ROUTE TO FOOD

Pesticides in Kenya:
Why our health, environment and food security are at stake

October 2019

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Introduction

Agriculture accounts for about 24% of Kenya's GDP with an estimated 70% of the rural population working in the sector either directly or indirectly. As an agricultural economy and while promoting mainly conventional agriculture, Kenya's demand for pesticides is relatively high and steadily increasing (Fig. 1). In 2018 Kenya imported 17,803 tonnes valued at 128 Mill $. These pesticides are an assortment of insecticides, fungicides, herbicides, fumigants, rodenticides, growth regulators, defoliators, proteins, surfactants and wetting agents. Of the total pesticide imports, insecticides, fungicides and herbicides account for about 87% in terms of volume and 88% of the total cost of pesticide imports

It's remarkable that the volume of imported insecticides, herbicides and fungicides has more than doubled within four years from 6,400 tonnes in 2015 to 15,600 tonnes in 2018, with a growth rate of 144% (Fig. 2) (AAK, 2018).

FIGURE 1 Monetary value of imported herbicides, insecticides and fungicides from 2015 to 2018.

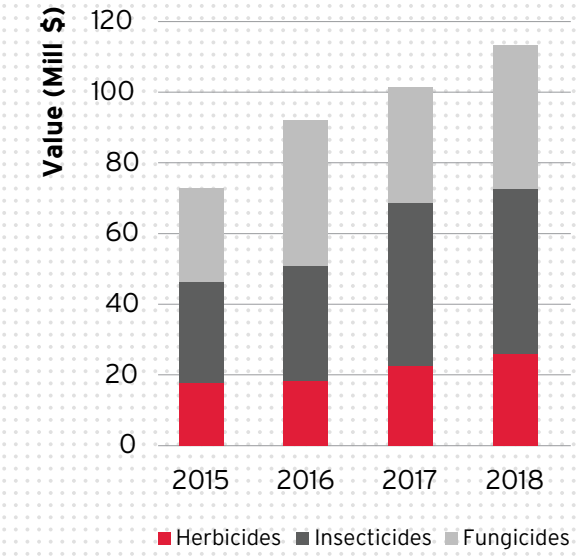
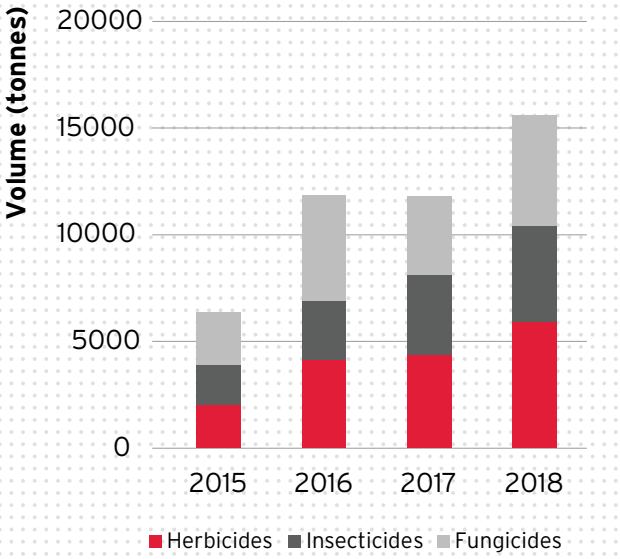


FIGURE 2 Volume of herbicides, insecticides and fungicides imported from 2015 to 2018.



The increase in pesticide use requires necessary safe guards to control how they are applied, which will be challenging to fulfil in Kenya as is shown in this paper.

In Kenya there are no data available concerning the use of pesticides or the concentrations of pesticides in water, soil and food and the related impacts. Most of the research focuses on the persistent organic pollutants, such as DDT, lindane and endosulfan, which are rarely used anymore (Abong'o *et al.*, 2018). On an irregular basis, Kenyan Plant Health Inspectorate Service (KEPHIS) takes food samples, initiated and funded by the EU (EC, 2013), but the actual levels of pesticides are not made available to the public. Additionally, no regular monitoring system is in place. Epidemiological health studies related to pesticide exposure in Kenya, do not exist. This means it is not definitively known if we are facing an impact of pesticides on our environment and our health.

NEED TO KNOW

Kenyan consumers and farmers are not aware about the extent of pesticide use, their concentrations in food and environment and their possible effects on the environment and ecosystem services.

Due to the high toxicity towards human health and the environment and due to their persistence (length of time in the environment), many of these pesticides are banned or heavily restricted in Europe. Despite European restrictions and interventions to use less hazardous products, some of the withdrawn pesticides are still in use in Kenya, and continue to threaten the environment and the health of Kenyan citizens.

NEED TO KNOW

This paper sheds light on the amount and type of active ingredients and related harmful products used in Kenya, as well as Europe's and other countries' contribution to the situation.

The paper discusses potential impacts on environment and human health and the shortcomings in international and national legislation, which enable the current use of restricted pesticides in Kenya. To conclude, different solutions are suggested to introduce the first steps towards a better pesticide management approach and towards a more sustainable and regenerative agriculture.

Hazards of pesticide use

The heavy use of pesticides in industrial and domestic settings, has resulted in negative health, environmental and economic consequences worldwide (Ashburner and Friedrich, 2001). Pesticides are widely distributed in the environment (like air, soil, water and plants) and as a result, water and soil quality are decreasing and there is an increase in chronic health effects that are suggested to be related to pesticide exposure. Very often not only one pesticide is present, but mixtures of different pesticides at the same time. For example, in Swedish surface water there are 3 to 33, different pesticides in one water sample (Adielsson *et al.*, 2019). The total cumulative effect of these mixtures on biodiversity, food production and our health is still unknown.

Many pesticides are either acutely toxic, have long-term toxic effects, are endocrine disrupters (acting on the hormone system), are toxic to different wildlife species or are known to cause a high incidence of severe or irreversible adverse effects.

Health hazard

Based on World Health Organization (WHO) data, the Global Alliance on Health and Pollution indicated in their annual report that 9 million deaths worldwide are related to environmental pollution (GAHP, 2015). WHO warned in several reports, that chronic, non-communicable diseases are a major challenge, making up 86% of the total burden of disease in the WHO European region. Non-communicable diseases include diabetes, Alzheimer's, cancer, osteoporosis, chronic lung disease, stroke, and heart disease. While WHO does not provide any figures on the respective share of pesticides to environmental pollution, experts consider them as one of the principal environmental risk factors for chronic diseases.

