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Contemporary Issues, Challenges and Solutions in Nigerian Agriculture: A Review of the Period 2020–2025

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ABSTRACT
Nigeria's agricultural sector is central to food security, employment generation, economic diversification, and rural development, yet its transformative potential remains constrained by persistent structural, environmental, institutional, and socioeconomic challenges. This narrative review critically examines contemporary issues affecting Nigerian agriculture between 2020 and 2025, evaluates strategies for sectoral revitalisation, and draws lessons from relevant international experiences. Secondary data were obtained from peer-reviewed literature, policy documents, and national and international databases, including Scopus, Web of Science, Google Scholar, African Journals Online, and the Central Bank of Nigeria, the National Bureau of Statistics, FAOSTAT, the World Bank, and FEWS NET. Evidence was synthesised thematically around key agricultural problems, transformation models, international experiences, and policy recommendations. The review identifies declining land and labour productivity, weak input and extension systems, inadequate irrigation, poor rural infrastructure, high post-harvest losses, limited agro-processing capacity, climate variability, environmental degradation, insecurity, policy inconsistency, underinvestment, land constraints, and unequal access to digital technologies and agricultural finance as major barriers to agricultural transformation. Although initiatives such as the Anchor Borrowers' Programme, NIRSAL, digital agriculture, climate-smart practices, and value-chain development have generated important opportunities, their impacts have been limited by weak implementation, institutional fragmentation, inadequate funding, and exclusion of smallholders, women, and youth. International experiences from Asia, Latin America, India, and the Sahel demonstrate the importance of sustained public investment, effective farmer organisations, community-led adaptation, integrated value-chain development, and stable policy institutions. The review recommends a coherent, long-term, private-sector-enabled agricultural transformation agenda supported by increased investment in research, irrigation, extension, rural infrastructure, agro-industrialisation, climate-smart agriculture, inclusive finance, digital connectivity, land-tenure reform, and shock-responsive social protection. These measures are essential for building a competitive, inclusive, climate-resilient, and food-secure agricultural system in Nigeria.

Keywords: Nigerian Agriculture; Agricultural Transformation; Food Security; Agricultural Policy

INTRODUCTION

Agriculture remains one of the most vital pillars of the Nigerian economy, playing a central role in national development, food security, employment generation, and economic diversification. Historically the primary driver of Nigeria's exports before the crude oil boom, agriculture has returned to the forefront of national policy as the volatility and unreliability of global oil revenues have intensified the urgency to diversify the country's revenue base (Olomolu and Nwafor, 2018). Today, agriculture accounts for approximately 24% of Nigeria's Gross Domestic Product (GDP), while the broader food economy and agribusiness activities including input supply, processing, marketing, and retailing contribute an additional 20% and employ an estimated 85 million people (Ikuemonisan, 2024). Yet despite this vast human and biophysical resource endowment, Nigeria's agricultural potential remains heavily constrained. The sector's performance over the 2020–2025 period has been shaped by a complex interplay of structural bottlenecks, environmental shocks, and emerging policy responses (Abraham and Jankowska, 2025).

Throughout this period, the pursuit of national food security and Sustainable Development Goal 2 (Zero Hunger) has faced formidable obstacles. Nigeria's standing on the Global Hunger Index remains classified as "serious," with the country slipping from 103rd in 2022 to 109th out of 125 countries in 2023, driven by a continuous rise in the prevalence of undernourishment and food price inflation (Oweibia *et al.*, 2024). This food security crisis is compounded by several interlocking challenges. First, low productivity and technological gaps persist: traditional, manual farming methods using basic tools continue to dominate the upstream sector, resulting in low land and labour productivity, with the Gross Production Value per agricultural worker declining by over 42% between 2012 and 2022 (Abraham and Jankowska, 2025). Second, climate variability and natural shocks continue to disrupt production cycles. Third, widespread insecurity and regional conflict, including persistent rural banditry, herder–farmer clashes over grazing routes, and insurgencies such as the Boko Haram conflict in the northern states, have severely disrupted local farming systems, forced community displacements, and depressed the yields and self-sufficiency ratios of staple grains like millet, sorghum, and maize. Fourth, severe underfunding and credit constraints limit farmers' capacity to invest and expand. Finally, socioeconomic barriers and

demographic pressures weigh heavily on the sector: rural farming populations are ageing, with the average age of a Nigerian farmer now exceeding 45 years, as younger generations migrate to cities in search of alternative livelihoods. Deep gender disparities compound this problem, as adult women hold sole customary land rights in less than 8.2% of households, compared to 34.2% of adult males, limiting women's capacity to secure credit or make long-term land investments (Oweibia *et al.,* 2024).

In response to these challenges, the 2020–2025 period has witnessed concerted efforts to transition Nigerian agriculture from a government-led development activity into a private-sector-led commercial agribusiness model. Successive policy frameworks, such as the Agriculture Promotion Policy (APP) and the agricultural components of the Economic Recovery and Growth Plan (ERGP), have sought to close supply–demand gaps and improve standards compliance (Olomu *et al.,* 2020). Targeted interventions such as the Central Bank of Nigeria's Anchor Borrowers' Programme (ABP) have provided vital input and credit subsidies to smallholders, driving remarkable progress in the self-sufficiency of key staples like rice, whose self-sufficiency ratio rose from 64.9% in 2012 to 115.5% in 2022 (Abraham and Jankowska, 2025). Concurrently, the de-risking of agricultural lending through the Nigeria Incentive-Based Risk Sharing System for Agricultural Lending (NIRSAL) has catalysed formal banking-sector funding into agro-allied value chains.

