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ASSESSMENT OF FARMERS' PRODUCTION CONSTRAINTS AND FOOD SECURITY OUTCOMES IN JAMA'ARE LOCAL GOVERNMENT AREA, BAUCHI STATE, NIGERIA

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ABSTRACT
The paper assesses farmers' production constraints and food security outcomes in the Jama'are Local Government Area, Bauchi State, Nigeria. The data for this work were derived from both primary and secondary sources. The study employed random sampling to select 357 respondents, proportionally representing the total population of 4,206. A structured questionnaire was administered to obtain socioeconomic data on the farmers and the constraints they face. The data were analyzed using frequency tabulations and percentages, and the results reveal that irrigation farming remains an important means of enhancing agricultural production and supporting food security in Jama'are Local Government Area of Bauchi State. The major constraints faced by farmers in the study area were lack of capital (49%) and transportation problems, mainly due to poor access roads (59%) and a lack of vehicles. It was recommended that governments and non-governmental organizations address inadequate capital and transportation constraints arising from poor road accessibility in Jama'are Local Government Area to enhance agricultural activities within the LGA, the State, and the nation as a whole.

Keywords: Identification, Assessment, Constraints, Farmers, and Food Security

INTRODUCTION

In contemporary agriculture, irrigation is the controlled, timely supply of water to crops based on scientific principles, with due consideration for soil properties and the specific water requirements of different crops. As a result, irrigation represents a significant innovation compared to traditional farming practices. As a result, several changes occur, creating different types of benefits. Farmers cannot always depend solely on rainfall to sustain their crops; in fact, many of the world's agricultural regions receive little or no precipitation. In these areas, farmers must divert water from streams, lakes, or wells. As a result, people developed irrigation systems. Irrigation is the method of supplying water to land to support plant growth. In this regard, technology has played a significant role in shaping human civilization. Irrigation, in particular, is an important area of study for geographers. In today's context of rapid population growth and global food shortages, expanding irrigated agriculture is essential for boosting food production. Although the global area under irrigation has nearly doubled over the past two decades, this expansion has not been matched by a proportional increase in agricultural output. This is partly because, worldwide, the areas suited to irrigation have already been developed (Somarshekar, 2009).

In Nigeria, irrigation systems are broadly categorized into government-managed (public) schemes, farmer-owned systems, and floodplain (fadama) irrigation. Growing demand for irrigated agriculture led to a national assessment of water resources in 1972, resulting in the establishment of major irrigation projects: Bakolori, Chad Basin, and Kano River schemes (Salihu *et al.,* 2023). Following their success, the government created several River Basin Development Authorities across the

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country to develop irrigation infrastructure and promote food self-sufficiency. Despite these efforts, irrigation performance in Nigeria and much of sub-Saharan Africa has been relatively inefficient compared to regions like Asia, mainly due to poor management (Adelodun & Choi, 2018). Although recent improvements have been observed, several challenges persist. Key among these are inconsistent government policies and weak institutional coordination, as different ministries handle water and agriculture responsibilities, leading to fragmented and sometimes conflicting approaches (Okhirebhu et *al*., 2025). However, recent policy initiatives aim to improve coordination and provide a more stable framework.

Adeyolanu *et al*. (2024) outlined additional major challenges: inadequate funding, poor infrastructure maintenance, and limited technical capacity. Essential inputs such as equipment, maintenance, and expertise are often insufficient. Additionally, farmers' attitudes and low awareness hinder effective participation, particularly in large-scale irrigation schemes. Many farmers lack the necessary skills and tend to view irrigation facilities as government property, resulting in poor maintenance, rapid infrastructure deterioration, and, in some cases, abandonment of irrigation projects.

Agricultural development concluded that Nigeria is among the nations where irrigation is the only way left to grow enough food for the population. The comprehensive strategy for the conservation and development of Nigeria's water resources identified several factors to consider. These include water availability, quality, location, distribution, variation in occurrence, climatic variability, soil conditions, competing demands, and socioeconomic conditions. In addressing each of these, every effort must be made to use water as efficiently as possible to enable continuous, high-level use. The aim today is to increase agricultural production per unit volume of water, per unit area of cropped land, per unit time (FAO, 1997).

Most public irrigation schemes in Nigeria are large-scale and were expected to transform agricultural production, achieve food self-sufficiency, and raise the standard of living for those involved. However, these schemes have performed poorly. The most discouraging outcome of the large-scale irrigation strategy adopted in the past four decades is low capacity utilization at the schemes. Not only are there wide discrepancies between irrigable (planned) areas and irrigated areas, but there are equally large differences between areas with developed irrigation and areas actually irrigated. These differences cut across virtually all the schemes (Baba, 2010).

