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Chemical Contaminants in Nigerian Agricultural Products: The Evaluation, Alleviation and Consequences on Public Health

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ABSTRACT

This article provides a plethora of knowledge regarding the assessment of chemical contamination of agricultural goods in Nigeria, potential containment strategies, the problem's influence on public health, and supporting regulatory frameworks. This paper examines chemical contaminants and recommends the implementation of suitable measures to avert adverse health effects. It also focuses on the origins and routes of contamination. Therefore, this conversation highlights the need for multisectoral methods to address this intricate issue, with input from CSOs, government policymakers, academic and research institutions, and business stakeholders. We carefully reviewed recently published papers, journals, and other significant databases relevant to the subject to compile this crucial review article. The goal is to provide much-needed knowledge that will help solve the issue of contaminants in Nigerian agricultural products. By enacting strict laws and policies, raising awareness, and promoting sustainable farming practices, Nigeria can effectively combat the threat of chemical risks to food quality.

Keywords: Chemical contamination, Agricultural goods, Public health, Regulatory frameworks, Mitigation strategies

INTRODUCTION

Chemical contamination of Nigeria's agricultural products poses a serious issue that could impact the country's economy, ecology, and health. Therefore, this discussion aims to outline the process of evaluating and reducing these toxins, as well as their impact on public health in Nigerian agriculture. Certain chemical residues, such as heavy metals, industrial chemicals, and pesticide residues, found in consumable agricultural products in Nigeria have received more attention recently [1]. Through pollution, irrigation with water, and the use of agrochemicals, these toxins find their way into the food chain [2], [3]. As a result, they pose a major risk to human health in the form of acute toxicity as well as long-term conditions like cancer, reproductive disorders, and neurological impairment [4]. As a result, it is imperative to thoroughly examine the extent of chemical contamination in the majority of Nigerian agricultural goods at every stage of the value chain. This entails identifying potential contamination hotspots, figuring out how much contamination is in food, and thinking about potential consumer impacts. Additionally, it entails adhering to organizational quality standards regarding safety regulations and requirements. Promoting better farming practices and increasing accreditation and monitoring are necessary to mitigate the impact of chemical contaminants on Nigerian agricultural goods. Therefore, integrated pest management, the use of fewer chemical products, and appropriate waste management within the context of agriculture can all help to minimise the usage and spread of pollutants. Chemical pollutants found in agricultural goods greatly threaten the health of Nigerians, particularly children, pregnant women, and residents of rural regions who may lack access to adequate medical treatment. To address these ramifications, government agencies and departments, academic institutions and research centers, corporate and industrial stakeholders, and non-governmental organizations must work together to safeguard and maintain food security. In conclusion, it is best to

characterise the problem of chemical contamination in Nigerian agricultural goods as multifaceted because it is broad and pervasive. The health, future, and agricultural value chain of Nigerian consumers can be safeguarded by implementing study findings on potential ways to reduce risk through evaluation, and communication [5].

Evaluation of Chemical Contaminants

For the population's welfare and the safety of food, it is essential to examine any chemical contaminants found in agricultural products produced or imported into Nigeria. It comprises the methodical evaluation of various pollutants found in agricultural commodities, including industrial chemicals, pesticides, heavy metals, and microbiological diseases [6]. Molecular techniques like chromatography, spectroscopy, and immunoassays often aid in the detection of pollutants [7]. These techniques enable scientists and government organisations to accurately ascertain the level of pollutants present in food and, in turn, assess the risks to consumers. Institutions like NAFDAC and SON play a crucial role in the evaluation process by establishing safety protocols and monitoring schemes. These programs entail obtaining samples of agricultural produce from farms, marketplaces, and processing facilities and analyzing them in laboratories to determine the extent of compliance with safety regulations. We also assess Nigerian agricultural goods for chemical contamination based on the sources and routes of contamination. This entails researching the use of agrochemicals, pollution, tainted irrigation water, and natural phenomena, including soil erosion and volcanic activity. To assist stakeholders in minimising their use of food products, this article offers information on the sources of contaminants. In conclusion, assessing the presence of chemical pollutants in Nigerian agricultural goods is essential for developing control and prevention plans as well as for assessing potential negative health effects on consumers. Nigeria can ensure the quality of its agricultural products and the health of its people by implementing improved methods, regulations, and control over its products.

