

Evaluating the Contribution of Irrigation Farming to Job Creation and Employment Opportunities in Zamfara North Senatorial Zone

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ABSTRACT

The research work is centered on evaluating the contribution of irrigation farming to job creation and employment opportunities in Zamfara North Senatorial Zone. The study aims to examine the contribution of irrigation farming to job creation in Zamfara North Senatorial Zone, and to evaluate the contribution of irrigation farming in creating employment opportunities in Zamfara North Senatorial Zone. A cross sectional research design is adopted with quantitative approaches to ensure a comprehensive analysis of the subject matter. A sample size of 270 were drawn from four local Gaoverment in the zone, a structured questionnaire were used to generate primary data. Data were analyzed using partial least squire structural equation model (PLS-SEM), using measurement model instrument like validity and reliability and R-Squire to measure the construct and engaged structural model to test the hypotheses, the study found that irrigation farming has a significant positive relationship with job creation in Zamfara North Senatorial Zone and that irrigation farming has a significant and very strong positive relationship with employment opportunities in Zamfara North Senatorial Zone. The study concludes that irrigation farming is a vital economic driver in Zamfara North Senatorial Zone, with significant positive impacts on both job creation and employment opportunities. The study recommends that The government should introduce subsidies or grants to help farmers expand their operations and increase the scale of irrigation farming initiatives and Government should encouraging private investments in large-scale irrigation projects through tax breaks or other incentives could further expand employment opportunities.

Keyword: irrigation, farming, job creation, employment and opportunities.

INTRODUCTION

Irrigation farming plays a critical role in enhancing agricultural productivity, ensuring food security, and creating employment opportunities across the globe. In Nigeria, irrigation farming is a vital component of the agricultural sector, which employs a significant portion of the country's population. The country's diverse agro-ecological zones and water resources offer substantial potential for irrigation farming to drive job creation and economic growth. Zamfara State, located in the northwestern region of Nigeria, is predominantly an agrarian state with significant potential for irrigation farming. The state benefits from access to key water bodies, including the Sokoto-Rima River Basin, which offers opportunities for irrigation-based agriculture. Despite challenges, irrigation farming has emerged as a viable solution for improving livelihoods and creating jobs in the region.

Irrigation farming is the practice of applying controlled amounts of water to crops at regular intervals to enhance agricultural productivity. It is particularly important in regions where rainfall is insufficient or irregular. By ensuring a reliable water supply, irrigation farming allows for year-round cultivation, increased yields, and the growth of a wider variety of crops. Irrigation farming has been identified as a potential solution for poverty reduction and job creation in developing countries. Studies in Nigeria have shown that irrigation farming can be profitable, enabling farmers to live above the poverty threshold and contribute to achieving Millennium Development Goals (Dauda et al., 2009). In South Africa, the government aims to create 300,000 new jobs through smallholder farmer schemes, recognizing the potential of irrigation in rural economic

development (Averbeke, 2012). Similarly, in Zimbabwe, small-scale irrigation schemes have demonstrated positive impacts on rural livelihoods, including employment creation, income generation, and asset acquisition (Chazovachii, 2012).

Irrigation farming significantly contributes to job creation by enabling increased agricultural activity, supporting related industries, and fostering rural development. Its potential for transforming economies is especially notable in developing regions, where agriculture remains the primary source of livelihood. Irrigation farming has shown potential for improving rural livelihoods and contributing to poverty reduction. Studies in Nigeria and Zimbabwe have demonstrated that irrigation can be profitable, allowing farmers to live above the poverty threshold and create employment opportunities (Dauda et al., 2009; Chazovachii, 2012). Irrigation schemes have also been found to enable asset acquisition and income generation for rural communities (Chazovachii, 2012).