Food security: when all people, at all times, have physical and economic access to sufficient safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life. Food security exists when people have access to enough safe and nutritious food for normal growth and development and an active, healthy life. Chronic food insecurity occurs when a person cannot consume enough food over an extended period to maintain a normal, active, and healthy life. Acute food insecurity is any type that threatens people's lives or livelihoods (World Bank 2026; Anthem, 2025).

World Bank (2026) pointed out that food security can be achieved when the following dimensions are realized: i) Physical availability of food; Food availability addresses the "supply side" of food security and is determined by the level of food production, stock levels and net trade, ii) Economic and physical access to food; Concerns about insufficient food access have resulted in a greater policy focus on incomes, expenditure, markets and prices in achieving food security objectives, iii) Food utilization: Utilization is commonly understood as the way the body makes the most of various nutrients in the food. Sufficient energy and nutrient intake results from good care and feeding practices, food preparation, dietary diversity, and intra-household distribution of food. Combined

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with good biological utilization of consumed food, this determines individuals' nutritional status. Stability of the other three dimensions over time: Even if your food intake is adequate today, you are still considered to be food insecure if you have inadequate access to food periodically, risking a deterioration of your nutritional status.

Adverse weather conditions, political instability, or economic factors (unemployment, rising food prices) may affect food security status. In this vein, Anthem (2025) pointed out that extreme weather and economic shocks are key drivers of food insecurity, often overlapping and interconnected, the core factors of which that are affecting one's food security are: Use (safe preparation, proper utilization, and effective nutritional absorption of food resources); Access (ability of people to obtain affordable and non-discriminatory access to food despite economic, environmental or social barriers); Availability (adequate supply and distribution of food influenced by economic, agricultural, infrastructural, and conflict-related factors); and Stability (consistent and reliable availability, access and utilization of food over time).

Climate change, inadequate rainfall, and occasional uncontrollable flooding often led to repeated crop failures, undermining rural livelihoods. Consequently, poverty levels remain high, and food insecurity persists annually (Brown & Harris, 2005). With continued reliance on traditional rain-fed agriculture and a rapidly growing population, irrigation has emerged as a more reliable way to revitalize the agricultural sector, particularly given its anticipated contribution to Nigeria's economic development. This necessity prompted the Bauchi State government to initiate small- and medium-scale irrigation development projects. These projects have operated for several years and likely influenced both people and the environment. Therefore, it became essential to identify and assess the constraints farmers face to enhance food security in the Jama'are Local Government Area of Bauchi State.

MATERIALS AND METHODS

Study Area

Jama'are Local Government Area (LGA) (Fig. 1) is situated within the Sudano-Sahelian ecological zone in the northern part of Bauchi State, Nigeria, between latitudes 11°35′N and 11°50′N, and longitudes 9°45′E and 10°50′E. The area shares boundaries with Itas-Gadau LGA to the north, Katagum to the east, Shira to the south, and Kiyawa LGA of Jigawa State to the west (Bauchi State Government, 2017; National Bureau of Statistics (NBS), 2019).

The LGA's administrative headquarters is Jama'are town. Covering about 493 km², Jama'are LGA has a population of 117,883 (Aliyu *et al*., 2019). The landscape is largely flat with slight undulations and is intersected by the Jama'are River, an important tributary of the Hadejia–Jama'are River system (FAO, 2020). This river significantly supports floodplain (Fadama) agriculture and dry-season irrigation farming across the area (Hadejia–Jama'are River Basin Development Authority (HJRBDA), 2016). The floodplains are dominated by alluvial and loamy soils, which are particularly suitable for irrigated farming, especially for crops such as rice and vegetables (FAO, 2020).

The study area has two distinct seasons: the dry season, which extends from October to April, and the rainy season, which usually begins in late May and ends in September. Annual rainfall ranges from 800 mm to 1,200 mm, with the highest precipitation usually recorded in August. Mean daily temperatures are generally high, with maximum temperatures averaging 30.7°C, while minimum temperatures average 13.5°C. April is typically the hottest month, while December is the coolest. Relative humidity peaks between July and September but drops considerably in January and February.

