

# Time for a “Detox” in Agriculture

Challenges of Pesticide Use and Regulation  
in Nigeria and Possible Solutions



# The Authors

## Lead researcher:

Dr. Silke Bollmohr is a ecotoxicologist, risk assessor of pesticides and expert for sustainable agriculture. She has worked for twenty years in various countries in Africa to establish strategies for a reduction in the use of highly hazardous pesticides. In the last four years, she worked in Kenya on strategies on how to phase out pesticides that are banned in Europe, among other issues.

## Research support:

Oladipo Ademola Olubayo is a senior research associate at the Farm and Infrastructure Foundation, Nigeria. He has more than fifteen years of research experience in the field of agriculture, which includes research on agricultural policy, organic agriculture, rural livelihoods, and soil conservation.

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**T** +234-809-2960-591 **E** [info@ng.boell.org](mailto:info@ng.boell.org) **W** [www.ng.boell.org](http://www.ng.boell.org)

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# Introduction

Nigeria is well known for its oil wealth, but the agricultural sector is the backbone of the country's economy. Agriculture accounts for about 22% of GDP, compared to oil and gas (9.5%), manufacturing (9.7%) and trade (16.1%). Over 36% of the active labour force is employed in agriculture directly.<sup>1</sup>

However, the sector faces a number of major challenges. It needs to feed a rapidly expanding population in a warming climate characterised by increasingly frequent floods and droughts that reduce soil fertility, while parts of the country remain in conflict, ranging from the Boko Haram crisis in the northeast to farmer–herder clashes in the Middle Belt. The ongoing Covid-19 pandemic and associated restrictions have further exacerbated the situation through supply-chain disruptions that have led to spiralling food-price inflation.

Nigerians already experience a huge malnutrition burden. The national prevalence of stunting of children under the age of five is 43.6%, significantly higher than the developing-country average of 25%. Nigeria's under-five wasting prevalence of 10.8% is also higher than the developing-country average of 8.9%. Almost half (49.8%) of women of reproductive age suffer from anaemia, and 6.3% of adult men and 6% of women have diabetes.<sup>2</sup>

The country is currently unable to meet its domestic requirements for food as the population growth rate has outpaced the rate of food production. According to the United Nations, the number of people living in Nigeria is expected to more than double by 2050 from its current level of just over 200 million, fuelling rapidly growing consumer demand for food.<sup>3</sup> Government policies have therefore focused on increasing productivity. However, these mainly promote conventional “industrial” agriculture that requires high external inputs, such as pesticides and artificial fertilizers.

As in many other African countries, the intensification of agricultural production to meet the demand of both local and export markets is increasing the use of pesticides in Nigeria. In conventional agriculture, which often utilizes monoculture cultivation, pest invasions can drop yields by up to 40%. Climate change can bring invasions by newly arrived pests that may even increase the rate of loss. This predicament is often used to justify the heavy use of pesticides.

However, this level of use has resulted in negative health, environmental and economic consequences in Nigeria and worldwide. Because pesticides are widely distributed in the environment – in the air, soil, water and plants – water and soil quality and related biodiversity are decreasing. There is also evidence that an increase in chronic health conditions may be related to pesticide exposure. Furthermore, exposure to more than one pesticide, especially in food, and the cumulative effect of these mixtures on our health is still unknown.<sup>4</sup>

As Nigeria pushes its agricultural sector towards more efficient production and a greater role in the country's economic diversification strategies, this study surveys the pesticides that are currently in use, their effects on humans and the environment, and how policy influences pesticide use.

It also identifies gaps and possible solutions to ensure more sustainable food production through agricultural techniques that both require fewer chemical inputs and are crucial to mitigate growing environmental challenges such as erosion, loss of biodiversity, and land degradation. These would help to ensure improved food security and safety at home and also create better conditions for export to countries with stricter food-safety standards.

## Agriculture in the Nigerian Economy

Agriculture in Nigeria is characterized by small-scale and subsistence production. Major crops include cassava, sesame, rice, cocoa, palm oil, ginger, groundnut, tomatoes, sorghum, millet and wheat.

Figure 1 shows a general increase in production of some main crops over the last 18 years. However, the Economic Recovery and Growth Plan (2017–2020) has clearly not yet led to the desired results. In 2017–2018, production either remained constant or decreased.

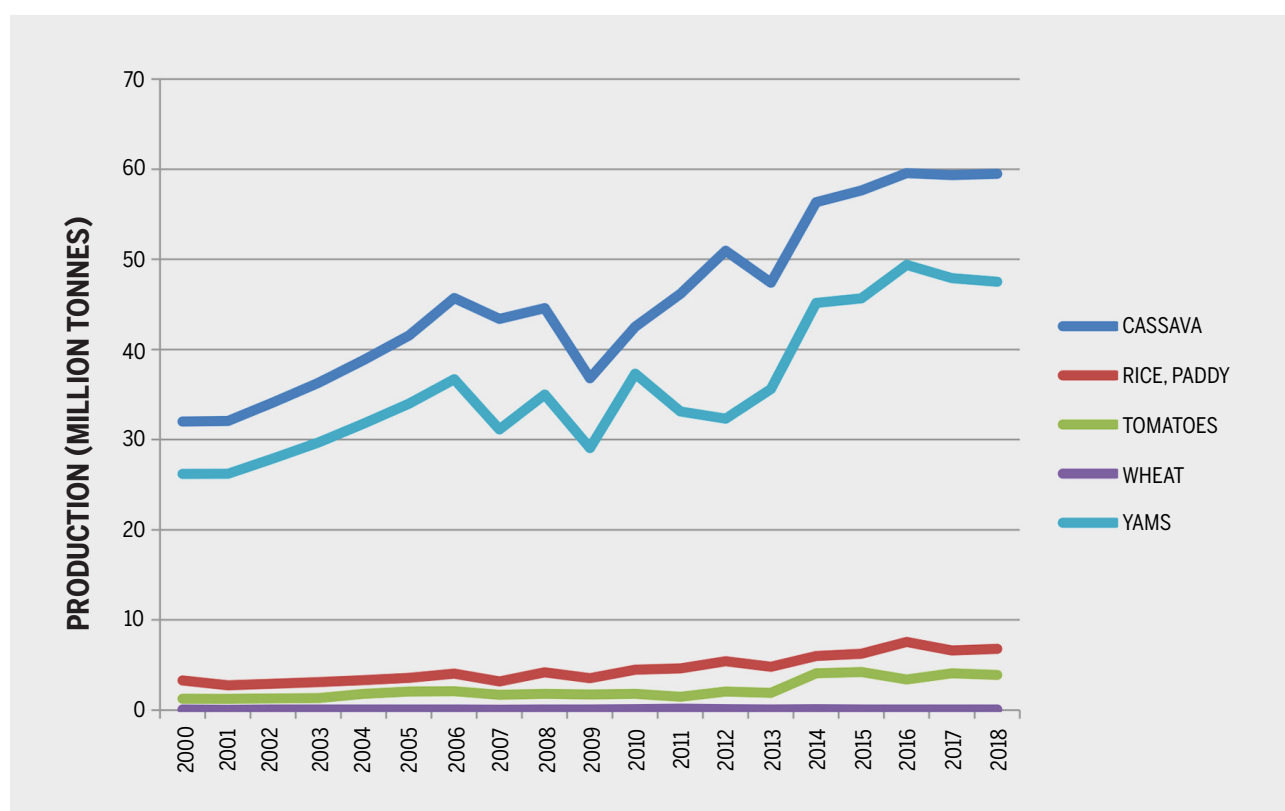


Figure 1. Production of main crops from 2000–2018 (FAO, 2020).

Despite all efforts taken to support the agricultural sector, Nigeria remains a net food importer with imports constantly increasing.<sup>5</sup> Figure 2 shows the increase in wheat imports between 2000 and 2018 as one example.

