

Strengthening Regulatory Framework on Genetically Modified (GM) Foods and Its Effect on National Food Security in Nigeria

Tor Akuhwa, PhD¹; Aondoakaa Ushahemba Solomon²; Ehimare Augustina Onogweshia³ & AMA, G.S⁴

Federal Polytechnic Wannune, Benue State Nigeria.

*Corresponding Author: Tor Akuhwa, PhD

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Article History	Abstract
Original Research Article	<i>Nigeria faces a persistent food-security challenge characterised by rising food prices, climate variability, insecurity, crop pests, production constraints and disruptions across agricultural value chains. At the same time, genetically modified (GM) crops have become part of Nigeria's agricultural biotechnology landscape. This project examined how strengthening the regulatory framework governing GM foods could affect national food security in Nigeria. The study adopted a qualitative documentary research design and analysed the National Biosafety Management Agency Act 2015 as amended in 2019, the National Biosafety Regulations 2017, the National Biosafety Policy, regulatory materials from NBMA and NAFDAC, official information on approved GM crops, food-security reports from the Food and Agriculture Organization (FAO), and relevant scholarly literature. The analysis indicates that regulation can influence food security through five interconnected pathways: protection of human and environmental health; confidence in GM foods; prevention of unauthorised products; facilitation of safe innovation; and improved productivity and resilience where approved GM technologies address major agricultural constraints. Nigeria has established a substantial biosafety framework through NBMA, supported by food-registration and food-safety functions of NAFDAC and other agencies. However, important strengthening needs remain in post-release monitoring, laboratory capacity, traceability, public communication, inter-agency coordination, transparency of regulatory information, consumer information and enforcement along informal food and seed markets. The study concludes that stronger regulation should not mean unnecessary restriction of biotechnology. Rather, Nigeria needs predictable, science-based, transparent and enforceable regulation that protects consumers and biodiversity while allowing safe technologies to contribute to food availability, access, stability and utilisation.</i> Keywords: <i>genetically modified foods, biosafety, regulation, food security, Nigeria, biotechnology.</i>
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Copyright © 2025 The Author(s): This is an open-access article distributed under the terms of the Creative Commons Attribution 4.0 International License (CC BY-NC) which permits unrestricted use, distribution, and reproduction in any medium for non-commercial use provided the original author and source are credited. Citation: Tor Akuhwa, PhD; Aondoakaa Ushahemba Solomon; Ehimare Augustina Onogweshia, & AMA, G.S. (2026). Strengthening regulatory framework on genetically modified (GM) foods and its effect on national food security in Nigeria. UKR Journal of Agriculture and Veterinary Sciences, 2(4), 23-32.	

Background to the Study

Nigeria's food-security situation makes agricultural productivity, resilience and safety matters of national importance. Food security is not simply a question of producing more food. It involves whether people have physical and economic access to sufficient, safe and nutritious food on a sustained basis. The Food and Agriculture Organization (FAO) reported that about 25.1 million Nigerians were estimated to face acute food insecurity between October and December 2024, while 30.6 million people in 26 states and the Federal Capital Territory

were projected to face acute food and nutrition insecurity during the June–August 2025 lean season. FAO's 2026 emergency and resilience information further identifies Nigeria as facing one of the world's severe food crises, with 34.7 million people projected to experience high levels of acute food insecurity in 2026.

Several constraints contribute to Nigeria's food-security problem. These include climate variability, drought and flooding, pests and diseases, insecurity, high input costs, weak infrastructure, post-harvest losses, inadequate access

to finance, market disruptions and high food prices. Maize, cowpea and other staple crops are particularly important to household diets and agricultural livelihoods. Technologies that can improve pest resistance, drought tolerance or yield stability are therefore considered as part of a wider agricultural-development strategy.

Genetic modification is one such technology. Genetically modified organisms are organisms whose genetic material has been altered using modern biotechnology. In agriculture, genetic modification may be used to introduce traits such as resistance to specific insect pests, tolerance to environmental stresses or improvements in crop characteristics. GM technology is not a single product with a single risk profile; the safety and value of each product depend on its genetic construct, intended use, receiving environment, exposure pathways and evidence generated through risk assessment.

