



**REPORT OF THE SITUATION OF HIGHLY HAZARDOUS PESTICIDES (HHPs)  
AND ALTERNATIVES IN KENYA**

**By**



**Centre for Environment Justice and Development**

**P. O Box 24464-00100**

**Nairobi, Kenya**

**Web: [www.cejadkenya.org](http://www.cejadkenya.org)**

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## List of Acronyms

Acronyms	
EMCA	Environmental Management and Coordination Act
EIA	Environmental Impact Assessment
UPOPs	Unintentionally produced Persistent Organic Pollutants
NEMA	National Environment Management Authority
PCPB	Pesticide Control Products Board
MOH	Ministry of Health
GHS	Globally Harmonised System
KEBS	Kenya Bureau of Standards
KRA	Kenya Revenue Authority
GIFAP	International Group of National Associations of Manufacturers of Agrochemical Products
AAK	The Agrochemicals Association of Kenya
UNIDO	United Nations Industrial Development Organization
UNEP	United Nations Environment Program
KNCP	Kenya National Cleaner Production Centre
IVM	Integrated Vector Management
DDT	Dichlorodiphenyltrichloroethane
KEMRI	Kenya Medical Research Institute
GDP	Gross Domestic Product
ICIPE	International Centre for Insect Physiology and Ecology
KALRO	Kenya Agricultural and Livestock Research Organisation
KEPHIS	Kenya Plant Health Inspectorate
KNBS	Kenya National Bureau of Statistics
ODS	Ozone Depleting Substances
SAICM	for Strategic Approach to International Chemicals Management
PCPB	Pest Control and Produce Board
HHPs	Highly Hazardous Pesticides
WHO	World Health Organization
PAN	Pesticides Action Network
EAC	East Africa Community
PPPs	public-private partnerships
OGS	Organic Guarantee System
KOAN	Kenya Organic Agriculture Network

PIC	Prior Informed Consent
FAO	Food and Agriculture Organization
OA	Organic Agriculture
MRLs	Maximum residue levels
PELUM	Participatory Ecological Land Use Management
BvAT	Biovision Africa Trust
TOF	The Organic Farmer

<b>FCP</b>	Farmer Communication Program
EAOPS	East Africa Organic Products Standards
IPM	Integrated pest management
EOA	Ecological Organic Agriculture
OTEA	Organic Trade and Value Chain Development in East Africa
OCA	Organic Consumer Alliance

## **1. Introduction**

### **1.1. Background**

This report presents findings of a study conducted by Centre for Environment Justice and Development (CEJAD) between December 2018 and January 2019 with support from IPEN. The purpose of the project study was to develop a country situation report on pesticides management, and promote the phase out of Highly Hazardous Pesticides (HHPs) and the use of alternative, non-chemical approaches such as agro-ecology in agricultural practices in Kenya.

Specifically, the project study was aimed at:

1. Assessing the use and management of pesticides, including existing policy and regulatory frameworks to phase out HHPs in Kenya
2. Establishing the existing alternative practices to use in phasing out HHPs in Kenya, such as agro-ecology, organic farming and participatory IPM techniques
3. Enhancing awareness on the impacts of HHPs and their alternatives through case stories, educational materials and the media.

### **1.2. Study Approach and Methodology**

The study was undertaken by in-house personnel at CEJAD. Information was collected primarily through desktop literature review, consultations with stakeholders, and field visits to document available/existing success stories on alternatives to HHPs.

Data was collected through:

- *Literature review:* Available reports on pesticides use and management in Kenya.
- *Survey tools:* A semi-structured key informant interview guide was prepared for primary data collection from the identified stakeholders.
- *Key informant interviews:* Interviews were conducted with the identified stakeholders to elicit expert opinion. This targeted respondents from institutions such as the Ministry of Environment and Forestry, Kenya Organic Agriculture Network, Organic Consumer Alliance and Limuru Archdiocesan farm, among others.

### **1.3. Data Analysis**

Quantitative and qualitative data was collected, organised and analysed, guided by the study objectives. The identification of Highly Hazardous Pesticides in Kenya was based on the PAN International List of Highly Hazardous Pesticides compiled in March 2018.

## 2. Study Findings

### 2.1 General overview of Kenya's agricultural sector

#### 2.1.1 Background of Kenya's agricultural sector

Compared to other countries in the East Africa region, Kenya has the largest and most diversified economy, with an economic growth rate of 4.9% in 2017<sup>1</sup>. Agriculture remains the backbone of the Kenyan economy, contributing approximately 34.6% to the Gross Domestic Product (GDP)<sup>2</sup>.

The agriculture sector is made up of crops, livestock and fisheries sub-sectors. The crops sub-sector is key to agriculture development and industrialization for the country. The sub-sector is broadly categorized into industrial, food and horticultural crops. Crops production contributes an average of 28% of the total GDP. Key among these include tea, coffee, sugarcane, cotton, barley, tobacco, cereals, pulses, vegetables, fruits and flowers, all of which contribute to about 55% of all agricultural exports. Table 1 below shows the contribution of the agricultural sector to the economy by activity.

**Table 1: Contribution of agriculture sector to Gross Domestic Product by activity, 2013 – 2017**

Agricultural activity	Contribution by year in %				
	2013	2014	2015	2016	2017*
Growing of crops	18.4	19.7	23.0	25.4	28.3
Animal production	5.3	5.1	4.7	4.5	4.2
Support activities to agriculture	0.6	0.6	0.6	0.5	0.5
Forestry & logging	1.4	1.3	1.3	1.3	1.2
Fishing & aquaculture	0.7	0.7	0.6	0.5	0.4

*Source: Kenya National Bureau of Statistics, 2018*

\*Provisional

<sup>1</sup>Kenya National Bureau of Statistics (KNBS). Economic Survey, 2018

<sup>2</sup>Kenya National Bureau of Statistics (KNBS). Statistical Abstract, 2018

## **2.1.2 Main crops produced in Kenya**

Key crops produced in the country include tea, coffee, pyrethrum, sugarcane, cotton, barley, tobacco, cereals, pulses, vegetables, fruits and flowers, among others. Table 2 below gives a snapshot of crops produced for sale in Kenya between the years 2013 and 2017.

**Table 2: Production of various crops for sale in Kenya**

Crop	Production for sale in '000 tonnes				
	2013	2014	2015	2016	2017*
Wheat <sup>1</sup>	185.0	218.0	227.3	215.9	156.9
Maize <sup>2</sup>	316.4	289.4	295.3	265.8	239.2
Rice paddy <sup>1</sup>	43.6	46.2	43.7	38.1	30.4
Sugarcane <sup>1</sup>	6,700.0	6,500.0	7,200.0	7,100.0	4,800.0
Seed cotton <sup>1</sup>	7.2	1.5	15.7	15.8	11.9
Clean coffee	38.4	42.5	32.2	39.7	33.7
Sisal	26.0	23.1	21.2	21.5	22.5
Tea	432.4	445.1	399.1	473.0	439.9

*Source: Kenya National Bureau of Statistics, 2018*

\*Provisional: 1- No purchases of paddy, wheat, cotton and sugarcane by boards; 2- Deliveries to the marketing boards and millers only

## **2.2 International chemical conventions related to pesticides use in Kenya**

### **2.2.1 Stockholm Convention**

The Stockholm Convention on Persistent Organic Pollutants (POPs) is a multilateral agreement that establishes the commitment of Parties like Kenya to protect human health and the environment from the risks posed by POPs. Initially developed to target 12 POPs, the Stockholm Convention also established long-term objectives including the potential of listing additional POPs for reduction or elimination and use. Kenya signed the Stockholm Convention on 23 May 2001 and ratified it on 24 Sept. 2004. The Convention then finally entered into force in Kenya on 23rd December 2004. The Convention entered into force globally on 17 May 2004. The Kenya national focal point for the Stockholm Convention is the Principal Secretary, Ministry of Environment and Forestry.

The Convention aims to eliminate or restrict the production and use of POPs by listing them in Annexes A, B and C to the Convention. Annex A (elimination) lists a total of 28 (up to October 2016) chemicals, most of which are pesticides. It requires Parties to take measures to eliminate the production and use of these chemicals.

Annex B (restriction) lists chemicals whose production and use should be restricted by Parties in light of any applicable acceptable purposes and/or specific exemptions listed in the Annex. Restricted chemicals include DDT, Perfluorooctane sulfonic acid, its salts and perfluorooctanesulfonyl fluoride.

Parties are required to take measures to reduce the unintentional releases of chemicals listed under Annex C with the goal of continuing minimization and, where feasible, ultimate elimination.

### **2.2.2 Montreal Protocol**

The Montreal Protocol is an international environmental agreement with universal ratification to protect the earth's ozone layer by eliminating use of ozone depleting substances (ODS), which would otherwise allow increased UV radiation to reach the earth, resulting in higher incidence of skin cancers and eye cataracts, more-compromised immune systems, and negative effects on watersheds, agricultural lands and forests.

Kenya signed the Montreal Protocol in February 1988 and has ratified the Protocol and its four amendments, namely; London (1990), Copenhagen (1992), Montreal (1997), and Beijing (1999). The country is yet to ratify the Kigali amendment of 2016 which entered into force in January 2019.

### **2.2.3 Rotterdam Convention**

The Rotterdam Convention (formally, the Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade) is a multilateral treaty to promote shared responsibilities in relation to importation of hazardous chemicals. The Convention promotes open exchange of information and calls on exporters of hazardous chemicals to use proper labelling, include directions on safe handling, and inform purchasers of any known restrictions or bans.

Annex III contains chemicals that are subject to the Prior Informed Consent (PIC) procedure. The chemicals listed include pesticides and industrial chemicals that have been banned or severely restricted for health or environmental reasons by two or more Parties. A total of 51 chemicals are listed in Annex III; 36 are pesticides (including 5 severely hazardous pesticide formulations) and 15 are industrial chemicals. Parties to the Convention can decide whether to allow or ban the importation of chemicals listed in this treaty, and exporting countries are obliged to make sure that producers within their jurisdiction comply with the Convention. Kenya ratified the Rotterdam Convention on 3 February, 2005 and it entered into force on 4<sup>th</sup>, May 2005.

## **2.3 Focal person for SAICM**

The Director, Multilateral Environmental Agreements (DMEAs), Ministry of Environment and Forestry is the National Focal Point for the Strategic Approach to International Chemicals Management (SAICM) in Kenya.

