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# Potentials of Arable Crops Farming in Obudu Dam Resort in Bridging the Gap of Food Security in Nigeria

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**ABSTRACT:** This paper focused on potentials of arable crops farming in Obudu Dam resort in bridging the gap of food security in Nigeria. Dams are major issues in sustainable management of finite water resources, they have also become the subject of vigorous public debate. This article considered Obudu dam in the light of the report of the world commission on dams and using the Nigeria at large. It is argued that economic development and population growth particularly in arid and semi-arid regions makes plain the need for dams for irrigation, hydropower and domestic uses. This work x-rays the genealogy and geography of Obudu dam, environmental impact of the dam on the communities, economic activities of the communities as it influences food security, issues influencing effective functioning of Obudu dam, dam disaster as affected by the communities and impacts of Obudu Dam on food security in Nigeria. It is however recommended that the irrigation project of the dam be extended to all areas for family's access to irrigation water, the culture of land tenure system should favor women and youths, the vulnerable groups and government to involved the communities in project selection and execution, Comprehensive basin wide assessment on dam impacts on all human and natural systems must be made before a project is embark upon.

**KEYWORDS:** Arable crops, Farming, Dam, Food, and Food Security

## I. INTRODUCTION

Dams are critical structures that control and confine the flow of water across waterways, varying from small earth embankments to massive concrete structures, and are utilized for water supply, hydropower, irrigation, and river navigation (Aspen Institute, 2022). They play a vital role in providing essential resources for domestic, agricultural, and industrial uses, contributing to daily activities such as cooking, cleaning, and cultivation (Ingwu, 2019). Additionally, dams facilitate recreational activities like fishing and boating while enhancing flood security by regulating water during excess and low flow periods (Association of State Dam Safety Officials, 2020). Amidst this backdrop, the World Commission on Environment (2018) and the International Food Policy Research Institute (IFPRI, 2021) have highlighted the persistent issue of agricultural stagnation in Africa, a continent deeply affected by hunger and starvation. This situation is exacerbated by Africa's limited rainfall, dry seasons, and frequent droughts, making dam construction a meteorological necessity for sustaining and replenishing freshwater resources. Research focusing on the relationship between dams, arable crops, and food security in Nigeria is increasingly relevant. This paper aims to update existing studies by exploring the role of dams in agricultural productivity and food security, with a specific focus on the potential of arable crop farming around Obudu Dam in Nigeria. It seeks to contribute to the scholarly conversation by examining the genealogy and geography of Obudu Dam, assessing its environmental impact on local communities, exploring the economic activities influenced by the dam, addressing operational challenges, and understanding the community interactions that affect dam functionality and disaster management. This comprehensive analysis will elucidate the impacts of Obudu Dam on food security in Nigeria, providing insights into how well-designed dam projects can support agricultural development and mitigate food insecurity in regions prone to hydrological and climatic variability. The goal is to identify gaps in current research and suggest future directions for enhancing the efficacy of dams in supporting sustainable agricultural practices and improving food security outcomes in the region.





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### THE GENEALOGY OF OBUDU DAM AND ITS GEOGRAPHY

Obudu Dam, located in the Obudu Local Government Area of Cross River State, Nigeria, is an earth-fill structure with a height of 15 meters and a crest length of 425 meters, holding a capacity of 4.2 million m<sup>3</sup>. Commissioned in 1999, it serves purposes such as farm irrigation, fishing, and recreation. The dam is situated on the Obudu crystalline basement plateau, known for its low seismic activity, at coordinates of latitude 6°36'52"N and longitude 9°10'150"E. Surrounding the dam are the villages of Ukwel-Obudu, Bebuabie, Begiaba, and Kakum. The local government area borders Vandeikya in Benue State to the north, Akwaya commune in Cameroon to the east, and the Boki and Bekwarra areas to the south and west. Obudu is a multilingual area where Bette (a Bantu language), Emame, Evant (Tivoid languages), Alege, Utugwang, Ubang, and Ukpe-Bayobiri are spoken.

### ECONOMIC IMPORTANCE OF OBUDU DAM

Obudu Dam in Nigeria stores water for multiple uses, impacting the environment both positively and negatively. Negative effects include blocking fish migration, trapping sediments, altering water temperatures and chemical compositions, changing dissolved oxygen levels, fragmenting rivers, and destroying surrounding forests, which contributes to global warming. However, the dam also delivers significant benefits; it is a crucial water supply source for domestic activities such as cooking, cleaning, bathing, drinking, gardening, and irrigation, as well as for industrial uses. Plans are underway for the dam to support hydroelectric power generation and enhance river navigation.