Beyond these interventions, significant opportunities for transformation are emerging across several high-potential areas. Agribusiness and value-chain upgrading continue to gain momentum, while digital agriculture and ICT adoption are accelerating: rapid growth in internet penetration, which expanded to 163.8 million users by 2023, has paved the way for smart farming, with mobile phone-based extension advisory services, digital weather forecasting, and automated e-wallet input delivery platforms actively reducing transaction costs and bridging crucial agricultural knowledge gaps. Innovative cultivation practices and inclusivity efforts are similarly reshaping the sector: the adoption of climate-smart conservation agriculture, soil-less hydroponic systems, and greenhouse technologies is providing resilient urban food solutions, while empowering youth and women through the dismantling of cultural land-access barriers and the introduction of tailored vocational training (TVET) remains pivotal to unlocking the sector's full productive capacity. Emerging rural agrotourism initiatives are also unlocking alternative revenue streams, helping to brand organic, traditional products and mitigate rural unemployment (Ayodeji et al., 2021; Abraham and Jankowska, 2025).

This review therefore provides a critical evaluation of how these contemporary issues, structural bottlenecks, and emerging solutions have shaped Nigerian agriculture between 2020 and 2025. By analysing recent productivity trends, policy implementation performance, and rural socioeconomic dynamics, the study explores practical pathways toward building a competitive, climate-resilient, and food-secure agricultural system capable of driving inclusive growth across Nigeria.

To ensure a rigorous, transparent, and replicable analysis of the contemporary issues, challenges, and solutions in Nigerian agriculture between 2020 and 2025, this study adopted descriptive and analytical research design based on secondary data sources. This narrative review employs a systematic framework to track policy inputs, intermediate sector outputs, and ultimate development results.

The temporal scope of this review is restricted to the 2020–2025 period, with historical baselines integrated where necessary to establish long-term trajectories. In line with peer-review standards for policy and development evaluations, the search strategy prioritises recent, directly relevant literature published within the last five years to capture the immediate impacts of contemporary shocks and interventions.

Database searches were conducted in databases such as Scopus, Web of Science, Google Scholar and African Journals Online using combinations of keywords including "Nigerian agriculture", "agricultural policy", "value chains", "climate-smart agriculture", "digital agriculture", and "food security. Alongside target searches of institutional databases. To construct a comprehensive view of the sector, literature was gathered across three main categories: National and International Statistical Databases such as the Central Bank of Nigeria (CBN) Statistical Bulletin, the National Bureau of Statistics (NBS), the Food and Agriculture Organization (FAOSTAT), the World Bank Development Indicators, the Famine Early Warning Systems Network (FEWSNET), and the United Nations Statistics Division. Government Policy and Interventional Frameworks such as the Economic Recovery and Growth Plan (ERGP), the Agriculture Promotion Policy (APP), the National Agricultural Investment Plan (NAIP), and guidelines/reports on the Anchor Borrowers' Programme (ABP) and the Nigeria Incentive-Based Risk Sharing System for Agricultural Lending (NIRSAL) and Peer-Reviewed Research and Evaluation Reports.

Studies were included if they analysed structural challenges in Nigerian agriculture, proposed or evaluated models and strategies for sector revamping, or examined international experiences with clear implications for Nigeria. Both qualitative and quantitative studies, as well as thematic reviews and major policy documents, were retained, while very narrow technical agronomy experiments without sectoral or policy relevance and non-Nigerian case studies without explicit links to Nigeria were excluded. Evidence was synthesised narratively under four themes: key problems, models and strategies, countries' experiences, and current recommendations.

RESULTS AND DISCUSSION

Key Problems in Nigerian Agriculture

Low Productivity and Weak Value Chains

At the primary production level, Nigeria's agricultural sector is defined by persistent yield gaps across major food and cash crops, a pattern quantitatively reflected in a long-term decline in land productivity. Empirical data show that Nigeria's Gross Production Value (GPV) per hectare of agricultural land declined by 31.6% over a ten-year period, falling from USD 923.3 in 2012 to USD 631.7 in 2022 (FAO, 2025). This yield stagnation is fundamentally tied to low rates of technological adoption, declining soil fertility, and poor-quality inputs (Abraham and Jankowska, 2025).

Under the Central Bank of Nigeria's (CBN) Anchor Borrowers' Programme (ABP) and its predecessor, the Growth Enhancement Support Scheme (GESS), the state attempted to build input-supply structures. While GESS registered 10.5 million smallholders in its database, implementation was severely constrained by input shortfalls, including an estimated gap of 300,000 metric tonnes between the demand for and supply of certified seeds, alongside limited fertiliser delivery volumes. Consequently, the use of purchased seeds by smallholders has historically remained below 30% (Olomu et al., 2020).

These input shortages are compounded by critical deficits in key agricultural support services. Irrigation systems remain

negligible: Nigerian agriculture remains almost entirely dependent on erratic seasonal rainfall, and access to irrigation actually fell from a baseline of 3.0% of cultivated plots in 2011 to 1.6% in 2012, recovering only marginally to 1.7% by 2016—far below the Vision 2020 target of 10–25% irrigated land. Extension services remain similarly weak: outreach, which is crucial for modern agronomic knowledge transfer, reached only 10% of rural farming households in 2011, expanding slightly to 14% by 2016. These deficits are further compounded by socioeconomic and demographic shifts, as the average age of the Nigerian farmer now exceeds 45 years. As rural youth migrate to urban centres to escape the perceived drudgery of agricultural work, the sector faces a persistent shortage of energetic, skilled labour, directly reducing overall labour efficiency (Olomolu and Nwafor, 2018; FAO, 2025).

A key driver of low labour productivity is the low level of mechanisation across Nigeria's farming landscape. The vast majority of smallholder farmers continue to carry out strenuous farm operations using rudimentary manual tools such as hoes and cutlasses. As a result, the Gross Production Value per agricultural worker (GPV/AWU) fell steadily from approximately USD 2,873.7 in 2012 to a low of USD 1,644.7 by 2022—an overall decline of about 42.8% in labour productivity (Abraham and Jankowska, 2025). Although modern tools such as tractors and drones have demonstrated success in lowering labour requirements and boosting output in localised trials, broader adoption remains heavily constrained by limited access to capital, high risk perceptions among commercial banks, and challenging terrain that hampers mechanisation. This keeps smallholders locked in subsistence cycles, preventing them from achieving the economies of scale needed to lower unit production costs and compete in regional markets (Ogunniyi *et al.*, 2020).