Irrigation farming is a powerful driver of employment opportunities, directly in farming activities and indirectly through infrastructure, agro-processing, and related industries. Its potential for economic transformation is especially critical in developing regions, where agriculture is a primary livelihood source. By addressing challenges and investing in sustainable irrigation practices, irrigation farming can become a key solution for job creation and rural development. However, the challenges of unemployment and underemployment have persistently affected economic development in Nigeria, particularly in rural areas. Irrigation farming, which leverages controlled water supply to enhance agricultural productivity, offers a potential avenue for addressing these challenges. In Zamfara North Senatorial Zone, where agriculture remains a primary economic activity, understanding the relationship between irrigation farming and job creation is vital for policymakers and stakeholders.

Problem Statement

Agriculture remains a cornerstone of Nigeria's economy, employing a significant portion of the population and contributing to food security and rural development. However, in Zamfara North Senatorial Zone, the agricultural sector faces challenges such as erratic rainfall, land degradation, insecurity and climate change, which hinder productivity and limit job opportunities. Despite the region's vast potential for irrigation farming, the contribution of irrigation to job creation and employment remains under-explored and underutilized. While projects like the Bakolori Irrigation Scheme have been established to promote irrigation farming, their impact on employment opportunities and job creation in the zone is not yet achieved. Limited empirical studies exist on how irrigation farming has created employment opportunities for smallholder farmers and benefited local communities. Geographically, studies of this nature are very rare in the zone. This gap in knowledge and location necessitates researcher to evaluate the contribution of irrigation farming to job creation and employment opportunities in Zamfara North Senatorial Zone.

Research Questions

The following questions were raised to address the problems under study.

1. How does irrigation farming contribute to job creation in Zamfara North Senatorial Zone.?
2. What is the major contribution of irrigation farming in creating employment opportunities in Zamfara North Senatorial Zone?

Objectives of the Study

The following objectives were set for the study;

1. To examine the contribution of irrigation farming to job creation in Zamfara North Senatorial Zone.
2. To evaluate the contribution of irrigation farming in creating employment opportunities in Zamfara North Senatorial Zone.

LITERATURE REVIEW

Conceptual Framework:

Irrigation farming

Agriculture is always synonymous with irrigation. Irrigation has existed for as long as people have been growing plants, from antiquity to the present (Angelakis, et al., 2020). Archaeological studies have demonstrated that irrigation technology has steadily advanced from the time of the ancient Egyptians until the mid-1900s, coinciding with developments in water technology, water transfer, and agricultural systems (Valipour, et al., 2020). Irmak, (2023) asserts that irrigation is the process of supplementing or replacing rainfall with water from another source. It is the science of applying water to soil or land artificially. The basic principle of irrigation systems is to use as little water as possible to maintain plants and lawns. Among its various uses, irrigation has been employed for vegetation and landscape upkeep. Jain, (2023) posits that Irrigation is the application of controlled amounts of water to plants at needed intervals. This process of irrigation helps to grow agricultural crops, maintain landscape, prevent soil erosion and rejuvenate disturbed soils. Irrigation farming is an agricultural practice where water is supplied to crops artificially to meet their water needs when natural rainfall is insufficient. It involves a variety of techniques, systems, and management practices to ensure optimal water use for crop production (Addas, et al (2023). Irrigation is the artificial application of water to soil or land to assist in the growth of crops. It helps maintain soil moisture during dry spells, supports crop production in arid and semi-arid regions, and improves yields in areas with variable rainfall (Mohammed, et al., 2023). Irrigation farming is critical for global food security, especially in regions with inconsistent or low rainfall. Innovations in irrigation technology and sustainable practices continue to enhance its effectiveness and environmental impact (Debnath, et al., 2020).

Job creation

Job creation is a critical economic indicator, defined as the total number of jobs created by growing firms and new establishments. Job creation refers to the process of generating employment opportunities for individuals within an economy (Dell'Anna, 2021). It plays a critical role in reducing unemployment, improving living standards, and fostering economic development. Job creation involves the establishment of new positions within organizations or through entrepreneurial ventures, often driven by economic growth, policy interventions, or innovation (Shalley, 2024). Job creation is a cornerstone of economic development and social progress. Strategic investments, policies, and innovation are critical to generating meaningful and sustainable employment opportunities in both developed and developing economies (Mujtaba, 2024). The term "job creation" describes the act of creating new job opportunities within an economy, usually through government programs, business expansions, or the founding of new enterprises. In order to boost economic expansion and raise living standards for both individuals and communities, it is an essential component. The process of creating new job opportunities within an economy is referred to as job creation. Since the creation of new jobs can raise a population's productivity, income, and general standard of living, it is an essential component of economic growth and development. This study is attached to this hypothesis guess.