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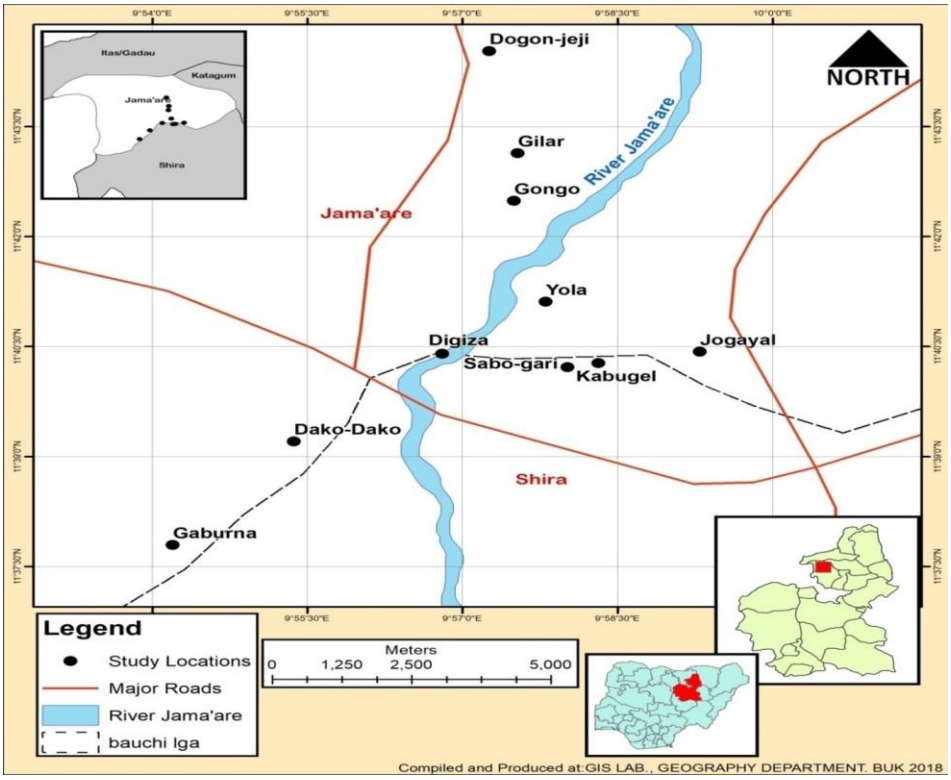

Figure 1: Location of the Study Area

Geologically, the area is underlain by two major formations: the Basement Complex and the Chad Formation. The Basement Complex, which occupies about forty percent of the land area, consists mainly of crystalline rocks such as granites and gneisses, with groundwater occurring within weathered and fractured zones. The Chad Formation, which covers about sixty percent of the area, consists of sand, silt, gravel, clay, and shale deposits. The Hadejia–Jama'are River Basin contains both basement and sedimentary rock formations of secondary and tertiary origin. Groundwater resources are commonly found within the Quaternary. Chad Formation under both confined and unconfined conditions, while sandy and gravelly deposits form productive aquifers.

The soils in the area are generally deep but sandy, with low water retention capacity (Muhammad, 2016). Vegetation is characteristic of the Sudan Savanna, consisting mainly of grasses and scattered drought-tolerant tree species such as *Acacia* species and *Parkia biglobosa* (Olofin et al., 2008). Land use is predominantly agricultural, with most farmers engaged in crop production, irrigation farming, fishing, and small-scale trading (NBS, 2019). The combination of favourable physical and hydrological conditions makes Jama'are LGA well-suited for small-scale irrigation activities and an ideal setting for studies on irrigation agriculture and rural livelihoods in semi-arid northern Nigeria (Shehu *et al*., 2021).

Sampling Size and Technique

The population for this study consists of irrigation farmers and those who are either directly or indirectly affected by irrigation activities in Jama'are Local Government Area in Bauchi State. Table 1 presents the distribution of villages, population figures of irrigation farmers and sample sizes. We used Krejcie and Morgan's (1970) table to obtain a sample of 357 from the population of 4206 irrigation farmers. We later distributed the sample proportionately across the sampled villages.

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Table 1: Villages, Population, and Samples

Village	Population Number	Samples
Gaburna	780	66
Yola	2000	169
Dako-Dako	320	27
Gongo	601	50
Digiza	285	24
Jogayel	250	21
Total	**4206**	**357**

This study employed a multi-stage sampling technique. In this regard, fifteen (15) villages are involved in irrigation (i.e., Dogonjeji, Gabirna, Dako-Dako, Digiza, Yola, Sabon-gari, Jogayel, Kabugel, Gongo, Jurara, Guda, Galdimari, Hanafari, Sabon Kafi, and Gilar). Of the 15 villages, 6 (Gabirna, Yola, Dako-Dako, Gongo, Digiza, and Jogayel) were purposively selected for their high representativeness of irrigation practices in the study area, and accidental sampling was also used to select respondents. Descriptive statistics were used to analyze data on demographic and socioeconomic characteristics and constraints confronting farmers in the study area.