Beyond primary production, major value-chain weaknesses occur at the midstream logistics and downstream processing stages, generating high post-harvest losses and suppressing value addition. Post-harvest crop losses remain exceptionally high due to rudimentary community warehousing and a severe lack of modern cold-storage infrastructure a problem that is particularly devastating for highly perishable crops such as cassava and tomatoes (Abraham and Jankowska, 2025). Processing capacity, meanwhile, remains highly underdeveloped, and shifting the sector's focus from raw commodity exports toward value-added processing remains a critical gap.

Olomu et al. (2020) highlight that the performance of Nigeria's agricultural sector has been stunted by policy contradictions, reversals, and sudden implementation discontinuities. Across successive administrations, agricultural policy has oscillated between prioritising primary production and pursuing commercial agribusiness integration. For example, the Agricultural Transformation Agenda (ATA) of 2012 attempted to establish Staple Crop Processing Zones (SCPZs) linking primary production to industrial processing hubs. This strategy, however, failed to yield the desired results due to inadequate public funding and the sudden withdrawal of anchor investors such as Cargill.

Olomu et al. (2020) further demonstrate that policy initiatives have often neglected critical linkages between actors within the value chain—input suppliers, transporters, smallholders, processors, and retailers—and that government interventions have at times crowded out private-sector innovators. A prime example occurred in 2016, when the federal government bypassed the established private-sector e-wallet model to purchase and distribute fertiliser directly to farmers, thereby impeding the development of private input markets. Consequently, the agribusiness environment remains poorly integrated, leaving the majority of smallholder farmers isolated from formal agro-industries and urban food markets. Achieving sustainable food security and economic diversification will require structured public-private partnerships (PPPs) designed to de-risk agricultural lending, upgrade midstream logistics, and establish clear, enforceable national food-quality standards.

Climate Change and Environmental Degradation

Nigeria's agricultural sector remains highly sensitive to climate variability, largely because the vast majority of smallholder farmers depend almost entirely on rain-fed cultivation. This structural vulnerability is severely worsened by a profound deficit in public irrigation infrastructure across the country (Pratt et al., 2022). Historical data indicate that the proportion of irrigated agricultural plots remains negligible, dropping from 3.0% in 2011 to a mere 1.6% in 2012, before recovering only slightly to 1.7% by 2016. Consequently, farmers have very little defence against unpredictable seasonal weather shifts, leaving the entire sector highly susceptible to immediate climate shocks (Oweibia *et al.*, 2024).

During the 2020–2025 period, the rising frequency and severity of extreme weather events—including rising temperatures, prolonged droughts, and intense seasonal floods—significantly undermined crop and livestock output. The 2019 floods, for instance, devastated major rice-producing states such as Kebbi and Delta, causing widespread crop destruction and triggering a sharp, temporary drop in the national self-sufficiency ratio (SSR) for rice. Prolonged droughts, coupled with climate-exacerbated pest outbreaks such as the fall armyworm, have driven severe yield fluctuations and sudden declines in the self-sufficiency ratios of critical staple crops, including maize, millet, and sorghum. Meanwhile, intensifying droughts in the north have degraded natural grasslands and depleted water sources, disrupting traditional pastoral routes a shift that in turn fuels herder–farmer conflicts and threatens livestock safety (Ojumu et al., 2023; Ibrahim *et al.*, 2025).

The ecological foundation supporting Nigerian agriculture is facing severe degradation from both climate change and unsustainable land-use practices. Soil fertility depletion, soil erosion, and land overuse are primary contributors to the long-term decline in land productivity, a trend illustrated by a 31.6% reduction in Nigeria's Gross Production Value (GPV) per hectare of agricultural land over a ten-year period, falling from USD 923.3 in 2012 to USD 631.7 in 2022 (FAO, 2025). Agricultural expansion into fragile ecosystems and rampant deforestation further compromise the environment's resilience. Deforestation has accelerated rapidly, diminishing forest cover and destabilising local microclimates. Scholars such as Oluwatayo et al. (2019) emphasise that these combined environmental pressures pose a direct and substantial threat to long-term agricultural productivity and rural livelihoods. Without sustainable land management practices such as combating erosion, utilising organic fertilisers, and undertaking land reclamation, efforts to balance environmental sustainability with food production targets will continue to struggle.

The direct consequence of these climate and environmental shocks is a worsening national food security crisis. Nigeria's standing on the Global Hunger Index reflects this stress, slipping to 109th out of 125 countries in 2023, with its hunger level categorised as "serious." This decline is driven by a continuous rise in the prevalence of undernourishment, which

is particularly severe among vulnerable smallholder farmers in remote regions (Oweibia *et al.,* 2024).

Smallholder farmers are highly vulnerable to climate shocks because they typically lack the financial resources and technical capacity to adapt. This vulnerability is compounded by two systemic factors in particular. First, water infrastructure damage: extreme droughts and floods damage delicate rural water catchment and storage systems, directly threatening water availability for consumption and farming in economically disadvantaged villages. Second, very low insurance uptake: when climate disasters strike, smallholders face severe economic losses due to minimal uptake of agricultural insurance, leaving them without the safety nets needed to rebuild their farms or purchase improved seeds and fertilisers for the next planting season.

As systematically reviewed by Akinkuolie *et al*. (2025), addressing these climate-induced food insecurities requires the urgent deployment of tailored, climate-smart adaptation strategies such as drought-resistant crop varieties, improved rainwater harvesting, and soil conservation techniques to build long-term resilience across Nigeria's smallholder agricultural landscape.

