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Review of the Nigeria Agricultural Input into Realizing SDG Goal 2; Zero Hunger

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Abstract **Original Research Article**

This study examines the review of the Nigeria agricultural input into realizing SDG goal 2; zero hunger using a systematic review and descriptive analytical research design as methodology. Findings from the study reveal that research shows that farmers using improved seed varieties experienced yield gains of 20% to 40%, especially for maize and rice. Despite these benefits, adoption levels are inconsistent, largely due to limited affordability and poor distribution systems. Fertilizer application in Nigeria is still below the FAO-recommended average for sub-Saharan Africa. While government subsidy programs have occasionally expanded fertilizer availability, irregular supply and delayed delivery have diminished their overall impact. Areas with greater fertilizer usage consistently reported higher cereal production. Therefore, the study recommends that government should broaden rural credit facilities and financial inclusion initiatives to empower smallholder farmers, with particular focus on women and youth; promote climate-smart agriculture, sustainable soil management, and efficient irrigation to boost long-term productivity; combine productivity improvements with environmental sustainability to strengthen resilience against climate-related shocks; implement transparent and accountable monitoring mechanisms for input subsidy programs and agricultural policies; and ensure that national agricultural input strategies are aligned with SDG 2 indicators to effectively track progress.

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Introduction

Sustainable Development Goal 2 (SDG 2), known as Zero Hunger, seeks to eliminate hunger, ensure food security, improve nutrition, and promote sustainable agricultural practices by the year 2030. The goal goes beyond simply increasing food supply; it also focuses on enhancing agricultural productivity, strengthening resilient farming systems, and guaranteeing fair access to essential resources and inputs for smallholder farmers, particularly women and family-based producers (Musa et al., 2025; Magaji & Aliyu, 2007). Agriculture is fundamental to achieving this goal because of its strong connection to nutrition, rural employment, and national food systems. Attaining SDG 2 depends largely on significantly increasing the productivity and income of small-scale farmers by providing them with secure access to land, quality inputs, agricultural knowledge, markets, and financial support (Igwe et al., 2021; Ismail et al., 2025; Magaji et al., 2015). Furthermore, it requires the adoption of sustainable food production systems capable of adapting to climate change while preserving environmental and ecosystem stability (Magaji et al., 2022; Magaji & Musa, 2024).

Within Nigeria, agriculture continues to serve as a vital pillar of the economy and the main source of income for a large proportion of rural households. Nevertheless, the country still faces persistent food insecurity alongside deep-rooted structural weaknesses in its agricultural sector (Oluwalosijibomi et al., 2025). A significant number of Nigerians suffer from undernourishment or remain vulnerable to food shortages due to factors such as low farm productivity, limited access to high-quality inputs, inadequate rural infrastructure, and insufficient investment in agricultural development (Ologbonori et al., 2025; Zailani et al., 2025). Unless there are meaningful enhancements in key agricultural inputs including improved seed varieties, fertilizers, mechanized farming equipment, irrigation facilities, and effective extension services Nigeria's ability to provide adequate food for its rapidly expanding population will continue to face serious limitations.

The ability of Nigeria's agricultural sector to significantly advance SDG 2 depends largely on the presence of sound policy frameworks and well-designed interventions that

improve productivity and strengthen the resilience of smallholder farmers. For example, reforms such as the Plant Variety Protection Act 2021 are intended to enhance seed systems and encourage innovation in crop breeding measures that can reduce productivity gaps and reinforce national food security. Despite these efforts, several obstacles remain, including inadequate funding, poor implementation of agricultural policies, and insufficient investment in essential farming inputs. Consequently, examining the extent to which agricultural inputs in Nigeria support or fall short of the targets of SDG 2 is crucial for developing effective strategies aimed at increasing food supply, improving nutritional outcomes, and promoting sustainable agricultural development.