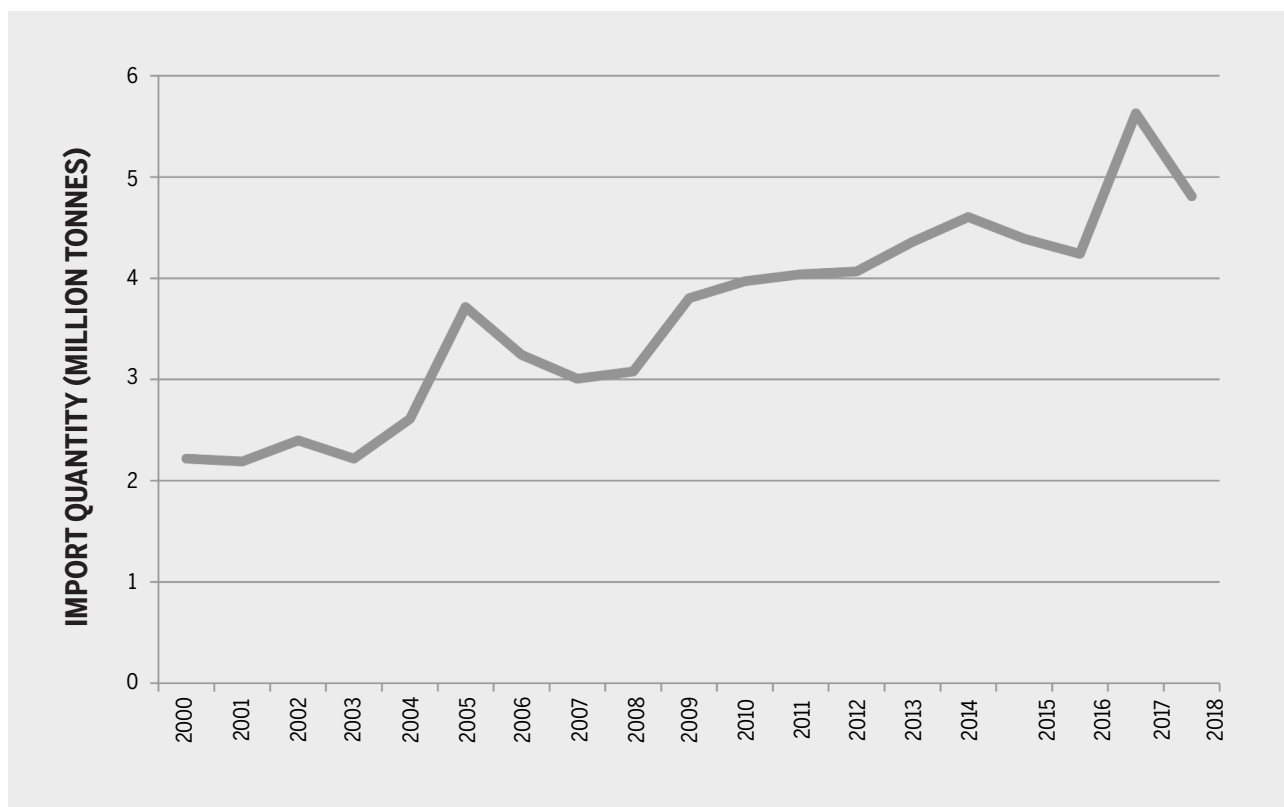


Figure 2. Nigerian wheat imports, 2000–2018 (FAO, 2020).<sup>6</sup>

Nigeria's main trade partners in agriculture are the Netherlands, the United Kingdom, the United States, India, China, Switzerland, Germany and Japan<sup>7</sup> and the major export products are sesame seeds, cashew nuts, fermented cocoa beans, ginger and cotton. Sesame, cashew nuts and cocoa account for more than half of the nation's agricultural exports, which declined by 11% from 2018 to 2019.<sup>8</sup>

In the 1960s, Nigeria was the second-largest cocoa producer in the world, with 18% of global production. Today, the country accounts for less than 8%, well behind Côte d'Ivoire (39%) and Ghana (21%). Inefficient systems for setting and enforcing food quality standards, as well as poor knowledge of target markets, have been notable drivers of the decline of export revenues from agriculture.<sup>9</sup>

Nigeria's 2008 National Environmental Summit listed the key environmental challenges as deforestation and land degradation, decrease in biological diversity, drought and desertification, flooding, erosion, and pollution.<sup>10</sup> Decreased soil fertility (related to land degradation, erosion, desertification and pollution) is an additional major challenge for the agricultural sector.<sup>11</sup>

Figure 3 shows the area under harvest and the resulting yield of cassava from 2000 to 2018. Despite a marked increase in the area harvested since 2009, the yield decreased over this period. This could indicate soil degradation, among other factors.

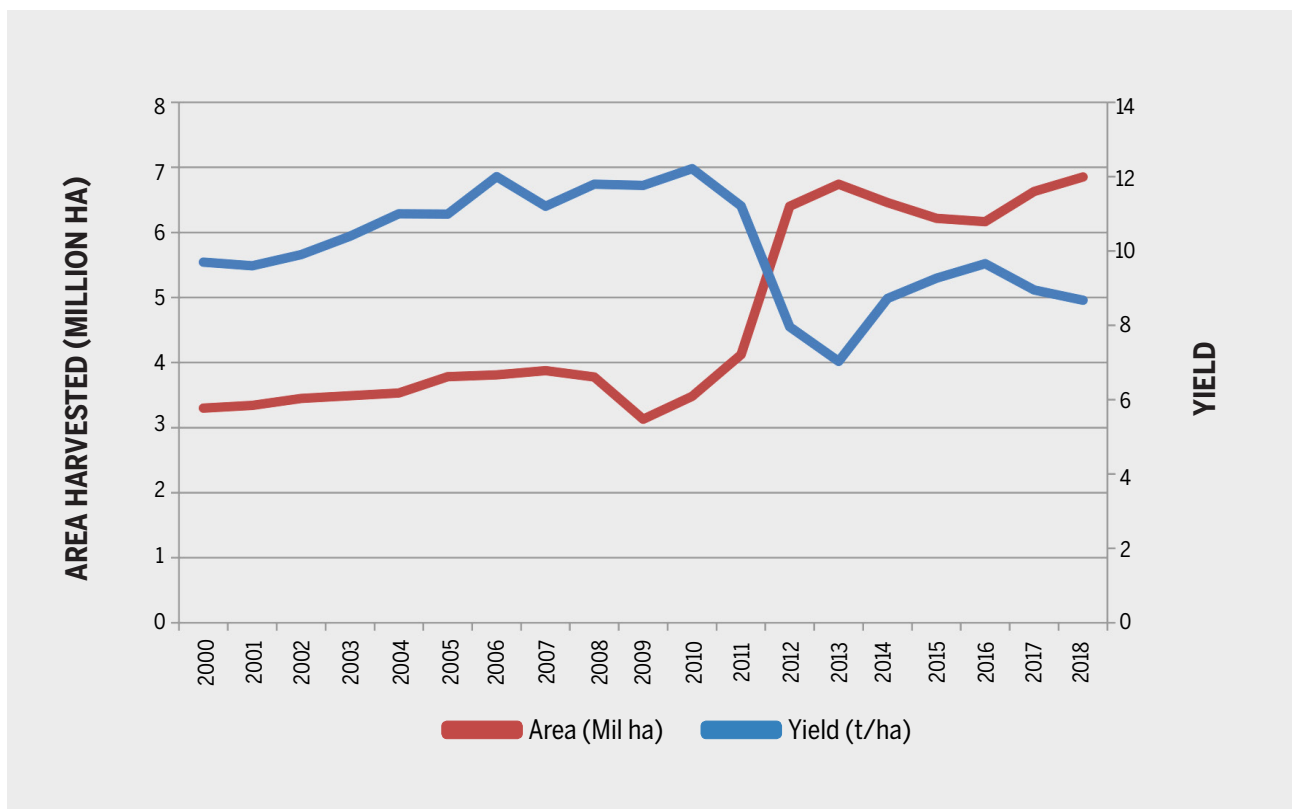


Figure 3. Area harvested and resulting yield in tonnes per hectare for cassava, 2000–2018 (FAO, 2020).