The dam is pivotal in electricity generation, acting as a major renewable energy source without fuel requirements. It regulates water flow during flood seasons, mitigating flood risks by storing excess water and releasing it during periods of low flow or when natural water sources are insufficient. Additionally, Obudu Dam offers recreational opportunities like fishing and boating. Local communities, including those in and around Obudu, receive treated water via pipelines from the dam, which also helps control sediment and aids river navigation along routes like Indeabeb, Beshue, and Embue-Ife, enhancing transport and accessibility.

## II. IMPACTS OF OBUDU DAM ON THE ENVIRONMENT

**Ecological impact:** The World Commission on Dams (2018) found that 60 % of the world's rivers are impacted by dams and diversions, which induce physical, chemical, and geomorphologic alterations by disrupting natural river flow. Dam construction negatively affects biological productivity, harming riverine and riparian plant life and downstream habitats, as noted by Albert (2022). Additionally, the creation of storage dams kills terrestrial plants and displaces animals, while reducing water quality and altering the seasonal water yield. Dams also obstruct migratory river animals like salmon and trout and contribute to the depletion of groundwater aquifers, further damaging downstream forests by suppressing natural flood cycles.

**Emission of Greenhouse Gases (GHG):** The American Society of Civil Engineers (2020) highlights that reservoirs contribute to greenhouse gas emissions (GHG) from decaying vegetation and carbon inflow from catchment areas. Estimates indicate that reservoir emissions could represent 1 % to 28 % of global warming potential from GHG emissions, challenging the view that hydropower is purely beneficial compared to fossil fuel power sources. This highlights that reservoir, contrary to previous beliefs, do indeed emit significant GHGs (Association of State Officials, 2016).

**Alteration of flow Regime:** Storage dams alter the natural flow of rivers, critically impacting downstream aquatic ecosystems by changing flood timing, duration, and frequency, which are vital for the survival of plant and animal communities. Impoundments lead to significant physico-chemical and biotic modifications downstream. The specific changes resulting from damming a river involve complex interactions during the construction and operation phases, as noted by Burnett, Adam, and Lettenmaier (2017). These alterations compromise the dynamic nature essential to maintaining healthy aquatic ecosystems.

**Biodiversity Loss:** Dams significantly impact ecosystems by disrupting species movement and altering upstream and downstream species composition, leading to biodiversity loss, and habitat destruction for forests and wildlife. They block crucial migratory patterns of river-dwelling species, such as upstream spawning by anadromous fish like salmon, and downstream migration by catadromous fishes like eels. Additionally, changes in the physico-chemical properties of



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water bodies due to dams can directly cause the death of aquatic biota, as noted by Caldwell, Sun, McNulty, Cohen, and Moore (2020).

**Social Impact:** Dams have had a profound negative impact on societies, displacing an estimated 40-80 million people globally. In China, official records state that 10.2 million people were displaced from 1950 to 1990, though independent sources suggest the numbers, particularly in the Yangtze Valley, are much higher. World Bank-funded projects reveal that large dams are responsible for 63 % of such displacements, disproportionately affecting indigenous people and ethnic minorities who often lack legal recognition or land rights. Dam failures also cause significant displacement and destruction; in Nigeria, the 2003 storm-damaged Obudu dam spillway resulted in over 200 houses, farmlands, and businesses being destroyed. Similarly, the 1980 failure of the Ojirami dam in Southern Nigeria devastated the Enwan and Akuku communities, destroying properties worth millions of naira and forcing residents into cramped housing conditions, significantly worsening their living standards.

**Gender-Related Impacts:** Gender inequalities in access to economic and natural resources are pronounced in dam-adjacent communities like Ukwel-Obudu, Kakum, Begiaba, and Bebuabie, where women need family head permission to use resources and rarely own or inherit land (Economist Group 2018). Dams often exacerbate these disparities by disproportionately burdening women or inequitably distributing benefits. For example, the construction of the Mahaweli dam in Sri Lanka disrupted existing land co-ownership rights for women, introducing a new policy that typically nominates a son as the sole heir, further marginalizing women in affected areas (Doyle, Stanlye, Harbor, and Grant, 2021).

**Impact of Cultural Heritage:** Dams significantly impact cultural heritage by submerging or degrading cultural resources, including temples, shrines, artifacts, and archaeological sites like burial grounds and ancient remains. They also damage cultural heritage through associated land reclamation and irrigation projects, leading to the loss of sacred landscape elements.

**Health Related Impacts:** Dams significantly impact cultural heritage by submerging or degrading valuable cultural resources. These structures can inundate temples, shrines, and a wide array of artifacts, fundamentally altering or completely erasing archaeological sites, including burial grounds and ancient remains. The construction and associated activities of dams, such as land reclamation and irrigation projects, further exacerbate this damage. Such developments often lead to the irreversible loss of sacred elements within the landscape, eroding the cultural fabric of affected communities. The presence of dams, therefore, poses a substantial threat to the preservation of historical and cultural identities, as these critical cultural touchstones are compromised or lost entirely to water and development pressures.