9 million

deaths worldwide are related to environmental pollution

(GAHP, 2015)

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. No one remains untouched by pesticide exposure. Long-term exposure to pesticides can also result in chronic health effects. Accurately estimating the number of such cases is even more challenging as symptoms may develop only years after exposure, diseases are often multi-causal, and people tend to be exposed to multiple harmful substances throughout their lifetime. A few studies in Kenya established a link between pesticide exposure and acute and chronic health effects (e.g. Tsimbiri *et al.*, 2015; Ohayo-Mitako *et al.*, 2000).

In terms of chronic health effects, pesticides can be classified as causing carcinogenicity, mutagenicity / genotoxicity, reproductive toxicity and neurotoxicity (UN, 2017). Additionally, many pesticides are classified as endocrine disrupters, meaning they interact with the hormone system, causing adverse effects such as increase or decrease in the activity of male or female hormones. This is not surprising since most pesticides are deliberately designed to act on the hormone system of plants and insects and accordingly their toxicity derives from the resulting change in hormones activities.

Environmental hazard

While regulators are mostly concerned about health risks through pesticide residues, their effect on non-target organisms are hugely underestimated, especially in African registration procedures.

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

Evidence of these effects worldwide are numerous: Acute bird poisoning with carbofuran (Munir *et al.*, 2011), endocrine disrupting effects of atrazine in amphibians (Hayes *et al.*, 2010), population change of macroinvertebrates (insect larvae) in agricultural streams (Bollmohr & Schulz, 2000) and decrease in bee populations due to neonicotinoids (Dively *et al.*, 2015) are just a few examples. The impact of neonicotinoids on pollinators places special emphasis on the possible effect of pesticides on ecosystem services and in turn on sustainable food production.

Neonicotinoids, a commonly used class of systemic insecticides, cause soil degradation and water pollution and endanger vital ecosystem services such as biological pest control. Designed to damage the central nervous system of target pests, they can also cause harm to beneficial invertebrates as well as to birds, butterflies and other wildlife. For example, heavy use of these insecticides has been blamed for the 50% decline over 25 years in honeybee populations in the United States and the United Kingdom. This decline threatens the very basis of agriculture, given that wild bees and managed honeybees play the greatest role in pollinating crops. According to estimates from the Food and Agriculture Organization of the United Nations (FAO), of some 100 crop species (which provide 90% of global food), 71% are pollinated by bees. The European Union (EU), unlike the United States, restricted the use of certain neonicotinoids in 2013.

Toxicity of active ingredient vs toxicity of products

The product (e.g. Roundup) that one can buy is actually a pesticide formulation that contains a number of different materials, including active and inert ingredients, as well as possible contaminants and impurities.

Active ingredients are the chemicals in a pesticide product that act to control the pests (in Roundup it is glyphosate). They must be identified by name on the pesticide product's label together with its percentage by weight.

NEED TO KNOW

If a new pesticide is registered in Europe, it is first the active ingredient not the product, which is tested and registered.

However, the product mostly contains the ***inert ingredient***, which often constitutes over 95% of the pesticide product. Inert ingredients are mixed into pesticides products as a carrier or sticking agent, and are often as toxic as the active ingredient and sometimes even more toxic. For example, the inert ingredient called POEA in Roundup, which is not allowed in various European countries. Pesticide manufacturers are only required to list the active ingredients in a pesticide, leaving consumers and applicators unaware of the possible toxics present in the inert ingredients of pesticide products they are using. Pesticide manufacturers argue they cannot release information on inert ingredients because they are trade secrets, and if released, their products could be duplicated.

In addition, pesticides, when subject to various environmental conditions, break down to other materials known as metabolites, which are sometimes more toxic than the parent material.

Pesticide use in Kenya

The Pest Control Products Board (PCPB) is a statutory organization of the Government of Kenya established under the Pest Control Products Act of 1982 to regulate the importation and exportation, manufacture, distribution and use of pest control products in the country.

Through the PCPB, 230 active ingredients are registered in 862 products for horticultural use. Active ingredients registered for flower production and forest management, as well as substances used for biological control are excluded from this analysis.

There are more products than active ingredients since one active ingredient can be in different formulations registered by different companies in different products. The active ingredient glyphosate (as isopropylamine salt) for example, is registered in 39 products by 22 companies, followed by imidacloprid being registered in 42 products registered by 19 companies.

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, vary greatly.

For each active ingredient and product registered in Kenya, we looked up the different toxicity data in the Pesticide Properties Database (PPDB) (FOOTPRINT, 2006), which provides toxicity information on all active ingredients worldwide (Table 1). The tabulation is shown in Figure 3.

Table 1. Categories of toxicity according to PPDB

Wildlife toxicity (bees, fish) [↔g/L]		Chronic human health	
Very toxic	< 0.1	Yes	Carcinogenicity Mutagenicity Reproduction toxicity Neurotoxicity Endocrine disruption
Toxic	0.1-1.0	Possible	
Moderately toxic	1.0 -10	No	
Low toxic	10-100	No data	
Not toxic	>100		

Thereafter, for each active ingredient registered in Kenya (database available on the PCPB website), we looked up the registration status in Europe in the EU Pesticide Database. The tabulation is shown in Table 2.

Registered products in Kenya and human health

NEED TO KNOW

It is concerning that there are products on the Kenyan market, which are certainly classified as carcinogenic (45 products), mutagenic (31), endocrine disrupter (51), neurotoxic (175) and many which show clear effects on reproduction (360) (Fig. 3).

Additionally, many products show "possible" effects on carcinogenicity, mutagenicity, reproduction toxicity, neurotoxicity and endocrine disruption. Some active ingredients in products are not found in the European database, meaning that they have never been registered in Europe. However, some data on their toxicity are available in the scientific literature, for example cuprous oxide (de Oliveira-Filho *et al.*, 2004). A minority of the products show no chronic effects, especially concerning endocrine disruption and reproduction toxicity.

FIGURE 3 Number of products showing the probability of chronic health effects according to the classification in Table 1. The data are based on the Pesticide Properties Database (FOOTPRINT, 2006).