## Agricultural Policy Initiatives

Having identified agriculture as the key development priority in its efforts to reduce poverty and diversify the economy away from the oil sector, the Federal Government of Nigeria has developed a variety of policy initiatives.

The Agriculture Promotion Policy (2016–2020)<sup>12</sup> was developed by the Federal Ministry of Agriculture and Rural Development in 2016 to ensure food security for the domestic market and the delivery of quality-standard products for the export market.

The Economic Recovery and Growth Plan (2017–2020),<sup>13</sup> developed by the Ministry of Budget and National Planning, aimed to diversify the economic base of the country and create jobs. The agricultural sector is at the core of its objectives, with a projected average growth of 6.5%. However, the actual growth rate averaged about 3%, less than half of the target.

The Growth Enhancement Support Scheme was initiated by the Nigerian government to boost agricultural production through the provision of “smart subsidies” for farm inputs to small-scale farmers. However, it seems to have been replaced by the Agricultural Input Management Support Scheme and falls now under the Fertilizer Market Stabilization Programme.<sup>14</sup>

In response to unprecedented challenges due to Covid-19, the government released the Nigeria Economic Sustainability Plan.<sup>15</sup> This includes recommendations for an appropriate stimulus package and also touches on agriculture in the form of the Mass Agricultural Programme and the Food for All Programme. These programmes will provide 20,000 – 100,000 hectares for further crop production, using aggregated smallholder farms and abandoned state-farm settlements and agricultural projects.

# Hazards of Pesticide Use

Many pesticides that are used in agriculture do not stay on the target crop but also enter the environment or our bodies, whether through direct exposure during application or indirectly through food. While farmers and rural residents are exposed most frequently and directly to pesticides, residues are found everywhere – in our food, our drinking water, in the rain and in the air. They may be acutely toxic, have long-term toxic effects, affect the hormone system, be toxic to wildlife or cause a high incidence of severe or irreversible adverse effects.

## Health hazards

Long-term exposure to pesticides can also result in chronic health effects. Accurately estimating the number of such cases is challenging since symptoms may only develop years after exposure, diseases are often multicausal, and people tend to be exposed to multiple harmful substances throughout their lifetime.

Pesticides have been classified as causing carcinogenicity, mutagenicity/genotoxicity, reproductive toxicity, and neurotoxicity.<sup>16</sup> Many are endocrine disrupters, meaning they interact with the hormone system, causing adverse effects such as an increase or decrease in the activity of male or female hormones. Since most pesticides are designed to affect the hormone systems of plants and insects, this is not surprising.

## Environmental hazards

While regulators are most concerned about health risks through pesticide residues, the effects of pesticides on non-target organisms are hugely underestimated, especially in the registration procedures of most African countries.

Pesticides can persist in the environment for decades and pose a global threat to the ecological system upon which food production depends. Excessive use and misuse of pesticides contaminates surrounding soil and water sources, causing the loss of biodiversity, destroying beneficial insect populations that act as natural enemies of pests, and reducing the nutritional value of food.

These effects have been well-documented. To give just a few examples: acute bird poisoning with carbofuran;<sup>17</sup> endocrine-disrupting effects of atrazine in amphibians;<sup>18</sup> population change of macroinvertebrates in agricultural streams;<sup>19</sup> and a decrease in bee populations due to neonicotinoids, a new class of insecticides.<sup>20</sup> The impact on pollinators places greater emphasis on the effects of pesticides on ecosystem services and, in turn, on sustainable food production.

Herbicides like glyphosate are known to impact negatively on the essential bacteria and fungi of a healthy soil ecosystem. The same applies to fungicides that are intended to control fungus on crops but also kill beneficial fungi in the soil.<sup>21</sup>

When it comes to reducing the risks and public health problems posed by pesticides, it is important to understand that the toxicity of different substances, for human beings and for the environment, varies greatly. The Pesticide Properties Database (PPDB) provides toxicity information on all active ingredients worldwide (see Table 1 below), categorized from very toxic to not toxic. This study classified the toxicity of registered pesticides in Nigeria according to the categories of environmental and human health toxicity used in other publications.<sup>22</sup>

**TABLE 1.** CATEGORIES OF TOXICITY ACCORDING TO PPDB

Wildlife toxicity (Bees, fish) [ug /L]		Chronic human health effects	
Very toxic	< 0.1	Yes	Carcinogenicity
Toxic	0.1–1.0	Possible	Mutagenicity
Moderately toxic	1.0–10	No	Reproduction Toxicity
Low toxic	10–100	No Date	Neurotoxicity
Not toxic	>100		Endocrine disruption

“

Pesticides have been classified as causing carcinogenicity, mutagenicity/genotoxicity, reproductive toxicity, and neurotoxicity.



# Pesticide Use in Nigeria

The registration of pesticides in Nigeria is covered by the Drugs and Related Products Act (1996), the Pesticide Registration Regulations (2019) and the Guidelines for Pesticide Registration. The National Agency for Food and Drug Administration and Control (NAFDAC) is the registration body and also regulates and controls the import, export, manufacture, advertisement, distribution, sale and use of chemicals.

A list of NAFDAC's approved pesticides includes 145 active ingredients registered in 1004 products.<sup>23</sup> The disparity of these numbers indicates that active ingredients are found in different formulations. The active ingredient glyphosate (as isopropylamine salt), for example, is registered in 115 products.

There are no reliable data over time for Nigeria's pesticide imports, but the latest information available from the UN Food and Agriculture Organization (FAO) shows that the country imported pesticides worth US\$384 million in 2018.<sup>24</sup> This is the highest import value within West Africa, and twice as high as countries in East Africa (with Kenya as an example) (Figure 4). South Africa is the only African country importing more pesticides than Nigeria.

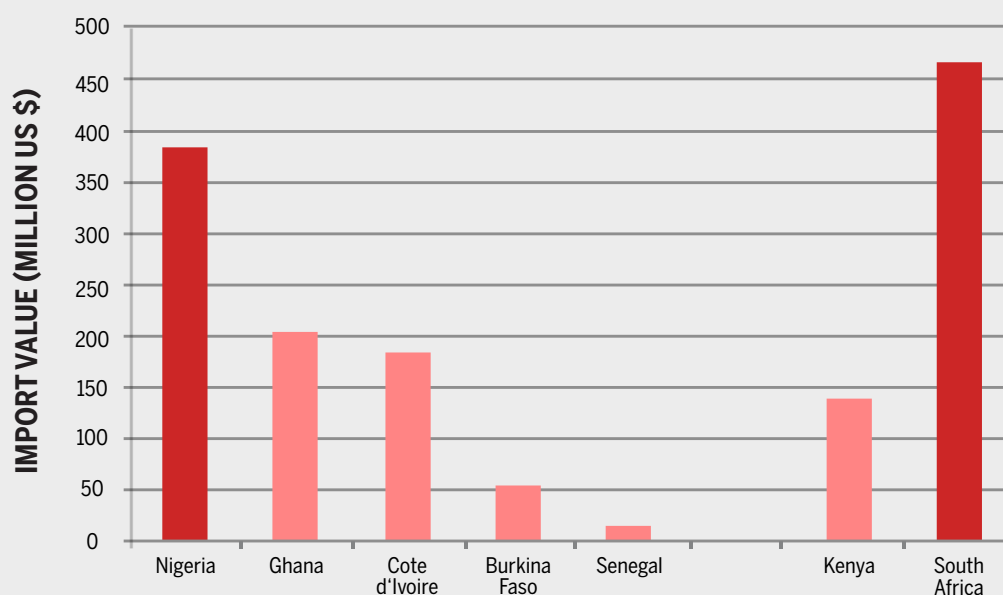


Figure 4. Pesticide import value (US\$million) for West African countries and Kenya (East Africa) and South Africa, 2018  
SOURCE: FAOSTAT: Pesticides trade.