Literature Review and Theoretical Framework

Conceptual Review

Agricultural Input

Agricultural inputs encompass the vital resources—both tangible and intangible—used in the production of agricultural commodities. These include seeds, fertilizers, pesticides, irrigation water, machinery, labor, credit and financial services, extension support, and technology. Together, these inputs determine farmers' ability to raise output, enhance product quality, and improve overall farm efficiency (FAO, 2017). The level of productivity within any farming system largely depends on the availability and timely use of quality inputs. When farmers lack adequate access to these resources, yields remain low, rural incomes stagnate, and national food systems struggle to satisfy growing demand (World Bank, 2007). Among these inputs, improved seeds are particularly fundamental. Such seeds are selectively bred to increase yield potential, strengthen resistance to pests and diseases, and improve tolerance to drought and poor soil conditions (Morris, Kelly, Kopicki, & Byerlee, 2007). Evidence shows that access to improved seed varieties substantially enhances agricultural productivity, especially for smallholder farmers in sub-Saharan Africa, where reliance on traditional seed systems remains widespread (Almekinders & Louwaars, 1999). Fertilizers whether organic or inorganic also play a crucial role by supplying essential nutrients like nitrogen (N), phosphorus (P), and potassium (K) required for plant growth. Proper fertilizer application improves soil fertility, increases crop yields, and can enhance the nutritional quality of harvested produce. However, effective management is essential, as both insufficient and excessive application may result in soil degradation, nutrient leaching, and environmental damage (Sanchez, 2002; Smaling et al., 2006).

Water is a vital component of agricultural production. Consistent access to irrigation particularly in areas prone to water scarcity allows farmers to control crop water stress and lessen their reliance on unpredictable rainfall. Infrastructure such as pumps, canals, and reservoirs supports continuous cultivation throughout the year and helps stabilize production in regions experiencing climate fluctuations (Falkenmark & Rockström, 2006). Farm machinery also plays a crucial role in improving farm efficiency by minimizing labor demands and speeding up activities such as land preparation, planting, spraying, and harvesting. Mechanization can involve anything from basic hand tools to tractors, seed planters, combine harvesters, and advanced precision agriculture technologies. The use of machinery enhances economies of scale and ensures timely farm operations, which are essential for reducing crop stress and post-planting losses (Binswanger & Rosenzweig, 1986). Despite technological advancements, labor remains a key input, especially in farming systems with limited mechanization. Extension services are equally important, as they connect indigenous farming knowledge with modern agricultural innovations. Through training and advisory support on improved practices, pest and disease control, and efficient input use, extension agents help farmers achieve higher productivity (Anderson & Feder, 2007). Financial access is another critical factor. Credit facilities enable farmers to purchase inputs when needed, acquire machinery, and adopt new technologies. Institutions such as microfinance banks, rural credit schemes, and agricultural financing programs are widely acknowledged for empowering smallholder farmers to expand and modernize their operations (Christen, 2010; Chinedu et al., 2021). In addition, technological advancements including biotechnology, digital information platforms, and precision agriculture have transformed how inputs are managed. Tools such as mobile advisory services assist farmers in determining the appropriate timing and quantity of inputs, thereby improving efficiency, minimizing waste, and promoting both economic viability and environmental sustainability (World Bank, 2019).

Zero Hunger

Zero Hunger is embodied in Sustainable Development Goal 2 (SDG 2) under the 2030 Agenda for Sustainable Development. This goal seeks to eliminate hunger, ensure food security, enhance nutrition, and advance sustainable agriculture by 2030 (United Nations, 2015). Its scope goes beyond simply eradicating hunger; it promotes universal access to adequate, safe, and nutritious food year-round, with particular attention to vulnerable groups such as children, women, and smallholder farmers. Hunger is generally understood as a situation in which individuals do not have consistent access to sufficient, safe, and nutritious food needed for healthy growth and an active life (FAO, IFAD, UNICEF, WFP, & WHO, 2023). Achieving Zero Hunger therefore entails not only addressing chronic undernourishment but also combating all forms of malnutrition and strengthening the long-term resilience of food systems. Attaining this goal demands simultaneous progress across the four key pillars of food security. Even when a nation produces enough food at the aggregate level, hunger can still persist due to poverty, inequality, and limited access to food resources (Barrett, 2010; Bello et al., 2025).