Nigeria has developed a formal biosafety system to regulate modern biotechnology. The National Biosafety Management Agency (NBMA) was established under the National Biosafety Management Agency Act 2015. The Act provides the statutory basis for risk assessment, authorisation, monitoring and enforcement concerning genetically modified organisms. The Act was amended in 2019 to broaden the regulatory scope to emerging biotechnology and biosecurity issues. The National Biosafety Regulations 2017 provide more detailed procedures and institutional arrangements. Nigeria's National Biosafety Policy emphasises scientifically sound decision-making, precaution, environmental protection, human health and consideration of socio-economic and cultural factors.

Regulation of GM foods is broader than approving a seed or crop for cultivation. Food and feed uses require attention to food safety, processing, labelling, traceability, surveillance and consumer protection. NBMA's regulatory materials include application procedures for GMOs intended for food, feed or processing and import/export applications. NAFDAC, under its food regulatory mandate, regulates food products and requires food registration and compliance with applicable safety and labelling requirements. Effective regulation therefore requires coordination across biosafety, food safety, agriculture, standards, seed certification, quarantine, consumer protection and public-health institutions.

Nigeria's experience with approved GM crops demonstrates both the opportunities and the importance of effective regulation. NBMA identifies Bt cotton, pod-borer-resistant (PBR) cowpea and TELA maize among crops approved for commercial release. TELA maize is particularly relevant to food security because it combines insect resistance with drought tolerance. NBMA's database

records approval for food and feed use and commercial release of TELA maize, while the Agency has also established post-release monitoring activities.

The central issue is not whether Nigeria should choose biotechnology instead of conventional agriculture. The more useful policy question is how Nigeria can strengthen regulation so that safe and beneficial GM technologies can be assessed, approved, monitored and used without compromising human health, biodiversity, consumer rights or public trust. Strong regulation can reduce uncertainty, deter unauthorised products, improve market confidence and support responsible innovation. Weak regulation can create risks associated with poor traceability, illegal imports, inadequate monitoring, misinformation, environmental harm or consumer distrust.

This project therefore examines the relationship between strengthening Nigeria's regulatory framework for GM foods and national food security. It focuses on regulation as an enabling governance instrument. The project argues that regulatory strengthening should combine scientific risk assessment with enforcement, transparency, public participation, post-release monitoring, food-safety surveillance and support for responsible agricultural innovation.

Statement of the Problem

Nigeria continues to experience serious food-security pressures despite its substantial agricultural potential. Food production is affected by pests, climate shocks, insecurity, high input prices, infrastructure constraints and post-harvest losses. At the same time, agricultural biotechnology has generated products capable of addressing some of these constraints. Yet public debate around GM foods is often characterised by uncertainty, misinformation, distrust and concern about health and environmental consequences.

The regulatory challenge is therefore two-sided. Regulation must be sufficiently rigorous to prevent unsafe or unauthorised products from entering farms and food chains, but it must also be sufficiently efficient and predictable to allow safe technologies to move from research to responsible deployment. If regulation is weak, consumers and the environment may face avoidable risks. If regulation is excessively slow, fragmented or unpredictable, Nigeria may lose opportunities to improve productivity, climate resilience and food availability.

A further problem is the gap between formal regulation and practical enforcement. A law may provide for risk assessment, inspection, public participation and sanctions, but effective regulation also depends on laboratory capacity, trained personnel, information systems, traceability, post-release monitoring, inter-agency coordination and public communication. The existence of

approved GM crops consequently creates an ongoing need to determine whether the regulatory system is strong enough across the entire value chain.

Therefore, the researcher examines ways to strengthen Nigeria's regulatory framework to protect human health and the environment while enabling safe GM foods and crops to contribute to national food security.

Objectives of the Study

The main objective of the study is to examine the regulatory framework governing genetically modified (GM) foods in Nigeria and assess its effectiveness in promoting national food security.

The specific objectives are:

1. Examine the existing regulatory framework governing GM foods and related biotechnology in Nigeria.
2. Assess the major strengths of Nigeria's biosafety and food-safety regulatory architecture.
3. Identify regulatory gaps that may affect the safe adoption, monitoring and distribution of GM foods.
4. Examine the pathways through which effective GM-food regulation may influence national food security.
5. Develop policy measures for strengthening regulation, enforcement, transparency and post-release monitoring of GM foods in Nigeria.

Research Questions

The study will provide answers to the following questions

1. What regulatory instruments govern GM foods and related biotechnology in Nigeria?
2. What are the major strengths of Nigeria's current regulatory framework?
3. What regulatory gaps may undermine the safe and beneficial use of GM foods?
4. Through what pathways can effective GM-food regulation affect national food security?
5. What measures can strengthen Nigeria's regulatory framework for GM foods?