## Environmental health threat

According to the classification shown in Table 1, this study revealed that 47% of all pesticide products registered in Nigeria are toxic or very toxic to aquatic systems. This poses a major threat to fish species where rivers and other bodies of water receive pesticides via runoff or spray-drift, especially where fields are very close to the water. Depending on their persistence, they can have a short- or long-term effect on fish populations. Similarly, 40% of all registered products are toxic or very toxic to bees, which threatens the survival of bee populations and other pollinators. This negatively affects food security as food and seed production relies on pollination.

Farmers are often not aware of the toxicity to bees or fish of many of the products they use nor of the precautions to be taken. For example, pesticides should not be sprayed in the morning when pollinators are out foraging<sup>25</sup> or close to bodies of water (many products may not be used within 20 metres of a river).

In Nigeria, various studies have detected high concentrations of pesticides in the water and soil<sup>26</sup> and highlighted the relationship between pesticide use and a decrease in honey bees.<sup>27</sup>

## Human health threat

It is concerning that there are pesticides on the Nigerian market that cause serious chronic health effects. Twenty-five registered products have been proven to be carcinogenic, 63 to be mutagenic, 47 are endocrine-disrupting chemicals, 262 products show neurotoxicity and 244 show clear effects on reproduction (Figure 5).

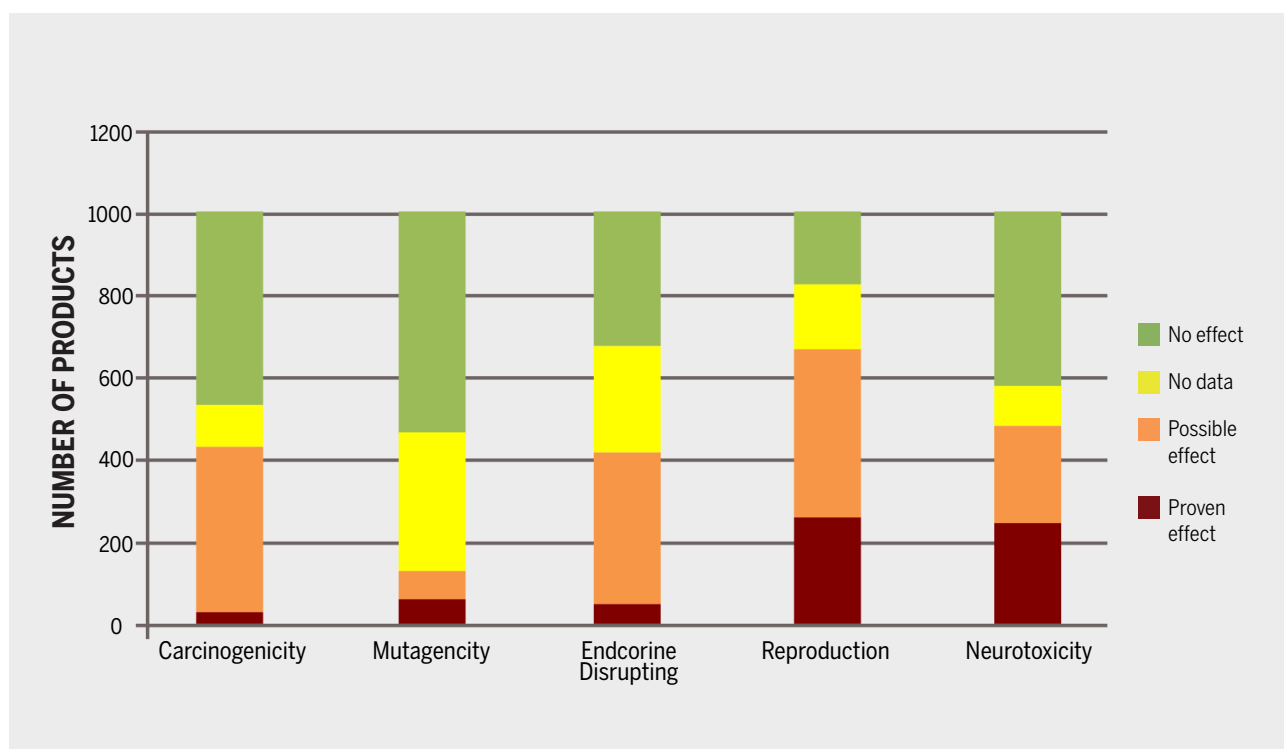


Figure 5. Number of products showing the probability of chronic health effects according to the classification in Table 1, based on PPDB data.

Additionally, many products show “possible” effects on carcinogenicity, mutagenicity, reproduction toxicity, neurotoxicity and endocrine disruption. Some active ingredients in products have not been researched and no data are available. Only a minority of the products show no chronic effects, especially concerning endocrine disruption and reproduction toxicity.

Because the majority of the farmers are not aware of the levels of toxicity as they apply the chemicals, and because personal protection equipment (PPE) is not always available to them if they are aware, farmers can be directly exposed to these pesticides and their effects. Unfortunately, there is no regular monitoring of pesticides in food or water in Nigeria.

Nigeria has adopted the European Union’s standard of maximum residue levels (MRLs) tolerated in or on food. However, it is widely recognized that the country has trouble adhering to these, which directly impacts its export opportunities. Researchers in Nigeria have reported the contamination of vegetables by pesticide residues, as well as high persistent levels of organochlorines – many of which have been restricted or banned.<sup>28</sup>

Pesticide residue levels exceeding the allowed MRLs have been measured in various vegetables from different areas in Nigeria, including:

- pesticide residues (dichlorvos, diazinon, chlorpyrifos, fenthion, malathion, fenitrothion, and bifenthrin) in watermelon.<sup>29</sup>
- dried beans exported to Europe that were rejected due to high levels in cypermethrin, dichlorvos, dimethoate, chlorpyrifos, and diazinon.<sup>30</sup>
- three carbamates (carbaryl, carbofuran and pirimicarb) exceeded MRLs in eggplants<sup>31</sup>
- indigenous vegetables (*Telfairia occidentalis* and *Celosia argentea*) had pesticide levels that exceeded MRLs.<sup>32</sup>

Sixty percent of the pesticides (e.g. atrazine, carbofuran, diazinon) detected in the vegetables have been withdrawn from sale in Europe. This is partly due to the adoption of stricter regulations during the last two decades.



Researchers in Nigeria have reported the contamination of vegetables by pesticide residues, as well as high persistent levels of organochlorines.



## Pesticide products withdrawn in EU

The EU's 1991 Council Directive (91/414/EEC) concerning the placing of plant protection products on the market raised the standards on health and environmental safety. It required pesticide manufacturers to re-register their products and to submit new data to show that a substance could be used without unacceptable risks, following the "precautionary principle" of doing no harm towards the environment or human health.

Under this process, manufacturers decided not to submit around 320 active ingredients for review, for various reasons. Some were no longer profitable, having been superseded by newer substances. In other cases, companies realised certain pesticides would not pass the stricter safety requirements. As a result, 60% of all pesticide active ingredients (approximately 500 by now) that were previously authorized for use in the EU have been taken off the market but not legally banned.