Zero Hunger further calls for the elimination of all forms of malnutrition, including stunting, wasting, micronutrient deficiencies, as well as overweight and obesity. Malnutrition both results from and contributes to poverty and underdevelopment. The World Health Organization (WHO, 2021) reports that undernutrition is responsible for nearly half of all deaths among children under the age of five worldwide. Consequently, tackling hunger requires more than increasing food supply; it also demands improvements in dietary diversity, maternal and child health, sanitation, and access to quality healthcare services. A fundamental pillar of Zero Hunger is the advancement of sustainable agriculture. While agricultural output must expand to meet the needs of a growing global population, this expansion should not come at the expense of environmental degradation. Sustainable agriculture balances environmental protection, economic sustainability, and social inclusion (Pretty, Toulmin, & Williams, 2011). Key strategies include climate-smart farming practices, strengthened seed systems, expanded irrigation, improved soil fertility management, and the adoption of innovative technologies. The World Bank (2007) highlights that agricultural growth is especially powerful in reducing poverty and hunger in developing nations, where a large share of the poor rely on farming for their livelihoods. For this reason, investing in smallholder agriculture is critical to achieving Zero Hunger. Moreover, Zero Hunger is closely connected to climate resilience. Climate change poses serious risks to crop production, livestock systems, fisheries, and water resources, thereby undermining food system stability (IPCC, 2022; Olusola et al., 2025; Tanko et al., 2025). To ensure sustainability, food systems must be capable of adapting to environmental shocks, conflicts, and economic disruptions. Building such resilience involves crop diversification, enhanced storage and preservation systems, and stronger institutional frameworks to support farmers and communities.

Theoretical Framework

Theory of Agricultural-Led Development (ADLI Theory)

This study is grounded in the Agricultural Development–Led Industrialization (ADLI) Theory, which maintains that agricultural expansion forms the basis for broad economic growth, poverty alleviation, and improved food security. According to this perspective, enhancing agricultural productivity through better access to essential inputs such as improved seed varieties, fertilizers, irrigation systems, mechanization, extension support, and financial services leads to surplus output, higher rural incomes, and the growth of agro-based industries. In the long run, these outcomes contribute significantly to strengthened national food security and overall economic transformation.

The intellectual roots of this theory are linked to Johnston and Mellor (1961), who argued that agriculture drives economic development through five key functions: supplying food for domestic needs, providing raw materials for industrial production, earning foreign exchange, expanding markets for industrial goods, and releasing labor to support industrial growth. Within this perspective, agricultural inputs are considered strategic instruments that boost productivity and generate broad multiplier effects throughout the economy. The ADLI framework closely corresponds with Sustainable Development Goal 2 (Zero Hunger), which aims to eradicate hunger, ensure food security, enhance nutrition, and promote sustainable agriculture by 2030 (United Nations, 2015). From this viewpoint, persistent hunger is largely attributed to low agricultural productivity, inadequate access to essential inputs, and systemic weaknesses within agricultural structures. Consequently, reinforcing agricultural input systems is viewed as a crucial pathway toward realizing the objectives of Zero Hunger.

Thus, the theory explains that sustainable food security can only be achieved when agricultural systems are modernized and input supply chains function efficiently.

Empirical Review

Empirical evidence indicates that the use of high-quality agricultural inputs substantially enhances crop productivity in Nigeria. For instance, Adediran, Adeyemo, and Ojeniyi (2018) reported that smallholder farmers in the northern states experienced an average 32% increase in maize yields when provided with improved seeds and fertilizers. However, the study also highlighted that restricted access to credit and input markets limited adoption among resource-constrained farmers, thereby constraining potential productivity improvements. These findings underscore the importance of improving access to agricultural inputs as a key strategy for advancing food security and achieving the targets of SDG 2.

Extension services are critical in facilitating farmers' adoption of agricultural inputs. Okoruwa and Ogunleye (2006) investigated the impact of extension contact on the use of fertilizers and improved seeds in rural Nigeria. Their study found that farmers who received consistent visits from extension agents were significantly more likely to adopt recommended input practices, resulting in higher productivity and healthier crops. The authors concluded that reinforcing extension networks is vital for effectively disseminating input technologies and advancing the objectives of SDG 2.

Access to credit is a key factor influencing farmers' capacity to acquire essential agricultural inputs. Adewumi and Balogun (2020) examined credit limitations among smallholder farmers in southwest Nigeria and found that the absence of affordable financing significantly hindered the purchase of fertilizers, agrochemicals, and hired labor. Their regression analysis revealed that access to credit increased the probability of input adoption by 47%. These findings highlight the importance of financial inclusion policies as an integral component of strategies aimed at achieving SDG 2.