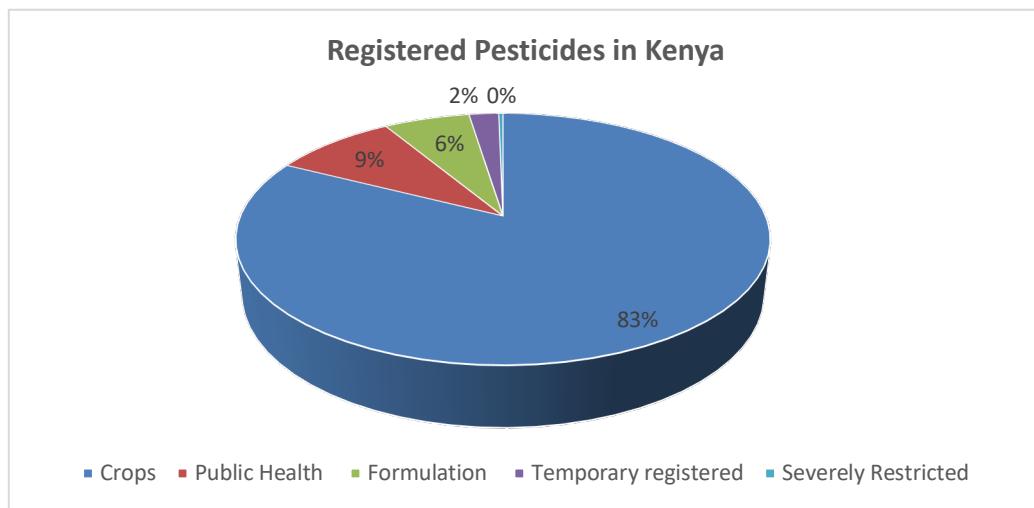
Kenya implemented a Quick Start Programme project, funded by UNEP, in 2009. The enabling framework project for the implementation of SAICM supported the development of the National Chemicals Profile, SAICM implementation plan and Inter-ministerial Coordination Mechanism for the implementation of SAICM in Kenya.

## **2.4 Status of pesticide use in Kenya**

### **2.4.1 The list of nationally registered pesticide**

As of 2018, Kenya had a total of 1627 registered pesticides products. Of this number, 1345 (83%) are registered for use in crops; 145 (9%) products are for use in public health; 101 (6%) are registered as technical grades for formulation locally; 35 (2%) are temporarily restricted; and 5 products' use is severely restricted in the country, as shown in the Figure 1 below.

**Figure 1: Registered pesticides in Kenya**



#### **2.4.2 The list of HHPs amongst list of nationally registered pesticides**

Highly Hazardous Pesticides (HHPs) are defined as pesticides that are acknowledged to present particularly high levels of acute or chronic hazards to health or the environment, according to internationally accepted classification systems such as those from the World Health Organization (WHO) or Globally Harmonized System (GHS) or their listings in relevant binding international agreements or conventions. In addition, pesticides that appear to cause severe or irreversible harm to health or the environment under conditions of use in a country may also be considered to be and treated as highly hazardous<sup>3</sup>.

In the identification of Highly Hazardous Pesticides in Kenya, the PAN International List of Highly Hazardous Pesticides compiled in March 2018 was used. This list was compiled based on the following criteria:

- Pesticide formulations that meet the criteria of classes Ia or Ib of the WHO Recommended Classification of Pesticides by Hazard; or
- Pesticide active ingredients and their formulations that meet the criteria of carcinogenicity Categories 1A and 1B of the Globally Harmonized System on Classification and Labelling of Chemicals (GHS); or

<sup>3</sup>FAO and WHO (2016): International Code of Conduct on Pesticide Management. Guidelines on Highly Hazardous Pesticides, Rome 2016 <http://www.fao.org/publications/card/en/c/a5347a39-c961-41bf-86a4975cdf2fd063/>

- Pesticide active ingredients and their formulations that meet the criteria of mutagenicity Categories 1A and 1B of the Globally Harmonized System on Classification and Labelling of Chemicals (GHS); or
- Pesticide active ingredients and their formulations that meet the criteria of reproductive toxicity Categories 1A and 1B of the Globally Harmonized System on Classification and Labelling of Chemicals (GHS); or
- Pesticide active ingredients listed by the Stockholm Convention in its Annexes A and B, and those meeting all the criteria in paragraph 1 of Annex D of the Convention; or pesticide active ingredients and formulations listed by the Rotterdam Convention in its Annex III; or
- Pesticides listed under the Montreal Protocol; or
- Pesticide active ingredients and formulations that have shown a high incidence of severe or irreversible adverse effects on human health or the environment.

According to the PAN International List of Highly Hazardous Pesticides, 704 pesticides representing 43% of the national registered pesticides in Kenya are Highly Hazardous Pesticides. Of this number, 567 (81%) are registered for use in crops; 78 (11%) are registered for use in public health, and a further 52 (7%) products are registered as technical grades for formulation purposes. In addition, 7 (1%) other products that are temporarily registered are also highly hazardous, as shown in the Table 3 below.

**Table 3: Number of HHPs registered in Kenya**

Application	Number of registered HHPs
Crops	567
Public Health	78
Technical grades for formulation	52
Temporarily registered	7
<b>Total</b>	<b>704</b>

Source: PCPB List of registered products 2018

#### **2.4. 3Active ingredients**

The active ingredients used in various identified highly hazardous pesticides in Kenya have been broadly identified according to the following table as depicted in the PAN International List of Highly Hazardous Pesticides.

**Table 4: Criteria of identifying highly hazardous active ingredients**

<b>1. High acute toxicity</b>
Extremely hazardous' (Class Ia) according to WHO Recommended Classification of Pesticides by Hazard or
Highly hazardous' (Class Ib) according to WHO Recommended Classification of Pesticides by Hazard or
Fatal if inhaled' (H330) according to the Globally Harmonized System (GHS) or
<b>2. Long term toxic effects</b>
Carcinogenic to humans according to IARC, US EPA or 'Known or presumed human carcinogens' (Category I) according to the Globally Harmonized System (GHS) or
Probable/likely carcinogenic to humans according to IARC, US EPA or
'Substances known to induce heritable mutations or to be regarded as if they induce heritable mutations in the germ cells of humans', 'Substances known to induce heritable mutations in the germ cells of humans' (Category I) according to the Globally Harmonized System (GHS) or
'Known or Presumed human reproductive toxicant' (Category I) according to the Globally Harmonized System (GHS) or
<b>3. Endocrine disruptor</b>
EU interim criteria 'Suspected human reproductive toxicant' (Category 2) AND 'Suspected human carcinogen' (Category 2) according to the Globally Harmonized System (GHS) or
potential endocrine disruptor according to EU Category 1 of the EU priority list (2004) or
<b>4. High environmental concern</b>
Pesticides listed in Annex A & B of the Stockholm Convention or meeting the Conventions' criteria or Ozone depleting pesticides according to the Montreal Protocol or
<b>5. High environmental concern – where two of the three following criteria are met:</b>
P = 'Very persistent' half-life > 60 days in marine- or freshwater or half-life > 180 days in soil ('typical' half-life), marine or freshwater sediment) (Indicators and thresholds according to the Stockholm Convention) AND/OR
B = 'Very bioaccumulative' (BCF >5000) or KowlogP> 5 (existing BCF data supersede Kow log P data) (Indicators and thresholds according to the Stockholm Convention) AND/OR
T = Very toxic to aquatic organisms (LC/EC 50 [48h] for Daphnia spp. < 0,1 mg/l)
<b>6. Hazard to ecosystem services</b>
Highly toxic for bees' according to U.S. EPA (LD50, µg/bee < 2) or
<b>7. Known to cause a high incidence of severe or irreversible adverse effects</b>
Pesticides listed in Annex III of the Rotterdam Convention or meeting the Conventions' criteria

Analysis of the PCPB list of registered products in 2018 revealed that there are 61 active ingredients in the 704 registered HHPs in the country, as shown in Table 5 below.

**Table 5: Active ingredients in the identified HHPs in Kenya**

No.	Active ingredients	No.	Active ingredient
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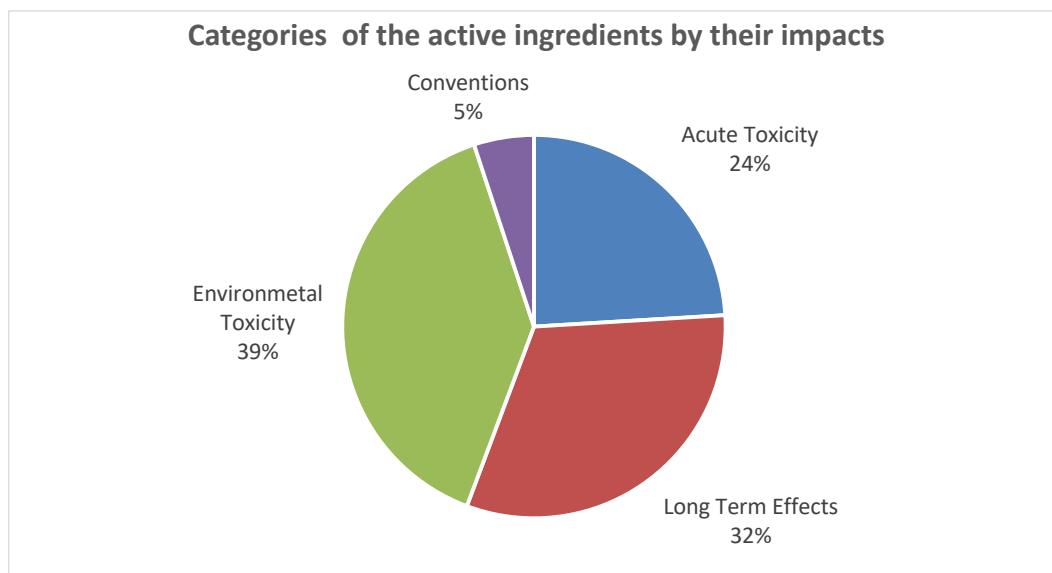
1.	2,4-DB	33.	Glufosinate-ammonium
2.	Abamectin	34.	Glyphosate
3.	Acephate	35.	Hexythiazox
4.	Aluminium Phosphide	36.	Imidacloprid
5.	Beta-cyfluthrin; Cyfluthrin	37.	Indoxacarb
6.	Bifenthrin	38.	Haloxyfop-methyl
7.	1,3-dichloropropene	39.	Kresoxim-methyl
8.	Carbendazim	40.	Lambda-cyhalothrin
9.	Acetochlor	41.	Lindane
10.	Bromadiolone	42.	Lufenuron
11.	Bromoxyniloctanoate	43.	Linuron
12.	Chlorothalonil	44.	Magnesium phosphide
13.	Chlorpyrifos	45.	Mancozeb
14.	Copper II hydroxide	46.	Methomyl
15.	Cyhalothrin	47.	Omethoate
16.	Cypermethrin	48.	Paraffin Oils
17.	Cypermethrin, alpha	49.	Ethoprophos; Ethoprop
18.	Cyhalothrin, gamma	50.	Permethrin
19.	Deltamethrin	51.	Iprodione
20.	Diafenthuron	52.	Prallethrin
21.	Dicofol	53.	Metam- Sodium
22.	Diazinon	54	Quizalofop-p-tefuryl
23.	Dimethoate	55.	Spinosad
24.	Enbdosulfan	56.	Propoxur
25.	Fenamiphos	57.	Thiamethoxam
26.	Diclofop-methyl	58.	Pirimiphos-methyl
27.	Fipronil	59.	Thiacloprid
28.	Flufenoxuron	60.	Trichlorfon
29.	Folpet	61.	Thiophanate-methyl
30.	Warfarin		
31.	Chloropicrin		
32.	Zinc phosphide		

Source: PCPB List of registered products 2018

The analysis further found that 39% of the active ingredients are categorized as environmentally toxic and, in particular, are highly toxic to bees; 32% are categorised as having long term effects, such as being carcinogenic or are likely to be carcinogenic or mutagenic; 24% are categorised as being highly toxic; and a further 5% of the active ingredients having been listed for ban by other Conventions as shown in the Figure 2 below. A list of identification

of the impacts of each active ingredient has been provided as an annex accompanying this report.