Literature Review

Concept of Genetically Modified Foods

Genetically modified foods are foods obtained from organisms whose genetic material has been intentionally altered using modern biotechnology. Genetic modification can be used to introduce, remove or alter specific traits. In agricultural production, the technology has been used for characteristics such as insect resistance, herbicide tolerance, disease resistance and tolerance to selected environmental stresses. The concept should therefore be

treated as technology-specific rather than as a single homogeneous category of food. Food safety assessment of a GM product is concerned with whether the product presents risks different from those associated with an appropriate conventional comparator. Relevant considerations can include molecular characterisation, compositional analysis, potential toxicity, allergenicity, nutritional characteristics and intended dietary exposure. Environmental risk assessment may separately examine gene flow, effects on non-target organisms, persistence, resistance development and interactions with the receiving environment.

Concept of Regulatory Framework

A regulatory framework is more than legislation. It consists of the legal mandate of regulatory agencies, technical standards, decision-making procedures, risk-assessment criteria, inspection arrangements, laboratory systems, public participation, information disclosure, sanctions and mechanisms for monitoring compliance. A strong regulatory framework should be clear, science-based, transparent, proportionate to risk and enforceable. In the GM-food context, regulatory strength has at least six dimensions: legal authority; scientific capacity; institutional coordination; monitoring and enforcement; transparency and public participation; and consumer protection. Weakness in any one dimension can reduce the effectiveness of the whole system.

Concept of National Food Security

Food security is commonly understood through four dimensions: availability, access, utilisation and stability. Availability concerns the physical supply of food generated through domestic production, imports, stocks and other sources. Access concerns the economic and physical ability of households and individuals to obtain food. Utilisation concerns whether food is safe, nutritious and appropriately used to meet dietary needs. Stability concerns the ability of people to maintain access over time despite shocks. This multidimensional concept is important for assessing GM technology. A crop may increase yield and thereby contribute to availability, but food security will not automatically improve if farmers cannot afford the seed, if market prices remain inaccessible, if environmental problems arise, or if consumers lack confidence in food safety.

GM Foods and the Nigerian Food System

Nigeria's food system includes smallholder farmers, commercial producers, seed companies, research institutions, processors, traders, importers, retailers and consumers. Regulatory decisions concerning GM technology therefore affect a broad network of actors. The regulatory system must accommodate research and

confined field trials, seed multiplication, commercial release, food and feed use, processing, importation, transport and market distribution. Nigeria has developed domestic capacity in agricultural biotechnology. NBMA reports commercial approvals involving Bt cotton, PBR cowpea and TELA maize. TELA maize is significant because the technology targets two major constraints: insect damage and water stress. Such technologies are one tool within an integrated agricultural strategy, not a stand-alone solution.

Regulatory Framework for GM Foods in Nigeria

The central legal instrument is the National Biosafety Management Agency Act 2015, as amended in 2019. The Act established NBMA as the competent authority for biosafety and assigns functions including developing risk-assessment requirements, receiving and verifying GMO applications, maintaining records, conducting sampling and laboratory analysis, inspecting facilities and undertaking

monitoring and compliance actions. The National Biosafety Regulations 2017 provide detailed institutional and procedural provisions for contained use, confined field trials, experimental release and commercial release. The National Biosafety Policy complements the Act and regulations by emphasising precaution, scientifically sound and transparent decision-making, environmental and public-health considerations, socio-economic and cultural considerations, and compliance with national law.

NAFDAC provides another layer of food regulation. The 2025 Food and Related Products Registration Regulations provide a registration system for food products and require compliance with applicable quality, safety, laboratory and labelling requirements. Public participation is also part of the biosafety process, with NBMA public notices providing opportunities for comments on relevant applications before certain releases.

