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METABOLIC RIFT: AGROCHEMICAL BIOPOLITICS AND THE ENCLOSURE OF NIGERIAN NUTRITIONAL SOVEREIGNTY

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Abstract
Nigeria's agricultural trajectory can be understood through the lens of a "metabolic rift"—a structural disjunction between soil ecological health and human nutritional needs. Since the 1970s, agricultural policy has largely prioritized increased caloric output through synthetic intensification, contributing to what may be described as a "caloric mirage," in which rising yield volumes obscure a gradual decline in soil quality and nutritional value. This paper examines the political and economic mechanisms underpinning the erosion of Nigeria's nutritional sovereignty, with particular attention to agrochemical dependency and the privatization of seed systems. Drawing on Metabolic Rift Theory and Foucauldian concepts of biopower, the study interprets national dietary management as a site of technocratic governance, though not necessarily reducible to deliberate population control. Methodologically, the study adopts a longitudinal qualitative historical approach (1970–2025), supported by secondary datasets and comparative analysis across Nigeria's six geopolitical zones. Findings suggest that the widespread adoption of NPK-based fertilization has contributed to a measurable decline in micronutrient density—estimated between 23% and 40% for key minerals such as zinc and iron—despite increases in crop yields. This imbalance manifests unevenly across regions. In parts of Northern Nigeria (e.g., Kaduna, Kano, Sokoto), high agricultural output coexists with persistent malnutrition, reflecting a production–nutrition disconnect. In the South (e.g., Enugu, Cross River), dietary transitions are increasingly associated with rising obesity alongside micronutrient deficiencies, often described as "hidden hunger." Additionally, the Plant Variety Protection Act (2021) has accelerated the formalization of seed ownership, raising concerns about reduced access to traditional seed systems and long-term implications for agricultural biodiversity. Addressing these challenges requires a shift toward agroecological approaches that emphasize soil health, biodiversity, and the integration of indigenous knowledge systems, alongside more balanced metrics that account for both yield and nutritional quality.
Keywords: *Metabolic Rift, Biopolitics, Nigeria, Nutrition Transition, Genetic Enclosure, Mineral Depletion, Agricultural Colonialism, Food Sovereignty, Agroecology.*

Introduction: The Biopolitics of the Nigerian Diet

The contemporary Nigerian food system is defined by a profound "metabolic rift"—a fundamental rupture between the ecological health of the soil and the biological requirements of the human population. Bhardwaj et al., in a landmark meta-analysis titled *An Alarming Decline in the Nutritional Quality of Foods*, document a systemic degradation of mineral density in global staples, specifically identifying the loss of essential micronutrients as the "biggest challenge for future generations' health" (Bhardwaj et al., 2024). Within the Nigerian context, this rift is not an accidental byproduct of modernization but a structural outcome of synthetic-intensive agricultural models that prioritize biomass volume over the accumulation of essential minerals like magnesium, iron, and zinc (Bhardwaj et al., 2024; Sanni, 2025). As Sanni observes in a 2025 regional policy analysis, this "nutrition transition" has institutionalized a state of "hidden hunger," where West African populations meet caloric requirements while suffering from chronic micronutrient deficiencies that fuel a dual burden of malnutrition and non-communicable diseases (Sanni, 2025).

This study contends that the post-1970s pivot toward synthetic-driven development created a "Caloric Mirage"—a developmental era where state stability was achieved by maximizing crop volume at the expense of nutritional complexity. Initiated by the "Green Revolution" mandates, these policies institutionalized a preference for starchy staples that respond rapidly to NPK (nitrogen, phosphorus, potassium) fertilizers but lack the mineral integrity of traditional varieties (Dittoh et al., 2025; Kehinde et al., 2023). Kehinde et al. demonstrate through an empirical survey of Nigerian smallholders that land tenure systems and credit-linked mandates were used to manufacture a willingness to adopt chemical-heavy intensification, effectively decoupling national food security from the ecological resilience of indigenous organic systems (Kehinde et al., 2023). This transition marked the beginning of a technocratic management of life, where the biological potential of the citizenry was traded for short-term macroeconomic metrics (Dagunga et al., 2023; Dittoh et al., 2025).