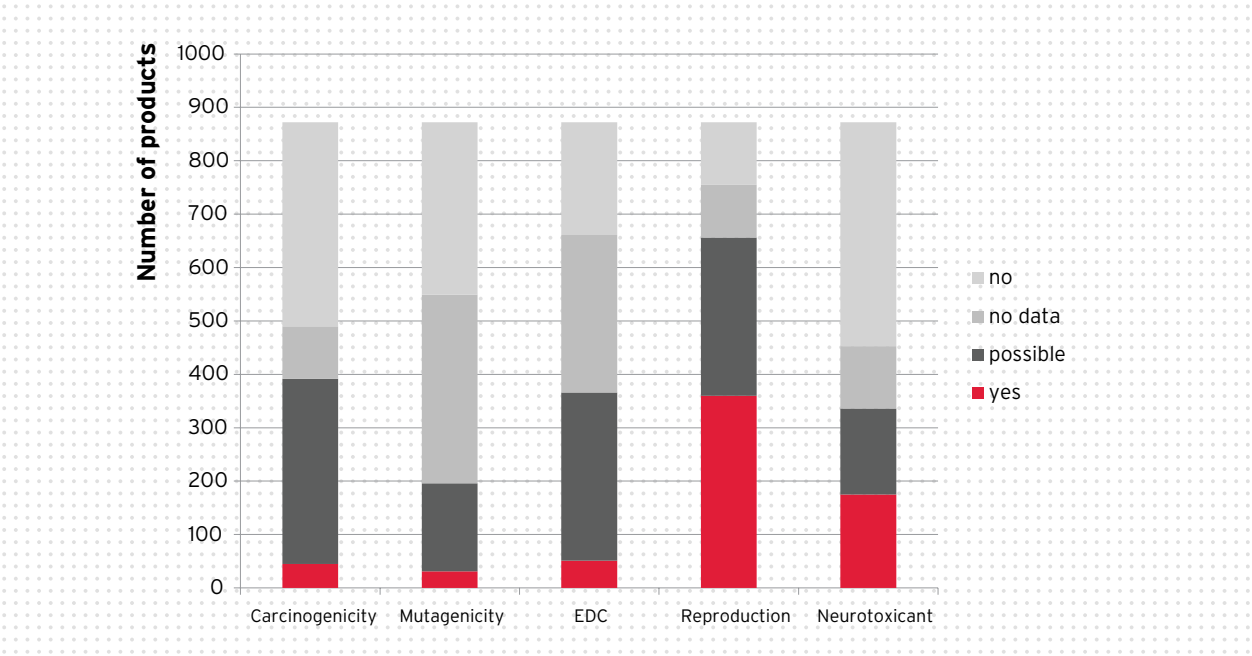


Table 2 reflects the active ingredients of products available in Kenya, which show clearly any of the five chronic health effects. Many of the active ingredients are no longer approved in Europe, for example carbendazim (marked with *) and many of them show more than one chronic effect, for example permethrin (written in bold).

NEED TO KNOW

Of particular concern, are the active ingredients chorothalonil, carbendazim, acephate and permethrin which are not approved in Europe, have more than one chronic health effect and are sold in many products in Kenya.

Although abamectin and chlorpyrifos are approved for use in Europe, they are concerning as they are found in many products in Kenya, 40 and 24 products respectively, and have more than one chronic health effect. Additionally, Mancozeb (contained in 78 products) shows clear effects on development / reproduction toxicity. Kenya should lead on withdrawing these active ingredients from the market.

NEED TO KNOW

The list in Table 2 can serve as a first priority list of active ingredients to be withdrawn from the market in Kenya. In absence of reliable usage data, the recommendation is based on information on pesticides that are registered.

Table 2. Active ingredients showing certain chronic health effects

Carcinogenicity	Mutagenicity	Endocrine disrupter	Development/ reproduction toxicity	Neurotoxicity
Chlorothalonil *(20)	1,3-Dichloropropene*(3)	**Acephate*(8)**	**Abamectin (40)**	**Abamectin (40)**
Clodinafop (3)	**Carbendazim *(17)**	Bifenthrin (10)	**Carbendazim*(17)**	**Acephate*(8)**
Fenchlorazole*(1)	**Dichlorvos*(1)**	Carbaryl*(2)	**Carbofuran*(1)**	**Chlorpyrifos (24)**
Oxyfluorfen (10)	Thiophanate-methyl (7)	**Carbofuran*(1)**	**Chlorothalonil* (20)**	**Dichlorvos*(1)**
Permethrin*(6)	**Trichlorfon*(1)**	**Deltamethrin (13)**	**Chlorpyrifos (24)**	**Deltamethrin (13)**
Pymetrozine*(2)		Fenitrothion*(3)	Dimethoate*(13)	**Gamma-cyhalothrin (1)**
		Flubendiamide (2)	**Gamma-cyhalotrin (1)**	**Glufosinate-ammonium*(1)**
		Flufenoxuron*(1	Glufosinate-ammonium*(1)	**Omethoate*(1)**
		Omethoate*(1	Imidacloprid*(42)	**Oxydemethon-methyl*(2)**
		Permethrin*(6)	Mancozeb (78)	Malathion (17)
		Thiacloprid (1)	**Oxydemeton-methyl*(2)**	**Permethrin*(6)**
			Permethrin*(6)	**Thiacloprid (1)**
			Tebuconazole (29)	**Trichlorfon*(1)**
			Thiacloprid (1)	**2,4-D-Amine (13)**
			2,4 D-Amine (13)	+ 18 other active ingredients
			+27 other active ingredients	
Sum of active ingredients				
6	**5**	**11**	**42**	**32**

Note: Highlighted in bold are the active ingredients showing more than one chronic effect, *not approved in Europe, (number) number of products containing the active ingredient.

Within the National Pesticide Residue Monitoring Programme (NPRMP) undertaken by KEPHIS, 1139 food samples were taken (KEPHIS, 2018; EC 2013). Out of the 1139 samples collected from the field under the NPRMP, 530 (46.53%) had pesticide detections, while 123 (10.80%) had exceedances of set EU maximum residue levels (MRLs). The most detected active ingredients were carbendazim, azoxystrobin, cypermethrin, chlorpyrifos, profenofos, difenoconazole, imidacloprid, tebuconazole and deltamethrin with 81, 80, 63, 50, 37, 35, 33, 31 and 30 detections respectively. Many of these pesticides show at least one of the chronic effects.

With respect to the samples collected, kales, peas and capsicum had the most pesticide residue detections at 94.40%, 75.84% and 59.18%. This means that operators and farmers as well as consumers, are directly exposed to the highly toxic pesticides.

