to address these challenges by spreading risk, enhancing resource use, and increasing income. However, the specific pathways and constraints influencing diversification adoption among these farmers remain unclear. Understanding the diversification practices and constraints of smallholder maize farmers in Kaduna State is crucial for guiding policymakers and development agencies in designing effective strategies to promote and support diversification among these farmers (Bationo *et al*., 2015; Abdullahi and Abalu, 2016; Apuuli *et al*., 2017; Ojo *et al*., 2018; Olowe *et al*., 2018; Aminu *et al*., 2019).

Diversification can be a powerful strategy for smallholder farmers to overcome these challenges and improve their livelihoods (Nkonde *et al.*, 2015; Apuuli *et al.*, 2017; Otsason and Ajisegiri, 2017; Fisseha *et al*., 2021; Akpeni *et al.*, 2020). By incorporating other crops, livestock, or income-generating activities into their farming systems, farmers can reduce dependence on a single crop and income source, making them more resilient to shocks. Understanding the diversification pathways and constraints faced by Kaduna's maize farmers holds immense significance. This study, therefore, serves as a beacon of hope, aiming to illuminate the path towards a more diversified, resilient, and sustainable agricultural future for Kaduna's maize farmers.

Monoculture dependence exposes farmers to a web of interconnected problems: fluctuating market prices, devastating pest and disease outbreaks, and the looming threat of climate change, all of which wreak havoc on single-crop systems, jeopardizing income stability and food security. Monoculture often leads to the unsustainable utilization of land, water, and other resources, hindering agricultural productivity and long-term sustainability (Fernandez and Harwood, 2016; FAO, 2019; Badgley *et al*., 2020). Without diverse income streams, escaping poverty and achieving improved well-being remain distant dreams for many farmers. Kaduna State grapples with a poverty rate of 72%, exceeding the national average (NBS, 2022). Considering agriculture as the primary income source for most rural households, the need for strategies to enhance agricultural livelihoods becomes abundantly clear. Nigeria's maize yields lag behind other African nations, partly due to reliance on traditional varieties and unsustainable practices (Adebayo and Olowe, 2017; Ajibade and Amao, 2017; Jayne *et al.*, 2018; Aliyu *et al*., 2018; Chete, 2019; Adamu and Yakubu, 2019; Abubakar and Usman, 2019; FAO, 2020).

The broad objective of the study is aimed at exploring diversification activities and constraints among smallholder maize farmers in Kaduna State, Nigeria. The specific objectives were to:

1. Explore the various livelihood diversification activities among smallholder maize farmers

2. Describe the constraints associated with livelihood diversification activities among smallholder maize farmers.

2.0 METHODOLOGY

2.1 Research Location

The study was carried out in Kaduna State. It is made up of 23 LGAs and four agricultural zones (Birnin Gwari, Lere, Maigana, and Samaru Kataf). The State lies in the north-western part of Nigeria's agro-ecological zones. It is located between Latitude 9°02N and 11°32N and Longitude 6° 00'E and 9° 10'E of the prime meridian (Kaduna Agricultural Development Agency, KADA, 2018) (Figure 1). The State occupies an area of 48,473.2 square kilometers (KBS, 2022). The State had a total population of 8,789,003 people in 2019 and is projected to have about 9,172,587 people in 2022, at an annual growth rate of 3%, (NBS, 2022). Crop cultivation (like maize millet, maize, and sorghum) and legumes (including cowpea, groundnut, and soy bean) are mostly rain-fed and practiced in the upland. The main occupation is farming, while trading is very common in both urban and rural areas. Other income-generating activities and occupations in the study area include civil service, carpentry, building, welding, poultry farming, tailoring, hair plaiting, brick making, automobile mechanics, plumbing, electricians, paint work, commercial motoring, and tricycle driving. The map of Kaduna State showing the study area is shown in figure 1.