**Figure 2: Categories of the active ingredients by their impacts**

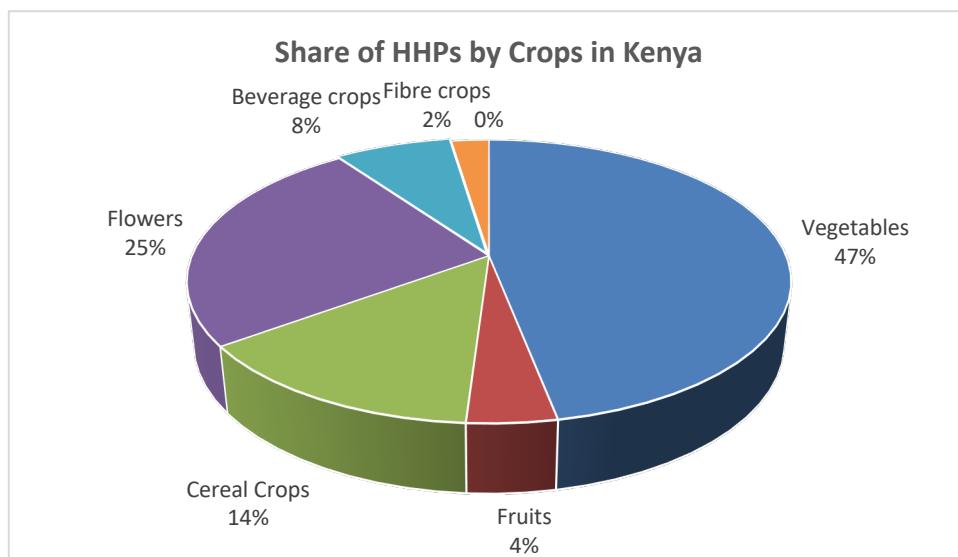


**Source:** Compiled from PCPB List of registered products 2018

#### 2.4.3 Crops using HHPs

The application of HHPs in the agricultural sector in Kenya covers various crops. The analysis showed that HHPs are used in about 44 crops in the country as either insecticides, herbicides, fungicides, acaricides, miticides or rodenticides. 47% of the HHPs registered for use in crops in Kenya are used in vegetable crops; 25% are used in the flower sub – sector, 14% are used to control pests in cereal crops; 8% are used in beverage crops; 4% are used to control pests in fruits; and a further 2% are used in fibre crops as shown in the Figure 3 below.

**Figure 3: Share of HHPs by crops in Kenya**



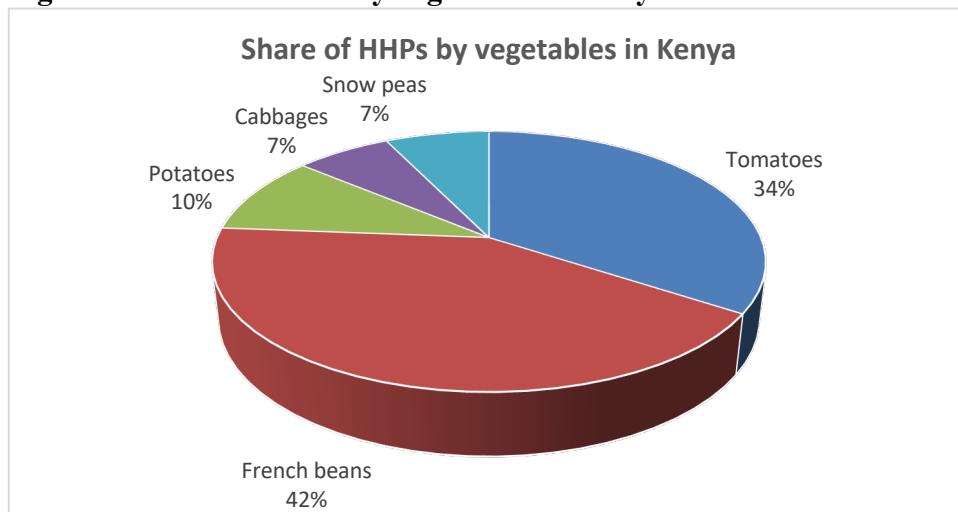
Source: Compiled from PCPB List of registered products 2018

The registered highly hazardous pesticides in Kenya are used in the following crops:

#### i. Vegetables

The vegetables using HHPs include cabbages, cucumber, squash, chilis, French beans, capsicum, lettuce, tomatoes, snow peas, coriander, brassica, onions, carrots, eggplant, broccoli and potatoes. Considering the leading 5 vegetables, 76% of the HHPs registered for use on vegetables are used on tomatoes and French beans, as shown in the Figure 4 below.

**Figure 4: Share of HHPs by vegetables in Kenya**



Source: Compiled from PCPB List of registered products 2018

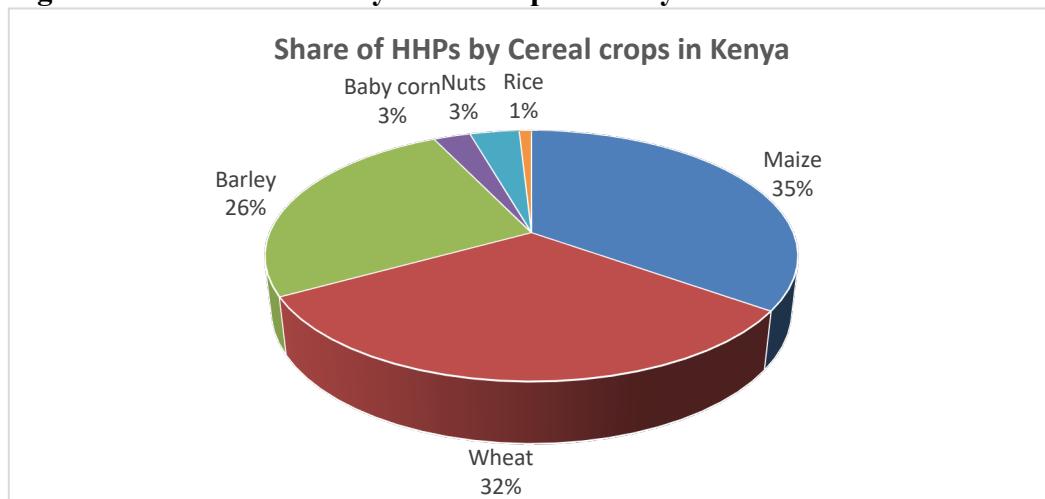
#### ii. Flowers

HHPs for use in the flower sector are mainly used on roses and carnations. As earlier pointed out, there are 211 registered HHPs for use in the flower industry.

### iii. Cereal crops

Cereal crops using HHPs include maize, oats, barley, sorghum, ground nuts, wheat and rice. Data from the PCPB show that majority (93%) of the HHPs registered for use in cereal crops are used in maize, wheat and barley, with the rest applied on rice, oats and nuts as shown in the Figure 5 below.

**Figure 5: Share of HHPs by cereal crops in Kenya**

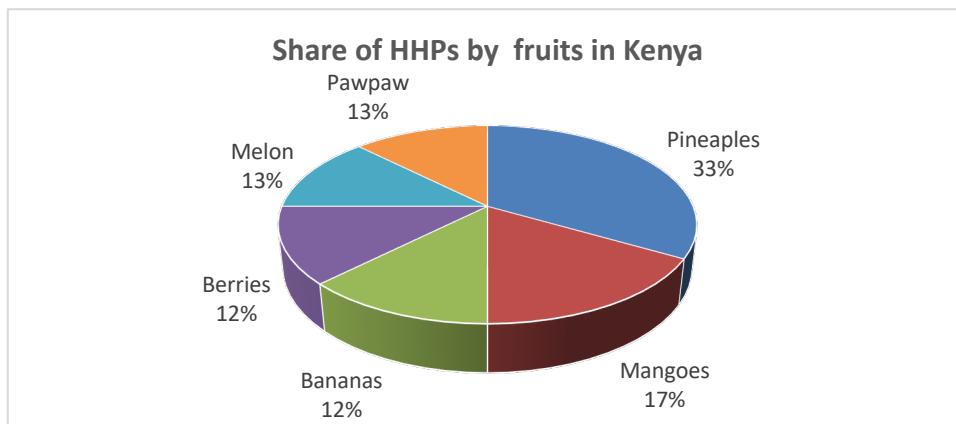


Source: Compiled from PCPB List of registered products 2018

### iv. Fruits

Highly hazardous pesticides registered for use on fruits in Kenya are mainly used on pineapples, bananas, strawberries, passion fruits, pears, pawpaw, water melons, mangoes, apples, fruit trees, citrus and grapes. The analysis of data from PCPB revealed that most of these pesticides are used for control of pest in pineapples, as shown in the Figure 6 below.