Registered products in Kenya and environmental health

According to the classification shown in Table 1, half (52%) of the products registered in Kenya are toxic or very toxic to fish (toxicity values <1), which might lead to a major threat to fish species, when pesticides enter the river and other water bodies via runoff or spray-drift. Depending on their persistence, they may have a short or long term effect on fish populations.

Thirty-two per cent of all registered products are toxic or very toxic to bees (toxicity values <1), which threatens the survival of bee populations and other pollinators and negatively effects food security as our food and seed production rely on pollination. Additionally, farmers are not aware of the toxicity to bees of many of the products they use and are not aware of the precautions to be taken. For example, not to spray in the morning when pollinators are out and foraging (van der Valk *et al.*, 2014).

NEED TO KNOW

Only limited data are available on the status of Kenyan pollinator populations and their importance for food production.

In terms of potential serious effects on pollinators, abamectin (in 30 products), imidacloprid (in 42 products), cypermethrin (in 35 products), lambda cyhalothrin (in 32 products) and chlorpyrifos (in 24 products) should be substituted by less toxic active ingredients.

32%
of all registered products are toxic or very toxic to bees

Pesticide use restricted in Europe

Figure 4 illustrates that of the 230 active ingredients registered in Kenya, 134 are approved in Europe, 19 are not listed in the European database and 77 have been withdrawn from the European market or are heavily restricted in their use due to potential chronic health effects, environmental persistence, high toxicity towards fish or bees or due to the fact that there is insufficient data to prove no harm towards environment or human health ***(the "Precautionary Principle").***

Precautionary Principle

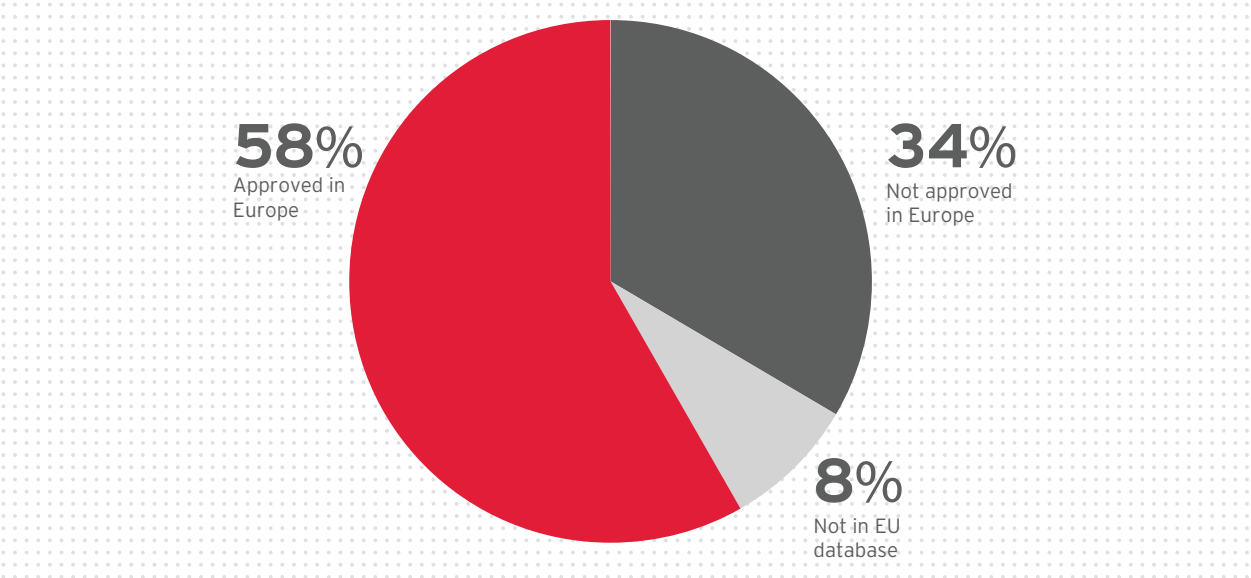
When an activity raises threats of harm to human health or the environment, precautionary measures should be taken even if some cause and effect relationships are not fully established scientifically.

NEED TO KNOW

At least 33% of the active ingredients in the Kenyan market pose a serious potential impact on human and environmental health and are withdrawn from the European market.

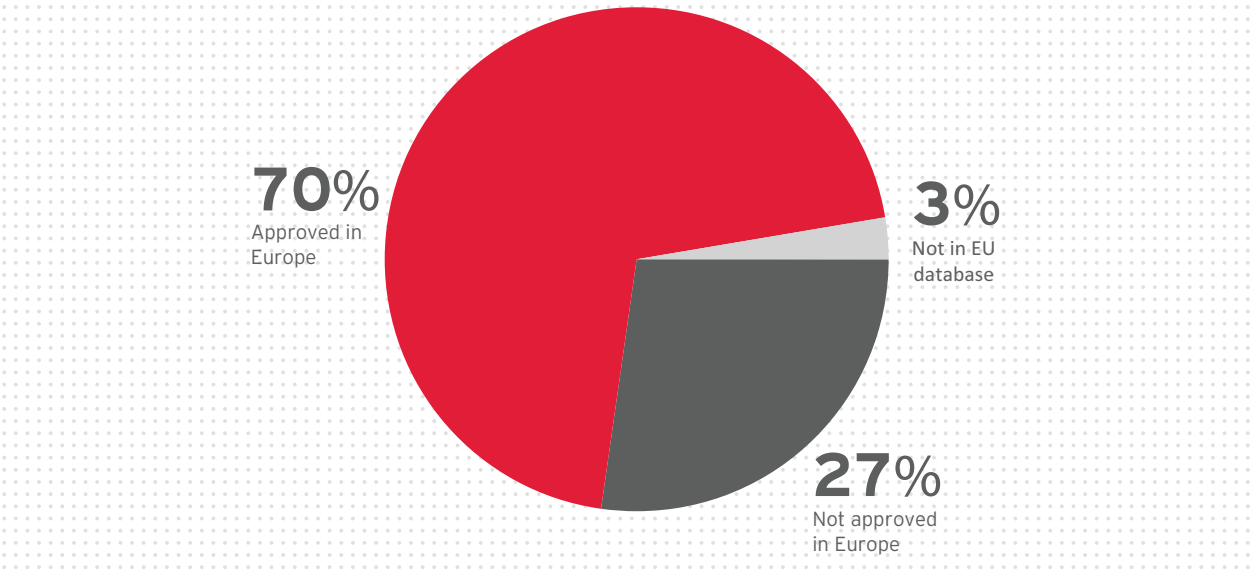
This percentage could increase, keeping in mind that not all approved active ingredients in Europe are harmless to the environment and human health. As shown in Table 2, many active ingredients influence either one or two of the chronic human health conditions or are very toxic to bees and fish, but are still approved in Europe (e.g. abamectin, mancozeb and thiacloprid).