Governance, Policy Inconsistency and Under-Investment

Nigeria's agricultural policy landscape over the past two decades has been characterised by an undulating sequence of implementation, policy reversals, and institutional discontinuities. Administrative transitions have repeatedly disrupted long-term developmental frameworks, forcing the adoption of stopgap measures that lack alignment with economy-wide plans (Olomolu and Nwafor, 2018). Since the cessation of regular national development planning in the late 1980s, the sector has undergone a series of rapid, fragmented policy shifts. Under the NEEDS programme and the Presidential Initiatives (2001–2007), early civilian-era strategies prioritised commodity-specific production, yielding temporary gains such as cassava output expanding from 33 million metric tonnes in 1999 to 46 million metric tonnes in 2006. The Seven-Point Agenda (2007–2010) then shifted national focus toward preparing a comprehensive Food Security Strategy in 2009, introducing value-chain concepts to agricultural planning. This was followed by Vision 20:2020 and the Agricultural Transformation Agenda (ATA) (2011–2015), which formalised value-chain development across five key commodities rice, cassava, sorghum, cocoa, and cotton through the Growth Enhancement Support Scheme (GESS) and Staple Crop Processing Zones (SCPZs). Finally, the Agricultural Promotion Policy (APP, also known as the Green Alternative) (2016–2020) and the Economic Recovery and Growth Plan (ERGP) attempted to consolidate the ATA's gains while addressing its structural gaps (Olomu *et al.,* 2020).

Despite these ambitious blueprints, policy contradictions have repeatedly undermined private-sector confidence and value-chain integration. A prime example occurred during the implementation of GESS: while the scheme successfully registered 10.5 million smallholders in a technology-driven "e-wallet" database to bypass corrupt fertiliser distribution channels, financing the subsidy proved fiscally unsustainable, leaving a backlog of N39 billion in unpaid input loans that severely slowed commercial bank lending. Similarly, despite policy goals emphasising private-sector autonomy, the federal government in 2016 bypassed its own established e-wallet model to purchase and distribute fertiliser directly to farmers, crowding out private agro-allied distributors and impeding market-led innovation (Olomu *et al.,* 2020). These sudden shifts in regulatory rules, combined with a lack of intergovernmental coordination between federal and state authorities, have repeatedly stalled major public-private partnerships (PPPs).

Public financial investment in Nigerian agriculture remains profoundly inadequate, representing a major barrier to structural transformation. Despite successive administrations pledging commitment to economic diversification, public funding has consistently failed to meet international and regional benchmarks. At the continental level, Nigeria remains a signatory to the 2003 Maputo Declaration and the 2014 Malabo Declaration, both of which mandate African governments to allocate at least 10% of their annual national budgets to agriculture. Nigeria, however, has steadily drifted further from this target. The shortfall is particularly stark when measured against agriculture's actual economic weight: while the average ratio of public agricultural expenditure to agricultural GDP stood at a negligible 1.1% between 2014 and 2016, the broader ratio of total government expenditure to total national GDP stood at 9%—a commitment level eight times larger. By comparison, high-performing agricultural nations in Africa average a 19% commitment of public resources to agricultural GDP (Ikuemonisan, 2024).

This deep financial neglect has starved critical public services of funding and forced national programmes to become heavily dependent on volatile foreign donor support. At the subnational level, agricultural value chains receive even less priority, resulting in fragmented, weakly coordinated interventions across Nigeria's 36 states.

The direct consequence of this underfunding is a persistent deficit in critical rural infrastructure and agricultural services. Extension outreach has decayed steadily: although the first National Implementation Plan of Vision 20:2020 targeted an extension worker-to-farmer ratio of 1:500 by 2020, household participation in extension services remained extremely low, rising only marginally from 10% in 2011 to 14% in 2016. Irrigation infrastructure remains similarly negligible: while national plans set targets of irrigating 10–25% of cultivated land by 2015 and 2020, actual irrigation access instead declined from 3.0% of plots in 2011 to a mere 1.7% by 2016, leaving the country's food supply highly vulnerable to erratic seasonal rainfall. Research systems have stagnated as well: the national agricultural research system has been starved of public funds, disconnecting public research institutes from the practical needs of smallholders, while weak institutional capacity and data-collection gaps are so severe that during the Malabo Declaration review, Nigeria was able to provide data for only 19 of the 40 standard monitoring indicators required for the biennial continental evaluation. Finally, rural road and storage deficits compound these problems: funding delays have stalled critical investment in rural road networks, market links, and storage infrastructure, leaving rural communities isolated, keeping post-harvest losses high, and driving up food prices in urban consumer markets (Oweibia *et al.,* 2024).

Weak administrative structures and regulatory gaps continue to deter the private agro-allied investment needed to drive commercial agribusiness. Commercial banks view primary agriculture as a high-risk sector owing to erratic rainfall, pest outbreaks, and high credit default rates. To mitigate this risk, the Central Bank of Nigeria established NIRSAL to provide credit guarantees and interest-rate rebates encouraging bank lending to the agricultural value chain. While NIRSAL facilitated N85.6 billion in agricultural finance between 2017 and 2018, its guidelines proved overly complex for most commercial financial institutions. Consequently, agricultural credit as a share of total commercial bank lending remains low, rising only from 1.7% in 2010 to 3.3% in 2016 well below the target of 10%. Most of these loans are directed

toward large-scale processors rather than capital-starved smallholders, who typically lack the formal land titles required as collateral (Abraham and Jankowska, 2025).

Downstream export performance is further limited by weak regulatory enforcement of product standards. Regulatory bodies such as the Standards Organisation of Nigeria (SON) and NAFDAC are constrained by inadequate funding and limited human resources, which has hindered the establishment of robust testing laboratories, crop traceability protocols, and international quality certifications. Consequently, Nigeria has struggled to comply with the World Trade Organisation's Sanitary and Phytosanitary (SPS) Standards and CODEX Alimentarius guidelines. This regulatory gap has resulted in the frequent rejection of high-value commodities—such as beans, sesame seeds, and ginger—in international markets, severely undermining the sector's ability to drive non-oil export growth and economic diversification (Olomolu and Nwafor, 2018).