Figure 6 illustrates that 40% of all the pesticide products registered in Nigeria have been withdrawn from the European market or are heavily restricted due to potential chronic health effects; environmental persistence; high toxicity for fish or bees; or insufficient data to uphold the principle of preventing harm. This 40% represents 57 active ingredients in 402 products that are still in use in Nigeria.

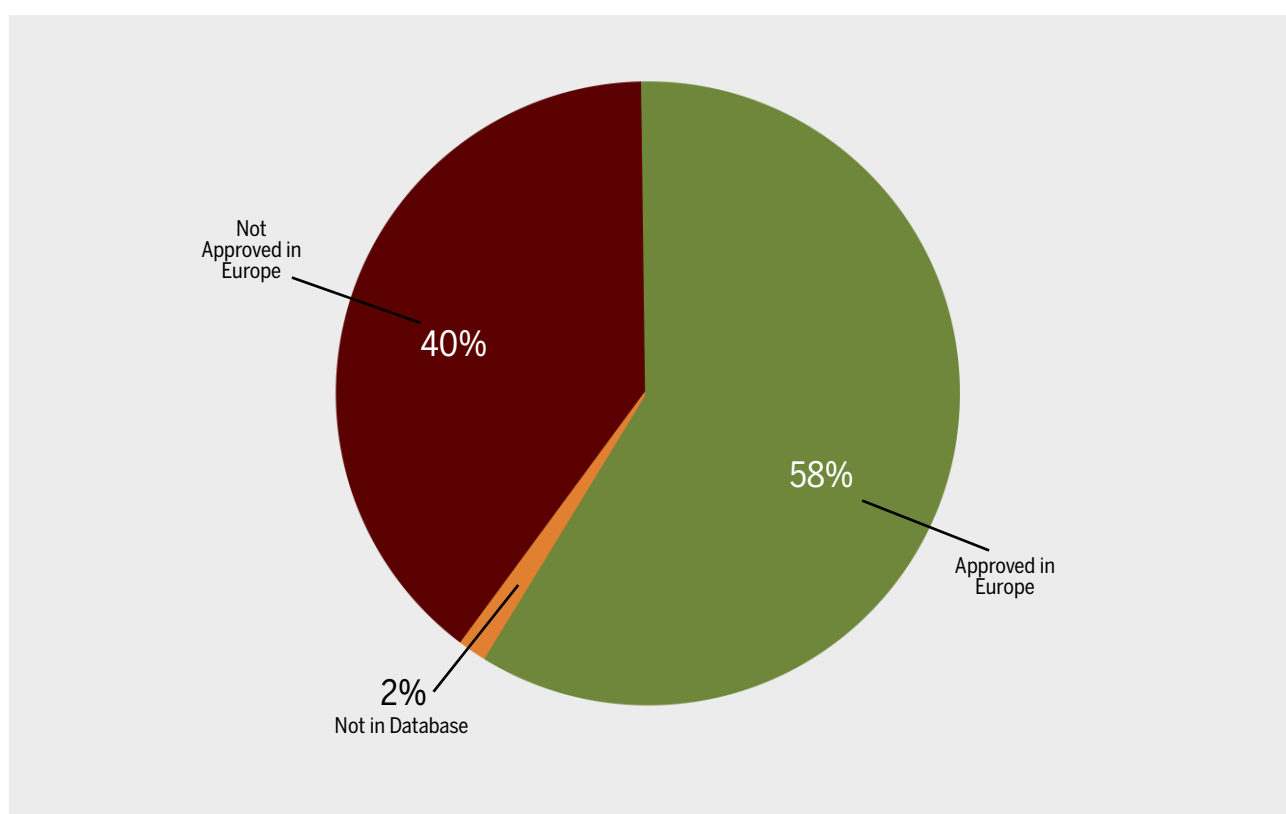


Figure 6. Products registered in Nigeria and not approved in Europe. Based on data from the EU Pesticide Database.<sup>33</sup>

# Legislation and Registration of Pesticides

## International legislation

International codes, treaties, conventions, commissions and advisory bodies play an important role in plant protection and pesticide management. Through the ratification of international conventions, governments accept obligations that should be incorporated into national policies.

However, the overall global governance of pesticides remains weak and inadequate. It relies mainly on the World Health Organization's 2014 International Code of Conduct on Pesticide Management, which is only a guideline. Another non-binding instrument is the Strategic Approach for International Chemical Management (SAICM), which was created during the first International Conference on Chemicals Management in 2006. While its proposed Global Plan of Action included "promoting alternatives to reduce and phase out highly toxic pesticides", SAICM has failed to develop any concrete programme or action in this regard.<sup>34</sup>

The only binding international conventions dealing with pesticides are very specific and do not provide a comprehensive approach to all pesticides. The Stockholm Convention on Persistent Organic Pollutants aims to eliminate the production and use of certain pesticides defined as persistent organic pollutants (POPs), but only a handful of currently used pesticides are eligible for listing and it is a very long process to put additional pesticides on the list. Nigeria ratified the Stockholm Convention in 2004 and the Ministry of Environment submitted a national implementing plan for POPs management to the Secretariat of SAICM in 2009, which was updated in 2017.

The other important instrument is the Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade. However, as its name suggests, it does not ban the production, use or trade in hazardous pesticides. Instead, it establishes a "prior informed consent" procedure that allows countries to control the import of listed substances. The vast majority of pesticides currently in use are not covered by this Convention. Nigeria ratified the Rotterdam Convention in 2001 and it entered into force in 2004. Carbofuran is the only pesticide still in use in Nigeria that is on the Convention's list of banned or restricted chemicals.<sup>35</sup>

The Basel Convention is an international treaty that was designed to ensure environmentally sound management of hazardous waste, including pesticides. It intends to reduce the movement of hazardous waste between nations and to minimize the amount and toxicity of wastes generated. Nigeria ratified the Basel Convention in 1991 and it entered into force in 1992.

In 2006, the FAO Council recommended a progressive ban on highly hazardous pesticides (HHPs). In 2016, it published a set of specific guidelines for regulators to deal with them. The first mitigation option recommended to governments is to end their use, which is also supported by the International Labour Organization's 2010 Code of Conduct on Safety and Health in Agriculture. The second mitigation option is to select products with the lowest risks to human health and the environment. Ensuring the proper use of pesticides – for example, through training farmers –

is only the third option. In response, the Pesticide Action Network published a list of HHPs adapted to the FAO criteria in 2016. In Nigeria, 53 active ingredients (38% of all active ingredients) that are classified as highly hazardous are still registered.

## Pesticide registration in Europe

Pesticide registration in the EU, which is governed by Regulation (EC) 1107/2009, is a slow and complicated process.

The authorisation procedure for a new pesticide active substance starts when the applicant – the company that has a commercial interest in placing the substance on the market – submits a dossier with the required data (sometimes up to 100,000 pages, as in the case of glyphosate) initially to a Member State of its choice (called the Rapporteur Member State or RMS) and to the European Commission.

The risk assessment for a new active ingredient is quite comprehensive and requires many studies, including mammalian toxicity, ecotoxicity, metabolism, and production of potentially toxic metabolites, as well as models to predict the compound's environmental concentrations and an estimate of a safe level of exposure for workers, consumers, and others. The set of studies must include studies of the RMS, which then provides an assessment.

However, there are still gaps and demands for improvement.<sup>36</sup> For example:

- Pesticides are only approved for use at the EU level after the producer has demonstrated that they are “safe” for humans and the environment under realistic conditions of use. However, these demonstrations are based largely on predictions and modelling tools. Safety is therefore not demonstrated but merely presumed.
- Decisions to authorise the use of pesticides are based mainly on a risk assessment of the active ingredient(s) and not on the whole pesticide product, although the product is used in pest management. Once the active substance is approved, the applicant may register its product(s) in the EU countries of interest.
- Pesticide companies and their contracted laboratories – instead of independent research institutions – produce most of the data in the dossiers. The complete dossier with all results remains unpublished.