**Figure 6: Share of HHPs by fruits in Kenya**



*Source: Compiled from PCPB List of registered products 2018*

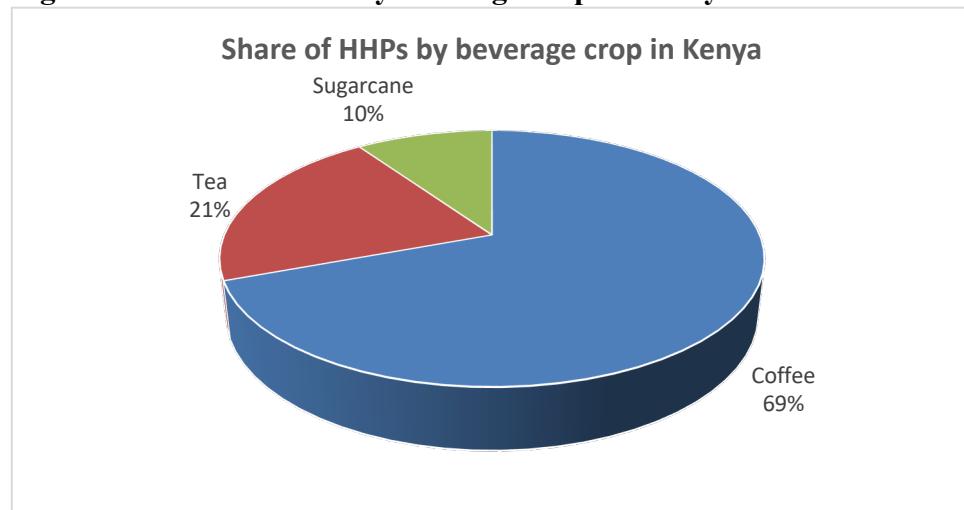
#### v. Fibre crops

20 HHPs are registered for use in sisal and cotton in the country, the majority (19) of which are used in cotton.

#### vi. Beverage crops

There are 62 HHPs registered for use in coffee, tea and sugarcane in the country. Of this number, 43 (69%) are registered for use in coffee, 13 (21%) for use in tea, and a further 6 (10%) products registered for use in sugarcane as shown in the Figure 7 below.

**Figure 7: Share of HHPs by beverage crops in Kenya**



*Source: Compiled from PCPB List of registered products 2018*

#### 2.4.4 List of HHPs banned in other countries but in use in Kenya

According to the PCPB list of registered products, a total of 37 products registered for use in Kenya are banned or not approved for use in other countries as shown in the Table 6 below<sup>4</sup>.

**Table 6: List of banned pesticides in other countries**

No.	Pesticide (Common Name)	Total Ban per Active Ingredient	Country Banned/Not approved
1.	Acephate	31	China, 28 European Union countries, Oman, Palestine,
2.	2, 4-D	3	Mozambique, Norway, Vietnam
3.	Aluminium Phosphide	1	China
4.	Bifenthrin	2	Brazil and Oman
5.	Carbendazim	29	Mozambique, 28 European Union Countries
6.	Chlorociprin	34	Benin, 28 European Union Countries, Guinea, Mauritania, Oman, Palestine, Saudi Arabia
7.	Chlorothalonil	3	Colombia, Palestine, Saudi Arabia
8.	Chlorpyrifos	2	Palestine, Saudi Arabia
9.	Cyfluthrin	29	Colombia, 28 European Union Countries
10.	Beta Cyfluthrin	- 1	Colombia
11.	Diafenthuron	29	Mozambique, 28 European Union Countries
12.	Diazinon	30	Mozambique, 28 European Union Countries, Palestine
13.	Diclofop Methyl	- 2	Mozambique, Saudi Arabia
14.	Dicofol	45	Antigua & Barbuda, Benin, Brazil, Canada, Colombia, Cote D'Ivoire, 28 European Union Countries, Guinea, Indonesia, Iraq, Japan, Korea, Mauritania, Oman, Palestine, Saudi Arabia, Switzerland, USA,
15.	Dimethoate	4	Cameroon, Saudi Arabia, Sri Lanka, Suriname,
16.	Diuron	1	Mozambique
17.	Endosulfan	75	Australia, Bangladesh, Burkina Faso, Cambodia, Canada, Cape Verde, Chile, China, Costa Rica, Cote D'Ivoire, 28 European Union Countries, Gambia, Guinea – Bissau, Indonesia, Iran, Japan, Jordan, Korea, Lao DPR, Malaysia, Mali, Mauritania, Mexico, Mongolia, Morocco,

<sup>4</sup> PAN consolidated List of Banned Pesticides, 2017

				Mozambique, Myanmar, Nepal, New Zealand, Nicaragua, Niger, Norway, Oman, Palestine, Peru, Saudi Arabia, Thailand, Trinidad & Tobago, Uruguay, Venezuela, Vietnam, Zimbabwe
18.		Ethoprophos	8	Nicaragua, Papua New Guinea, Saudi Arabia, Vietnam, Cambodia, China, Guinea, Mauritania
19.		Fenamiphos	6	Cambodia, China, Guinea, Mauritania, Mozambique, Saudi Arabia
20.		Fenthion	30	28 European Union Countries, Korea, Sri Lanka
21.		Fipronil	8	Cape Verde, Chad, Gambia, Mauritania, Niger, Senegal, Togo, Uruguay
22.		Folpet	2	Saudi Arabia, Malaysia
23.		Glyphosate	1	Sri Lanka
24.		Haloxyfop-methyl	1	Brazil
25.		Iprodione	1	Mozambique
26.		Lindane	69	Bangladesh, Brazil, Bulgaria (in addition to EU bans), Cambodia, Cameroon, Canada, Chile, China, Costa Rica, Cote D'Ivoire, 28 European Union Countries, Fiji, Gambia, Guinea, Guyana, Hungary (in addition to EU Ban and Not approved), India, Indonesia, Japan, Korea, Kyrgyzstan, Lao DPR, Malaysia, Mauritania, Mexico, morocco, Myanmar, Nepal, New Zealand, Niger, Nigeria, Oman, Panama, Peru, Saudi Arabia, South Africa, Sri Lanka, Suriname, Switzerland, Thailand, Vietnam, Zimbabwe
27.		Linuron	2	Norway, Oman
28.		Magnesium Phosphide	1	Palestine
29.		Mancozeb	1	Saudi Arabia
30.		MetamSodium	1	Saudi Arabia
31.		Methomyl	14	Antigua & Barbuda, Benin, Cambodia, China, Colombia, Guinea, Korea, Lao DPR, Malaysia, Mauritania, Myanmar, Nicaragua, Saudi Arabia , Vietnam
32.		Omethoate	32	Brazil, China, 28 European Union Countries, Korea, New Zealand
33.		Oxamyl	3	Antigua & Barbuda, Brazil , Cambodia
34.		Permethrin	29	Syria, 28 European Union Countries
35.		Propoxur	29	Saudi Arabia, 28 European Union Countries

36.		Trichlorfon	32	Brazil, 28 European Union Countries, New Zealand, Korea, Togo
37.		Zinc Phosphide	2	China, Mozambique

## 2.4.5 Health and environmental impacts related with HHPs in Kenya

Agrochemicals play a pivotal role in boosting agricultural production in many countries of the world, including Kenya. Studies have shown that the use of agrochemicals can lead to increased crop yields, animal production and reduced post-harvest losses; and, as such, contribute immensely to food production, particularly in famine prone countries. Studies have also, however, shown that the use of highly hazardous pesticides can negatively impact human health and the environment.

### 2.4.5.1 Health effects of Highly Hazardous Pesticides in Kenya

According to World Health Organization (WHO), the widespread use of Highly Hazardous Pesticides has resulted in health problems and fatalities in many countries, mainly as a result of occupational exposure and accidental or intentional poisoning. Available data on the global health impacts of highly hazardous pesticides shows that in 2012 alone, global impact of self-poisoning from preventable pesticide ingestion was estimated to be 186,000 deaths and 4,420,000 disability-adjusted life years<sup>5</sup>.

Chronic exposure to highly hazardous pesticides can affect the skin, eyes, nervous system, cardiovascular system, gastrointestinal tract, liver, kidneys, reproductive system, endocrine system and blood, with children being highly vulnerable. Studies have also shown that some highly hazardous pesticides may affect the immune system, with some obsolete pesticides suspected to cause cancer, including childhood cancer<sup>6</sup>.

There have been very limited studies investigating the health and environmental impacts of highly hazardous pesticides in Kenya. A study conducted in seven major vegetable producing districts of Central and Eastern provinces of Kenya (namely Nyeri North, Kirinyaga, Kiambu,

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<sup>5</sup>WH (2006). Preventing disease through healthy environments: Towards an estimate of the environmental burden of disease. Geneva, World Health Organization

([http://www.who.int/quantifying\\_ehimpacts/publications/preventingdisease.pdf](http://www.who.int/quantifying_ehimpacts/publications/preventingdisease.pdf))

<sup>6</sup>IPCS (2010). INCHEM: Chemical safety information from intergovernmental organizations. Geneva, World Health Organization, International Programme on Chemical Safety (<http://www.inchem.org>).

Nyandarua, Meru Central, Makueni and Muranga districts) to investigate the health effects of pesticide use among vegetable farmer in Kenya in the year 2005 reported increased cases of sneezing, dizziness, headache, blurred vision and skin irritations among vegetable farmers<sup>7</sup>.

Data gathered from a study by Mwanthi et al. (1995) at the district hospital in Githunguri, Kiambu, a coffee growing zone in Kenya, revealed that the majority of the cases of acute chemical poisoning were predominantly males. Although 68% of farmers who were in contact with agrochemicals all year round were girls and women, a possible explanation is that spraying was mainly done by men.

Cultural, economic factors and literacy levels are significant in determining exposure levels for various individuals. The reported health conditions conclude that both acute and chronic conditions are attributes of exposure to agrochemicals. Most commonly reported complaints include: eye, nose and skin irritation, respiratory conditions, asthmatic attacks, nausea and vomiting<sup>8</sup>.

A study carried out in the Naivasha region by Tsimbiri, et al. 2015, also showed that several residents from Lake Naivasha suffer from symptoms that could be linked to pesticide exposure. The results of this study showed that several residents exhibited respiratory, skin, joints and bones, and nervous system symptoms, with many cases reported among planters, weeders and harvesters, as compared to the sprayers working in the horticultural farms. Naivasha town, being the hub of large scale horticultural farming in Kenya, consumes large volumes of pesticides.<sup>9</sup>

### **3. Management of pesticides in Kenya**

#### **3.1 Registration of pesticides in Kenya**

The registration of pesticides in Kenya is under the mandate of the Pest Control Products Board, a statutory organization of the Kenya Government established under the Pest Control

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<sup>7</sup> Ibrahim Macharia et al (2013). Health Effects of Pesticide Use among Vegetable farmer in Kenya. Invited paper presented at the 4th International Conference of the African Association of Agricultural Economists, September 22-25, 2013, Hammamet, Tunisia

<sup>8</sup>Kimani et al, (1995).Agrochemicals exposure and health implications in Githunguri location, Kenya.EastAfr Med J 72, 531-5. BEST: International Journal of Humanities, Arts, Medicine and Sciences (BEST: IJHAMS) ISSN(E): 2348-0521 Vol. 2, Issue 3, Mar 2014, 1-14 © BEST Journals

<sup>9</sup>Tsimbiriet al, (2015) Health Impact of Pesticides on Residents and Horticultural Workers in the Lake Naivasha Region, Kenya. Occupational Diseases and Environmental Medicine, 3, 24-34

Products Act, Cap 346, Laws of Kenya of 1982 to regulate the importation and exportation, manufacture, distribution and use of pest control products.