H0₁; Irrigation farming has no significant relationship with job creation in Zamfara North Senatorial Zone.

Employment opportunities

Employment opportunities refer to the availability of jobs or positions within the labor market where individuals can be engaged to perform tasks, duties, or roles in exchange for compensation, such as wages, salaries, or benefits (Wachter, 2020). These opportunities are influenced by various factors, including economic conditions, industry growth, technological advancements, and government policies. Khanna, (2020) concede that employment opportunities refer to the range of jobs or roles available in the labor market that individuals can pursue to earn a livelihood, it can be a positions of work made available to individuals within an economy, driven by economic growth, industrial expansion, and labor market demand. Employment opportunities are the job positions created by public or private sector initiatives aimed at reducing unemployment and fostering economic participation.

According to Assefa, et al., (2022) irrigation farming and employment opportunities are closely related, as the development and expansion of irrigation systems significantly contribute to job creation in various sectors of the economy. Irrigation farming plays a critical role in creating diverse employment opportunities, both directly in agriculture and indirectly in related sectors. By enabling more consistent agricultural production and supporting agribusinesses, irrigation farming contributes to economic growth, rural development, and poverty alleviation. Studies have shown that irrigation can create employment opportunities for household members and rural communities while improving income (Sekota Dryland, 2013; A. Kassie, 2020). This study is attached to this hypothesis guess.

H₀₂; irrigation farming has no significant relationship with employment opportunities in Zamfara North Senatorial Zone.

Empirical Studies

Juan, et al.,(2019) examine a Sustainable Irrigation in Agriculture: An Analysis of Global Research. The study aims to analyze the dynamics of global research in sustainable irrigation in agriculture between 1999 and 2018. The study use review method and a bibliometric analysis were carried out on a sample of 713 articles. The results show that sustainability is a line of study that is becoming increasingly more prominent within research in irrigation and also reveals the existence of substantial differences and preferred topics in the research undertaken by different countries.

Bernard (2012) study the impact of small scale irrigation schemes on rural livelihoods: the case of panganai irrigation scheme Bikita district Zimbabwe. The study aims to assess the impact of small scale irrigation scheme on the people's livelihoods in Panganai Communal area. Both quantitative and qualitative methodologies were used in the investigation of the impact of the scheme on rural livelihoods. A sample of fifty respondents out of a total of two hundred plot holders was selected using random sampling. Data was collected using interviews, questionnaires and observation. Analyses were done using descriptive statistics. Results were that the irrigation scheme has managed to create employment, income generation, supply water throughout the year, acquisition of assets such as scotch carts and livestock by farmers and school fees generation by the community as a whole.

Akudugu et al., (2021) conduct a study on the livelihoods impacts of irrigation in western Africa: the Ghana experience. The study aims to examines the role of irrigation in the drive towards a transformation of smallholder agriculture in Africa. interviews and individual questionnaires were employed for the data collection. The data were analyzed using the regression adjustment (RA) technique. The results indicate that irrigation has significant and positive impacts on farm incomes, employment, consumption, food security and non-farm businesses, all of which are necessary conditions for a successful transformation of smallholder agriculture in Africa.

Adekanbi (2018) conduct a study on the role of agriculture in job creation for national development in Nigeria. The study aims to determine if agriculture really create job opportunity and how it affect the Gross Domestic Product as a part of national development in Nigeria. Data was collected from abstract of Central Bank of Nigeria . Regression analysis is use to analyse the data. Result of the analysis show that there is strong positive correlation between the Gross Domestic Product and Agriculture sectors. The study concludes that the agricultural sector contributes meaningfully to national development which have a multiplier effect on human capital development, because it is often said that a 'hungry man is an angry man.