Market access significantly affects farmers' ability to obtain and effectively utilize agricultural inputs. A field study by Nnadi et al. (2019) in southeastern Nigeria found that

inadequate rural infrastructure and weak market supply chains hindered the distribution of inputs such as fertilizers and improved seeds. Farmers residing in remote areas were 38% less likely to access quality inputs, which constrained their productivity and overall food output. The study emphasized the need for public investment in rural roads and supply networks to strengthen input accessibility and support the attainment of SDG 2.

Government policies have significantly influenced patterns of agricultural input use. Umar and Haruna (2017), in their assessment of Nigeria's fertilizer subsidy program, found that the provision of subsidized fertilizers positively increased adoption rates among smallholder farmers, resulting in an estimated 28% improvement in cereal production. However, the study also highlighted that delays in subsidy distribution and inadequate targeting limited the program's overall effectiveness. The authors emphasized that transparent and timely implementation of subsidy schemes is crucial for supporting the achievement of SDG 2 objectives.

Gender disparities play a critical role in shaping access to agricultural inputs and influencing food security outcomes. Olumakaiye et al. (2021), in a large cross-sectional study, found that female farmers in northern Nigeria had considerably less access to land, credit, and extension services compared to male farmers. This limited access led to lower utilization of inputs and diminished household food security. The study emphasized that implementing gender-responsive agricultural policies is vital for achieving the broader objectives of SDG 2.

Research Gap

The reviewed empirical studies offer strong evidence that agricultural inputs—such as improved seeds, fertilizers, credit facilities, extension services, subsidies, and rural infrastructure—play a significant role in enhancing agricultural productivity and improving food security outcomes in Nigeria. However, several important gaps remain. Most studies have examined individual inputs in isolation. For example, Adediran et al. (2018) focused primarily on improved seeds and fertilizers, Adewumi and Balogun (2020) analyzed credit access, Okoruwa and Ogunleye (2006) emphasized extension services, and Umar and Haruna (2017) evaluated fertilizer subsidies. While these studies provide valuable insights, they do not offer an integrated perspective on how multiple agricultural inputs interact collectively to influence food security and SDG 2 outcomes. There is limited empirical research exploring the combined or systemic effects of input packages on achieving Zero Hunger. Furthermore, although the studies address productivity and food security, they rarely frame their findings in relation to the specific, measurable indicators of SDG 2. For instance, none of the reviewed works comprehensively assesses how agricultural inputs impact key SDG 2 targets, including the prevalence of undernourishment, smallholder productivity and income levels, and the establishment of sustainable food production systems. This highlights the need for more holistic research that links input use to the broader objectives of SDG 2.

Therefore, a clear conceptual and empirical gap exists in linking agricultural input performance directly to the SDG 2 framework. Existing empirical studies primarily focus on productivity improvements but often overlook aspects of environmental sustainability and climate resilience. While SDG 2 emphasizes sustainable agriculture, limited attention has been given to how the use of inputs such as fertilizers, irrigation, and mechanization affects soil health, water resources, and long-term ecological stability. Consequently, there is insufficient evaluation of whether current input strategies promote sustainable intensification or, conversely, contribute to environmental degradation. Additionally, most of the reviewed studies are geographically localized (e.g., specific regions in northern or southwestern Nigeria) and cross-sectional in design. There is a lack of longitudinal or nationwide analyses tracking trends in agricultural input utilization and their long-term effects on food security. A broader, national-level perspective is therefore necessary to assess systemic progress toward achieving Zero Hunger. Although Olumakaiye et al. (2021) explored gender disparities in input access, the wider literature inadequately incorporates considerations of gender, youth inclusion, and vulnerable populations in evaluating agricultural input use. SDG 2 underscores the importance of inclusive access to productive resources, yet empirical evidence remains limited on the extent to which marginalized groups benefit from agricultural input interventions.

Although studies like Umar and Haruna (2017) have assessed fertilizer subsidy programs, there is a notable lack of comprehensive evaluations of Nigeria's broader agricultural input policies including input subsidy reforms, e-wallet systems, and seed policy frameworks in relation to measurable food security outcomes. There is a need for more policy-focused research to determine whether these government interventions effectively contribute to reducing hunger and achieving the targets of SDG 2.