FIGURE 4 Active ingredients registered in Kenya and not approved in Europe.



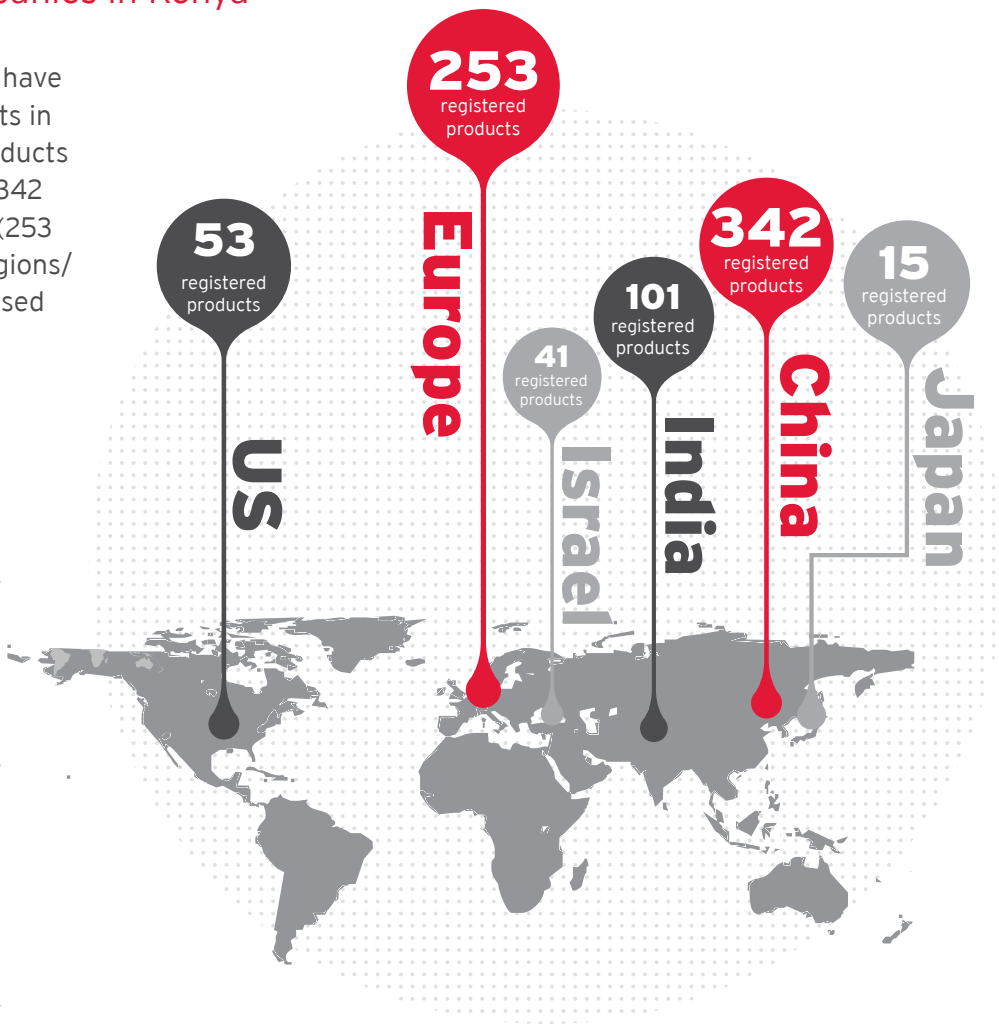
The situation looks similar if one looks at the registered products. There are 235 products (27%) out of 862 registered products that contain active ingredients, which are withdrawn from the European market (Fig. 5). Restricted active ingredients contained in most of the products are for example, carbendazim (in 17 products), dimethoate (in 13 products), fenoxaprop-P-ethyl (in 12 products) and thiamethoxam (in 13 products).

FIGURE 5 Products registered in Kenya and not approved in Europe.



Registering companies in Kenya

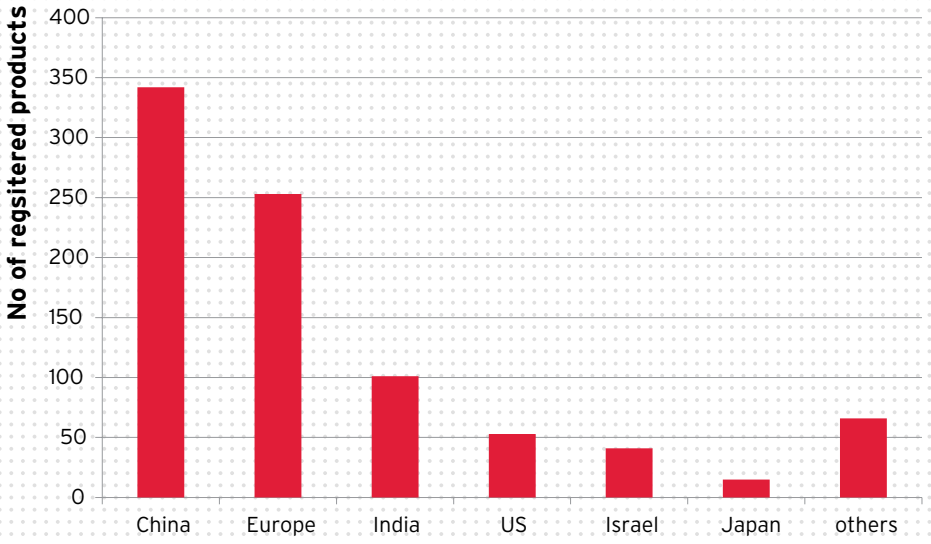
In total, 171 companies have registered 862 products in Kenya. Most of the products originate from China (342 products) and Europe (253 products). All other regions/ countries are summarised under 'others' (Fig. 6).



Although there are 36 different European companies, more than half of the products (57%) are registered by BASF, BAYER AG and Syngenta.

Amongst the 62 Chinese companies, the companies Jiangsu Baoling Chemical, Ningbo Sunjoy Agroscience, Shandong Cynda Chemical and Zhejiang Bosst CropScience, registered 41% of the 342 products.