Data Sources

The data required to achieve the research objectives were collected quantitatively and covered aspects such as crop types, fertilizers applied, perceived benefits, profitability of cultivated crops, and production costs. The researchers obtained these data directly from the farmers.

Data Collection

Field observations were undertaken during both the dry and rainy seasons to identify the various agricultural activities practiced in each period. Particular attention was given to cropping patterns, the types of crops cultivated, and their estimated yields per hectare. The observations also examined newly introduced irrigation facilities within the area, as well as the prevailing social behaviors and economic conditions of the participants. Data on agricultural output were collected based on the total weight harvested from each cultivated plot. Transportation information focused on moving farm produce from production sites to the nearest markets. In addition, data relating to production costs and prevailing market prices were obtained to assess the economic performance of farming activities.

Data Analysis

Frequency tabulations and percentages were used to analyze data on demographic and socioeconomic characteristics, as well as the constraints confronting farmers in Jama'are LGA.

Ethical Consideration

The Bauchi State Ministry of Agriculture Research Ethics Committee granted institutional clearance and approval. The researchers also secured local permission from Jama'are Local Government authorities/community leaders. Before administering the questionnaire, participants were informed of the study's purpose, their rights, and the confidentiality of their responses. For confidentiality, all responses (data) were anonymous, protecting participants' identities.

RESULTS AND DISCUSSION

Socioeconomic Characteristics of the Irrigation Farmers

This study examined the socioeconomic characteristics of irrigation farmers in Jama'are LGA, and Table 2 presents the findings. The results indicate that most respondents were male: 94% in Yola, 92% in Gongo, 91% in Gabirna, and 100% in Dako-Dako, Digiza, and Jogayel. This pattern aligns

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with Shehu *et al*. (2021), who reported that 97% of participants in their study on farmers' perceptions of seasonal changes in northern Nigeria were male. Most respondents were between 25 and 64 years old, accounting for 78% in Gabirna, 74% in Yola, 80% in both Dako-Dako and Gongo, 72% in Digiza, and 57% in Jogayel. This distribution reflects the predominance of men in agricultural activities in the Hausa region, particularly among individuals within the economically active age group.

Furthermore, most respondents in the surveyed areas had attained O-Level education (about 20%), while only around 3% possessed Qur'anic education. This suggests that many of the irrigation farmers are rural residents who prioritize irrigation farming and often do not pursue education beyond secondary school, indicating that a large proportion have mainly informal or basic educational qualifications. Household sizes among the respondents were relatively large, ranging from 1 to 20 members, with proportions of 71% in Gabirna, 77% in Yola, 69% in Dako-Dako, 80% in Gongo, 79% in Digiza, and 78% in Jogayel.

Table 2: Socioeconomic Characteristics of Respondents

Veriables		Gabirna % n = 66	Yola % n = 169	Dako-Dako % n = 27	Gongo % n = 50	Digiza % n = 24	Jogayel % n = 21
Sex	Male	91	94	100	92	100	100
	Female	9	6	0	8	0	0
	Total	**100**	**100**	**100**	**100**	**100**	**100**
Age (Years)	< 25	17	24	22	8	23	29
	25 – 44	46	24	26	40	38	24
	45 – 64	30	50	44	40	35	33
	65 >	7	2	8	12	4	14
	Total	**100**	**100**	**100**	**100**	**100**	**100**
Highest Qualification	None	18	47	37	30	58	10
	PSLC	18	12	19	20	9	29
	O'Level	20	9	15	6	0	14
	Dip/NCE	18	5	15	4	0	19
	Degree	15	2	4	0	0	24
	M. Sc.	5	1	0	0	0	0
	PhD	3	0	0	0	0	0
	Qur'anic	3	24	10	40	33	5
	Total	**100**	**100**	**100**	**100**	**100**	**100**
Household Size	1 – 10	30	41	37	30	54	33
	11 – 20	40	36	29	50	26	43
	21- 30	23	12	34	12	8	19
	31 – 40	5	6	0	8	8	5
	40 >	2	5	0	0	4	0
	Total	**100**	**100**	**100**	**100**	**100**	**100**
Others Occupations	Business	46	41	37	40	42	48
	Civil Service	37	36	26	30	4	24
	Trade	17	23	37	30	54	28
	Total	**100**	**100**	**100**	**100**	**100**	**100**

Constraints Confronting Farmers

The study identified the constraints farmers in Jama'are LGA face. These include irrigation constraints, Transportation problems, storage problems, and marketing setbacks (Table 3). For irrigation constraints, lack of capital (49%) is the highest, with 'None' (1%) the least. This reflects a realistic situation, as it is uncommon for any project to operate without financial limitations, and the

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absence of constraints is rarely attainable. On this basis, it can be concluded that inadequate capital constituted the major challenge confronting farmers in Jama'are Local Government Area.