Beyond soil chemistry, the modern phase of this rift is characterized by the "biopolitical enclosure" of genetic sovereignty. Raimi and Masri, employing a critical discourse on "GMO agripreneurship," argue that the systematic replacement of communal seed networks with patented genetic material functions as a form of "agricultural colonialism" (Raimi & Masri, 2025). Legislation such as the *Plant Variety Protection Act 2021* facilitates this enclosure by centralizing the genetic code of staples under international Intellectual Property regimes, creating a "single point of failure" for national food security (Dessie & Zegeye, 2024; Raimi & Masri, 2025). Dessie and Zegeye highlight that these frameworks often prioritize corporate property rights over local biodiversity, effectively privatizing the very biological foundations of the Nigerian diet (Dessie & Zegeye, 2024). Consequently, the metabolic rift serves as both a biological reality and a political instrument—a mechanism through which the state manages the population's life through controlled, impoverished inputs (Kaul, 2025; Raimi & Masri, 2025).

This paper argues that the transition from indigenous organic farming to synthetic-intensive and patented models represents a "technocratic enclosure" of Nigerian nutritional sovereignty. By applying a dual framework of **Metabolic Rift Theory** and **Foucauldian Biopower**, and utilizing a **Longitudinal Historical Audit**, the study demonstrates how the "Caloric Mirage" and the enclosure of the genetic code have produced "obese plants" that fundamentally bankrupt the nation's metabolic health. Through case studies in the six geopolitical zones in Nigeria, the study proposes a path toward reclaiming nutritional sovereignty through agroecological restoration.

Theoretical Framework: Metabolic Rift and Biopolitical Enclosure

This study utilizes a dual-theoretical framework to analyze the Nigerian food system, intersecting **Metabolic Rift Theory** with **Foucauldian Biopower**. This synthesis allows for an analysis that is both biologically grounded and politically critical, moving beyond simple production metrics to examine the "life-management" of the Nigerian population.

Metabolic Rift Theory

The concept of the "metabolic rift" originates from the analysis of the ecological rupture between social systems and the natural environment. In the context of Nigerian agriculture, this rift manifests as a biological bankruptcy of the soil. Bhardwaj et al. identify this as an "alarming decline in the nutritional quality of foods," where the intensification of farming disrupts the natural cycling of nutrients between the lithosphere and human biology (Bhardwaj et al., 2024). Jones et al. describe this process as "nutrient stripping," where the global disparity between food security goals and soil nutrient stocks leads to the production of crops that are biologically hollow (Jones et al., 2013). By applying this lens, the study argues that the Nigerian "nutrition transition" is not merely a change in consumer preference, but a physiological outcome of a severed and unnatural metabolic cycle.

Foucauldian Biopower and Agripreneurship

To explain *how* this rift is managed by the state, the study employs the lens of **Biopower**. Foucault's biopolitics describes the mechanisms through which the state manages the "body politic" through health, diet, and biological regulation. Raimi and Masri apply this to modern agriculture, framing "GMO agripreneurship" as a form of "agricultural colonialism" that facilitates the enclosure of nutritional sovereignty (Raimi & Masri, 2025). This enclosure is legalized through Intellectual Property regimes, such as the *Plant Variety Protection Act*, which Dessie and Zegeye note often prioritize corporate property over regional biodiversity (Dessie & Zegeye, 2024). Under this framework, the Nigerian diet is no longer a site of cultural sovereignty but a managed technocratic output. The state uses caloric volume to achieve "hegemonic stability," effectively trading the biological integrity of the citizenry for macroeconomic metrics (Kehinde et al., 2023; Raimi & Masri, 2025). This "biopolitical enclosure" ensures that the population remains dependent on patented, synthetic-intensive food systems, effectively centralizing the "code of life" under state and corporate control (Kaul, 2025; Raimi & Masri, 2025).