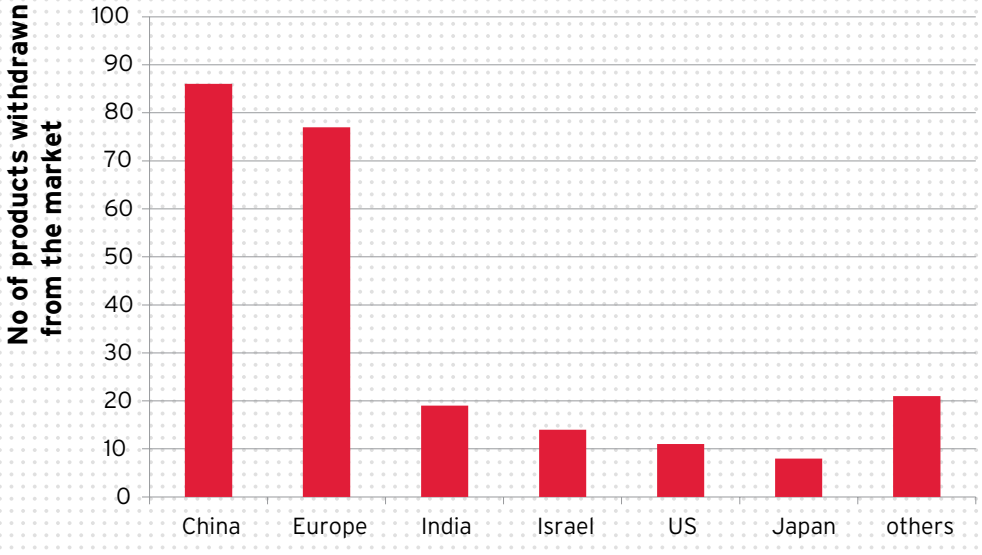
FIGURE 6 Products registered by companies from different regions.



NEED TO KNOW

The products registered in Kenya, that are withdrawn from the European market, are mostly sold by Chinese companies (86 products) closely followed by European companies (77 products) (Fig. 7). This is important and warrants a serious discussion about existing European, Kenyan and international legislation, standards, guidelines and their gaps.

FIGURE 7 Products (not approved in Europe) registered by companies from different regions.



Companies justification

For a pesticide to be withdrawn, it has to be registered under Regulation (EC) 1107/2009 first. Some pesticide companies have not registered or re-registered products, which they knew would have not have been authorized in their own country, but continue to produce and export the same products to developing countries. There are also cases of pesticide manufacturers increasing exports of products that have been banned or restricted in their own countries, possibly in order to profit from existing stocks or to compensate for financial losses in local markets.

Double standard

The EU Regulation EC304/2003 allows their companies to produce and export banned or restricted pesticides for domestic use to other countries – the so called double standard. However, in a recent report to the Human Rights Council (Elver, 2017), the United Nations Special Rapporteurs on Toxic Wastes and the Right to Food stated that to expose other nations to toxins known to cause major health damage or fatality is a clear human rights violation. They called on countries to remove these existing double standards especially with countries with weaker regulatory systems.

The Rotterdam Convention

The Rotterdam Convention is an international treaty that requires exporters based in an EU Member State to indicate their intentions to export certain pesticides to a non-EU country. The goal of the Convention is to alert importing countries to chemicals which have been banned or severely restricted by other governments. This applies to all the chemicals listed in Annex I to the Prior Informed Consent (PIC) Regulation. Companies argue, that importing countries can freely decide if they want to import such chemicals.

Labels and safe use of pesticides training

The industry often argues that their products are safe for use when applied in the right way according to the label. Mostly they refer to their belief that pesticides can be well-managed and reduced to an acceptable level, for example through training programmes promoting so-called ‘safe use’. However, many international organisations such as the Pesticide Action Network, Greenpeace and the European Centre for Constitutional and Human Rights, are calling for highly hazardous pesticides to be phased out, because they do not believe in the old risk management approach anymore and doubt that certain highly hazardous pesticides are ‘manageable’.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Legislation and Regulation

International

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 which should be incorporated into national policies.

However, the overall global governance of pesticides remains weak and inadequate. It relies mainly on the International Code of Conduct on Pesticide Management (FAO and WHO, 2014). The Code of Conduct is a guideline, and therefore is a powerless mechanism on the basis of which to take action or enforce the implementation of programmes. Another non-binding instrument is the Strategic Approach for International Chemical Management (SAICM). SAICM was created in 2006 during the first International Conference on Chemicals Management (ICCM). While its 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.

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. 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.

In 2006, the FAO Council recommended a progressive ban on highly hazardous pesticides (HHPs). In 2016, the FAO published a set of specific guidelines for regulators to deal with highly hazardous pesticides. The first mitigation option recommended to governments is to end their use, which is also supported by the Code of Conduct on Safety and Health in Agriculture of the International Labour Organization (ILO, 2010). 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 step.

NEED TO KNOW

Importantly the International Code of Conduct on Pesticide Management, which provides a framework for government regulators and the private sector on best practice in managing pesticides, clearly states that not only governments but also pesticide manufacturers have a responsibility to remove the most toxic pesticides from the market.

Experts consider this the most important step that pesticide producers can take to reduce the adverse effects of pesticides.

National

The role of governments is to find a responsible balance between enabling judicious pesticide use where such use is necessary to achieve desirable crop production levels, and reducing the adverse health, environmental and agronomic risks (Jules, 2005). Governments have a range of policy instruments to influence this balance. Pesticide legislation and registration offers possibilities for regulating the availability and use of pesticides. The use of dangerous products can be banned or restricted to certain crops, users or circumstances. Governments have the opportunity and power to make budget allocations on the enforcement of pesticide legislation, for monitoring of pesticides residues in food and drinking water, and for research into the side-effects of pesticides use.

Registration process

Europe

Regulation (EC) 1107/2009 which mainly governs pesticide regulation in the EU, is a slow and complicated process.

The authorisation procedure for a new pesticide active substance starts when the applicant – the company that has commercial interest in placing the substance on the market – submits an "application" (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 for short) and to the European Commission. The set of studies must include studies of the RMS then provides an assessment.