## Pesticide registration in Nigeria

The National Agency for Food and Drug Administration and Control Act, 1993 (No. 15 of 1993) establishes NAFDAC, under the Federal Ministry of Health and overseen by its Governing Council, as the registration body and sets out its functions in relation to chemicals. The registration process has four requirements: i) the pesticide has to be manufactured or formulated in NAFDAC-approved establishments; ii) the application must be completed using an application form obtained from NAFDAC; iii) the application must be accompanied by the correct fee; iv) a sample of the pesticide must be provided.

The registration process involves the risk-based evaluation of comprehensive data. However, it is unclear if only the data that are submitted by the industry are considered or if additional data are requested from local independent research institutions if, for example, effects under local conditions are unclear. Information required in the application includes: certificate of analysis, certificate of manufacture, specimen label, name of the formulation, composition, environmental effects/fate, degradation, metabolism in plants and animals, toxicological data, teratogenicity and mutagenicity studies, residue levels for intended use, efficacy data from trials in Nigeria, method of application of dose, directions for use, disposal of containers, and precautions including first aid and a note to a physician.

No information is available on how NAFDAC makes its registration decisions or the types of final decisions the registration body can make. There are no special requirements for highly hazardous pesticides and no locally adapted risk-assessment procedures are defined.

In 2008, Nigeria signed the regional regulation on Harmonisation of the Rules Governing Pesticides Registration in the Economic Community of West African States. This would centralize and facilitate the registration process for West African countries. Countries could share resources to ensure a proper locally adopted risk-assessment of chemicals prior to their entry into West Africa. However, to date, these have not been incorporated into national legislation.

NAFDAC's additional mandate is to ensure food safety within the country and to monitor the risk assessment of chemicals. However, various other agencies are also involved in the regulation of pesticides:

- Nigeria Agricultural Quarantine Services (NAQS), under the Federal Ministry of Agriculture and Rural Development, is responsible for residue-monitoring for export certification and for pest-monitoring
- Standards Organization of Nigeria, under the Federal Ministry of Industry, Trade and Investment, is responsible for developing and enforcing standards and for the set-up of laboratories for pesticide analysis
- National Environmental Standards and Regulations Enforcement Agency (NESREA), under the Federal Ministry of Environment, is in charge of the enforcement of regulations
- Department of Food and Drugs Services, under the Federal Ministry of Health, is responsible for developing policies, guidelines and programmes to ensure food safety for Nigeria.

Interaction and collaboration between all these agencies is essential to ensure a functioning pesticide registration, regulation and enforcement system. However, every agency seems to work in a silo with little communication between role-players. A National Pesticide Policy, led by NAQS, is the first attempt to combine all responsibilities, policies and guidelines. Although this was announced in March 2019, no further progress has yet been published.

## Biopesticides

There is currently no legislation which provides distinct registration pathways for biopesticides/ biological control agents. NAFDAC has published the following draft regulations, which to date have not come into force: Biopesticides Registration Regulation 2019 (Draft); Biopesticide Labelling Regulation 2019 (Draft); and Biopesticide Advert Regulation 2019 (Draft).

## Highly hazardous pesticides

The registration of hazardous chemicals and pesticides (or restricted pesticides) is carried out by NESREA through the National Environmental (Hazardous Chemicals and Pesticides) Regulation 2014. While the definition of hazardous chemicals and pesticides in this legislation is quite loose and could refer to any pesticide, it is assumed that this Act deals specifically with restricted chemical and pesticides under the Prior Informed Consent (Rotterdam) Convention and the Persistent Organic Pollutant (Stockholm) Convention. Again, for the functional management of these dangerous pesticides, the other agencies must be informed about processes and involved in enforcement strategies.

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There are no special requirements for highly hazardous pesticides and no locally adapted risk-assessment procedures are defined.



# Strategies and Policies Influencing Pesticide Use in Nigeria

Nigeria has various policies and strategies aimed to intensify conventional crop production with higher productivity in order to promote food security and economic growth. The issue of food safety is very neglected, and alternative agricultural techniques – which are important to ensure a sustainable agricultural sector in the long term – are hardly mentioned.

Section 4.1.5.2 of the Agriculture Promotion Policy (2016–2020) refers to agricultural pests and diseases. It recognizes the possible effects of pesticides on human health but not the effects on the environment when soil and water are contaminated. Its pest management strategy seems to promote the safe use of pesticides rather than using fewer pesticides. However, there is a brief mention of integrated pest management programmes and the use of organic control strategies.<sup>37</sup>

In section 5.3 of the Economic Recovery and Growth Plan (2017–2020), the Ministry of Budget and National Planning recognizes land degradation and pollution as pressing environmental concerns in Nigeria. The plan promotes the sustainable management of natural resources and addressing severe land degradation and desertification. However, its Agriculture Programme does not mention any sustainable agricultural techniques. Instead, it facilitates access to inputs like pesticides and fertilizers.

The Nigerian government liberalized agricultural inputs distribution in 2018 and established the Growth Enhancement Support Scheme to deliver subsidy inputs to farmers as part of its Agricultural Transformation Agenda. This scheme clearly promotes high-input agriculture that depends on pesticide use. The government even implemented a pesticide distribution system using electronic voucher alerts (e-wallet) that enable farmers to purchase a limited quantity of subsidized inputs directly from a government-approved dealer in their communities. The dealer in turn collects the corresponding subsidy. This was criticised for providing easy access to pesticides but no advice on pest management in general or the proper application of pesticides.<sup>38</sup> As a result, misuse has led to health hazards and the deterioration of soil fertility.

Also worrying is the fact that many of the pesticides distributed to the farmers are, as discussed above, highly toxic. Possible effects on environmental and human health can be exacerbated if farmers do not know about safe and sustainable application techniques and correct dosages; if they do not have or use PPE; and if there are no mitigation measures in place. It is also unclear how the pesticide distribution is taking place under the scheme and if there are still subsidy programmes for pesticides in place.

The Nigeria Economic Sustainability Plan as a response to Covid-19 aims to support smallholder farmers, directly or through outgrower schemes, with services and inputs including land-clearing, ploughing, seeds, saplings, fertilisers, pesticides and extension services. Farmers will also be linked to low-interest input financing. It again emphasizes support for inputs for crop production based on conventional agriculture. The plan also reduces all fees for product registration by NAFDAC, although it is unclear if pesticides are included.

The First Draft of the Integrated Pest Management Plan of the Nigeria Staple Crop Processing Zone was prepared in 2016, supported by the World Bank. Although the possible negative impacts of pesticides are acknowledged, the overall aim of the plan is not clear. There is no statement that the plan should lead to a decreased use of toxic pesticide. Its emphasis on their safe use should not be the main focus of a truly integrated pest management (IPM) strategy. It encourages the use of resistant seeds, which are already allowed and implemented in Nigeria, as e.g. herbicide-resistant seeds, which have actually led to increased use of herbicides.

Only the first draft of this plan is publicly available and no further developments have been reported so far. If it receives attention again, much more emphasis should be put on the actual control of pests with mechanical, cultural and biological strategies. The use of synthetic chemicals should only be used if all others have failed. Extension services, policies and strategies should be directed towards a four-step approach that begins with good agricultural practice and moves through cultural/mechanical strategy to biocontrol strategy/use of biopesticides and finally to the use of synthetic chemicals.

The Nigeria Agricultural Quarantine Services announced the National Pesticide Policy in 2019. This has the potential to enable the different agencies involved in the regulation and registration of pesticides to collaborate for the reduced use of toxic pesticides and the effective development of alternatives to be used within an IPM plan. So far, no further information on this policy has been released.