Routes and Sources of Contamination

To assess the level of chemical contamination in Nigerian agricultural products and the potential health risks to consumers, it is critical to identify the sources and processes that contribute to contamination. Common sources of contamination include agrochemicals such as pesticides, herbicides, and fertilisers [8]. While these inputs aid in pest control and increase crop yield, their incorrect or excessive application can contaminate crop produce, leaving residues in the soil and water. In addition, several other industries affect the environment, including waste management, manufacturing, and mining, which release industrial chemicals, heavy metals, and other pollutants into the ecosystem [9]. These contaminants have the potential to contaminate the air, water, and land, endangering nearby agricultural areas and food crops. Different migrations of contaminants occur based on the type of contamination and the agricultural practices used. For example, chemicals used in agriculture, such as fertilisers and pesticides, have the potential to contaminate water bodies and soils, finally reaching the plant tissues. Similarly, plants can absorb heavy metals from the soil or irrigation water, which can then accumulate in any edible section of the plant. Livestock husbandry is another source of contamination because chemicals used in animal feed and medicine for animal illnesses find their way into the food chain through the meat, milk, and eggs they produce. Furthermore, failure to take appropriate health and sanitation precautions could expose food safety to harmful microorganisms excreted in animal faeces or contaminated feed.

Mitigation Strategies and Best Practices

It is impossible to overstate the importance of chemical pollutants in Nigerian agricultural output, which is critical for public health and food security. We outline several best practices and solutions to address the issue. Promoting sustainable farming methods is an excellent idea for reducing contamination [10]. IPM approaches, which also include crop rotation, resistant cultivars, and biocontrol, can minimise crop spraying with chemical pesticides and reduce the residues left behind in food crops [11]. Similarly, using organic agricultural techniques such as composting, green manure applications, biocontrol techniques, etc. could guarantee minimal usage of artificial fertilisers and pesticides, resulting in lower contamination levels [12]. Agriculture's ability to reduce microbial contamination is contingent upon the improvement and advocacy of sanitation and hygiene standards. To lower the possibility of contamination during the manufacturing and distribution systems, this involves improving the proper handling, storing, and processing techniques. The best hygiene practices and GAPs along the food chain can also aid in the prevention of microbially-induced foodborne

illnesses. Enhancing the efficacy and efficiency of regulations and inspections is critical to ensuring adherence to safety and regulatory mandates when using veterinary and agrochemical products. Increasing surveillance, inspecting more often, and imposing fines are effective tactics to prevent contamination and inappropriate use of personal protective equipment. Finally, we must provide farmers, extension agents, and food handlers with awareness and training programs regarding appropriate practices and legal requirements in the agriculture sector to ensure adherence to safer procedures in food production. To reduce chemical contamination of agricultural produce in Nigeria, stakeholders must collaborate and network. To share information, gain expertise, and enhance preventative and intervention strategies, it entails promoting cooperation between governmental and non-governmental organisations, academic institutions, businesses, and non-governmental organisations. As a result, stakeholders can capitalise on one another's advantages to implement solutions that address the cause of pollution and promote sustainable farming. In conclusion, stringent regulation, improved sanitation and hygiene, and a redesign of sustainable agricultural methods are all necessary for the efficient elimination of chemical pollutants from Nigerian agricultural goods. As a result, it is reasonable to conclude that Nigeria will be able to reduce contamination risks and ensure the safety and quality of the food supply, as well as the health of the populace, with the aid of the tactics outlined and examples of best practices.