### ECONOMIC ACTIVITIES OF THE COMMUNITIES AROUND THE OBU DU DAM AS IT INFLUENCES FOOD SECURITY

The major economic activities of Ukwel- Obudu, Begiaba, Bebuabia and Kakum communities in Obudu Local Government Area of Cross River State are agriculture based. The land occupied by communities is a hilly fertile semi-forested area and it is a communal property. It is very fertile for arable crop as well as tree crops cultivation. It is derived from close kinship system, typical of the African kinship arising from some friendly ties among existing families and villages. This accounts for the dispersed type of settlement because residence unlike in other communities is on family land. Food crops such as cassava, groundnuts, melon, okro, pepper, vegetables, yam, cucumba, soya bean, maize, Rice etc. are cultivated by women for subsistence and a little surplus for sale. Oil palm exploited for palm oil and palm wine, yam, timber exploitation and hunting are performed by men. Indeed, the women are allowed only a small quantity of palm oil for domestic use even though the women process the palm fruits for the men or husband. She is however, allowed to own the sludge and kernel which she with the assistance of her children and wards crack to sell for the purchase of soup condiments and other needed items.

Livestock and poultry keeping is also practiced by the communities. The men keep goats, sheep, Cattle, rabbits and pigs, while poultry is mainly dominated by the women and their children who guide maintain and monitor the birds, they report to their husbands or men any loss noticed. The women's major source of wealth is from cassava which they either process into garri or ferment into (akpu) a major source' of food in the area. She sells the excess of the akpu from the subsistence. She also makes small fortune from the sale of groundnut which she sells after reserving some for house



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use and as seedlings against the next planting season. The market days are days arranged by the entire local government. The small market in the community falls every five days. The main market 'is the Katuba {Regional} market which also falls, every five days but in Obudu town. Because of the presence of Obudu dam resort, few young men in the community occasionally fish in the dam which is a government owned project. But the catch from the dam is not enough to sustain the young men livelihood but go a long way to reduce hunger in the land.

### MAJOR ISSUES INFLUENCING THE EFFECTIVE FUNCTIONING OF OBUDU DAM

The Obudu dam in cross River State, Nigeria is faced with a number of issues ranging from flooding, water scarcity, abandoned rehabilitation projects, climate change. Other problems that the dam face include;

- Sub-standard construction materials/techniques
- Inadequate spillway flood capacity and design error
- Geological instability caused by changes to water levels during filling or poor surveying
- Sliding of a mountain into the reservoir
- Poor maintenance, especially of outlet pipes
- Extreme inflow and seepage
- Human, computer or design error
- Internal erosion, especially in earthen dams
- Loss of reservoir capacity due to sediment accumulation

### DISASTER IN OBUDU DAM

In July 2003, the Obudu Dam spillway in Nigeria was severely damaged by a storm, leading to a catastrophic disaster that destroyed over 200 houses, numerous farmlands, settlements, and businesses. Experts attribute the disaster to the combined effects of excessive water released from Cameroon's Lagdo Dam and unusually intense rainfall in Obudu, which lasted for 16 hours and measured 314.5 mm—surpassing the 15-year peak month average for July and September. These conditions caused the overflow of water courses leading to Obudu Dam, overwhelming the spillway and leading to its failure (Bosshard, 2015). The damage necessitated urgent rehabilitation, with costs estimated at around N350m (approximately \$2.8 m). Commissioned in 1999, the dam primarily supports irrigation for local farming communities and promotes recreational and tourism activities. Following the disaster, locals urgently appealed to the government for immediate repair to prevent further floods (Brown and Lall, 2016).

### IMPACTS OF OBUDU DAM ON FOOD SECURITY AS INFLUENCED BY THE SURROUNDING COMMUNITIES

Food security is defined by the FAO (2021) as a state where all people have physical and economic access to sufficient, safe, and nutritious food at all times to meet their dietary needs for an active and healthy life. It hinges on four interrelated variables: availability, accessibility, utilization, and stability. Availability ensures consistent access to adequate food quantities through production, imports, or aid. Accessibility involves obtaining nutritious food, influenced by household income, income distribution, and food prices. Utilization pertains to the proper biological use of food, requiring a balanced diet, clean water, and sanitation. Stability of these factors over time is crucial. Inadequate food security arises from insufficient availability, poor access, or improper utilization, often exacerbated by subsidy removal, climatic changes, poor infrastructure, inconsistent government policies, inadequate storage, poverty, and land tenure issues. Recent statistics reveal significant malnutrition in Nigeria, with 18% of the population undernourished and substantial rates of stunting and wasting among children under five (Joshua, Makuachukeu, Mohammad, and David, 2024). Recognizing the importance of food security for national strength, the Nigerian government has launched arable farming programs to enhance food security and reduce reliance on the oil sector, simultaneously addressing unemployment and boosting economic stability.