## Sustainable Agriculture in Nigeria

Conventional agriculture may not be able to meet the demand of the growing population. Soil quality will further decrease along with biodiversity (especially pollinators) and water quality, which will reduce the productivity of the land. Furthermore, food safety standards can only be met if the use of pesticides is decreased, which calls for different pest-control strategies.

There is currently no policy in place to promote research on non-chemical control measures and alternatives to existing pesticides. The need to strengthen the capacity of research institutes in Nigeria is mentioned in Section 4.3.5 of the Agriculture Promotion Policy, which promotes the future use of IPM to reduce pesticide use. The lack of legislation to provide distinct registration pathways for biopesticides/biological control agents hinders the implementation of alternative agriculture even more.



Food safety standards can only be met if the use of pesticides is decreased, which calls for different pest-control strategies.

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It is not surprising that sustainable agricultural techniques like organic farming or agroecology are not appearing in Nigeria yet. The national agricultural budget for 2021 allocated 60% of the total capital budget to research and development but only 1.3% to sustainable agricultural techniques. With no top-down policies on these strategies, movements for sustainable agriculture are mostly driven from below by NGOs and farmers.

## Organic farming

Organic farming is understood as a method of crop and livestock production that does not use pesticides, fertilizers, genetically modified organisms, antibiotics and growth hormones. But it is much more than that: it is the process of using environmentally friendly farming methods to improve soil health, to protect the environment, and to support human health. Organic farmers use traditional and modern farming methods and combine them with research to ensure a balance in nature's ecosystems. Various farmers' associations and organizations in Nigeria are working to promote and implement organic farming, such as the Ecological Organic Agriculture Initiative, which regularly hosts the National Organic Agriculture Business Summit. The potential benefits driving the transition to organic farming are mostly better opportunities for export markets. The local market is not aware of the benefits of organic food yet, as it is the case in other African countries. In Kenya, for example, there is a strong demand for organic products.

## Agroecology

The FAO has recognized the need for a worldwide transition to food systems that are more sustainable, which means systems that produce more food with more socio-economic benefits and less harmful environmental consequences. It is therefore guiding countries to transform their food and agricultural systems towards agroecology.<sup>39</sup>

Agroecology refers to the “ecology of the food system”, with a farming approach that is inspired by natural ecosystems. It combines local and scientific knowledge and applies ecological and social approaches to agricultural systems, focusing on the interactions between plants, animals, humans and the environment. This means farming that not only produces food, jobs and economic well-being but also creates cultural, social and environmental benefits. Agroecology protects and provides ecosystem services like pollination, natural pest control, nutrient and water cycling, and erosion control.<sup>40</sup>

The Alliance for Agroecology in West Africa (3AO) is a coordination and information platform composed of farmers' organizations, research institutes/universities, international NGOs and social movements that was created 2018 and includes Nigerian entities. It promotes and supports an agroecological transition in West Africa to ensure resilient, sustainable livelihoods adapted to local agricultural challenges.

# Gaps and Challenges

## Data availability

Neither the FAO nor the WHO provides information on the sale and use of pesticides worldwide. The FAO publishes only general statistics about pesticide use and nothing on specific substances. This information is insufficient because of poor and inconsistent country reporting, especially in the case of Nigeria. Countries tend to publish only general figures about pesticide use in their territory while companies retain business information about their share in specific markets as confidential.

### Solution

- Pesticide imports and use need to be strictly monitored, and reliable official information made available. The data should be gathered, stored, and made readily accessible to public entities, with no ties to the pesticide industry.
  - It is important to include pesticide use in the regular Nigerian agricultural census.
  - Before products are newly registered and trade agreements are established, the respective government authorities of exporting countries should share information with importing countries on possible human and environmental effects.
  - The studies by private companies that are used for registration need to be accessible so that they can contribute to the body of public knowledge.
  - Information-sharing between countries concerning incidents with pesticides, regulatory actions taken, and experience with alternatives to highly hazardous pesticides is essential for functioning regional pesticide management.
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## Monitoring and reporting

There is a lack of adequate monitoring and reporting systems for pesticide residues in food and the environment and their impacts on human health and the environment. Moreover, the absence of poison information centres and the limited medical facilities result in failures to diagnose, treat and report pesticide poisoning.

### Solution

- Greater political will and budget allocations along with better collaboration and communication between the relevant agencies can implement effective monitoring strategies for food and water quality.
- Monitoring should also include regular farm inspections to ensure that recommended mitigation measures are implemented. This would entail increased budgets and support for farm extension services.

## Registration of pesticides

Many registered pesticides in Nigeria cause chronic health effects and show very high environmental toxicity. Forty percent of the registered pesticides in Nigeria have been withdrawn from the European market, partly because of the toxicity, persistence or lack of data. Some of these, including carbofuran and diazinon, have been found in high levels in green vegetables.

### Solution

- Highly hazardous pesticides need to be banned or restricted in Nigeria. Restrictions should target users (e.g. requiring certified training); area of use (e.g. distance from bodies of water); time of use (e.g. limited to evening); type of use (e.g. limited to seed dressing or as stem injection); or type of crop (e.g. specifying crop/pest combinations under strictly controlled circumstances).
  - Place emphasis on finding alternatives for pest management.
  - Taxes or import tariffs for highly hazardous pesticides makes the use of less expensive and less toxic pesticides more attractive to farmers, commercial distributors and importers.
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## Local standards

The risk-based evaluation of pesticides is not adapted to Nigerian conditions. Pesticides are registered without adapting international test results to local conditions, such as species, climate and diet. For example, the EU's maximum residue levels are calculated according to the usual diet of Europeans, but the Nigerian diet includes much more maize, sorghum and beans, which would indicate lower MRLs.

### Solution

- MRLs should be calculated and adapted according to the Nigerian diet.
- Additional toxicity tests should be performed with local species (fish, bees, etc.) if needed.

These tests should be paid for by the pesticide industry.

- Regulators' capacity and knowledge should be improved. The FAO Pesticide Registration Toolkit<sup>41</sup> provides practical guidance on conducting risk assessments for pesticide registration or review of existing registrations.
- Support and budget for more robust and independent basic research on the impacts of pesticides, particularly with regards to the long-term effect of pesticide formulations and their metabolites, and the synergistic effects of multiple residues on human health and ecosystems in Nigeria.

## Registration decisions

No information is available on how the registration body makes its decisions and what data were evaluated from already existing dossiers. Decisions are made with a great amount of uncertainty with regards to unknown effects and risks towards local species and under local conditions.

### Solution

- The registration process should be transparent and based on the precautionary principle of doing no harm, instead of the myth of “safe use”.
  - The registration body should collaborate with research institutions to fill identified knowledge gaps on the possible effects of certain pesticides.
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## Integrated pest management

An effective IPM system has not been secured in Nigeria, as the involved authorities are fragmented, directed by different ministries, and do not seem to collaborate.

### Solution

- A central government authority for IPM can be set up to be responsible for the setting of national standards, including MRLs; the enforcement of pesticide regulations; monitoring pesticide residues; and the development of alternatives.
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## Legislation

International regulations and conventions are too weak and powerless to enforce action. Unequal standards allow the pesticide industry to export highly hazardous products to countries with weaker regulations. Additionally, there is a lack of national legislation that would ensure effective pesticide management. For example, there is no legislation in Nigeria that prescribes the use of PPE for the application of pesticides and no legislation with any provision to regulate and/or monitor pesticide residues in food.

### Solution

- Corporations should be held accountable for the negative impacts of the distribution of highly hazardous pesticides products.
- Particular attention must be drawn to the responsibility of relevant governments to prohibit the export of these products, especially if they are already withdrawn in the country of origin.
- Public health policies should address pesticide residues in food and drinking water.
- Environmental policies on water quality, nature conservation and biodiversity can also influence the availability and use of pesticides.