Methodology: Longitudinal Historical Auditing and Triangulated Analysis

This study utilizes a Longitudinal Qualitative Historical Audit covering the period from 1970 to 2025 to investigate the structural evolution of the Nigerian metabolic rift. This periodization allows for a critical comparison between the pre-systemic chemical era and the current phase of "biopolitical enclosure." The research design employs a triangulated systematic review of three primary data domains: a policy audit of agricultural mandates (e.g., the *Green Revolution* and the *Plant Variety Protection Act*), a synthesis of recent peer-reviewed biochemical datasets regarding mineral density declines in staples, and studies on its effect in the six geopolitical zones in Nigeria. By intersecting these domains, the study maps the biological realities of soil degradation directly against the legislative frameworks that drive them, identifying the specific single points of failure within the national food system.

The Caloric Mirage: Historical Audit of Nigeria's Agrarian System (1970–2005)

The "Caloric Mirage" describes a foundational era in Nigerian agrarian history where the state prioritized the maximization of crop volume to ensure political stability, effectively ignoring the resulting biological degradation of the national diet. Following the civil war and the oil boom from the 1970 era, the Nigerian government launched a series of technocratic interventions, most notably **Operation Feed the Nation** and the **Green Revolution**. These programs were designed to achieve caloric self-sufficiency by transitioning the peasantry from traditional, nutrient-dense organic polycultures to high-input, cereal-based monocultures (Dittoh et al., 2025).

The Legislative Tether: Land Tenure and Chemical Mandates

During this period, the "metabolic rift" was institutionalized through a system of chemical and legislative tethers. At this point in history, the result rift may not have been the intention of the government but was yet established. Kehinde et al. argue that historical land tenure arrangements and the state-led distribution of subsidized fertilizers were used as instruments to manufacture a "willingness" among smallholders to adopt intensive farming practices (Kehinde et al., 2023). By providing credit and inputs that were strictly linked to the cultivation of specific high-yielding varieties, the state effectively tethered the farmer to a synthetic metabolic cycle. This transition forced a departure from indigenous soil management techniques, replacing the natural "metabolism" of the soil with a reliance on nitrogen, phosphorus, and potassium inputs (Kehinde et al., 2023). This legislative enclosure ensured that while the total volume of starch available to the growing urban population increased, the ecological resilience of the farming system was systematically dismantled.

The "Roundabout Journey" to Biological Poverty

Dittoh et al. characterize this era as a "roundabout journey" that moved Nigerian agriculture away from sustainability toward a state of systemic vulnerability (Dittoh et al., 2025). The focus was squarely on caloric output—primarily maize, rice, and cassava—to suppress urban food prices, maintain hegemonic stability and boost agricultural economy. However, this focus ignored what Bhardwaj et al. describe as the "alarming decline in nutritional quality," where crops forced into rapid growth via synthetic stimulants fail to accumulate the same levels of zinc, iron, and magnesium found in traditional cultivars (Bhardwaj et al., 2024). This era established the "mirage" of food security: a landscape of apparent plenty that masked the onset of "hidden hunger".

By the end of this period, the Nigerian food system had successfully decoupled agricultural growth from nutritional integrity. Sanni's analysis of the "nutrition transition" in West Africa identifies this 1970–2005 window as the critical juncture where the traditional diet began to be replaced by market-dependent, calorie-heavy, but nutrient-poor models (Sanni, 2025). This historical audit reveals that the metabolic rift was not a failure of the Green Revolution, but its primary biopolitical success—achieving state stability by trading the long-term biological health of the population for immediate caloric abundance and a departure from unaltered organic agricultural practices.