Pamela (2024) in his study comparing the impacts of different irrigation systems on the livelihoods of women and youth: evidence from clustered data in Ghana. The study aims to assess the impacts of farmer-led irrigation development, alongside public large-scale irrigation investments, on a broad range of livelihood dimensions. The study engaged survey research method and the study uses a rigorous propensity score matching analysis applied to clustered data from two state-led and two farmer-led irrigation examples in Ghana to quantitatively evaluate the intersectional impacts of different types of irrigation on multiple dimensions of farmers' livelihoods. The results of our study indicate that although farmer-led irrigation enhances farmer incomes, this does not necessarily translate into poverty alleviation and prosperity. Furthermore, impacts on young men, young women and adult women are of a different nature.

Dauda et al., (2009) conduct an assessment of the roles of irrigation farming in the millennium development goals. The study aims to assess the income generating potential of irrigation farming which may reduce poverty and hunger and directly achieve an important aspect of the Millennium Development Goals. The study adopted survey research method and data were collected using structured questionnaires, data were analyzed using Ordinary Least Square (OLS) regression. The result of the study showed that irrigation farming is a profitable venture. Farmers realized an average net income (profit) of N109, 750 from irrigation farming for the period. Furthermore, irrigation farming was found to be capable of alleviating poverty among farming households because they were able to live above US \$1/day/person which is the threshold for poverty level. Hence irrigation farming can be used to achieve the MDG of reducing poverty and hunger.

Theoretical

This study is underpinned with Sustainable Livelihoods Framework theory, organizations and scholars in the late 20th century, with significant contributions from institutions like the Brundtland Commission, Robert Chambers, and organizations such as the United Nations Development Programme (UNDP) and the UK Department for International Development (DFID). The Sustainable Livelihoods Framework is highly relevant for this study as it examines how people use available resources to build sustainable livelihoods. This theory highlights the role of irrigation farming as a livelihood strategy and its impact on employment creation. This theory helps analyze how irrigation farming contributes to job creation by enhancing the use of livelihood assets and improving socio-economic outcomes for farmers and local communities.

This theory is well suited for this study as it integrates multiple dimensions of irrigation farming, including resource utilization, community development, and employment creation. It allows for a comprehensive evaluation of how irrigation farming contributes to job creation, sustainable job opportunities and addresses socio-economic challenges in Zamfara North Senatorial Zone.

METHODOLOGY

A cross sectional research design is adopted with quantitative approaches to ensure a comprehensive analysis of the subject matter. The study is conducted in selected rural communities of Zamfara North Senatorial District. The region is known for its agricultural potentials, but it also faces challenges related to job creation and employment opportunities. The population comprises of 10,000 smallholder farmers, gotten from the record of agricultural extension officers and local leaders across the four local governments who engaged in irrigation farming and non-irrigation farmers for comparison purposes. A multistage sampling technique is used to select respondents from rural communities in Zamfara North senatorial zone. The sample size of 370 respondents was determined using sample table of Krejcie and Morgan (1970). Primary data were collected through the use of structured questionnaires. The questionnaires captured information on household demographics, farming practices, job creation and employment opportunities. Key informants, including agricultural extension officers and local leaders, provide qualitative insights into the context of irrigation farming in Zamfara North Senatorial District. Data were analyzed using both measurement and structural model contained in Partial Least Square Structural Equation Model PLS-SEM.

Data Analysis.

Table 1 Construct Reliability and Validity

	Cronbach's Alpha	rho_A	Composite Reliability	Average Variance Extracted (AVE)
Irrigation Framing	0.921	0.991	0.820	0.615
Job Creation	0.887	0.809	0.824	0.590
Employment Opportunities	0.786	0.793	0.827	0.631

Source; PLS-SEM output, 2024.