The following regulations provide guidance for the registration of pesticides in Kenya:

- i. Pest Control Products (Registration) Regulations, ***Legal Notice No. 109/1984 and 46/1984***, and Pest Control Products (Registration) (Amendment) Regulations, L. N. 123/2006. These regulations require that all pesticides imported, distributed, sold and used in Kenya are registered by PCPB. The regulations further require that only pest control products of high quality, safety, economic value and efficacy under local conditions are registered for use in Kenya.
- ii. Pest Control Products (Labelling, Packaging and Advertising) Regulations ***Legal Notice No. 89/1984***, and Pest Control Products (Labelling, Advertising and Packaging) (Amendment) Regulations, L. N. 127/2006. These require that all packages of pesticides display a standard label on the packaging material.
- iii. Pest Control Products (Importation and Exportations) Regulations, ***Legal Notice No. 146/1984***, and Pest Control Products (Importation and Exportations) (Amendment) Regulations, L. N. 125/2006. The regulations require that permits for import and export of pest control products for commercial and experimental purposes in Kenya, must be granted by PCPB.

## **3.2 Legal and Institutional Framework for the management of pesticides in Kenya**

### **3.2.1 The legal and policy framework for the management of pesticides in Kenya**

Kenya is yet to have a comprehensive legislation and policy on chemicals management. The latter is, however, covered in a multiplicity of legislations covering aspects of safety, environment, health, waste management, and use of pesticides, among others. The following legislations touch on chemicals management in Kenya:

#### **a) The Constitution of Kenya, 2010**

The Constitution of Kenya, 2010 does not expressly mention the management of pesticides, but confers every Kenyan citizen a right to a clean and healthy environment as stipulated in Article 42. This right comes with state obligations in Article 69 of protecting the environment, whilst a duty is imposed on citizens in Article 70 to protect and conserve the environment. This Constitution ushered a new devolved system of governance which created 47 counties. Each county is expected to design its own best practices of environmental governance in harmony with the Constitution, Kenyan laws and guidelines for resources management as stipulated by NEMA regulations. They are also required to make budgetary provisions for issues such as waste and chemicals management.

#### **b) Pest Control Products Act, Cap 346**

This act regulates the importation, exportation, manufacture, distribution and use of products which are used for the control of pests and the organic function of plants and animals. The act also establishes the Pest Control Products Board and makes it the function of the Board to register pest control products. It requires that every person who desires to register a pest control product shall make an application to the Board. The act further establishes three classifications of pest control products, namely:

- i. A restricted class – a class of products which present significant environmental risks. These are products which are intended for use in aquatic and forestry situations.
- ii. Commercial Class – class with environmental effects which are limited to a specific region.
- iii. Domestic Class – this is a class of products for which:
  - No special precautions are required in use;
  - No equipment is required for inhalation hazard;

- No irreversible effects from repeated exposure;
- Disposal of containers can be safely done by placing it in the garbage bin; and
- The package sizes are limited to amounts that can be safely used and stored by consumers.

The act requires that packages of pest control products shall be sufficiently durable and be designed and manufactured to contain the product safely under practical conditions of storage, display and distribution.

**c) Environmental Management and Coordination Act (EMCA), Cap 387**

This act lays out general principles, approaches and instruments towards the fulfilment of obligations and requirements in the conservation and maintenance of a safe and healthy environment and prevention of environmental pollution. It is the overriding legislation in all matters of the environment, and where any provisions of any sectorial law conflicts with EMCA, EMCA supersedes it. It establishes a legal framework for, inter alia, the management of pesticides, toxic and hazardous chemicals for the promulgation of legislation by way of development of subsidiary regulations. The Act also adopts the preferred, precautionary principle – simply, when in doubt, do not do it. EMCA has sealed several of the shortcomings of the earlier statutes on chemicals management and deals with a more comprehensive and wide listing of chemicals. It captures hazardous chemicals and chemical wastes from industrial processes, research, photographic processes, and surface treatment of metals and wastes from the petrochemical industry, among others.

**d) The Food, Drugs and Chemical Substances Act, Cap 254**

The act provides for the prevention of adulteration of food, drugs and chemical substances and for matters incidental thereto. By and large the law prohibits the sale of unwholesome, adulterated or poisonous food and sets standards. In this regard, the act provides for tabulation of maximum residue levels (MRLs) or tolerable limits contained in food, drugs and chemical substances.

**e) Occupational Health and Safety Act, 2007**

This is an act of Parliament to provide for the safety, health and welfare of workers and all persons lawfully present at workplaces. The act's provisions for chemical safety require that:

- i. Every manufacturer, importer, supplier or distributor of chemicals shall make available to employers, material safety data sheets for chemicals and other hazardous substances,

- containing detailed essential information regarding their identity, supplier, and classification of hazards, safety precautions and emergency procedures.
- ii. Safety and health requirements are established based on risk assessments, technical standards and medical opinion, for the safe handling and transportation of chemicals and other hazardous substances.
  - iii. Every supplier of hazardous substances, whether as manufacturer, importer or distributor of hazardous substances, shall ensure that containers filled with hazardous substances are appropriately labelled and marked.
  - iv. Every supplier of chemicals, whether as a manufacturer, importer or distributor, shall ensure that all chemicals are classified according to their characteristics and property (such as toxicity, chemical, physical, corrosive and irritant, allergenic, sensitizing, carcinogenic teratogenic and mutagenic) effects as well as their effect on the reproductive systems.

**f) The EAC Customs Management Act, 2004**

The EAC Customs Management Act, 2004 (Revised 2009) set out guidelines on prohibited goods that are not allowed to enter the EAC region, including Kenya. Such goods include hazardous wastes and their disposal, all soaps and cosmetic products containing mercury, and used tyres for light commercial vehicles and passenger cars. Some agricultural and industrial chemicals are also prohibited. Agricultural chemicals prohibited include Aldrin, Captafol, Chlordaneform, Chlorobenxilate, DDT, Dieldrin, 1,2Dibroacetanil (EDB), Flouroacelamide, HCH, Hiplanchlor, Hoscachlorobenzene, Lindane, Mercury compounds, Monocrotophos (certain formulations), Methamidophos, Phospharmion, Methyl –parathion. Prohibited industrial chemicals are: Crocidolite, Polychlorinated biphenyls (PBB), Polychlorinated Biphenyls (PCB), PolychlororinatedTerphenyls (PCT), Tris (2,3 dibromopropyl) phosphate and Methyl bromide

**g) The Health Act, 2015**

This act establishes a unified health system, to coordinate the inter-relationship between the national government and county government health systems, to provide for regulation of health care service and health care service providers, health products and health technologies, and for connected purposes. Part VI on “promotion and advancement of public and environmental health” is particularly relevant to the subject of sound chemical and waste management. Section 38 (2b) calls for reduction of disease burden arising from environmental hygiene, sanitation,

occupational exposure and environmental pollution. Part XIV of the act further provides for interdepartmental collaboration, hence paving the way for co-operation between Ministries such as Environment, Water, Agriculture, and Energy (among others) to address matters of public health in regards to sound management of chemicals and wastes.

#### **h) Draft Chemicals Regulations, 2017**

The Regulations meant to regulate the chemicals sector are still in draft form. These Draft Regulations provide for registration of hazardous chemicals by NEMA. They also require labelling to be done in line with the globally harmonized labelling and classification (GHS) of chemicals and materials. Additionally, they provide directions to importers, transporters and distributors on how they should be handled. They further specify disposal, impacts and offenses for violations. These Regulations are expected to regulate primary emission sources from agricultural (for organochlorine pesticides) and industrial (polychlorinated biphenyls (PCBs), poly- and perfluorinated compounds (PFCs) and flame retardants) sources, health-related applications (dichlorodiphenyltrichloroethanes (DDTs) and lindane), or unintentional releases due to combustion (polychlorinated dibenzo-p-dioxins/furans (PCDD/Fs) and polycyclic aromatic hydrocarbons (PAHs)).

The policies that provide for the management of pesticides, including highly hazardous pesticides, in the country include:

#### **a) Kenya Vision 2030**

Kenya Vision 2030 is the country's development blueprint for the period 2008 to 2030. It aims at making Kenya a middle income country by 2030. The vision is anchored on three pillars: economic, social and political. Environment is subsumed in the social pillar. On environment, the country has set its sights on becoming a nation where her citizens live in a clean, secure and sustainable environment by 2030. The Vision has specific strategies that include: reducing pollution and waste generation, including sound chemical and waste management through designing and enhancing the application of economic incentives, and public-private partnerships (PPPs) for improved efficiency in water and sanitation delivery. This will promote environmental conservation, thereby supporting the economic pillar in its flagship projects and in realizing the Sustainable Development Goals (SDGs).

#### **b) The National Environment Policy, 2014**

The National Environment Policy, 2014 aims at providing a holistic framework to guide the management of the environment and natural resources in Kenya. Its aspiration is an integrated

environmental management approach to issues (including chemicals) in all government policies to ensure sustainable development at all levels. The guiding principles of the policy relate well to sound chemicals and waste management, some of which include: right to healthy and clean environment, right to development, sustainable resource use, public participation, subsidiarity, precautionary and polluter pays principle. On industry and environment, the environment policy calls for an environmentally-friendly industrial development strategy that integrates and promotes cohesion of development and environmental policies and enhances transfer of environmentally sound technologies.

Further, the policy recognizes the importance of chemicals in the national development process. In Section 57 it recognizes that management of chemicals does not have a guiding policy. In its absence, Kenya is vulnerable to risks and hazards associated with chemicals. Consequently, it commits that the government will need to integrate chemicals management programmes into development plans and implement the international process of the Strategic Approach to International Chemicals Management (SAICM) to develop and implement a chemicals management policy.

### **3.2.2 Institutional framework for the management of pesticides in Kenya**

The Table 7 below gives a summary of the key institutions that are involved in the management of pesticides in Kenya.

**Table 7: Various institution that are involved in the management of pesticides in Kenya**

Institution	Role
Ministry of Environment and Forestry (MEF)	It protects, conserves and manages the environment and natural resources for socio-economic development in Kenya through formulation of policies and coordination. It is the institution to drive the policy agenda in creating awareness and training in sound chemicals and waste management.
National Environment Management Authority (NEMA)	Charged with management of the environment and coordination of all relevant lead agencies. NEMA has a mandate in chemicals, including pesticides management, to oversee the environmental impact assessment (EIA) and environmental audits. The bulk of the projects in the Second Schedule of EMCA which require EIA relate to chemicals and hazardous waste management.