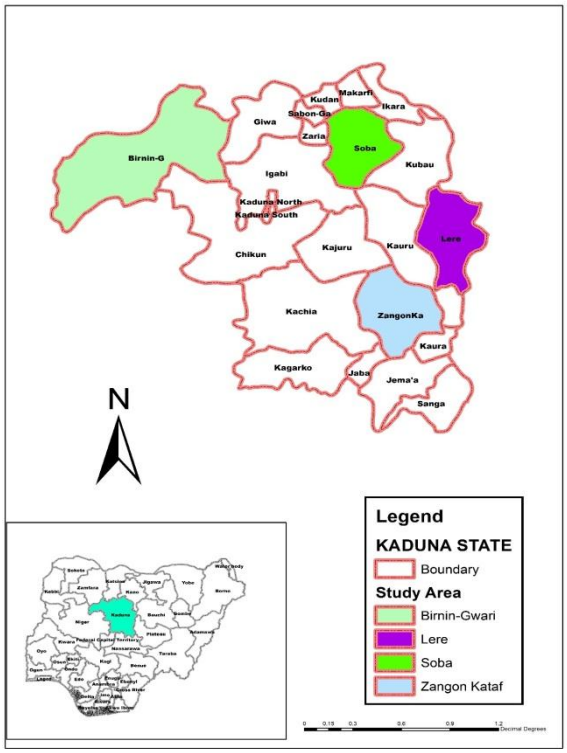

Figure 1: Map of the Kaduna State showing the Study Area

2.2 Population Sampling

A multistage sampling procedure was employed to select small-holder maize farmers for the study. The first stage involved the stratification of the State into four (4), on the basis of the Kaduna Agricultural Development Agency (KADA), administrative zones: Birnin Gwari, Lere, Maigana, and Samaru Kataf zones. The second stage involves the random selection of two (2) Local Government Areas (LGAs) from each of the four agricultural zones of the State through a balloting system to give a total of eight (8) LGAs (Table 1). To ensure representativeness, the third stage involves a simple random selection of 30% of the villages within each chosen LGA. This selection considered four key factors: size, respondent population, intensity of diversification, and output performance of rural households. To ensure a representative sample, 405 smallholder maize farmers were chosen from a total population of 8,034 through a random selection process. This study adopted the Yamane (1967) formula to calculate the sample size, consistent with the methodology used by Abdulrahman *et al.* (2016) in their similar research.

The formula is expressed as follows: $n_0 = \frac{N}{1+N(e^2)}$ Where: n_0 is the sample size without considering the finite population correction factor; e = 0.05; N = total number of observations

Primary data were used for this study. The data were obtained through the use of a structured questionnaire and an interview scheduled, which were administered to the selected smallholder maize farmers in the study area with the assistance of trained enumerators under the supervision of the researcher. Data that were collected include constraints associated with maize farmer's livelihood diversification activities and potential for intervention on livelihood diversification activities among smallholder maize farmers.

2.3 Analytical Techniques

Descriptive Statistics

Descriptive statistics such as such as frequency distribution, percentage, mean, and standard deviation, were employed to describe the constraints associated with maize farmer's livelihood diversification activities and the potential for intervention on the livelihood diversification activities among smallholder maize farmers.

Table 1: Population and sample size of the maize farmers in the study area

Zone	LGA	Villages	*Sample frame	Sample size
Samaru kataf	Kachia	Doka	320	16
		Gumel	290	15
	Kagarko	Kubacha	213	11
		Dogo	263	13
Birnin Gwari	Igabi	Farakwai	198	10
		Gadan Gayan	560	28
		Zangon –Aya	810	41
	Chikun	Kujama	436	22
		Kajuru	440	22
		Gayan	232	12
Maigana	Kubau	Anchau	250	13
		Pambegua	440	22
		Dutsen wai	480	24
	Makarfi	Danguzuri	221	11
		Mayere	390	20
		Gubuchi	480	24
	Ikara	Gedage	330	17
		Kurmin kogi	340	17
Lere	Lere	Yarkasuwa	360	18
		Sigau	509	25
	Kauru	Geshere	242	12
		Dandaura	230	12
	Total		8034	405

Source: KADA, 2019

3.0 RESULTS AND DISCUSSION

3.1 Available Resource Endowments that Permit Livelihood Diversification

Figure 2 demonstrates the significant role non-farm activities (such as education, petty trading, and barbing) play in the livelihood strategies and income generation of maize farmers. With approximately 38% of farm households engaging in these activities, their importance for diversifying income and reducing poverty is clear. Farmers often pursue non-farm activities to fulfil basic household needs, maintain food security, fund education, and mitigate the risks inherent in relying solely on farming income. This finding aligns with previous research by Oladimeji *et al*. (2015) and De Janvry *et al.* (2005), further emphasising the positive impact of non-farm activities on poverty alleviation.

Crop production, particularly food crops like maize, rice, sorghum, and vegetables, is the primary income source for farmers, generating roughly 45% of their earnings. However, diversification plays a crucial role; non-farm wage activities (like self-employment, teaching, construction, tailoring, transportation, and petty trading) contribute a significant 24% of income, followed by livestock production at 14%. Other sources like farm wage activities (4.3%), cash crops (2.7%), and remittances (2.6%) further supplement farmer income. This analysis demonstrates the importance of diverse income streams for farmers' financial stability.