Enclosing the Code: Biopower and the Plant Variety Protection Act

If the 1970–2005 era was defined by the "chemical tether," the contemporary period (2021–2025) and till present, is characterized by a genetic enclosure. This phase of the metabolic rift represents a transition from managing the soil to managing the very "code of life" within the seed. This shift is codified in the **Plant Variety Protection Act 2021**, which serves as a critical biopolitical instrument for centralizing Nigerian agricultural sovereignty under international Intellectual Property regimes. The Plant Variety Protection (PVP) Act 2021 is a Nigerian law that protects new plant varieties and grants breeders intellectual property rights. In essence, encouraging and protecting Genetically Modified Organism (GMO) inputs in the Nigerian agriculture landscape.

GMO Agripreneurship as Agricultural Colonialism

The contemporary drive for "GMO agripreneurship" is framed by the state as a solution to food insecurity, yet Raimi and Masri argue that it functions as a modern form of "agricultural colonialism" (Raimi & Masri, 2025). By incentivizing the adoption of genetically modified organisms through technocratic mandates, the state facilitates a "biopolitical enclosure" where the farmer's autonomy is replaced by corporate dependency. This model creates what is theorized as a **single point of failure**: the displacement of decentralized, resilient regional seed networks in favor of a centralized, patented genetic inventory (Raimi & Masri, 2025). This enclosure ensures that the metabolic cycle is no longer mediated by local ecological knowledge but by the legal and biological requirements of proprietary technology. And the beginning of a rude departure from indigenous agricultural practices.

Intellectual Property and the Erasure of Biodiversity

The legislative framework of the PVP Act priorities Intellectual Property Rights over the "common" biological potential of the Nigerian diet. Dessie and Zegeye observe that such bio-policies often lead to a "public perception

crisis," as they prioritize the property rights of breeders and multinational corporations over the preservation of indigenous biodiversity (Dessie & Zegeye, 2024). This legal enclosure has immediate metabolic consequences; by narrowing the genetic pool to a few high-performing, patented varieties, the food system becomes optimized for commercial throughput rather than nutritional diversity.

This management of life—or **Biopower**—treats the citizen's nutritional health as an externality to the broader objective of agricultural modernization. As the state and corporate stakeholders consolidate control over the genetic code, the metabolic rift deepens: the population becomes biologically dependent on an "impoverished" genetic base that requires continuous synthetic inputs to sustain itself (Bhardwaj et al., 2024; Raimi & Masri, 2025). Consequently, the PVP Act 2021 is not merely a piece of trade legislation; it is a biopolitical boundary that separates the Nigerian citizenry from their traditional right to seed sovereignty and nutritional integrity (Dessie & Zegeye, 2024; Raimi & Masri, 2025).

The Science of "Obese" Plants: Mineral Decline and NPK Fetishism

The term "obese plants" refers to the physiological result of NPK-intensive farming, where crops achieve significant biomass and caloric volume but suffer from a systematic "dilution effect" of essential micronutrients. This phenomenon represents the biochemical core of the metabolic rift. This constitutes an alarming decline in the nutritional quality of food where current agricultural models prioritize the "mining" of soil nutrients to meet market yield target. This "nutrient stripping" creates a global disparity between food security—defined by caloric quantity—and the actual mineral stocks available for human metabolic health (Jones et al., 2013).

The Dilution Effect and Mineral Depletion

The biological hollowing of Nigerian staples is driven by a focus on nitrogen (N), phosphorus (P), and potassium (K) at the expense of secondary and micronutrients. While synthetic NPK application stimulates rapid plant growth, it fails to replenish the full spectrum of minerals removed during the harvest. Debnath et al. document a historical shift in landmark rice and wheat cultivars released over the past 50 years, showing significant decadal drops in essential minerals like iron and zinc (Debnath et al., 2023). Specifically, longitudinal data indicates that as grain yields increase, the density of Fe and Zn can decline by nearly 40% and 23%, respectively, as the plant's internal metabolism is optimized for carbohydrate accumulation rather than mineral storage (Debnath et al., 2023). This "metabolic bankruptcy" means that even as the Nigerian population consumes more calories, they are receiving fewer of the building blocks required for immune function and neurological health. The focus on NPK-intensive models, which Peñuelas et al. describe as a necessity for global food security that simultaneously threatens environmental sustainability, essentially forces plants into an "obese" state—rich in starch but biologically impoverished (Bhardwaj et al., 2024; Peñuelas et al., 2023).