Pesticide Control Products Board (PCPB)	The Pesticides Control Products Board (PCPB) is the Kenyan government's pesticide and pesticide products regulatory agency that control importation, exportation, manufacture, distribution, transportation, sale, disposal and safe use of pest control products and mitigates potential harmful effects to the environment.
Ministry of Health (MOH)	Provides the policy direction and regulates matters of health in the country. Its key functions include developing and reviewing policies to promote Preventive and Promotive Health Services; food safety and quality; occupational health and safety; sanitation and hygiene; pollution control and health care waste management.
Ministry of Agriculture, Livestock, Fisheries and Irrigation	It provides the policy direction in the agricultural sector in Kenya. The Ministry is also charged with, inter alia, supporting research and promoting technology delivery, regulating and quality control of inputs, produce and products from agricultural sector, as well as management and control of pests and diseases.
Kenya Bureau of Standards (KEBS)	Charged with standards development for products, measurements, materials, processes, and their promotion at national, regional and international levels; certifying industrial products; supporting the production of quality goods; improvement of measurement accuracy; and circulating information relating to standards. In regard to chemicals and UPOPs reduction, it focuses on standards development (standards on Globally Harmonised System of classification and labelling of Chemicals), and testing.
Kenya Revenue Authority (KRA)	Charged with border control and ensuring that all goods entering and leaving the country are of the required standards. It is the duty of KRA to ensure that all the banned pesticides and products are not imported into the country.
Agrochemicals Association of Kenya (AAK)	The AAK is the national representative of the International Agrochemical Industry represented worldwide by Crop Life International (formerly GIFAP). It is therefore, the umbrella organization in Kenya for manufacturers, formulators, re-packers, importers, distributors, farmers and users of pest control products (pesticides). The Association's main service is product stewardship and training on proper use of agrochemicals. It undertakes training of its members and other stakeholders on safe and effective use of pesticides.
Kenya National Cleaner Production Centre (KNCP)	KNCP, established under the Kenya Country Co-operation Framework of the UNIDO-UNEP global program of Cleaner Production Centres, helps in building national capacity for resource efficiency and cleaner production, as well as champions sound management of chemicals and waste prevention attainable through awareness and training on the circular economy.
Kenya Medical Research Institute (KEMRI)	KEMRI is a state corporation charged with carrying out health research in Kenya. It undertakes research on Integrated Vector Management (IVM) towards achieving the targets of Roll Back Malaria initiative, the Abuja Declaration, and the Sustainable Development Goals. The IVM program focuses on finding alternatives to DDT for the control of malaria.
International Centre for Insect Physiology and Ecology (ICIPE)	ICIPE helps in the development and transfer of technology on alternatives to chemicals and serves as the Regional Centre for the Stockholm Convention on POPs.

Kenya Agricultural and Livestock Research Organisation (KALRO)	KALRO is a corporate body charged with the establishment of suitable legal and institutional framework(s) for coordination of agricultural research in Kenya through: promoting, streamlining, co-ordinating and regulating research in crops, livestock, genetic resources and biotechnology; expediting equitable access to research information, resources and technology; promoting the application of research findings and technology in the field of agriculture; and, conducting efficacy trials of agricultural pesticides for field and stored crops, and fertilizers.
Kenya Plant Health Inspectorate (KEPHIS)	KEPHIS is the regulatory body in the agricultural sector charged with quality assurance of agricultural inputs and produce; administering and enforcing phytosanitary measures; supporting the administration and enforcement of food safety measures; and establishing service laboratories to monitor the quality and levels of toxic residues in agro-inputs, irrigation water, plants, soils and agricultural produce. It also undertakes need-based training on safe use of chemicals to farmers; monitoring of agricultural produce for exports; quality inspections on agricultural produce on arrival; and analytical and advisory services.

### 3.3 Bottlenecks in phasing out Highly Hazardous Pesticides in Kenya

#### 3.3.1 Weak compliance and enforcement

The national pesticide regulation, Pest Control Products Act, CAP 346 of 1982, provides a reasonable basis for the management of pesticides in Kenya. However, absence of effective compliance monitoring and an enforcement framework has led to limited market surveillance of pesticides and, as such, banned products still find their way into the market. It has also led to unsafe pesticide storage and inappropriate distribution or use, creating an uneven playing field between companies that comply with legislation and others that do not, with the non-compliers potentially having an unfair competitive advantage<sup>10</sup>.

#### 3.3.2 Substandard, illegal and counterfeit pesticides in the market

The availability of substandard products that make their way into the market results in ineffective pest or vector control operations, consequently leading to increasing application rates and costs that may also increase cases of pest resistance and risk to the users and the environment, as they may be toxic to non-target organisms<sup>11</sup>.

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<sup>10</sup>Republic of Kenya, 2011: Kenya National Profile to Assess the Chemicals Management; Ministry of Environment and Mineral Resources

<sup>11</sup>FAO/WHO (2010). Pesticide residues in food: Maximum residue limits / extraneous maximum residue limits. Rome, Food and Agriculture Organization of the United Nations and World Health Organization, FAO/WHO Food Standards Programme, Codex Alimentarius Commission

### **3.3.3 Non-supportive policies/measures for the promotion of alternatives to HHPs in Kenya**

Kenya still lacks appropriate policies or measures that are aimed at phasing out highly hazardous pesticides from the market. The Pest Products and Control Boards have not put in deliberate measures and strategies that are aimed at ensuring a progressive ban of highly hazardous products in Kenya.

### **3.3.4 Inadequate education and awareness on highly hazardous pesticides**

There is little scientific evidence on the health and environmental impacts of highly hazardous pesticides in Kenya. Very few studies targeting specific HHPs have been conducted in the country, and where such information exists, it is not easily accessible to the policy makers and the general public<sup>12</sup>.

## **4. Alternatives to Highly Hazardous Pesticides in Kenya**

### **4.1 Policy frameworks that support ecosystem approaches as alternatives to synthetic pesticides in Kenya**

#### **4.1.1 National Integrated Pesticides Management (IPM) policy**

Integrated pest management (IPM) refers to a farmer-based and knowledge intensive management approach that involves natural and cultural control of pest populations by anticipating pest problems and managing their numbers to reduce losses, whilst using safer pesticides where justified. Such indigenous and newly developed non-chemical techniques include a combination of biological control, habitat manipulation, soil health management and use of resistant varieties, as well as modification of cultural practices.<sup>13</sup>

On the policy front, Kenya does not have a national policy framework for integrated pest management. However, IPM technologies are available for management of crop pests in Kenya, but the adoption of the IPM concept among Kenyan farmers is still very low as IPM is viewed as difficult and unrealistic.

#### **4.1.2 National organic agriculture policy framework**

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<sup>12</sup> Interview with Organic Consumer Alliance (OCA) conducted on 30<sup>th</sup>, January, 2019

<sup>13</sup>USIAD. Environmental Guidelines for Small-Scale Activities in Africa, 2009.

Kenya has developed a draft National Organic Policy 2017 that will spearhead the implementation of organic farming in the country by promoting a well-coordinated and vibrant organic agriculture sub-sector. The policy, if passed, will enhance public-private partnerships in the organic agriculture sub-sector, create employment, ensure environmental conservation and improve health, as well as boost nutrition and food safety in the country. Some of the issues that the draft policy, if passed, will address in the organic agriculture sub-sector include: research and development; training; extension; inputs; production; marketing and trade; and legal and institutional framework(s).

Other policies and legislations that support organic agriculture in Kenya are summarised in the table below:

**Table 8: Other policies and legislations that support organic agriculture in Kenya**

Policy/Legislation	Relevance
Agriculture and Food Authority Act, 2013	Gives the Cabinet Secretary in charge of Agriculture the power to develop national guidelines for preservation, utilization and development of agricultural land in Kenya.
Fertilizers and Animal Feedstuff Act (Cap 345)	Regulates importation, manufacture, compounding, mixing or selling of any fertilizer or animal foodstuff in the country, including organic products.
Crops Act No 16 of 2015	The act aims at accelerating growth and development of agriculture in general, including organic agriculture, enhancing productivity and incomes of farmers and the rural population, and improving the investment climate and efficiency of agribusiness.
Draft Agriculture Policy 2016 <sup>14</sup>	Interviews with key informant revealed that Kenya has developed a draft Agriculture Policy awaiting stakeholders' inputs. According to them, this policy has provided for the promotion of organic farming in Kenya.

Some of the key recommendations of the Draft Agriculture Policy include:

- i. Mainstreaming of organic agriculture research in the national agricultural research agenda,
- ii. Mainstreaming of training on organic agriculture in Non-Governmental Organizations and private training institutions as well public institutions,
- iii. Mainstreaming organic agriculture within the public extension programs,
- iv. Development and promotion of an effective system for production and standardization of quality organic inputs,
- v. Develop education and awareness programs for farmers on organic agriculture,

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<sup>14</sup> Interviews with key informants at Kenya Agriculture Information Network (KOAN) and Organic Consumer Alliance (OCS) conducted in the month of January, 2019

- vi. Develop market infrastructure and labelling requirements targeted at promoting certified organic agricultural products and services, and
- vii. Develop legal and institutional framework to support the growth of organic agriculture.

#### **4.1.3 Policy frameworks that support the manufacture, import, distribution and use of bio-pesticides**

Kenya does not have a national policy or regulation that supports manufacture, import, distribution and use of bio-pesticides. However, manufacture and importation, as well as distribution of such bio-pesticides, are dealt with within the provisions of Pest Control Products Act, Cap 346.

### **4.2 Implementation of crop-specific, pest-specific alternatives to HHPs in Kenya**

#### **4.2.1 IPM initiatives in Kenya**

Various institutions and organizations are involved in the development of integrated pest management strategies that target specific pests and crops in Kenya. Such institutions include Kenya Agricultural and Livestock Research Organization (KALRO), Kenya Agricultural Research Institute (KARI) and Kenyan and international Universities, as well as national, regional and international organizations such as the International Centre of Insect Physiology and Ecology (ICIPE). However, little efforts have been directed towards the development of IPM approaches that target a given pest or crop system in the country. Capacity, however, exists to develop such programs locally and implement them.<sup>15</sup>

The following IPM initiatives are undertaken in Kenya to manage pests:

##### **i) Push – Pull IPM technology**

Developed by ICIPE, in collaboration with Rothamsted Research, United Kingdom, and partners in eastern Africa, Push – Pull technology involves intercropping cereals with a pest repellent plant, such as desmodium, which drives away or deters stemborers from the target food crop. Concurrently, an attractant trap plant such as Napier grass (*Pennisetum purpureum*) is planted around the border of this intercrop to attract and trap pests. This technology addresses five key constraints of cereal–livestock mixed production systems, including insect pests (stemborers), the parasitic weed *Striga* (and other weeds), poor soil fertility and soil moisture

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<sup>15</sup>GoK.Pest Management Plan For Kenya Arid And Semi-Arid Lands Swap Report 2010

management, whilst fulfilling the need for high quality animal feed. There are about 157, 890 farmers practicing push- pull IPM technology to manage cereal pests in Sub- Sahara Africa, including Kenya<sup>16</sup>. This technology is used by farmers in Bondo, Butere, Rongo, Homa Bay, Busia and Kisumu, among other areas.