Public Health Implications and Risks

Public health is concerned about chemical pollutants found in Nigerian agricultural goods, which can cause various deformities from acute poisoning to long-term health problems [13]. Various impacts can result from ingesting, inhaling, or coming into contact with pesticides, heavy metals, microbiological pathogens, and other polluted chemicals [14]. Acute poisoning can result from eating foods with high pesticide or hazardous chemical concentrations. It can include vomiting, diarrhoea, nausea, and neurological problems. Long-term, low-level pollutant consumption may lead to immunological diseases, neurotoxicity, carcinogenicity, reproductive issues, and developmental difficulties [15]. Seniors, children, and expectant mothers are among the groups most vulnerable to the negative effects of chemical pollution. Pregnant women are more likely to experience miscarriage, birth defects, and other pregnancy-related issues [16]. Children may also be more susceptible to the neurological effects of pesticides than other people [17]. Likewise, due to weakened immune systems or a lower capacity to metabolise poisons, older adults and those suffering from specific diseases are more susceptible to the harmful effects of pollutants [18]. To fully comprehend the complex and multifaceted dangers associated with chemical contamination in agricultural goods supplied in Nigeria, the public health sector must adopt an integrated strategy for risk assessment, prevention, and management. Part of this includes surveillance and monitoring programs, which allow for routine food inspections to assess contamination levels and identify emerging health risks for consumers. Lastly, it means implementing tactics to reduce exposure to pollutants, such as supporting safe agricultural methods, promoting appropriate food handling and storage, and stepping up oversight of agrochemicals and food safety. Consumer education is also essential to improve public health and prevent chemical contamination of agricultural products [19]. Public education about the health risks associated with certain pollutants, together with guidance on ways to minimise exposure and make informed dietary choices, can significantly contribute to health protection. In conclusion, there are significant risks associated with chemical pollutants that could have an impact on Nigerian agricultural goods and public health. Thus, it would be advantageous for Nigeria's public health, food security, and the agricultural sector's sustainable growth if government agencies, institutions, industries, and civil society worked together to address these threats.

Policy Responses and Regulatory Frameworks

Therefore, strict laws and procedures must address chemical pollutants in Nigerian agricultural products to improve citizen health protection and food safety [20]. These frameworks are essential for developing policies, monitoring their adherence, and enforcing them throughout the agricultural value chain. The Nigerian government, through agencies like the SON and NAFDAC, is primarily in charge of establishing and carrying out national policies about food safety and practices [21], [22]. These organisations include those that create safety regulations, conduct inspections, and handle the application of veterinary medications, agrochemicals, and other farming inputs. Several rules govern chemical contaminants in agricultural products, such as the maximum residue limit for pesticides and other contaminants in

food products, quality control standards for inputs and processed foods, and the registration and licensing of agrochemicals and veterinary drugs [23]. Regulatory agencies can protect the safety of the food supply and avoid exposure to potentially dangerous substances by establishing clear rules and legal frameworks. Governments, academic institutions, business associations, and civil society organisations must collaborate and interact with multiple stakeholders to implement policy interventions targeted at reducing chemical pollutants in agricultural products [24]. To promote compliance, coherence, and harmony in operations, this calls for information sharing, synchronisation of monitoring activities, and synchronisation of policies and processes. Furthermore, managing chemical contamination in agricultural goods, particularly those imported and exported, requires cooperative efforts and shared accountability. Nigeria can enhance food safety oversight and regulation, as well as market access, by coordinating its standards, policies, and processes and participating in global initiatives [25]. Therefore, it is crucial to implement policy responses and regulatory actions to mitigate the risk to public health that chemical contamination in Nigerian agricultural produce poses. Thus, to reassure consumers and ensure the quality of Nigeria's food supply, regulatory organisations must set high standards, closely monitor compliance from industry participants, and enact appropriate legislation regarding food goods. Collaboration between national and international stakeholders is equally vital to implementing optimal policies and successfully controlling the hazards posed by chemical contamination in agriculture.

CONCLUSION

Given the significant impact on food safety, human health, and economic development, it is imperative to address the concerning phenomenon of chemical contamination of agricultural goods in Nigeria immediately. It is necessary to collaborate with the government, academic institutions, the business community, and non-governmental organisations to address this intricate issue. Therefore, relevant legislative measures, eco-friendly farming encouragement, increased regulation and supervision, and active cooperation among Nigerian stakeholders can decrease the dangers of chemical pollutants in agricultural goods. By doing this, the country can protect the quality of the food that its citizens eat, improve their overall health, and encourage the agriculture sector to continue growing.

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