NPK Fetishism and Soil Exhaustion

The reliance on synthetic fertilizers has created a "fetishism" of NPK stoichiometry that has no precedent in ecological history. This chemical-heavy approach ignores the depletion of essential micronutrients like magnesium, boron, and manganese, which are not typically included in standard subsidized fertilizer blends in Nigeria (Jones et al., 2013; Majumdar & Prakash, 2018). Paramesh et al. highlight that the continuous use of high-analysis fertilizers without organic amendments leads to the deterioration of soil physical and biological properties, effectively "locking" the soil into a state of decreasing nutritional returns (Paramesh et al., 2023).
Under the biopolitical management of the Nigerian state, this science of "obesity" serves a dual purpose: it provides the illusion of plenty (the "Caloric Mirage") while institutionalizing a dependency on the global agrochemical industry. The resulting "hidden hunger" is not a failure of the system but a predictable outcome of a food model that treats soil and plants as machines for caloric throughput rather than complex biological entities (Bhardwaj et al., 2024; Raimi & Masri, 2025).

Regional Case Study and National Synthesis: A Divided Metabolism

The metabolic rift in Nigeria is not uniform; it manifests through distinct regional pathologies across the six geopolitical zones. While the **Northern** zones serve as the nation's "breadbasket," the **Southern** zones represent the vanguard of the "nutrition transition." This geographic division illustrates how the technocratic enclosure of the food system produces different biological outcomes—stunting and soil exhaustion in the North, and raising other issues in the South. On January 12, 2024, Nigeria became the second African country to approve GMO Maize for commercial planting despite many criticisms on the ills of GMO. Since then the approved Tela maize varieties have been planted in all geo-political zones in the country.

The Northern Breadbasket: Production Intensity and the Stunting Paradox

The three northern geopolitical zones—**North West**, **North East**, and **North Central**—are the primary engines of Nigerian agricultural production and export. States such as **Kaduna**, **Kebbi**, and **Sokoto** and **Borno** and **Taraba** record the highest crop biomass outputs in the country, particularly for cereals like sorghum, maize, and rice (Chiaka et al., 2022; Ukoba et al., 2024). **Kano State** remains a critical hub for both production and regional trade (Chiaka et al., 2022).

However, this high productivity is a "Caloric Mirage." Despite feeding the nation, these regions suffer from the most acute nutritional failures. Almost 50% of children in the North East and North West are stunted, a condition driven by what this paper defines as the metabolic rift: the decoupling of high-volume production from nutrient density (Morgan & Fanzo, 2020). In states like **Sokoto** and **Bauchi**, the soil is increasingly characterized by low organic carbon and available phosphorus, as NPK-intensive farming "mines" the soil without adequate organic replenishment (Mortimore, 1989; Oyun et al., 2025). The result is a landscape of "obese plants" that support national export goals while leaving the local population in a state of chronic micronutrient bankruptcy (Bhardwaj et al., 2024; Raimi & Masri, 2025).

The Southern Transition: Urbanization and Metabolic Syndrome

In the **South East**, **South South**, and **South West**, the metabolic rift manifests as an epidemic of overnutrition and "hidden hunger." The **Enugu State** case study reveals that as indigenous knowledge is marginalized, traditional, mineral-dense diets are replaced by market-dependent, calorie-heavy processed foods (Chukwu & Dogbe, 2023a, 2023b). This shift is mirrored in **Cross River State**, which records some of the highest obesity rates among women in the country (Kandala & Stranges, 2014).