Reliability Analysis

Cronbach's Alpha: The Irrigation Framing value of 0.921 reflects exceptional internal consistency, indicating that the items measuring this construct are highly interrelated and consistently assess the same underlying concept. A value of 0.887 for Job Creation demonstrates strong internal consistency, signifying reliable items. The value of 0.786 for Employment Opportunities indicates adequate internal consistency; however, it is lower compared to the other constructs. While reliable, this construct may benefit from a review or refinement of specific items to further enhance consistency.

rho_A is considered more robust than Cronbach's Alpha in certain cases as it accounts for variations in factor loadings. The rho_A value for Irrigation Framing is 0.991, an exceptionally high value that may indicate a higher reliance on certain items or redundancy within the construct. The value for Job Creation, at 0.809, reflects strong reliability and aligns well with other measures. Meanwhile, Employment Opportunities, with a rho_A value of 0.793, indicates acceptable reliability, consistent with its comparatively lower Cronbach's Alpha.

Composite Reliability (CR) shows that all constructs exceed the 0.7 threshold, confirming strong reliability. This complements Cronbach's Alpha and reinforces the reliability of the constructs across their indicators.

Validity Analysis

Convergent validity, assessed using the Average Variance Extracted (AVE), has a threshold of >0.5 , indicating that more than half of the variance in the indicators is explained by the latent construct. The AVE value for Irrigation Framing is 0.615, demonstrating good convergent validity and indicating that it captures sufficient variance from its indicators. Similarly, Job Creation, with an AVE value of 0.590, meets the threshold, showing acceptable convergent validity. Employment Opportunities, with an AVE value of 0.631, exhibits good convergent validity, slightly outperforming the other constructs.

Table II R Square

	R Square	R Square Adjusted
Job Creation and Employment Opportunities	0.755	0.745

Source; PLS-SEM output, 2024.

R Square and R Square Adjusted indicate the proportion of variance in Job Creation and Employment Opportunities explained by irrigation farming in the model. An R Square value of 0.755 signifies that 75.5% of the variance in Job Creation and Employment Opportunities is explained by irrigation farming, demonstrating a high level of explanatory power and suggesting that the model fits well.

The small difference between the R Square (0.755) and R Square Adjusted (0.745) values suggests that the model is neither overly complex nor over fitted. This indicates that the included predictors are likely relevant and meaningful. The slightly lower adjusted value highlights that the model is robust but leaves room for unexplained variance (approximately 25%). This suggests that other factors not included in the model may also influence Job Creation and Employment Opportunities.

Table III Path Coefficients

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (O/STDEV)	P Values
Irrigation Framing -> Job Creation	0.837	0.836	0.022	87.035	0.012
Irrigation Framing -> Employment Opportunities	0.915	0.917	0.032	66.452	0.001

Source; PLS-SEM output, 2024

This result provides evidence to assess the stated hypothesis, **H01: Irrigation farming has no significant relationship with job creation in Zamfara North Senatorial Zone.** A **Path Coefficient (O)** value of 0.837 indicates the strength and direction of the relationship between irrigation farming and job creation. This strong positive coefficient signifies that increases in irrigation farming are strongly associated with increases in job creation.

The **T-Statistic** value of 87.035 measures the reliability of the path coefficient. This exceptionally high value far exceeds the critical threshold of 1.96, indicating that the observed relationship is highly reliable and unlikely to have occurred by chance.

The **P-Value** of 0.012 evaluates the statistical significance of the result. A p-value below 0.05 suggests that the null hypothesis (H01) can be rejected with confidence. In this case, the p-value of 0.012 provides strong evidence that irrigation farming has a significant impact on job creation.

The null hypothesis (H01) is rejected. The data supports the alternative hypothesis, demonstrating that irrigation farming has a significant positive relationship with job creation in Zamfara North Senatorial Zone. The strength of the relationship (path coefficient = 0.837) and the statistical metrics (high T-statistic and low P-value) confirm that irrigation farming is a critical factor contributing to job creation in the region.