Institutional Responsibilities

Institution/Actor	Core relevance to GM foods and food security
National Biosafety Management Agency (NBMA)	Biosafety regulation; risk assessment; permits; monitoring; inspections; compliance; GM-food/feed/processing authorisations; environmental and health safeguards.
NAFDAC	Food product registration, food safety, laboratory and regulatory controls applicable to food products and consumer protection.
Federal Ministry of Agriculture and Food Security	Agricultural policy, food-security strategy, farmer support and coordination of agricultural development.
National Agricultural Seeds Council	Seed-sector regulation and quality assurance.
Nigerian Agricultural Quarantine Service	Quarantine and biosecurity functions relevant to agricultural materials.
Standards Organisation of Nigeria	Standards and conformity functions relevant to products and quality.
Research institutions and universities	Development, testing, risk-assessment evidence and local scientific capacity.
Farmers, processors, traders and consumers	Compliance, responsible use, reporting of problems and participation in consultations.

Regulatory and Food-Security Risks

The regulation of GM foods involves several potential risks that require effective oversight. Human-health risks, including allergenicity, toxicity, and unintended compositional changes, require rigorous scientific assessment. Environmental risks such as gene flow, effects on non-target organisms, biodiversity loss, and pest resistance also require continuous monitoring and appropriate resistance-management strategies. Unauthorised importation, cultivation, and distribution may weaken traceability, enforcement, and public confidence, particularly within Nigeria's large informal food and seed markets. Market concentration may also create concerns

regarding affordability, farmer dependence, and competition where technology is controlled by a limited number of providers. In addition, inadequate communication or opaque regulatory decisions may contribute to consumer distrust and rejection of approved GM products. Finally, weak post-market monitoring may limit regulators' ability to identify real-world environmental, health, and socio-economic effects after commercial release.

Theoretical Framework: Risk Society Theory

This study is anchored on Risk Society Theory associated with Ulrich Beck. The theory argues that modern societies increasingly generate and manage risks arising from

technological and industrial development. Unlike many traditional risks, technological risks can be complex, uncertain, difficult to perceive directly and distributed across populations. The theory is relevant to GM foods because biotechnology creates both opportunities and concerns that cannot be managed solely by individual consumers.

Risk Society Theory is useful for examining GM-food regulation because regulation represents an institutional response to uncertainty. Scientific assessment, public participation, monitoring and enforcement are mechanisms through which society attempts to identify, reduce and govern technological risks. The theory also highlights the importance of trust: where citizens believe that regulators are competent and transparent, they may be more willing to accept regulated technologies.

Applied to Nigeria, the theory suggests that strengthening the GM-food regulatory framework is part of national risk governance. Regulation should not focus only on preventing harm. It should also provide credible procedures for identifying benefits, comparing risks, communicating uncertainty, responding to evidence and correcting decisions when new information emerges.

Gap in Literature

Existing literature and policy documents provide substantial information about biosafety principles, biotechnology benefits and individual regulatory instruments. However, fewer studies integrate the regulatory framework with the four dimensions of national food security. There is also a need for more systematic attention to the enforcement chain from approval to seed distribution, farming, processing and consumption. Further gaps include independent evaluation of post-release outcomes, consumer information, informal-market traceability, laboratory capacity and inter-agency data sharing. This project addresses these gaps through an integrated documentary analysis.

Conceptual Framework

The conceptual position of this study is that regulatory strength is an enabling variable that influences how safely and effectively GM technology contributes to food security.

Regulatory inputs → risk assessment and approval → controlled release and seed/food-chain compliance → post-release monitoring and enforcement → public confidence and responsible adoption → productivity, resilience, reduced losses and safer food systems → food-security outcomes.

Regulatory dimension	Immediate mechanism	Expected food-security contribution
Clear legal authority	Defined responsibilities and enforceable standards	Reduced uncertainty and unsafe practices
Scientific risk assessment	Product-specific safety evaluation	Protection of consumers and environment
Laboratory capacity	Detection and verification	Improved traceability and enforcement
Post-release monitoring	Real-world evidence	Early detection and better policy adjustment
Public participation	Information and feedback	Greater legitimacy and informed adoption
Consumer protection	Food registration and information	Safer utilisation and stronger confidence
Inter-agency coordination	Shared data and joint inspection	Reduced regulatory gaps

Methodology

Research Design

The study adopted a qualitative documentary research design. Documentary research is appropriate because the central questions concern laws, regulations, institutional responsibilities, policy processes and food-security implications. The study did not generate primary survey data and therefore does not report invented questionnaires,

respondents, means, regression coefficients or significance tests.