These findings highlight the crucial role of non-farm activities in boosting maize farmers' income and reducing their reliance on agriculture alone. By diversifying into activities like self-employment, wage work, and leveraging remittances, farmers gain stability and lessen the risks associated with depending solely on farming. This aligns with Onwuemle, 2013 and Nmeregini, 2019, who similarly found that non-farm employment, provides essential income diversification and economic security, contributing significantly to poverty reduction efforts.

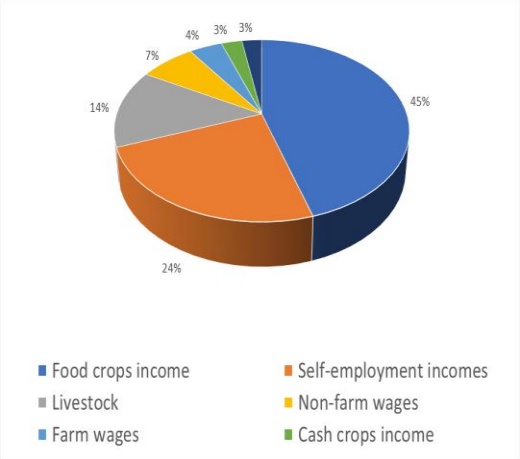

Figure 2: Livelihood strategies distribution of maize farmers

3.2 Constraints Associated with Maize Farmers Livelihood Diversification Activities

The major constraints to livelihood diversification in the study area were: lack of credit facilities, poor asset base, lack of awareness and training facilities, fear of taking risks, and lack of opportunities in the non-farm sector (Figure 3). The result presented in Figure 3 revealed that about 94.9% of the maize farmers indicated that a lack of credit facilities was a major constraint mitigating farming household diversification. Lack of access to institutional credit is a deterrent factor in livelihood diversification in the study area. In the absence of credit support from institutional agencies, resource-poor households are not able to start their own non-farm businesses or enterprises. Katona-Apte (1988) reported the vital role played by the Bangladesh Grameen Bank in providing credit to women, which enabled them to carry out diversification activities. Many households in the study area reported that after completion of training provided by private or government agencies on some self-employment activities, they could not start their own business due to a lack of finance or credit.

About 83% of the maize farmers indicate a poor asset base, which is one of the most important constraints to livelihood diversification in the study. Possession of even a small asset enables households to take advantage of opportunities in the non-farm sector, particularly in the self-employment sector. Ownership of a sewing machine may induce a person to start his own tailoring business. Similarly, possession of a bicycle may help the worker go to the nearby town for non-agricultural employment. Most of the landless and small farmers in this area do not have any assets, which acts as a big barrier to livelihood diversification.

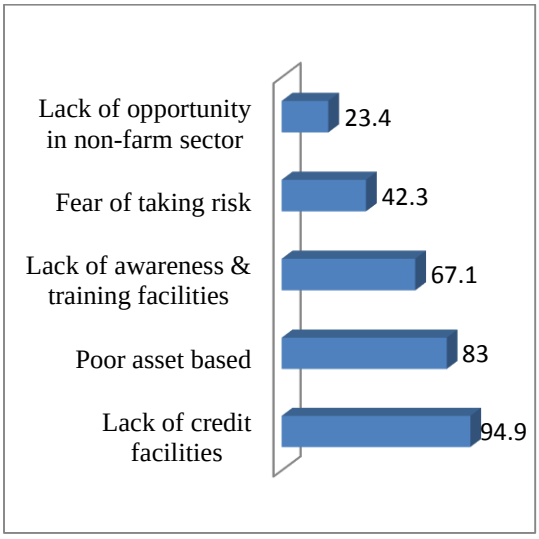

Figure 3: Distribution for Constraints Associated with Maize Farmers Livelihood Diversification Activities, Source: Field Survey, 2021

Lack of awareness and training constitutes about 67.1% of the constraints mitigating livelihood diversification in the study. According to rural households in the study area, they are unaware of any schemes provided by the government for the development of the rural sector. There is neither a government mechanism nor a non-governmental organisation to inform rural households regarding livelihood diversification. About 42% of the maize farmers indicate a fear of taking risks. Because the landless and small farmers in the study area do not have any assets and lack institutional support, which acts as a big barrier to livelihood diversification, the risk-bearing ability of the rural households is very low.

The result also revealed that about 23.4% of the maize farmers indicated a lack of opportunities in the non-farm sector, which was a constraint mitigating livelihood diversification in the study area. Opportunities for non-farm jobs within or around the sample villages are very low. Therefore, households do not have much scope to diversify their livelihood portfolio.