Obudu dam become a valuable asset for farming for the neighboring communities, by providing irrigation water and livestock, and support a variety of farming activities around them. Farmers extent their growing seasons and grow a wider variety of crops like; pepper, garden egg. Vegetables, okra, yam, cassava, soyabeans, cowpea, maize rice, etc. The Irrigation system help them to prevent yield losses due to water stress, livestock get drinking water easily, fishing activities become a lucrative business round the dam site. The support biodiversity conservation trees and shrubs around the dam can provide habitats for birds, marsupials, and invertebrates. People visit the dam for a variety of



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purposes, such as tourism, collecting water for drinking, washing, swimming and bathing, buying food stuffed and there is improvement in the standard of living of the people in communities. Appropriate management of the Obudu Dam led to improved productivity and profitability, as well as benefits to biodiversity and conservation.

### RECOMMENDATIONS

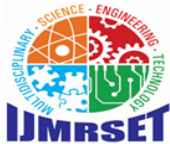
In view of the need to solve or at least mitigate dam-related problems identified in this paper, the following suggestions are made;

- The irrigation project of the dam should be extended to all areas of the community where families own land for cultivation. By so doing, so many families will have access to the irrigation site where crops farming all year round will be practiced. This will be of a great extent, create specialization in the farming of specific crops like Okra, vegetable, maize, yams, etc. gotten in both on and off seasons. The consequence of this is that farmers mostly women and youths who farm vegetables and other arable crops will enjoy improved and steady income that will be generated from the farm.
- Grassing areas close to Dam sites to reduce erodibility
- Government should involve benefiting communities on the selection and execution of projects that are established to improve the standard of living of the communities especially in the area of quality access road, schools, electricity, pipe born water, health care, housing scheme etc.in the communities
- There must be an aggressive policy train to change Nigerians desire and preference for foreign made goods. This will encourage the production of arable crops as well creating jobs, markets for our locally produced goods.
- The culture of the communities around the dam resort that does not allowing women to own land upon which she cultivates crops must stop. Women should be allowed equal land opportunities by families especially married women who are incorporated into the in-heritance status of their husband. This change in cultural practices will grant them more economic freedom.
- Comprehensive assessment of dam impact (i.e. on all human and natural systems) must be made before a project is embarked upon. This will not show only the various kinds of project effects and their magnitudes, but also their spatial and temporal distribution. These types of information will aid decisions on acceptance design and or the necessary modification of projects.
- Pareto-optimality (i.e. a condition whereby no community or section of a basin is made worse off in a development process) a community or section stands the risk of being made worse off, adequate compensation should be given to them.
- Government must show strong commitment and necessary political will, by establishing the necessary institutions and providing legal and administrative frame work for the implementation of policies aimed at attaining and maintaining food security of Nigeria.

### III. CONCLUSION

Obudu dam project in Semi-arid belt have caused disharmony, degradation, destabilization and dichotomies between peoples, areas, and governments because it empowered certain communities and impoverished others. In fact, it bears out Odihi (2018) Observation that "development has caused modern poverty". However, dam projects do not necessarily have to be dualistic or lopsided in the spatial distribution of their effects. What is needed is a rethinking of the water resources, management approaches to make it broad enough to include multiple interests not only in terms of uses but also different sections of river basin. Such a basin wide consideration will solve or minimize the problem of socio-economic and environmental degradation. It will transform communities of Kakum, Begiaba, Bebuabie and Ukwel-Obudu in all parts of the basin from conditions of food despair into food determination, hunger into harvests of abundance, enough water for hand washing, bathing, drinking, food insecurity into food security, rural poverty into rural opulence". The dam become an important factor in raising land values throughout the farming seasons of Obudu. The farmers need to engage in arable crop farming throughout the seasons with the availability of dam water, adequate and sufficient food will be accessed to chase hunger away from Obudu. The significance of obudu dam in small-scale agriculture cannot be overstated. From ensuring water security and irrigation to supporting livestock, mitigating droughts, conserving soil, and aiding emergency preparedness, the dam is a lifeline for farmers. Their multifaceted benefits promote sustainable agricultural practices and contribute to the overall resilience and success of small-scale farming operations. As the world faces increasing climate uncertainties, investing in Obudu dam becomes crucial for small-scale farmers to secure their livelihoods and contribute to food security in Nigeria.





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