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. However, there are still gaps and a demand for improvement, that include:

- Pesticides are only approved for use after the producer has demonstrated that they are "safe" for humans and the environment, under realistic conditions of use. Assertions of the "safety" of pesticides at the EU level are based largely on predictions and modelling tools. "Safety" is therefore not demonstrated, but presumed. For example, doses to which most people are exposed on a daily basis are not directly tested for safety. Instead, the safety of these typically low doses is extrapolated from higher doses stated not to cause specific adverse effects in industry-sponsored animal studies (e.g. with rodents). Doses 10 or 100 times lower are then assumed to be safe for humans and other species, without actually being tested. This is of concern, since current scientific knowledge shows that exposure to chemicals, particularly during the early life stages, at low environmental doses may trigger alterations in the hormone, nervous or immune system, leading to dysfunction and disease later in life – even though these effects are not evident at the higher doses that are tested for regulatory approvals.
- 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.
- Most of the data in the dossiers are produced by pesticide companies and their contracted laboratories and are unpublished.

NEED TO KNOW

There are concerns and limitations in the EU pesticide authorisation process, which are relevant and of concern to Kenya, because many of the products registered in Kenya (862 products) originate from Europe (253 products).

Why are active ingredients withdrawn from the market?

Active ingredients are withdrawn from the market partly as a result of the adoption of new and stricter regulations during the last two decades. The EU's 1991 Directive on the Placing of Plant Protection Products on the Market, set higher standards and required companies to re-register their products. Since then, pesticide manufacturers applying to gain EU-wide approval for a specific pesticide have to submit new data to show that the substance can be used without unacceptable risks, meeting stricter standards on health and environmental safety than before. Under this process, manufacturers decided not to submit for review around 320 active ingredients, 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 testing requirements. As a result, 60% of all pesticide active ingredients (approximately 500 active ingredients by now) previously authorized for use in the EU were taken off the market (withdrawn), but do not legally qualify as being banned.

Kenya

The registration of pesticides in Kenya is governed by the Pest Control Products Act, Cap 346 of the Laws of Kenya (PCPB, 1985). Since the law was enacted in 1982, many conventional chemical pesticides and biopesticides have been registered for use in Kenya.

Every company desiring to register a pest control product is requested to submit an application for introduction of a new pest control product, an experimental label and a copy of a dossier of technical information. If the Pest Control Product Board (PCPB) is satisfied with the information provided, in line with the Pest Control Products Registration Regulations LN 46/1984, the product is released under experimental permit for a local biological efficacy trial. Trials are carried out by institutions that have been accredited by the Board, and include KEPHIS, the Ministry of Health, the Agrochemicals Association of Kenya (AAK) and the National Environment Management Authority (NEMA).

On completion of the biological efficacy trial, a confidential report is received by the PCPB and the applicant applies for registration. The applicant is also required to provide a commercial label reflecting the application rates, timing of application as recommended by the local researcher, among other things. The product is then registered for a period of three years and a certificate of registration issued which costs the applicant $347.40 (KSh30,000). This is renewable after every two years (Ngaruiya, 2004).

NEED TO KNOW

During the registration process in Kenya, mainly the purity and the efficacy of the product is tested. However hardly any data on human health and environmental health under local conditions are taken into consideration. The Pest Control Products Act and Pest Control Products (Registration) Regulations 1984, do not even state environmental and/or human health as a possible concern during the registration process.

The assumptions on which a pesticide is registered in Europe (very often with compulsory mitigation measures) is different in Kenya which may lead to higher exposure risk for farmers, consumers and the environment:

A much higher percentage of the Kenyan population is working in agriculture: The sector employs more than **40% of the total population and more than 70% of Kenya's rural people, compared to below 5% in Europe.**

Personal Protection Equipment (PPE) for highly hazardous pesticides, as prescribed on the label or by training programmes, is often not available or not used because it is too expensive or too uncomfortable to wear.

Commonly used application equipment (mainly knapsack sprayers) tends to be less sophisticated compared to what is used in Europe.

Poverty, limited education, distances, and ineffective extension systems are amongst the factors that affect the feasibility of reaching all farmers with training and advice on pesticides.

Most of the farming systems in Kenya are small-scale farming systems with a maximum size of 2 acres, which are very often situated along hill-slopes and close to water ways and therefore prone to the risk of runoff of soil with pesticides attached to it. Due to the small size of most of the farms, it is not possible to implement mitigation measures for example a buffer zone of 20m. **Many active ingredients (e.g. bifenthrin) are registered and allowed for use only if this mitigation measure is implemented.**

Other factors affecting proper use of pesticides include: Limited user knowledge about pests and pest management options, available products and their risks; users not being able to read or understand labels (low literacy levels in certain areas); incomplete labels; labels not available in the local language; relatively high cost of following label instructions (e.g. buying recommended PPE and application equipment).

For these reasons, there is often a significant gap between the common conditions of use in Kenya and the prescribed instructions on the label, which leads to high human and environmental exposures and consequently to risks exceeding estimated levels based on the assumption that label instructions are followed.

Shortfalls and Solutions

Registration

33% of the registered pesticides in Kenya are withdrawn from the European market, partly because of the toxicity, persistence or lack of data (following the Precautionary Principle).

Many registered pesticides in Kenya cause chronic health effects and show very high toxicity towards the environment.

Solutions:

- Highly hazardous pesticides, organophosphates (based on their neurotoxicity and endocrine disrupting activity) and neonicotinoids (based on their toxicity towards pollinators) should be banned or restricted. Emphasis should be on finding alternatives to these highly toxic pesticides. A useful approach can be to look at crop protection methods in other countries with similar agronomic conditions that have cancelled the use of certain pesticides.
- Implementing taxes or import tariffs for highly hazardous pesticides, which makes the use of less expensive and less toxic pesticides more attractive to the farmer.
- Restrictions can involve the type of users (e.g. only certified users who have received training), areas of use (e.g. not close to water bodies), time of use (e.g. only in the evenings), type of use (e.g. only as seed dressing or as stem injection) or type of crop (only for specified crop/pest combinations under strictly controlled circumstances).
- Select pesticides with the lowest risk. If use of 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.
- Reduce reliance on pesticides. Determine to what extent current levels of pesticide use are actually needed and eliminate unjustified pesticide use. Make optimum use of non-chemical pest management practices in the context of sustainable intensification of crop production and integrated vector management.
- Pesticide regulation in Kenya should be based on the precautionary principle instead of the myth of safe use.

Often, pesticides are registered without adapting test results to local conditions (e.g. different species, climatic conditions and diet) and are taken from European or US MRLs. As for MRLs whose calculations are based on the diet of citizens, one needs to take into consideration that the Kenyan diet consists of much more maize than European diets. This should result in lower MRLs for glyphosate in maize in Kenya as an example.