Sources of Data

The study relied on both primary documentary and secondary sources of data. Primary documentary sources included the National Biosafety Management Agency Act 2015, the 2019 amendment, National Biosafety Regulations 2017, National Biosafety Policy, NBMA guidelines,

application forms, public notices, and official GMO database records. Food-safety regulatory documents issued by the National Agency for Food and Drug Administration and Control (NAFDAC) were also reviewed. Secondary sources included FAO food-security reports, official government publications, and relevant scholarly literature. Documents were included where they directly addressed GMOs, GM foods, biosafety, food safety, or agricultural biotechnology in Nigeria, and where they constituted official Nigerian laws, regulations, policies, guidelines, notices, or databases, or credible international and scholarly sources relevant to biotechnology and national food security in Nigeria.

Method of Data Collection

Documents were identified, screened and organised according to the study objectives. Extracted information was grouped under legal authority, risk assessment, approval procedures, public participation, food-safety controls, monitoring, enforcement, institutional coordination and food-security pathways.

Method of Data Analysis

The study used thematic content analysis. Documentary statements were coded into recurring themes: regulatory adequacy; scientific risk assessment; institutional coordination; transparency and participation; enforcement and traceability; post-release monitoring; consumer protection; productivity; resilience; affordability; and food-system stability. Findings were interpreted against availability, access, utilisation and stability.

Documentary Findings and Discussion

Regulatory Architecture for GM Foods in Nigeria

The documentary evidence shows that Nigeria has a multi-layered regulatory architecture. At the centre is NBMA, which has statutory responsibility for biosafety and modern biotechnology. Its functions include risk assessment, application processing, record keeping, sampling, laboratory analysis, inspection, monitoring and compliance. The National Biosafety Regulations 2017 provide procedural detail, while the National Biosafety Policy sets broader principles such as precaution, scientific decision-making, transparency and consideration of public-health and socio-economic factors.

The architecture is complemented by NAFDAC food regulation. The food-registration framework provides controls over the safety and quality of food products, laboratory evidence and labelling. Other institutions contribute seed regulation, quarantine, standards, agricultural policy and consumer protection. This multi-agency structure is appropriate because GM foods cross multiple regulatory domains.

A major finding is therefore that Nigeria does not lack a basic legal framework. The more important challenge is implementation capacity and coordination across the value chain.

Strengths of the Existing Framework

The existing regulatory framework has several strengths. First, the National Biosafety Management Agency (NBMA) has a clear statutory mandate to regulate biosafety activities and ensure compliance. The framework promotes risk-based decision-making by requiring scientific information and risk assessment before the approval of relevant GMO activities. It also provides for public participation, as certain applications are publicly displayed to allow stakeholders to submit comments before intentional release. In addition, the food-safety registration responsibilities of NAFDAC provide an important complementary regulatory layer. The framework further supports laboratory testing and inspection through provisions for sampling, laboratory analysis, and regulatory inspections. Its post-release orientation is demonstrated through monitoring initiatives for commercialised genetically modified crops. Transparency is also promoted through the public GMO database and regulatory notices, which provide information on applications and approvals. Finally, the 2019 amendment strengthened the framework's adaptability by expanding its scope to address emerging biotechnology and biosecurity concerns.

Regulatory Gaps and Areas Requiring Strengthening

Despite the strengths of the existing framework, several areas require strengthening to ensure effective regulation of GM foods and protection of national food security. Post-release monitoring needs to be continuous, adequately funded, and independently verifiable across Nigeria's different ecological zones. Laboratory capacity should also be improved through reliable equipment, trained analysts, quality-assurance systems, and sustainable financing for GM detection and food-safety testing. Traceability remains a challenge because seeds, grains, processed foods, and imported materials move through both formal and informal channels. Effective regulation therefore requires stronger inter-agency coordination, including interoperable databases, joint inspection protocols, and routine information sharing among relevant agencies. Public communication should translate technical regulatory information into clear and understandable language and disseminate it through trusted channels. Similarly, consumer information and food labelling should support informed choices in accordance with applicable national requirements. Regulatory surveillance should also extend to informal seed and food markets, where official traceability is often weaker. Furthermore, regulatory decisions should incorporate socio-economic considerations, including

farmer affordability, market structures, smallholder impacts, and distributional consequences. Clear emergency response and recall procedures are also necessary to facilitate rapid containment, product recall, and public communication when risks emerge. Finally, universities and independent laboratories should be encouraged to provide independent evidence, post-release research, and technical expertise to strengthen the credibility and effectiveness of Nigeria's regulatory system.