## **ii) Use of ICIPE Biopesticides**

Replacement of synthetic pesticides with biological alternatives is seen as an ideal strategy towards sustainable agriculture and the conservation of biological biodiversity globally. In accordance, ICIPE has been bio-prospecting novel arthropod pathogens, especially entomopathogenic fungi, for their efficacy against insect pests and disease without producing any toxic residues. Besides, entomopathogenic fungi are also environmentally safe. Through its research, ICIPE has formulated several bio-pesticides using isolates from *Metarhiziumanisopliae*, an entomopathogenic fungi that occurs naturally in the soil. These products have been found to be compatible with other components of ICIPE's integrated pest management (IPM) strategies. Through a partnership with Real IPM Ltd, a Kenya-based private sector company, two ICIPE bio-pesticides are being commercialised as Campaign® (icipe69) and Achieve™ (icipe78). Campaign® has been registered in Ethiopia, Kenya, Ghana, South Africa and Tanzania to control mealybugs, thrips and fruit flies, in crops such as cucumber, mango, papaya, roses and tomatoes, among others.

## **iii) Tsetse repellent technology**

Developed by ICIPE, the tsetse repellent technology involves controlled-release of potent repellents from a prototype dispenser (specifically designed to facilitate release of the repellents at a constant rate) that individual cattle wear encircling their necks to control tsetse flies.

## **iv) Use of *Bacillus ThuringiensisIsraelensis* (BTi) in Malaria Control**

Being that approximately 70 percent of Kenya's land is prone to malaria epidemics, the country has for a long time relied on the use of Dichlorodiphenyltrichloroethane (DDT) to control malaria. Being a Party to the Stockholm Convention, Kenya is piloting the use of *Bacillus ThuringiensisIsraelensis* (BTi), a naturally occurring soil bacterium for malaria control as a

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<sup>16</sup>Icipe.Push – Pull.A platform technology for improving livelihoods of resource poor farmers in sub-Saharan Africa.<http://www.push-pull.net/>. Accessed, January 23<sup>rd</sup>, 2019.

replacement of DDT in Malindi, Kirinyaga and Kisii counties. BTi is available in the Kenyan market and is traded as Aquabac®, Teknar®, Bactimos®, and Vectobac®, but its application is still low and not much has been done to promote its uptake or manufacture in the country.

#### **4.2.2 Organic agriculture initiatives in Kenya**

The Food and Agriculture Organization (FAO) defines Organic Agriculture (OA) as a production management system that promotes and enhances agro-ecosystem health, including biodiversity, biological cycles, and soil biological activity. As such, this system of agricultural production advocates for, where possible, the use of agronomic, biological, and mechanical methods, as opposed to the use of synthetic materials.<sup>17</sup>

The organic agriculture sub-sector in Kenya is still very small but has grown exponentially in the last 5 years, and stood at 150,000 ha in 2016. The policy is envisaged to accelerate the growth and uptake of organic agriculture in Kenya. According to a key informant at the Kenya Organic Agriculture Network (KOAN), organic farming in Kenya is mainly undertaken in areas such as Kiambu, Kitui, Nairobi, Bungoma, Trans Nzoia, Kisumu and Samburu, as well as in some parts of the coastal region. There are about 43,000 farmers practicing certified organic agriculture in Kenya.

Initiatives that are on-going in Kenya to promote organic farming include<sup>18,19</sup>:

##### **i. Ecological Organic Agriculture Initiative in Africa—**

The Ecological Organic Agriculture (EOA) Initiative is an African Union-led continental undertaking currently implemented in eight countries (Benin, Ethiopia, Kenya, Mali, Nigeria, Senegal, Tanzania and Uganda). It is implemented under the guidance and oversight of the AU-chaired Continental Steering Committee (CSC) with the aim of establishing an African organic farming platform based on available best practices; and to develop sustainable organic farming systems and improve seed quality.

Based on its 10-year Strategic Plan (2015-2025), its mission is to promote ecologically sound strategies and practices among diverse stakeholders involved in production, processing, marketing and policy-making to safeguard the environment, improve livelihoods, alleviate

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<sup>17</sup><http://www.fao.org/organicag/oa-faq/oa-faq1/en/>. Accessed, January 26<sup>th</sup>, 2019

<sup>18</sup> Interview with Kenya Organic Agriculture Network (KOAN) held on 17<sup>th</sup>, January, 2019.

<sup>19</sup> Interview with Organic Consumer Alliance Conducted in 30<sup>th</sup>, January, 2019

poverty and guarantee food security among farmers in Africa. There is additionally a goal of mainstreaming of ecological organic agriculture into national agricultural production systems by 2025 in order to improve agricultural productivity, food security, access to markets and sustainable development in Africa. There is an East Africa Organic Products Standards (EAOPS) that has been developed for all organic products produced in the East Africa Region.

### **ii. Organic Trade and Value Chain Development in East Africa (OTEA)**

This initiative is implemented by the International Federation of Organic Agriculture Movements (IFOAM) in partnership with National Organic Agriculture Movements in the East African Community with the aim of promoting the development of organic agriculture in the region. The cornerstone of this project is the development of market oriented organic production targeting both local and regional markets. It is anticipated that this initiative will help in:

- Developing a well –functioning Organic Guarantee System (OGS) in East Africa, increase consumer awareness, and create more demand for labelled organic products,
- Increasing the capacity of local producers to access and supply local and regional markets,
- Increasing the capacity and skills of all National Organic Movements to develop the organic sector, and
- Increasing the availability of reliable information and statistics on production, trade and multi-functional benefits of organic agriculture and its contribution to challenges and needs in East Africa.

### **iii. Mainstreaming of organic farming in county government policies and development plans**

Efforts are on-going in Kenya by different county governments to mainstream organic agriculture in their policies and county development plants. A case in point is Muranga County, which has developed an organic agriculture policy. Laikipia County is also developing an organic agriculture policy and, as such, these two counties are leaders in organic farming and will offer a good learning point to other counties. Furthermore, Kirinyaga County in its County Integrated Development plan aims at promoting organic farming by the concept of “green cities.”

#### **iv. Development of an organic agriculture factory**

Busia County has supported the development of an organic agriculture factory, an initiative that is aimed at promoting organic farming in the county.

#### **v. Development of a Farmer Communication Programme (FCP)**

Through the initiatives such as Infonet, The Organic Farmer (TOF) Magazine, Organic Farmer Radio and The Farmer Communication Outreach, as well as Mkulima Mbunifu, up-to-date and locally relevant agricultural information and related topics can now reach farmers more easily and in a language that they can understand<sup>20</sup>.

#### **4.2.3 Market for organic products**

Marketing for organic products in Kenya still remains a challenge for many organic farmers. However, the market outlets where organic products are sold include supermarket chains, specialized organic shops, organic restaurants, organic farmers' open markets and basket delivery schemes to consumers' homes or workplaces.

#### **Case study of successful organic farming in Kenya**

As pointed earlier, there are about 43,000 certified organic framers in Kenya practicing vegetable and fruits farming as well as bee keeping. The story of Limuru Archdiocesan Organic farm in Limuru, Kiambu County, Kenya is one example of successful organic farming in Kenya.

#### **Archdiocesan Organic Farm**

The farm is located in Limuru and is owned by the Limuru Archdiocesan Church. The farm was first incorporated in the year 1902 but started organic farming in the year 2004 and was started by the Holy Ghost Fathers. The farm occupies an 8 acre piece of land.

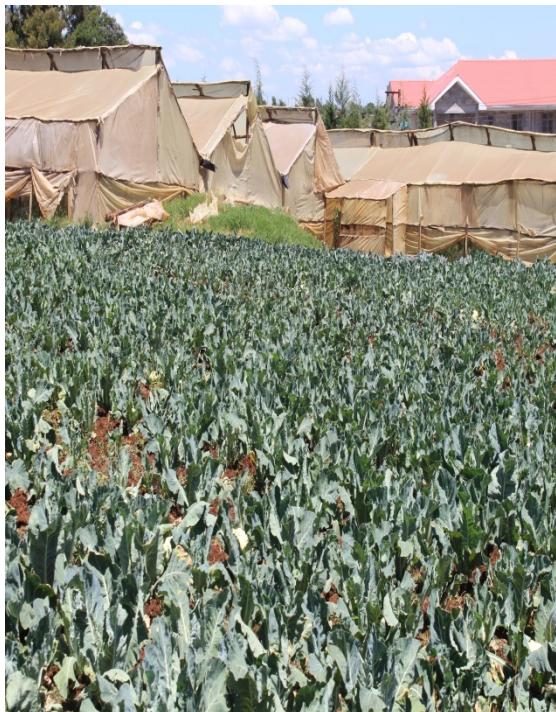
#### ***Crops grown in the farm***

Different crops are grown in the farm at different seasons. Such crops include onions (*Texas grano* (White onion) and *Red neptune* (red bulb)), cabbages, cauliflower, kales, leaks, spinach,

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<sup>20</sup><https://biovisionafricatrust.org/projects/infonet-biovision/>. Accessed 29<sup>th</sup> January. 2019

*Sonamnigrum* (managu) carrots, beetroots and broccoli. Organic herbs are also grown, notably oregano, mint, celery, thyme and sage.



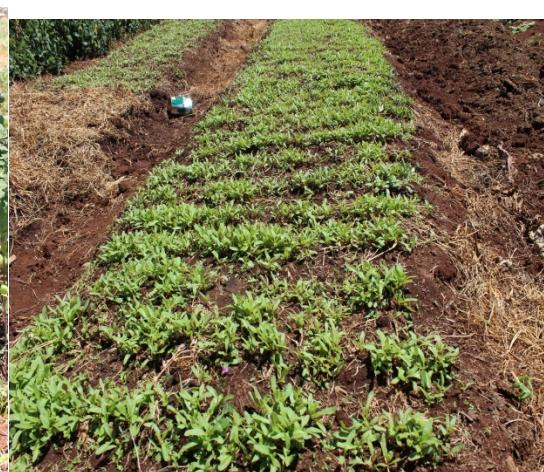
*Plate 1: Cabbages growing at the farm*



*Plate 2: Red Neptune onion variety at the farm*



*Plate 3: Mint, one of the herbs grown at the farm*



*Plate 4: Spinach nursery bed*

### ***Production at the farm***

The annual production at the farm averages 205 tonnes.