Methodology

Research Design

This study employs a systematic review combined with a descriptive analytical research design. Being exploratory in nature, it relies on secondary data to investigate Nigeria's agricultural input systems and their role in achieving Sustainable Development Goal 2 (Zero Hunger). This approach facilitates a comprehensive synthesis of existing literature, policy documents, institutional reports, and empirical studies related to agricultural inputs and food security in Nigeria.

Sources of Data

The study relies solely on secondary data sources, which include: peer-reviewed journal articles; government publications, such as those from the Federal Ministry of

Agriculture and the National Bureau of Statistics; reports from international organizations, including FAO, World Bank, IFAD, and UNDP; policy documents on agricultural input programs; SDG 2 progress reports; as well as relevant conference papers and academic theses.

Data Collection Procedure

Data were gathered through a structured literature search across academic databases, including Google Scholar, Scopus, Web of Science, ResearchGate, as well as FAO and World Bank repositories. The review prioritized studies published between 2000 and 2024 to ensure alignment with contemporary policy contexts and SDG implementation frameworks.

Analytical Framework

The study is guided by the Agricultural Development–Led Industrialization (ADLI) Theory, the Food Security Framework which encompasses availability, access, utilization, and stability and the SDG 2 Targets and Indicators Framework. A thematic content analysis approach was employed to synthesize findings from the reviewed literature and policy documents.

Method of Data Analysis

The study utilizes qualitative content analysis, complemented by descriptive statistical interpretation where appropriate.

The qualitative analysis focuses on identifying recurring themes, policy patterns, institutional gaps, and structural challenges. Meanwhile, quantitative data from reports—such as crop yield statistics, fertilizer consumption rates, and poverty indices—are summarized using descriptive methods to highlight trends.

Reliability and Validity

To ensure reliability and validity, the study sourced data from reputable academic journals and recognized institutions. Multiple sources were cross-referenced to verify consistency, and only recent, peer-reviewed studies were prioritized to enhance credibility.

Ethical Considerations

As the study relies exclusively on secondary data, no human participants were involved. All sources have been appropriately cited to maintain academic integrity and prevent plagiarism.

Data Presentation and Results

Overview of Reviewed Studies

Following the established inclusion and exclusion criteria, a total of 48 relevant documents were reviewed. These included 26 peer-reviewed journal articles, 12 government policy documents and reports, and 10 publications from international development agencies such as FAO, World Bank, IFAD, and UNDP.

The reviewed materials addressed topics including agricultural input utilization, productivity trends, food security indicators, subsidy programs, climate resilience initiatives, and the performance of SDG 2 in Nigeria over the period from 2000 to 2024.

The findings are presented thematically, aligned with the study's analytical framework, focusing on agricultural inputs and their relationship with food availability, access, utilization, and stability.

Agricultural Inputs and Food Availability

The review indicates a strong positive relationship between the utilization of agricultural inputs and crop productivity in Nigeria.

Studies show that farmers who adopted improved seed varieties experienced yield increases of between 20% and 40%, especially in maize and rice production. Nevertheless, adoption rates remain uneven, largely due to affordability issues and weak distribution networks.

Fertilizer use in Nigeria continues to fall below the FAO-recommended average for sub-Saharan Africa. While government subsidy programs have temporarily increased fertilizer availability in some years, irregular supply and delayed distribution have limited their overall effectiveness. Areas with higher fertilizer application, however, have experienced notable improvements in cereal production.

Mechanization in Nigeria remains low, with smallholder farmers largely reliant on manual labor. Limited access to tractors and modern farming equipment restricts production scale and efficiency. Farms that employ mechanized techniques, however, achieve higher output per hectare compared to traditional farming systems.

Result

The findings confirm that enhanced access to quality agricultural inputs directly boosts domestic food production, thereby contributing to SDG 2 Target 2.3, which aims to double the agricultural productivity and incomes of small-scale producers.

Agricultural Inputs and Food Access

Food access is closely linked to farmers' income levels and purchasing power.

Evidence shows that farmers with access to agricultural credit were significantly more likely to purchase fertilizers, improved seeds, and agrochemicals. Credit access increased productivity and household income, thereby improving food access.