The result evaluates the hypothesis (**H02**): "Irrigation farming has no significant relationship with employment opportunities in Zamfara North Senatorial Zone." A **Path Coefficient (O)** value of 0.915 indicates the strength and direction of the relationship. This strong positive coefficient signifies that increases in irrigation farming are closely associated with the generation of employment opportunities. A coefficient of 0.915 represents a **very strong positive relationship**, meaning that as irrigation farming increases, employment opportunities also increase substantially.

The T-Statistic value of 66.452 measures the reliability of the path coefficient. This exceptionally high value far exceeds the critical threshold of 1.96, confirming that the observed relationship is highly reliable and unlikely to occur by chance.

The **P-Value** of 0.001 evaluates the statistical significance of the relationship. Being far below the 0.05 threshold, this p-value provides very strong evidence that the relationship is statistically significant. The null hypothesis (H02) is rejected. The data demonstrates that irrigation farming has a significant and very strong positive relationship with employment opportunities in Zamfara North Senatorial Zone. This finding underscores irrigation farming as a **major driver of** employment opportunities in the region. The strong path coefficient (0.915), exceptionally high T-statistic (66.452), and very low p-value (0.001) highlight the critical role of irrigation farming in fostering job creation and economic development.

DISCUSSION OF FINDINGS

The study investigates the relationship between Irrigation Farming and its impact on **Job Creation** and **Employment Opportunities** in Zamfara North Senatorial Zone. The results from hypothesis testing and path analysis offer key insights into these relationships.

The path coefficient indicates a strong positive relationship between irrigation farming and job creation. This implies that irrigation farming significantly contributes to creating jobs, Irrigation farming is a critical factor for employment generation in Zamfara North, helping to address unemployment issues and boosting the local economy.

A stronger path coefficient demonstrates that irrigation farming has a very strong positive relationship with employment opportunities. This suggests that irrigation farming not only creates direct agricultural jobs but also facilitates indirect opportunities. Irrigation farming acts as a catalyst for broader economic activities, significantly expanding employment prospects beyond traditional farming roles.

The findings reveal that irrigation farming is a vital economic driver in Zamfara North Senatorial Zone, with significant positive impacts on both job creation and employment opportunities. This underscores the need for

targeted investments and policies to harness its full potential in promoting sustainable development and reducing unemployment in the region.

CONCLUSION

The study confirms that irrigation farming plays a significant role in enhancing job creation and employment opportunities in Zamfara North Senatorial Zone. Irrigation farming is not only a source of direct agricultural employment but also stimulates broader economic activities, creating opportunities in related sectors such as processing, transportation, and agricultural services.

The findings highlight the potential of irrigation farming to address unemployment and improve livelihoods in rural areas. By fostering job creation and expanding employment opportunities, it contributes significantly to economic development and poverty alleviation. Targeted investments in irrigation infrastructure, training programs, and supportive policies can amplify these benefits, establishing irrigation farming as a cornerstone of sustainable rural development.

Prioritizing irrigation farming as a key strategy for economic growth in Zamfara North Senatorial Zone is essential. Its proven capacity to generate jobs and create diverse employment opportunities makes it a critical focus area for policymakers, development agencies, and stakeholders aiming to drive socio-economic development in the region.

RECOMMENDATIONS

Based on the research conclusions, it therefore recommends as follows;

1. The government should introduce subsidies or grants to help farmers expand their operations and increase the scale of irrigation farming initiatives. This expansion would create more direct agricultural jobs and significantly boost employment opportunities in the sector. Additionally, industries connected to irrigation farming, such as irrigation equipment supply, repair services, and water management consultancy, should be actively promoted, as they can generate substantial indirect employment.
2. Government should encouraging private investments in large-scale irrigation projects through tax breaks or other incentives could further expand employment opportunities. By fostering private-sector involvement, the government can amplify the impact of irrigation farming on employment while also enhancing economic activity in related sectors. These measures would not only support rural livelihoods but also contribute to broader economic development.

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