Transportation problems are mainly associated with poor access roads (59%, Plate 1) and least as regards 'costs' (16%). Whereas 'none' (36%) is the highest storage problem, 'product damage' (26%), is the lowest. The biggest marketing setback was transportation issues (42%), while the lowest was 'none' (1%). In view of the foregoing, it can be concluded that Jama'are Local Government Area is characterized by poor road accessibility, while storage-related challenges are highest; 'product damage' (26%) is the lowest. The highest marketing setback concerned transportation issues (42%), and the lowest was 'none' (1%). In view of the foregoing, Jama'are Local Government Area is characterized by poor road accessibility, while storage-related challenges are relatively minimal or largely absent. In line with Adekunle et al. (2015), this finding relates to the problems farmers face in irrigation schemes in Nigeria, which not only make equipment short-lived but have also led to the abandonment of irrigation schemes due to a lack of irrigation equipment.

Table 3: Constraints Confronting Farmers in Jama'are LGA

Veriables		Gabirna % n = 66	Yola % n = 169	Dako-Dako % n = 27	Gongo % n = 50	Digiza % n = 24	Jogayel % n = 21
	None	5	6	4	4	8	0
Irrigation constraints	Lack of capital	53	53	48	40	50	48
	Climatic condition	3	6	11	12	8	10
	Pest and disease	15	24	22	30	21	23
	Edaphic factors	24	11	15	14	13	19
	Total	**100**	**100**	**100**	**100**	**100**	**100**
Transportation Problems	None	0	3	4	4	0	0
	Poor access road	46	42	63	70	62	67
	Inadequate transportation facilities	30	23	22	12	21	19
	High transportation costs	24	32	11	14	17	14
	Total	**100**	**100**	**100**	**100**	**100**	**100**
Storage problems	None	46	18	26	46	42	38
	Product damage	9	41	19	20	33	33
	Incompatible storage rooms	30	18	30	14	17	24
	High storage costs	15	23	25	40	8	5
	Total	**100**	**100**	**100**	**100**	**100**	**100**
Marketing setbacks	None	3	3	0	2	0	0
	Poor marketing chain	8	3	19	14	13	0
	Transportations issues	42	44	30	38	29	71
	Price Fluctuations	37	42	33	40	50	24
	Problem of middlemen	10	8	18	6	8	5
	Total	**100**	**100**	**100**	**100**	**100**	**100**

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Plate 1: Poor condition of the access road

CONCLUSION AND RECOMMENDATIONS

Based on the study's findings, irrigation farming remains an important means of enhancing agricultural production and supporting food security in Jama'are Local Government Area of Bauchi State. The study found that most irrigation farmers were economically active males with relatively large households and basic educational backgrounds, indicating a productive labour force capable of sustaining agricultural activities in the area.

However, inadequate capital, poor transportation infrastructure, and limited access to vehicles significantly constrain the productivity and sustainability of irrigation farming. Poor access roads have negatively affected the movement of farm inputs and produce, increasing production and marketing difficulties for farmers. Although storage-related challenges were relatively minimal, marketing setbacks, particularly transportation-related issues, continue to undermine the profitability and efficiency of agricultural activities in the area.

Based on the findings of the study, the following recommendations are proposed:

1. Government agencies and non-governmental organizations should provide accessible credit facilities, soft loans and agricultural subsidies to irrigation farmers in Jama'are Local Government Area to address the persistent challenge of inadequate capital. This would enable farmers to acquire essential farm inputs, irrigation equipment, and improved seeds to enhance productivity.

2. Government and relevant stakeholders should support the provision of affordable transportation and storage facilities. Rural road networks linking farming communities to major markets should be rehabilitated and expanded to reduce transportation difficulties.

Improved transportation infrastructure would facilitate the efficient movement of farm produce, minimize post-harvest losses and enhance market accessibility.

3. Governments should introduce measures to stabilize agricultural markets and reduce marketing setbacks through the establishment of regulated produce collection centers and fair pricing mechanisms. This would improve farmers' incomes and encourage increased participation in irrigation farming.

4. Further studies should be conducted on the environmental and socioeconomic impacts of irrigation farming in the area to provide more comprehensive data for policy formulation and sustainable agricultural planning.

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