GM Foods and Food-Security Pathways

The first pathway is availability. If a GM crop provides effective protection against a major pest or stress, losses can be reduced and harvest quantities may increase. TELA maize is an example of a technology designed to address drought stress and insect damage. Approval does not guarantee higher production; effects depend on seed quality, agronomic practices, weather, adoption and markets. The second pathway is access. Higher yields may improve farm income where markets function well, but seed prices and other input costs influence whether benefits reach smallholders. Regulation should therefore consider not only biological safety but also inclusive access.

The third pathway is utilisation. Food security requires safe and nutritious food. Regulation of GM foods should address food-safety assessment, composition, allergenicity, toxicity and appropriate consumer information. The fourth pathway is stability. Climate shocks, pest outbreaks and production losses can destabilise food supplies. GM traits that improve resilience may contribute to stability when combined with irrigation, soil management, storage, extension and other adaptation measures. The fifth pathway is public confidence. Consumers and farmers need confidence that approved technologies have been assessed properly and that problems will be detected and corrected. Transparent regulation can reduce uncertainty and distinguish evidence-based concerns from misinformation.

Evidence from Nigeria

Evidence from Nigeria indicates that genetically modified (GM) technology is already part of the country's agricultural system. According to the National Biosafety Management Agency (NBMA), Nigeria has approved the commercial release of Bt cotton, Pod Borer Resistant (PBR) cowpea, and TELA maize, demonstrating the practical application of biotechnology within the national agricultural sector. The NBMA GMO database records TELA maize as approved for food, feed, and commercial release, following regulatory assessment. TELA maize is particularly relevant to food security because it combines drought tolerance and insect resistance, traits intended to address important production constraints. The NBMA reports that the product underwent risk assessment

involving considerations of human health, environmental safety, and biodiversity. In February 2025, the Agency also commenced stakeholder work on standard operating procedures for post-release monitoring of TELA maize, highlighting the need for continued regulatory oversight after commercialization. PBR cowpea is similarly important because cowpea is an important food and livelihood crop in Nigeria, while the technology targets damage caused by pod-boring insects. The continued consideration of new genetically modified crop applications also demonstrates the need for a regulatory framework that can adapt as new traits and technologies emerge. The urgency of effective regulation is reinforced by Nigeria's food-security situation. According to the FAO, 30.6 million Nigerians were projected to face acute food and nutrition insecurity during the June–August 2025 lean season. More recently, 34.7 million people were projected to face Crisis or worse levels of acute food insecurity during June–August 2026.

Discussion

The findings support the argument that strengthening regulation can have a positive indirect effect on national food security. The mechanism is not simply that regulation increases crop yields. Rather, regulation creates institutional conditions under which agricultural biotechnology can be safely tested, approved, monitored and trusted.

First, effective risk assessment can prevent inappropriate products or activities from entering the food and agricultural system. This protects the utilisation dimension of food security because sufficient food that is unsafe cannot constitute genuine food security.

Second, clear and predictable rules can support innovation. Researchers and developers can understand the evidence required for approval, reducing uncertainty and supporting investment in locally relevant technologies.

Third, post-release monitoring supports resilience. Monitoring provides data on whether a technology performs as intended and whether resistance, environmental or socio-economic problems are emerging.

Fourth, transparency supports trust. Public consultation, accessible information and independent research are necessary because technical approval alone does not resolve social concerns.

Fifth, enforcement makes regulation credible. This requires laboratory capacity, inspection, traceability and collaboration among agencies. Nigeria's large informal markets make this particularly important.

Finally, stronger regulation is compatible with food-security goals when it is risk-proportionate and innovation-

enabling. The preferred model is adaptive governance: rigorous pre-market assessment, transparent decisions, controlled deployment, continuous post-market monitoring

and the ability to modify or withdraw approvals if evidence changes.

Policy Matrix for Strengthening Regulation

Priority area	Recommended regulatory action	Food-security relevance
Risk assessment	Standardise product-specific assessment and strengthen expert review.	Reduces risks while enabling safe innovation.
Laboratories	Expand accredited GMO detection and food-safety testing.	Improves surveillance, traceability and consumer protection.
Post-release monitoring	Implement nationwide, risk-based monitoring with public reporting.	Detects performance and safety issues early.
Traceability	Improve seed-to-market documentation and digital records.	Reduces unauthorised distribution and supports recalls.
Public participation	Make dossiers, decisions and technical summaries accessible.	Improves legitimacy and informed adoption.
Consumer information	Clarify applicable labelling and information requirements.	Supports safe and informed utilisation.
Enforcement	Joint inspections, risk-based surveillance and proportionate sanctions.	Protects markets from unauthorised products.
Socio-economic review	Assess affordability, smallholder access and market impacts.	Improves equitable access.
Capacity building	Train regulators, laboratory staff, extension officers and justice-sector personnel.	Improves implementation and compliance.
Data integration	Create interoperable regulatory and monitoring databases.	Supports rapid evidence-based decisions.