3.3 Potentials for Intervention on the Livelihood Diversification Activities among Maize Farmers

The major potentials for intervention on the livelihood diversification activities among maize farmers in the study were: contact farming, social support, temporary wage employment, government relief (agricultural support programme), and minimum investment (Table 2). Data in Table 2 revealed that 94.1% of the maize farmers perceived contract farming as a strategy for agricultural transformation because of its potential to address agricultural marketing and production challenges concurrently. Contract farming benefits farmers directly through access to credit, inputs, remunerative markets, and improved technology, thus increasing their productivity and income. Furthermore, the engagement of smallholder farmers in contract farming will result in proper coordination and allocation of resources, goods, and services, thereby reducing poverty and improving the livelihoods of farm households. This finding is in line with Bolwig *et al*., 2009 and Bellemare (2012), who identified income and productivity gains from CF in Africa. It is also argued that CF can lead to risk-sharing between the producer and the agribusiness firm; hence, it can reduce price and income volatility (Key and Runsten, 1999).

About 98% of the smallholder maize farmers see social support (the Millennium Village Project, Anchor Borrowers Programme, Agro-processing Productivity Enhancement, and Livelihood Improvement Support Project (APPEALS) as a potential strategy for intervention in livelihood diversification activities. In this type of system, grants and inputs like improved seeds and fertilizers, coupled with capacity-building training, were given to farmers, and the farmers were expected to donate 1% of their output for community development. The intervention gives an advantage to individuals and cooperatives of farmers to sell their surplus crops to regional buyers, including the World Food Programme. Interestingly, more local farmers are also donating a portion of their crop surpluses to the school meal programme, which is helping to make it possible for 75% of students project-wide to receive a meal at school every day, an intervention that supports better learning outcomes and, in turn, reduces levels of chronic undernutrition (stunting).

About 78% of the smallholder maize farmers indicate that minimum investment can serve as potential for intervention in livelihood diversification activities in the study area. Just like the USAID Feed the Future Nigeria Agribusiness Investment Activity, it aims to strengthen the enabling environment for agribusiness finance and investment. To achieve this goal, the activity focuses on four interrelated components: improving the enabling environment for agricultural sector growth; broadening access to finance by mitigating the credit risks of agribusinesses; promoting and facilitating investment opportunities for agribusinesses to expand and scale up operations; and sustainably enhancing the performance of agribusiness micro, small, and medium enterprises (MSMEs), as well as serving as a source of diversification for farmers.

Diversification to off-farm activities (71.9%) also serves as potential for intervention on the livelihood diversification activities in the study area because diversification to off-farm activities enhances households' income, helps to manage the risk in the agriculture sector, and has a positive effect on poverty reduction. Off-farm income is a coping strategy against risk and has the potential

to increase farmers' living standards. This finding is in line with Haggblade *et al*. (2007), who postulated that increasing expectations of off-farm work was considered to reduce poverty, especially in rapidly increasing population countries.

Table 2: Potentials for intervention on the livelihood diversification activities among maize farmers

Potentials for intervention	*F*	*%*		*M*	*SD*	Skewness	Kurtosis
Contract farming	381	94.1	0	9.4	0.24	-3.73	11.94
Temporarywage employment	364	89.9	3	0.9	0.30	-2.64	4.99
Social support	376	92.8	3	0.93	0.26	-3.32	9.04
Diversification to off-farm activities	291	71.9	2	0.72	0.45	-0.97	-1.06
Minimum investment	314	77.5	8	0.78	0.42	-1.32	-0.26

Source: Field Survey, 2021

F= frequency, %= percentages, M= mean and SD= standard deviation

4.0 CONCLUSION AND RECOMMENDATIONS

4.1 Conclusion

This study explored the various livelihood diversification pathways practiced by smallholder maize farmers in Kaduna State, Nigeria, alongside the constraints hindering their widespread adoption and effectiveness. The research identified a range of diversification activities pursued by farmers, including education, petty trading, and barbing. While diversification holds significant potential for enhancing livelihoods and resilience, critical constraints were found to limit its success, such as lack of credit, limited assets, inadequate training, risk aversion, and limited non-farm opportunities, which hindered their efforts. Diversification strategies like contract farming, social support, temporary work, government assistance, and low-investment activities hold promise.

4.2 Recommendations

It is therefore recommended

1 to empower resource-poor farmers through targeted training programmes on diversified income-generating activities. This could include technical skills like poultry rearing, vegetable farming, or handicraft production, as well as business management skills like marketing and financial planning.

11 Capacity building and training can be offered through a collaborative effort involving agricultural extension services, NGOs, and private organisations, each contributing their expertise and resources.

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