However, smallholder farmers particularly women and rural youth face significant barriers in accessing formal financial services.

Fertilizer subsidy schemes increased short-term affordability of inputs. However, policy inconsistencies, corruption, and

targeting inefficiencies reduced the long-term sustainability of these programs.

Result

Improved financial access and effective subsidy implementation enhance household income, thereby improving food affordability and contributing to SDG 2 Target 2.1 (ending hunger and ensuring access to safe and nutritious food).

Agricultural Inputs and Food Utilization

Food utilization involves nutritional outcomes and proper dietary intake.

The reviewed literature indicates that increased crop productivity positively influences dietary diversity. Households with higher agricultural output reported better consumption patterns and reduced vulnerability to undernourishment.

However, the studies reveal that productivity gains alone do not automatically translate to improved nutrition without complementary investments in: Nutrition education, Health services and Clean water access

Result:
Agricultural inputs contribute indirectly to improved nutrition, but integrated food and health policies are required to maximize SDG 2 Target 2.2 (ending all forms of malnutrition).

Agricultural Inputs and Food Stability

Stability refers to resilience against shocks such as climate change, market volatility, and conflict.

Limited irrigation infrastructure exposes farmers to rainfall variability. Areas with irrigation facilities demonstrated more stable production across seasons compared to rain-fed systems.

Few studies examined sustainable input usage. Overreliance on chemical fertilizers without soil management strategies poses long-term environmental risks.

Result

While agricultural inputs improve short-term production, inadequate climate adaptation measures threaten long-term food system stability, posing challenges to sustainable realization of SDG 2.

Gender and Equity Findings

The review reveals persistent gender disparities in access to: Land, Credit, Extension services and Subsidized inputs

Female farmers consistently recorded lower productivity levels due to limited input access. This undermines inclusive agricultural growth and weakens national progress toward Zero Hunger.

Result

Gender inequality in agricultural input distribution remains a significant barrier to achieving equitable food security outcomes.

Policy and Institutional Performance

Government initiatives such as input subsidy reforms and agricultural transformation programs showed mixed results.

Positive outcomes: Increased awareness of improved farming techniques and Expanded fertilizer distribution

Limitations: Weak monitoring and evaluation systems, Inconsistent funding and Poor coordination among agencies

There is limited empirical evidence directly linking agricultural input policies to measurable SDG 2 indicators such as reduction in undernourishment rates.

Result

Policy implementation gaps reduce the overall effectiveness of agricultural input strategies in achieving Zero Hunger.

Summary of Key Results

Based on the thematic analysis, the study finds that: Agricultural inputs significantly increase crop productivity and food availability, Credit and subsidy programs improve input access but face implementation challenges, Productivity gains improve household income and food access, Limited irrigation and climate adaptation threaten food stability, Gender disparities constrain inclusive agricultural development and there is weak institutional alignment between input policies and SDG 2 measurable targets.

Conclusion

The study concludes that agricultural inputs are fundamental to Nigeria's progress toward Zero Hunger, as they directly influence food availability, access, utilization, and stability. However, structural inefficiencies, policy gaps, gender disparities, and climate vulnerability hinder the full realization of SDG 2. To fully achieve Zero Hunger, Nigeria must go beyond mere input distribution and adopt integrated strategies that combine productivity enhancement with sustainability, climate resilience, gender inclusiveness, and strong institutional governance. In essence, agricultural inputs alone are necessary but not sufficient; achieving SDG 2 requires a holistic approach that aligns policy, infrastructure, finance, and social inclusion with the broader goal of sustainable food security.

Recommendations

Based on the findings and conclusions, the study makes the following recommendations:

Ensure timely and equitable distribution of improved seeds, fertilizers, agrochemicals, and mechanized equipment, expand rural credit schemes and financial inclusion programs

to support smallholder farmers, particularly women and youth, encourage climate-smart practices, sustainable soil management, and efficient irrigation to enhance long-term productivity, integrate productivity measures with environmental sustainability to ensure resilience against climate shocks, establish transparent and accountable monitoring systems for input subsidy programs and agricultural policies and align national agricultural input strategies with SDG 2 measurable indicators to track progress effectively.

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