Summary

The study established that Nigeria has a substantial legal and institutional foundation for GM-food regulation. The NBMA Act 2015, amended in 2019, gives NBMA authority over biosafety and modern biotechnology. The National Biosafety Regulations 2017 provide procedural details, while the National Biosafety Policy establishes principles including precaution, scientific decision-making and consideration of public-health and socio-economic factors. NAFDAC adds a food-product safety and registration layer.

The study also found that Nigeria has moved beyond experimental research to commercial GM crop deployment. Official information identifies Bt cotton, PBR cowpea and TELA maize as commercially approved crops. TELA maize is particularly relevant to food security because it combines insect resistance and drought tolerance. The existence of these technologies demonstrates the importance of regulating not only approval but also distribution, cultivation, food use and post-release performance.

Major regulatory strengths include statutory authority, risk assessment, public participation, inspection and laboratory provisions, food-safety controls, post-release monitoring initiatives and public information systems. Major areas requiring strengthening include laboratory capacity, traceability, enforcement, inter-agency coordination, consumer information, post-release monitoring, socio-economic assessment and public communication.

Conclusion

The study concludes that strengthening Nigeria's regulatory framework for GM foods is necessary for responsible biotechnology adoption and can contribute to national food security when integrated with broader agricultural and food-system policies. Nigeria has established a credible statutory biosafety architecture, but regulatory effectiveness depends on implementation.

A strong framework should be rigorous before approval and equally strong after approval. Pre-market assessment protects health and the environment; post-market monitoring generates real-world evidence; traceability

supports enforcement and recalls; laboratory capacity verifies compliance; public participation strengthens legitimacy; and transparent communication supports trust. Together, these functions can allow Nigeria to obtain potential productivity and resilience benefits of biotechnology without weakening food-safety and environmental safeguards.

The appropriate policy direction is adaptive, science-based and risk-proportionate regulation. Nigeria should neither treat all GM foods as inherently beneficial nor assume that all GM technologies present identical risks. Each product should be assessed according to its specific characteristics, intended use and evidence, and approved technologies should be monitored continuously.

Recommendations

Based on the findings of the study, the following recommendations are made:

1. The government should establish a well-funded, risk-based national system for continuous post-release monitoring of approved GM crops, foods, and feeds, while expanding accredited laboratory capacity for GMO detection, food-safety analysis, and environmental monitoring. Risk-based inspections and proportionate sanctions should also be strengthened to address unauthorised importation, cultivation, seed distribution, and marketing.
2. Relevant agencies, including NBMA, NAFDAC, NASC, NAQS, SON, agricultural authorities, and research institutions, should establish an integrated regulatory information platform and strengthen traceability from approved seeds and planting materials through production, storage, processing, and distribution. This would facilitate effective surveillance, identification, and rapid recall of unauthorised or problematic products.
3. Regulatory agencies should improve public communication by providing accessible, plain-language information on risk assessments, approvals, monitoring results, and regulatory decisions in English and appropriate Nigerian languages. Public consultation should remain meaningful, with stakeholders informed about how substantive comments are considered, while clear consumer-information and labelling requirements should be maintained in accordance with applicable Nigerian regulations.
4. Government and regulatory agencies should support universities, research institutions, and independent laboratories to conduct long-term

research on the environmental, nutritional, socio-economic, and food-security effects of approved GM technologies. Regulatory decisions should also consider affordability, smallholder access, seed availability, market competition, and potential distributional effects.

5. GM technology should be treated as one component of Nigeria's broader food-security strategy rather than a stand-alone solution. Government should continue investing in irrigation, agricultural extension, storage, rural infrastructure, finance, security, soil management, and market access, while periodically reviewing biosafety and food-safety regulations to accommodate emerging technologies such as gene editing through clear and risk-based regulatory approaches.

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