### ***Strategies employed by the farm***

The following strategies are employed to manage pests at the farm:

- i. Seasonal Planning: Due to variation in weather and climatic condition some of the crops are grown in large volumes to accommodate for the cold seasons that follow. It is also to ensure that specific crops are grown in specific conditions.
- ii. De- earthing of the onions is necessary to allow light and help in bulb formation.
- iii. Planting of pest repellent crops. Most pests cannot tolerate the liliaceae family (onion) because the repulsive smell are repellent to pests and it breaks the life cycle of cutworms.
- iv. Crop alternation and plant rotation. Alternating heavy feeders (uses all the nitrogen) to form the bulb and light feeders e.g. carrots (uses the standard amount of nitrogen) in the soil. This maintains the soil structure as well as fertility.
- v. Succession planting is practiced in this farm, where kale and spinach are planted together to save on space and extend produce.
- vi. Overhead irrigation/washing is mostly preferred to control aphids. In this case two people hold hose pipes and they wash the aphids away. The aphids can only return after one month. The washing is done a few times, after which the crop is harvested.
- vii. Handpicking of cutworms and diamond back moths.
- viii. Early planting.
- ix. Ensuring proper nutrition to maintain healthy crops: Crops such as cabbages and kale, when well supplied with manure, experience sufficient nutrients and tend to have healthy leaves (and pests take too much time before piercing one leaf to get to the next leaf).
- x. Growing of right seed varieties.
- xi. Organic repellents pesticides: These are made from the juice acquired from boiling repellent weeds such as Mexican marigold, garlic and hot pepper, which is sprayed on the vegetables. Initially pyrethrum residues were used to repel pests but not of late.



### **Challenges experienced by the farm**

The main challenges faced by the farm include:

- i. Marketing: The crops are grown organically but there is no market for the produce. Therefore the products are sold to anyone at a throw away price. There is therefore a need to create awareness about the organic products.
- ii. Labour force: The farm experiences high labour input for manure application, which is tedious and cumbersome to carry. The process of harvesting of the crops takes a long time because no chemicals are sprayed beforehand.

### **4.3 Organizations that support and initiate agro-ecological implementations in Kenya**

Table 9 below gives a snapshot of organizations that support and advocate for organic farming in Kenya.

**Table 9: Organizations that support agro-ecological implementations in Kenya**

Institution /organization	Role
Kenya Organic Agriculture Network (KOAN)	KOAN is the national coordinating body for organic agricultural activities in Kenya, and has membership of producers, exporters and traders of organic products; Non-Governmental Organizations as well as likeminded individuals that promote organic agriculture in Kenya. KOAN promotes organic agriculture through supporting and mainstreaming organic agriculture in government programs and policies, creating a market for organic products, certification and development of standards for organic products, capacity building for farmers, and developing extension and information programs, as well as ensuring quality control.
Organic Consumers Alliance (OCA)	Organic Consumer Alliance (OCA) is a limited company that advocates for a world free from toxins and environmental pollutants that cause harm to the soil, plants, animals, human beings and the entire ecosystem. OCA supports agro-ecology in Kenya by ensuring education and awareness on the benefits of organic agriculture by serving as a “Clearing House” for all health & safety matters related to the needs and concerns of organic consumers, providing a platform for organic consumers to exchange information/ideas and share experiences, and conducting capacity building, as well as policy advocacy.
Biovision Africa Trust (BvAT)	Biovision Africa Trust, a non-for-profit organization, was established in the year 2009 by Biovision Foundation of Switzerland and is supported by the International Centre of Insect Physiology and Ecology (ICIPE) with the main aim of alleviating poverty and improving the livelihood of small

	holder farmers in Kenya and other African countries. BvAT supports agro-ecology through supporting information dissemination and technological exchange about human, animal, plant and environment health.
<b>Participatory Ecological Land Use Management (PELUM) Kenya</b>	PELUM is a network of Civil Society Organizations / NGOs working with small-scale farmers in east, central and southern Africa. PELUM- Kenya is the Kenyan country chapter of the PELUM Association and has a membership of 44 member organizations. PELUM supports organic agriculture through promoting Participatory Ecological Land Use and Management practices, conducting capacity building, policy advocacy, promoting use of indigenous food programs, and offering a platform for small scale farmers to exchange information and experiences, as well as advocating for seed security.

#### **4.4 Main challenges facing the implementation of agroecology in Kenya**

The key factors derailing the uptake and growth of agro-ecology in Kenya include:

- i. Inadequate research in agro-ecology in the national agricultural research system: Formal research in the agricultural sector is carried out under the National Agricultural Research System while the informal research is carried out by farmers. However, little emphasis has been given to agro-ecology in the national agricultural research system. Data on organic farming or even integrated pest management packages in Kenya are fragmented and not readily accessible. Furthermore, there is inadequate capacity to conduct research on agro-ecology interventions in the country.
- ii. Low emphasis on agro-ecology in the education system for human capacity development: Training on agro ecology is mainly carried out by Non-Governmental Organizations and private training institutions in Kenya. There is low emphasis on agro-ecology in the education system for human capacity development. There is need for curriculum development for agro-ecology in the public education system in Kenya to encourage the growth of agro-ecology.
- iii. Inadequate extension services for agro-ecology: There is limited access to extension services for farmers practicing agro-ecology in the country. Furthermore, agro-ecology extension services have not been mainstreamed in the public extension services system of the national government. Extension services in organic agriculture, for example, is limited in terms of skills, depth of knowledge, number of extension staff and geographical coverage and are in many cases project based and therefore not supported beyond project timelines.

- iv. Lack of an effective system for production and standardization of quality inputs: Agro-ecology practices in Kenya heavily rely on non-organic seeds, hybrid seeds and seeds from one's own harvest owing to lack of certified organic seeds available in the domestic market due to the national seed production requirements. There is also a limited number of bio-fertilizers being produced locally. Although organic fertilizer standards exist, there is inadequate awareness on these standards are upheld among the farmers in Kenya.
- v. Limited production levels due to inadequate knowledge, skills and appropriate technologies among stakeholders: The government has prioritised conventional agriculture and, as such, little attention is paid to agro-ecology for skill and knowledge development as well as technological transfer. Besides, agro-ecology is labour intensive; hence, many farmers find it difficult to practice large scale organic farming in the country.
- vi. Inadequate market infrastructure and labelling requirements: Kenya still lacks a comprehensive guarantee system for marketing and trading of organic products that ensures that relevant organic standards, inspection and certification requirements are adhered to. Despite the increasing production of organic products, the market share still remains small compared to that of conventional products due to inadequate awareness on the existence of organic products and their benefits to health and environment; high costs of certification of organic products; limited distribution systems and storage facilities; and abuse of the 'organic' terminology in labelling of products owing to lack of a regulatory framework; as well as lack of differentiated markets for organic produce and products.
- vii. Unfavourable legal and regulatory framework for the growth and development of agro-ecology: Kenya still lacks a specific legal framework that speaks to agro-ecology. Coordination/ engagement structure/fora between different institutions that are involved in agro-ecology is also lacking.

## **5. Recommendations on ways to promote alternatives to Highly Hazardous Pesticides and phase out Highly Hazardous Pesticides in Kenya**

Table 10 below summarises the key actions that need to be taken in order to phase out highly hazardous pesticides and promote agro-ecology in Kenya.

**Table 10: Actions to phase out HHPs in Kenya and promote agroecology**

Challenges	Action/Recommendation
<b>1.0 Actions to phase out Highly Hazardous Pesticides in Kenya</b>	
<b>Weak compliance and enforcement</b>	There is a need to strengthen the compliance and enforcement capacity of PCPB to conduct market surveillance of already banned and counterfeit products in Kenya.
<b>Non-supportive policies/measures for the phase out of Highly Hazardous Pesticides</b>	There is a need to develop a roadmap to implement the progressive ban of Highly Hazardous Pesticides registered in Kenya.
<b>Substandard, illegal and counterfeit pesticides in the market</b>	There is a need to strengthen the capacity of relevant government agencies to identify banned products, as well as counterfeit products, in order to enhance border control on importation.
<b>Inadequate education and awareness on highly hazardous pesticides</b>	Design education and awareness programs on the health and environment impacts of highly hazardous pesticides in Kenya.
<b>Limited research on the health and environment impacts of highly hazardous pesticides in Kenya</b>	Conduct health and environment impact assessments of specific highly hazardous pesticides used in Kenya to inform decision-making on ban of such pesticides.
<b>2.0 Actions for the promotion of alternatives to Highly Hazardous Pesticides in Kenya</b>	
<b>Inadequate research in agro-ecology in national agricultural research system</b>	Mainstream agro-ecology research in the national agricultural research agenda to build the evidence on the benefits and viability of agro-ecology and its contribution to the country's food security agenda.
<b>Low emphasis on agro-ecology in the education system for human capacity development</b>	Mainstream training on agro-ecology in Non-Governmental Organizations and private training institutions as well public institutions, including development of curriculums on Integrated Pest Management (IPM) and Organic Agriculture (OA) for Non-Governmental Organizations as well as private and public training institutions.
<b>Limited extension services for agro-ecology</b>	Mainstream agro-ecology within the public extension programs to ensure that extension services are available and accessible to all the farmers practicing agro-ecology at all times.
<b>Lack of an effective system for production</b>	Develop an effective system for production and standardization of quality organic inputs to ensure they meet required standards.

<b>and standardization of quality inputs</b>	
<b>Inadequate knowledge, skills and appropriate technologies among stakeholders on organic farming</b>	Develop a capacity building program targeted at improving the skills and knowledge of farmers on organic farming and integrated pest management, and identify appropriate technologies that can support agro-ecology.
<b>Inadequate market infrastructure and labelling requirements</b>	Develop market infrastructure and labelling requirements targeted at promoting certified organic agricultural products and services to ensure that producers can easily access markets for their produce.
<b>Develop market infrastructure and labelling requirements targeted at promoting certified organic agricultural products and services</b>	Finalise the draft Organic Agriculture Policy as well as develop a national integrated pest management policy, and put in place appropriate governance structures that will support agro-ecology in Kenya.
<b>Inadequate awareness and education on organic farming</b>	Develop appropriate awareness and education programs aimed at promoting agro-ecology. This can include programs aimed at promoting IPM packages among farmers and those targeting markets for organic products, as well as those targeting the benefits of organic agriculture and integrated pest management to the general public (consumers).

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