## Strategies, plans and policies

Despite various policy interventions, the agriculture sector is still unable to meet domestic food requirements or the relevant standards for export. One contributing factor could be that all policies are directed towards “business as usual”, focusing on a high-input industrial agricultural model that is largely becoming unsustainable due to high input costs, decreased soil fertility, declining biodiversity, etc.

### Solution

- Embed a clear goal to reduce reliance on pesticides in the relevant policies. Determine to what extent current levels of pesticide use are actually needed and eliminate unjustified use. Make optimal use of non-chemical pest management practices in the context of a sustainable intensification of crop production and integrated vector management.
  - Policy support should be directed to the design of a sustainable food system that includes the whole value chain instead of focusing only on production.
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## Promotion of alternatives

No policies are in place to promote research, funding and/or implementation of organic farming, agroecology or any other sustainable agricultural strategy. The first draft of the Integrated Pest Management Plan focuses on the “safe use” of pesticides and lacks clear advice on alternative scientifically sound pest-control strategies.

### Solution

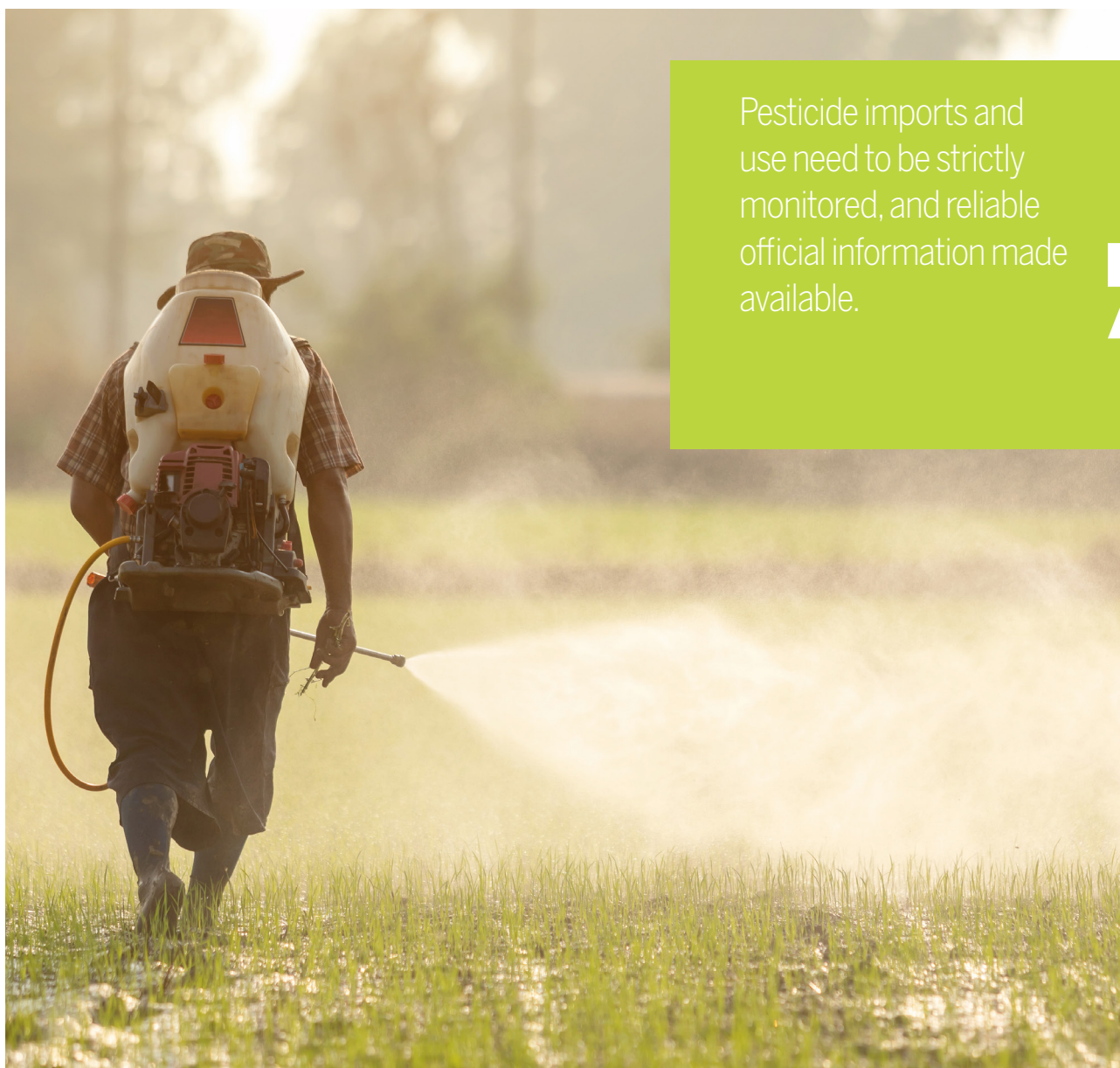
- Develop crop- and pest-specific biological pest-control mechanisms and make them easily accessible to all farmers.
- Implement regulations for the registration of biopesticides and biocontrol products. The use of biopesticides and biocontrol strategies in IPM is essential to ensure more sustainable pest control with less use of chemical pesticides.
- If the use of chemical pesticides is necessary, select products with the lowest risk to human health and the environment. Consider using financial incentives (e.g. subsidy or taxation instruments) to favour low-risk pesticides.
- Agroecological farming prevents pesticide exposure, enhances biodiversity, helps to improve air, soil, and water quality, and mitigates climate change. Redesign or adjust farming systems using the available knowledge on agroecology. Invest in training, communication and further research and monitoring of their effectiveness.

## Awareness and protection

Farmers and pest-control operators are often unaware of the long-term chronic effects of pesticides on human health and the environment, and there is also a lack of knowledge about less hazardous alternatives. The training that is offered in the safe use of pesticides is not solving this. Consumers are also not informed about pesticide residues in food and the dangers of being chronically exposed to pesticides.

### Solution

- Extension officers require better training, and more funding is needed for extension services, community radio programmes to promote sustainable agricultural techniques, etc.
- Various media and other organisations can be used to create awareness among consumers.



Pesticide imports and use need to be strictly monitored, and reliable official information made available.

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# Conclusion

Agriculture in Nigeria faces many challenges, including the loss of soil fertility, conflicts around land use and access to the means of production, pressure on natural resources and climate change. This has left the country unable to meet the demands of the domestic and export market. Yet national strategies continue to promote a conventional model of industrial agricultural that particularly promotes pesticide use.

This model fails to address national and regional dependencies on food imports, adaptation to climate change, sustainable use of natural resources, and access to safe, nutritious and balanced diets. With this in mind, the registration of pesticides, their sustainable management, and the promotion of alternatives is clearly lagging. The forthcoming National Pesticide Policy should fill these gaps to ensure a protective, scientifically sound and locally adapted registration of pesticides and a functioning management system that merges the federal agencies now responsible for different sections.

Although industrial agriculture remains the dominant model for food and farming systems around the world, it is increasingly being questioned, notably in West Africa, with calls for an agroecological transition. Agroecology presents a holistic response to the majority of agricultural challenges in West Africa and will contribute to realizing people's right to food by providing a new basis for the development of healthy and sustainable food systems.



Agroecology will contribute to realizing people's right to food by providing a new basis for the development of healthy and sustainable food systems.



# Notes

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■■■ HEINRICH  
BÖLL  
STIFTUNG

Heinrich Böll Foundation, 93 Obafemi Awolowo Way, Jabi District, Abuja.  
T +234-809-2960-591 E [info@ng.boell.org](mailto:info@ng.boell.org) W [www.ng.boell.org](http://www.ng.boell.org)