To break these recurrent cycles of ambitious but weakly implemented programmes, Sadiq et al. (2025) argue that "post-Buharinomics" agriculture requires a fundamental restructuring of policy instruments and institutional roles—a paradigm shift that demands moving away from government-led interventionism toward a market-enabling, private-sector-led commercial agribusiness model. The lessons of the 2010–2025 period demonstrate that direct state intervention in input distribution often crowds out private agro-dealers and creates heavy fiscal burdens on national budgets. Achieving sustainable food security and global competitiveness will instead require that public-sector involvement be restricted to setting and enforcing strict quality standards, de-risking commercial lending through syndicated financing mechanisms, and funding essential public infrastructure such as rural roads, irrigation, and storage facilities.

By establishing a stable, predictable policy environment with clear institutional mandates, Nigeria can unlock its agricultural potential and transition the sector into a key driver of inclusive, non-oil economic growth.

Demographic Pressures, Urbanisation, and Land Constraints

Nigeria's demographic profile exerts intense, continuous pressure on its national agrifood systems. The country is experiencing one of the highest population growth rates globally, with its total population projected to reach approximately 289 million by 2030 (Ikuemonisan, 2024). This rapid population increase is outstripping the pace of poverty reduction efforts and placing immense pressure on existing food supply chains. As the population expands, escalating demand for food intensifies the challenge of achieving national food security (SDG 2: Zero Hunger), leading to serious domestic shortages and a heavy reliance on high-cost agricultural imports (Ejiogu, 2018).

This demographic surge is coupled with rapid, poorly planned urbanisation and industrial expansion, which has triggered intense competition for land and water resources. The advance of urbanisation has directly encroached upon rural landscapes, reducing the amount of usable agricultural land and severely restricting domestic farm output potential (Mohammed *et al.*, 2024).

This pressure is clearly reflected in the steady decline in per capita landholdings over time, signalling a stark reduction in agricultural land availability. This land contraction is driven by a complex web of socioeconomic, cultural, and political factors, leaving smallholders with smaller, highly fragmented plots that prevent them from achieving the economies of scale necessary to lower unit production costs (Chukwunweike, 2023).

The vast majority of smallholder farmers lack formal, registered land titles or legal documentation. Without formal title deeds, farmers cannot use their land as collateral to secure bank loans or commercial credit, which cuts them off from purchasing productivity-enhancing inputs such as certified seeds, fertilisers, or mechanised services. Deep gender-based inequalities in customary land administration further compound this barrier to agricultural investment (Olomolu and Nwafor, 2018).

To feed a burgeoning population under tightening land constraints, Nigeria must urgently transition away from extensive cultivation—which relies on expanding land area rather than improving yields toward sustainable agricultural intensification strategies. Under intense socioeconomic pressure, resource-poor farmers are often forced to balance immediate economic survival against long-term environmental stewardship.

Breaking this cycle will require the deployment of sustainable land management practices, such as combating soil erosion, utilising organic fertilisers, and implementing targeted land reclamation, to protect the ecological foundations of agriculture. Integrating sustainable agribusiness models such as agroforestry, organic farming, and precision agriculture—has likewise demonstrated strong potential to reverse land degradation and boost crop yields on existing farmland without depleting fragile ecosystems.

By implementing clear land administrative reforms, clarifying customary land rights, and empowering youth and women with secure land access, Nigeria can unlock its agricultural potential and build a highly competitive, inclusive, and climate-resilient food system.

Digital and Financial Inclusion Gaps

While Nigeria has experienced an impressive expansion in digital connectivity with national internet users increasing from 48.4 million (28.4% penetration) in 2013 to 163.8 million (76.2% penetration) by 2023, the benefits of this digital transformation remain highly unequal. Within agricultural landscapes, a stark rural-urban digital divide persists. This inequality is clearly reflected in mobile phone ownership rates, with 82.7% of urban individuals owning a mobile device compared to only 65.6% of their rural counterparts. This digital gap leaves rural smallholders, who form the backbone of primary food production, disproportionately isolated from emerging agronomic innovations (Oweibia *et al.,* 2024).

As a result, digital climate-smart agriculture (CSA) initiatives, electronic extension portals, and mobile-based advisory systems have largely remained localised pilots rather than fully integrated national systems. Smallholder adoption is constrained by several interconnected barriers. Digital literacy and skills gaps remain widespread, while the cost of devices and mobile data continues to be prohibitive for many rural households. These are compounded by poor rural network infrastructure and limited trust in digital services more broadly (Oweibia *et al.,* 2024).

The agricultural sector's transition from subsistence farming to commercial agribusiness is further restricted by deep-seated bottlenecks in rural finance. Although formal lending to agriculture has grown in absolute terms—with deposit money bank loans to the sector rising from N1.8 trillion in 2010 to N5.9 trillion by 2016—agriculture's share of total commercial bank credit remains low, rising only from 1.7% to 3.3% over the same period. This level of financial commitment falls far short of the 10% target established

under the Agriculture Promotion Policy (Olomolu and Nwafor, 2018).

Izuogu *et al.* (2025) show that the allocation of these financial resources is highly skewed. Owing to the high-risk perception of rain-fed farming, unpredictable weather patterns, and pest outbreaks, formal banks impose stringent lending criteria. Strict collateral requirements mean that the bulk of formal bank loans are directed toward large-scale processors and commercial farms, leaving capital-starved smallholders almost entirely cut off from formal credit channels. Rural farmers are instead forced to rely on informal moneylenders, family networks, and traditional savings associations ("esusu"), which offer limited capital and highly volatile terms.

The lessons of the 2010–2025 period demonstrate that expanding digital and financial inclusion requires moving away from fragmented, government-led pilots toward inclusive system design and stable public-private partnerships. To de-risk the agricultural sector and attract private investment, future policies must focus on strengthening rural digital networks, simplifying credit-guarantee procedures, enforcing clear product quality standards, and clarifying land titles so that smallholders can leverage their land as formal collateral.