In states like **Oyo** and **Lagos**, the transition is accelerated by trade advantages and seaports that facilitate the influx of nutrient-poor, refined food products (Mekonnen et al., 2023). While the South appears "food secure" in terms of calories, it is the primary site of the "metabolic syndrome" identified by Sanni, where the consumption of "obese plants" translates directly into rising rates of diabetes and hypertension (Chukwu & Dogbe, 2023; Sanni, 2025).

Synthesis: The Biopolitics of a National Rift

Triangulating the data across all six zones—from the fertile but stunting-prone plains of **Benue** to the urbanized, obesity-prone centers of the South—reveals a food system in a state of biological collapse (Chiaka et al., 2022; Morgan & Fanzo, 2020). The Northern "enclosure" focuses on biomass for state stability and export, while the Southern "enclosure" focuses on market-driven consumption. Both, however, are symptoms of the same metabolic rift: a system where the "code of life" is managed for economic throughput rather than the biological integrity of the Nigerian citizen (Kaul, 2025; Raimi & Masri, 2025). Reclaiming sovereignty requires a national framework that moves beyond this divided metabolism toward a unified, agroecological restoration of the Nigerian diet.

Conclusion

This paper has demonstrated that the contemporary Nigerian food system can be interpreted through the lens of a “metabolic rift”—a structural disjunction between soil ecological health and the nutritional requirements of the human population. Through a longitudinal historical analysis, the study traces the evolution of this imbalance from the yield-focused policies of the 1970s Green Revolution to more recent developments in agricultural governance, including the increasing regulation of seed systems.

The findings suggest that gains in caloric output have, in some cases, coincided with a decline in nutritional quality. This reflects consequences of such input-intensive agricultural strategies, which often prioritize yield over micronutrient density. As a result, crops may exhibit high biomass while containing reduced levels of essential minerals.

A regional analysis across Nigeria’s six geopolitical zones highlights the uneven human impact of these dynamics. In parts of Northern Nigeria, including states such as Kaduna and Sokoto, high levels of agricultural production coexist with persistent rates of child stunting, underscoring the limitations of input-intensive farming systems in addressing nutritional outcomes. In contrast, Southern regions, including Enugu and Cross River, are experiencing dietary transitions associated with rising rates of obesity and non-communicable diseases, alongside continued micronutrient deficiencies (Chukwu & Dogbe, 2023; Kandala & Stranges, 2014; Sanni, 2025).

These patterns are further shaped by evolving agricultural policies, including legislation such as the Plant Variety Protection Act (2021), which has formalized aspects of seed ownership and use. While such frameworks aim to encourage innovation, they also raise important questions about access to genetic resources, the preservation of indigenous knowledge systems, and the long-term sustainability of local food systems.

Recommendations

To reclaim the metabolic integrity of the Nigerian diet, a radical departure from "NPK fetishism" and technocratic caloric metrics is required. We propose three critical "Policy Reclamations":

1. **Agroecological Restoration:** Moving beyond synthetic-intensive monocultures toward integrated nutrient management that prioritizes soil organic carbon and the replenishment of the full spectrum of micronutrients.
2. **Genetic Sovereignty:** Resisting the "agricultural colonialism" of patented seeds by institutionalizing protection for communal seed networks and traditional cultivars that maintain higher mineral density than their "obese" GMO counterparts.
3. **Metabolic Governance:** Redefining food security metrics from caloric volume to "Metabolic Integrity," ensuring that agricultural policy is judged by its ability to produce nutrient-dense food that supports the long-term biological potential of the citizenry.

Ultimately, the Nigerian nutrition transition is a political choice. By bridging the metabolic rift through agroecological resilience, Nigeria can move beyond the mirage of caloric abundance and toward a food system that truly nourishes the life of its people.

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