As for the effect of neonicotinoids, most toxicity tests are done with the European honey bee. No results are available on the effect on local bees (like stingless bees). This means we don't know what impact these neonicotinoids have on our local pollinator populations.

Solutions:

- Adaptation of MRL's according to the Kenyan diet.
- Additional toxicity test should be performed with local species (fish, bees etc.) if needed. These tests should be paid for by the pesticide industry.
- Increase in capacity amongst regulators, the FAO Pesticide Registration Toolkit (http://www.fao.org/pesticide-registration-toolkit) provides practical guidance on conducting risk assessments for pesticide registration or review of existing registrations.

Legislation

International regulations (e.g. International Code of Conduct on Pesticide Management) are too weak and too powerless to enforce action. Double standards allow the pesticide industry to export to countries with weaker regulations.

Solutions:

- Corporations should be held accountable for the negative impacts of the distribution of their pesticide products and particular attention must be drawn to the responsibility of the European headquarters of agrochemical corporations, especially in the case of double standards.
- Public health policies should address pesticide residues in food and drinking water, and risks associated with the storage, transport and disposal of pesticides.
- Environmental policies on water quality, nature conservation and biodiversity can also influence the availability and use of pesticides.

Data availability

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

Solutions:

- Pesticides-exporting countries should record data on the export of pesticides and make them available to the public. The respective government authorities of exporting countries, should share information with importing countries on possible human and environmental effects, before products are newly registered and trade agreements are established.
- Kenya should include pesticide use in the regular agricultural census.
- Pesticide imports and use should be strictly monitored, and official, reliable information made available. The data should be gathered, stored, and made readily accessible by public entities with no ties to the pesticide industry.
- Enhance information sharing with other countries on: incidents with pesticides, regulatory actions taken, experiences with alternatives to highly hazardous pesticides.
- More independent robust basic research is needed on the impacts of pesticides particularly with regards to the long-term effect of pesticide formulations and their metabolites and on synergistic effects of multiple residues on human health and on ecosystems in Kenya.
- Relevant studies from private companies that are used for registration need to be made accessible so that they can contribute to the body of knowledge.

There are no adequate monitoring and reporting systems for health and environmental impacts of pesticides. Absence of poisons information centres and limited medical facilities to diagnose, treat and report pesticide poisoning.

Solutions:

- Higher budget and political will as well as more capacity for institutions like KEPHIS, KEBS and NEMA to implement monitoring strategies of food and water.
- Monitoring should also include regular farm inspections to ensure that recommended mitigation measures are implemented.

Labelling

Not all the necessary information is provided on labels (e.g. bee toxicity, mutagenicity for pregnant women), labels are often written in small letters and there is no information on inert ingredients.

Solutions:

- Pesticides industry should respect the "right to know" as well as the "right to comprehend" and withdraw all pesticides products with inadequate labels. In addition, companies should train dealers, distributors and salespersons who sell their products to market them responsibly.
- Pesticide industry should refrain from selling pesticides if the availability of adequate protective equipment cannot be guaranteed and if mitigation measures cannot be met.
- Pesticide industry should offer effective and adequate disposal schemes.

Public and farmers' awareness

Farmers and pest operators are often unaware about the long-term chronic effects on human health and the environment, which is not being solved by the training in the safe use of pesticides. There is also a lack of knowledge about less hazardous alternatives.

Consumers are not aware about pesticide residues in food and the danger of being chronically exposed to pesticides.

Solutions:

- Better training of extension officers, more budget for extension services.
- Awareness creation amongst consumers through media and other organisations.

Promotion of alternatives

Generally, there is still a lack of knowledge on sustainable farming systems using less or no pesticides amongst farmers, extension officers, regulators and the public.

Solutions:

- Pesticide-free agroecological farming practices should be pursued through investment in training, communication and further research and monitoring of their effectiveness.
- Farming systems need to be redesigned or adjusted based on the available knowledge on agro-ecology. Agroecological farming systems prevent pesticide exposure; enhance biodiversity; help to improve air, soil, and water quality; and mitigate climate change.
- Farmers and policy-makers in county governments should be encouraged and supported in transitioning to and understanding agroecological practices like crop rotation, soil fertility management, push-pull technology, and crop selection adapted to local conditions.
- Measures can include trainings, direct payments, and market development for agroecological products, for example via public procurement.

Conclusion

The gaps in international and national pesticide risk assessment procedures and the lack of awareness amongst farmers and the public about the effects of pesticides, leads to unsustainable farming techniques which threatens food security and food safety in Kenya.

The Government of Kenya has the constitutional obligation to protect the right to safe food for its citizens. Despite this, many pesticides currently being used in Kenya, are highly toxic to human health and the environment, where at least 33% of all active ingredients registered in the country are already withdrawn from the European market.

Several solutions were provided for how best to tackle the problem. The most important ones are based on three pillars:

1. Strengthening national institutions and regulations, and increasing the responsibility of the pesticide industry in order to phase out highly toxic pesticides.
2. Promoting more sustainable farming systems, starting with the use of less toxic pesticides and increasing biodiversity on farms until the farming system is adapted to agroecological principles.
3. Awareness creation amongst farmers and the general public to increase the demand for safe and healthy food, which will support sustainable farming systems and is a preventative measure against diet-related illness.

Kenya is faced with critical agricultural and health-related decisions to make, that will impact the country's food security and socio-ecological transformation for decades to come. At this time, it is possible for Kenya to take a lead on the African continent by phasing out certain pesticides, whilst learning from other countries, that have done the same.

Only if current conventional farming systems are changed to more sustainable or even regenerative farming systems, can food safety and the right to food be assured.

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About the Route to Food Initiative

The Route to Food Initiative is a publicly funded programme of the Heinrich Böll Stiftung. Through the initiative, a Route to Food Alliance has formed that works towards realising the Human Right to Food in Kenya. Our activities aim to influence the political approach to food security and target avenues related to policy development and implementation at national and county-level. Additionally, the initiative relies on creative communications and an influencer-led campaign to promote innovative solutions to the problem of food insecurity. We engage with mainstream and alternative media to shift the emphasis of hunger and unaffordable or inadequate food to a discussion about food rights.

You can join the Route to Food Alliance via www.routetofood.org. If you would like a copy of this publication, it will be available on our website (www.routetofood.org) or can be requested by emailing info@routetofood.org.

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