Models and Strategies for Revamping the Sector

Policy and Institutional Transformation Models

A major consensus within recent agricultural literature advocates for a transition away from the historically fragmented, short-term programmes that have characterised Nigeria's agricultural landscape toward comprehensive, long-term agricultural transformation agendas. Prior to the 2010s, Nigerian agricultural policy was heavily constrained by a lack of systematic review frameworks, which frequently resulted in hurriedly conducted assessments and the rapid introduction of stopgap measures poorly integrated with broader, economy-wide plans. Following the cessation of regular national development planning in the late 1980s, policy oscillated through a succession of presidential initiatives and agendas that prioritised the production of isolated commodities without addressing the sector's underlying systemic bottlenecks.

This cycle of disjointed programming began to break with the formulation of the Vision 20:2020 blueprint in 2009, the Agricultural Transformation Agenda (ATA) in 2011, and the subsequent Agriculture Promotion Policy (APP) in 2016. Together, these frameworks drove a fundamental philosophical shift, reorienting Nigerian agriculture away from its traditional characterisation as a government-led development or social welfare activity and toward a commercial, private-sector-led agribusiness model. Rather than treating the smallholder as merely a subsistence actor, modern policy models aim to connect primary producers directly with a dynamic value chain of processors, distributors, and retailers.

To address deep-seated market failures, including missing and weak rural markets, empirical assessments call for integrated, systematic policy interventions that span the entire value chain rather than targeting isolated nodes. Historically, interventions that focused solely on raising output—without upgrading midstream logistics and downstream processing resulted in severe post-harvest losses and depressed farmer incomes. Olomu et al. (2020) argue that upgrading the agricultural sector requires a commitment to the "principle of specialized diversification and division of labour," under which producers, processors, marketers, and research institutions operate independently yet cohesively, ensuring that quality-tested resources flow seamlessly from one link of the chain to the next without structural obstruction.

Realising this model requires public-sector support to shift away from direct market interference such as the government's 2016 bypass of private agro-dealers to distribute fertiliser, which severely crowded out private-sector innovation—toward an enabling role focused on de-risking and standard-setting. This systemic value-chain upgrading is being driven by targeted, market-oriented mechanisms, including the Central Bank of Nigeria's (CBN) Anchor Borrowers' Programme (ABP), which links smallholder credit to guaranteed off-take by agro-processors, and the Nigeria Incentive-Based Risk Sharing System for Agricultural Lending (NIRSAL).

A cornerstone of modern spatial agricultural planning in Nigeria is the adoption of cluster-based developmental models, exemplified by Staple Crop Processing Zones (SCPZs) and agro-industrial parks. The theoretical framework underlying SCPZs is designed to drive rural industrialisation, boost import substitution, and lower the high transaction costs that deter private processors from sourcing locally. By concentrating essential public goodssuch as power, rural roads, water, storage infrastructure, and administrative services within designated high-potential production corridors, the state can attract anchor private investors to establish processing hubs in close proximity to farming communities (Akinkuolie et al., 2025).

Integrated Rural Development and Inclusive Growth Models

Recent literature highlights a clear shift in agricultural policy away from isolated, farm-level interventions and toward broader, integrated rural development frameworks. This approach treats agricultural revival as a multi-sectoral strategy in which productivity and resilience are shaped by social, educational, and institutional conditions that lie far beyond the farm boundary. The National Policy on Integrated Rural Development was historically established in Nigeria to integrate the rural economy into the mainstream of national development, coordinating the provision of rural infrastructure, moderating rural-urban migration, and empowering rural populations to mitigate poverty and generate sustainable wealth (Olomolu and Nwafor, 2018).

The necessity of this integrated model is underscored by the acute socioeconomic disparities between urban and rural areas in Nigeria. Poverty is disproportionately concentrated in rural regions, where populations remain trapped in cycles of deprivation due to extremely limited access to essential public services, including quality basic education, functional healthcare, clean water, sanitation, and viable employment opportunities. A truly inclusive growth model therefore requires a coordinated approach that addresses these foundational structural gaps in order to unlock rural human capital.

A competitive, modern agrifood value chain cannot function in a degraded rural environment. While the First National Implementation Plan of the Vision 20:2020 blueprint outlined clear policies for constructing rural roads and basic infrastructure to facilitate crop evacuation, prevent post-harvest losses, and attract younger generations to farming, rural communities have remained historically neglected. The severe deficit in critical public infrastructure, specifically rural feeder roads, electricity grids, water supply, and secure transport networks, continues to obstruct private-sector investment and agricultural commercialisation (Oweibia *et al.*, 2024).

Input delivery systems and spatial agro-allied corridors cannot operate efficiently without a functional public goods network. International assessments, including those from the World Bank on rural access and agricultural marketing projects, therefore emphasise that targeted agricultural support must be paired with substantial investment in rural connectivity and infrastructure in order to reduce rural-urban disparities and lower transaction costs along the value chain.

To protect vulnerable smallholders from environmental and macroeconomic shocks, integrated development models incorporate formal social protection and safety-net programmes. Under the National Social Investment Programme (NSIP), the Nigerian government has launched key initiatives to enhance social inclusion and human capital. Conditional Cash Transfers (CCTs) directly target the most vulnerable rural households, easing immediate financial burdens and establishing longer-term social protection, while the National Home-Grown School Feeding Programme (NHGSFP) addresses child malnutrition and primary school attendance by providing free, locally sourced meals. This latter programme is designed to create a virtuous cycle in which improved nutrition boosts cognitive and educational outcomes while simultaneously creating a stable domestic market for local smallholders (Oweibia *et al.*, 2024).

Achieving inclusive growth further requires dismantling the customary and institutional barriers that marginalise women in agriculture. Despite representing 60–80% of the active agricultural workforce and producing up to 80% of local food, women hold customary land rights in less than 8.2% of households, compared to 34.2% of men. This severe gender disparity prevents female farmers from securing formal bank loans or adopting modern inputs. Targeted micro-credit interventions, such as the Government Enterprise and Empowerment Programme (GEEP), have demonstrated success, disbursing 56% of their micro-loans to women-led cooperatives. Long-term structural transformation, however, will require formal land tenure reform and gender-inclusive agricultural policies that guarantee women equal access to productive assets, credit, and extension services (Olomolu and Nwafor, 2018).

Climate-Smart Agriculture and Sustainable Intensification

Climate-smart agriculture (CSA) has emerged as a central paradigm for addressing the intertwined challenges of productivity, adaptation and mitigation. Reviews of Nigerian agriculture highlight CSA practices such as drought-tolerant varieties, conservation agriculture, agroforestry, efficient irrigation and water-harvesting as viable pathways to greater resilience and yield stability. Sustainable intensification frameworks emphasise increasing output per unit of land while preserving or enhancing natural resources, through measures such as integrated soil fertility management, improved land tenure, and ecosystem-based approaches to farming and landscape management.

Adeyemi *et al.* (2024) argue that CSA and sustainable intensification must be mainstreamed into agricultural and environmental policies if Nigeria is to reconcile productivity goals with ecological constraints. Sadiq *et al.* (2025) link CSA to improved resilience to climate-induced food insecurity, especially when combined with early warning and social protection mechanisms.

Digital Agriculture and Information-Driven Models

Recent work on digitalisation of climate-smart agriculture underscores the potential of mobile-based advisory services, climate information platforms, remote sensing-supported extension and data-driven decision tools to overcome information asymmetries and improve farm management. Digital agriculture models focus on delivering timely, location-specific advice on weather, crop management and markets, often through partnerships between public agencies, private tech firms and farmer organisations. They also highlight the need for user-centred design, local language content, and attention to gender and youth inclusion to ensure that digital innovations translate into widespread adoption and impact.

Izuogu *et al.* (2025) show that digital CSA platforms can improve farmers' access to climate information but stress that scalability depends on addressing infrastructural, institutional and socio-cultural barriers. World Bank reports recommend integrating digital agriculture into extension systems and leveraging public–private partnerships to expand coverage.

Market-Oriented Smallholder Commercialization and Finance Models

Market-oriented models seek to transition smallholders from subsistence-oriented production to commercially viable enterprises. Key elements include input and output market reforms, improved price transmission, warehouse receipt systems, structured trading platforms and contract farming arrangements that link farmers to processors and retailers. Studies of Nigerian value chains point to the importance of innovative agricultural finance such as blended finance, credit guarantees, digital microfinance and index-based weather insurance to relax liquidity constraints and manage production and price risks.

Olomu *et al.* (2020) argue that without improved access to finance and more efficient market institutions, smallholder commercialisation strategies will have limited impact. World Bank analysis similarly highlights the need for risk-sharing instruments and inclusive financial products tailored to agricultural cycles.

Cooperative and Farmer Organisation Models

The role of producer cooperatives and farmer-based organisations features prominently in both Nigerian and international literature. Cooperative models improve farmers' bargaining power, facilitate collective access to inputs and technology, and enable joint marketing and value addition. Global experience with dairy cooperatives in India or commodity associations in African countries illustrates how strong farmer organisations, supported by enabling policies, can drive inclusive growth in agriculture. For Nigeria, similar models are proposed for crops, livestock and fisheries value chains, with particular attention to governance, accountability and equitable benefit sharing within organisations.

Fan, Pandya-Lorch and Yosef (2009) show that cooperative structures were central to several of the "Millions Fed" success cases, underscoring their relevance for Nigerian agricultural transformation. Nigerian policy debates increasingly recognise farmer organisations as key partners in implementing value-chain and CSA programmes.

Resilience, Social Protection and Shock-Responsive Agriculture

A final set of models highlights the need to integrate agricultural support with climate-risk management and social protection systems. Reviews of climate-induced food insecurity in Nigeria advocate for early warning systems, contingency financing and shock-responsive safety nets that can be rapidly scaled in response to droughts, floods or market disruptions. Such approaches emphasise that building resilience requires not only farm-level adaptation measures but also institutional arrangements capable of protecting

vulnerable households and stabilising food systems during crises.]

Sadiq *et al.* (2025) recommend linking agricultural interventions with social protection for at-risk households to reduce vulnerability during climate shocks. Millions Fed case studies from Sahelian countries show that combining community-based natural resource management with supportive policies can significantly enhance resilience.

Countries' Experiences Linked to Models

Asian Green Revolution and Crop Science

Evidence from South Asia shows that large-scale adoption of high-yielding crop varieties, combined with fertiliser, irrigation and robust extension systems, produced substantial increases in cereal production and significant reductions in hunger. Syntheses such as the Millions Fed case studies identify critical ingredients of this success: sustained public investment in agricultural research and development, complementary infrastructure investments, supportive price and trade policies, and strong state capacity to coordinate programmes. These lessons are highly relevant for Nigeria, where investment in crop science, irrigation and extension remains comparatively limited.

Fan, Pandya-Lorch and Yosef (2009) highlight that political commitment and long-term funding were essential to the Green Revolution's success, suggesting that similar factors are needed for transformative change in Nigeria. The emphasis on science-based solutions and institutional support resonates with Nigerian calls for stronger agricultural research systems.

Latin America: Conservation Agriculture and Sustainable Intensification

Case studies from countries such as Brazil and Argentina document how conservation agriculture practices, including zero tillage, residue management and integrated soil fertility strategies, have improved yields, reduced erosion and enhanced soil health. These experiences illustrate the practical application of sustainable intensification principles in contexts with significant environmental pressures. For Nigeria, they suggest that carefully designed programmes to promote conservation agriculture, supported by research, extension and appropriate machinery, could contribute to both productivity gains and environmental restoration, especially in erosion-prone regions.

Millions Fed case studies show that farmer adoption of conservation agriculture was facilitated by supportive policies, access to machinery and effective extension, all of which are areas requiring attention in Nigeria. Adeyemi *et al.* (2024) similarly call for scaling conservation-oriented practices to address degradation.

India: Dairy Cooperatives and Smallholder Inclusion

India's dairy revolution, anchored in cooperative organisations such as Amul, demonstrates how farmer-owned institutions can successfully integrate millions of small producers into organised value chains. Key features include transparent governance structures, reliable collection and payment systems, and supportive policies that encourage cooperative development and investment in processing and marketing infrastructure. Millions Fed case studies highlight how these cooperatives increased smallholder incomes, enhanced food security, and stimulated rural development. For Nigeria, the dairy cooperative model offers a blueprint for strengthening producer organisations in livestock and crop sectors, while adapting to local socio-institutional realities.

Fan *et al.* (2009) emphasise that cooperative success depended on strong leadership and accountability, dimensions that Nigerian cooperative development must also address. Nigerian livestock value-chain initiatives can draw on these lessons when designing farmer organisation support.

Sahelian Countries: Farmer-Managed Natural Resources and Adaptation

Experiences from Sahelian countries such as Burkina Faso and Niger show how farmer-led innovations in soil and water conservation such as zai pits, contour bunds and assisted natural regeneration of trees have reversed land degradation, improved yields, and strengthened resilience to climate shocks. Millions Fed documentation underscores the importance of community participation, local knowledge, and flexible support from governments and NGOs in scaling these practices. For northern Nigeria, which faces similar agro-ecological conditions, these examples suggest that empowering communities to lead adaptation efforts can be a powerful complement to top-down climate-smart agriculture programmes.

Sadiq *et al.* (2025) point to the need for locally appropriate adaptation strategies for climate-induced food insecurity, which aligns with farmer-managed natural resource approaches in the Sahel. Integrating such community-driven models into Nigerian CSA and resilience policies could enhance effectiveness.

Current Recommendations for Nigerian Agriculture

Strengthen Governance, Policy Coherence and Investment

Synthesised evidence points to the need for Nigeria to move from fragmented initiatives to a coherent, long-term agricultural transformation agenda with clear targets, stable funding and robust monitoring and evaluation systems. This requires consolidating overlapping programmes, clarifying institutional mandates and enhancing coordination among federal, state and local actors. It also entails significantly increasing public investment in core public goods for agriculture research and development, extension, irrigation, rural roads, storage and market infrastructure aligned with climate-smart and value-chain priorities.

Olomu *et al.* (2020) stress the importance of addressing systemic value-chain bottlenecks through consistent policy and investment. Akinkuolie *et al.* (2025) recommend strengthening institutions and financing mechanisms as central to post-Buharinomics agricultural reform.

Upgrade Value Chains and Promote Agro-Industrialisation

A second set of recommendations emphasises restructuring agricultural value chains to capture more value within Nigeria and reduce post-harvest losses. Studies and policy reports advocate for developing agro-processing zones, cold chains and logistics systems targeted at major staple and horticultural crops, as well as livestock and fisheries. Supporting small and medium-scale enterprises and cooperatives in processing and marketing, improving quality standards and certification, and strengthening market information systems can enhance competitiveness and job creation.

World Bank's landscape analysis highlights agro-industrialisation and value-addition as key to diversifying Nigeria's economy and generating rural employment. Nigerian value-chain studies similarly call for targeted support to processing and logistics to reduce large post-harvest losses.

Scale Climate-Smart and Environmentally Sustainable Practices

Given the severity of climate and environmental challenges, mainstreaming climate-smart agriculture into national policies, extension curricula and financing instruments is imperative. Recommendations include designing region-specific CSA packages—for example, drought-tolerant crops, water-harvesting and rangeland management in northern Nigeria; flood-resilient farming systems and mangrove restoration in coastal and riverine areas. Parallel investments in land restoration, soil fertility management and enforcement of environmental regulations are necessary to tackle degradation and deforestation, and to safeguard ecosystem services that underpin agricultural production.

Adeyemi *et al.* (2024) advocate for integrated approaches that link agricultural policy, environmental regulation and climate adaptation strategies. Adedeji et al. (2025) suggest embedding CSA within broader resilience and food-security frameworks.

Harness Digitalisation and Inclusive Agricultural Finance

Digital agriculture offers an opportunity to overcome information and coordination failures, but realising this potential requires deliberate efforts to expand connectivity and design inclusive platforms. Recommendations from recent studies emphasise scaling mobile-based advisory and weather information services tailored to smallholders' literacy and language needs, building trust through local intermediaries, and integrating digital tools into existing extension systems. On the finance side, policy reports call for developing inclusive financial products—such as tailored credit, savings and insurance instruments—linked to digital identities and farmer records, with mechanisms to reach women, youth and other marginalised groups.

Izuogu *et al*. (2025) recommend strengthening institutional support and infrastructure for digital CSA and ensuring participatory design. World Bank reports emphasise rural financial deepening and risk-management products as central to inclusive agricultural growth.

Build Resilience through Social Protection and Risk Management

Finally, evidence on climate-induced food insecurity highlights the importance of building institutional capacities for shock-responsive agriculture and social protection. Recommendations include integrating early warning systems, contingency funds and scalable safety nets with agricultural support programmes, so that assistance can be rapidly deployed to affected communities during crises. Promoting community-based disaster risk reduction and farmer-led adaptation, drawing on successful Sahelian experiences, can further strengthen resilience at local levels. These measures should be embedded within broader strategies for food system resilience and rural development.

Izuogu *et al.* (2025) stress the need for system-wide approaches that link climate information, social protection and agricultural support. Millions Fed case studies from the Sahel show that long-term commitment to community-based resource management and support can deliver sustained resilience gains.

CONCLUSION

This narrative review shows that Nigerian agriculture faces a complex set of structural and emerging challenges, including low productivity, weak value chains, climate and environmental stresses, governance and investment gaps, demographic pressures, and limited digital and financial inclusion. At the same time, a range of conceptual and practical models spanning policy and institutional reforms, climate-smart and sustainable intensification, digital agriculture, market-oriented commercialisation, cooperatives and shock-responsive social protection offer pathways for revamping the sector.

To translate these insights into transformative outcomes, Nigeria must pursue a coherent long-term agenda that aligns agricultural, rural development, industrial and environmental policies, while investing in the capacities of farmers, communities and institutions to innovate and adapt.

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