Centre for Environment
Justice and Development

FIELD SURVEY REPORT

Use and Impacts of Pesticides in Kajiado, Kirinyaga and Nakuru Counties, Kenya

November 2025

Field Survey Report: Use and Impacts of Pesticides in Kajiado, Kirinyaga and Nakuru Counties, Kenya

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Centre for Environment Justice and Development

Comments and inquiries may be forwarded to:

Centre for Environment Justice and Development (CEJAD)
3rd Floor, Ngong Hills Hotel Business Centre
Opposite Bishop Magua Centre, Ngong Rd
Nairobi, Kenya
Tel: +254 0720 465 400
Email: info@cejadkenya.org
Website: www.cejadkenya.org
Facebook: Centre for Environmental Justice And Development - CEJAD
X: @CEJADKenya
Instagram: @cejad_kenya
LinkedIn: Centre for Environmental Justice and Development

Authors: Martha Mwikali Mwanzia, Fredrick Onyango Otieno, Griffins Ochieng Ochola, Aron Kecha Agwa, Richard Dimba Kiaka (PhD) ,Sherphine Apiyo Kochiyo

Contributors: Eustace Kiarie, Wycliffe Nyamao, Fredrick Juma, Francis Nkadayo

Layout and design: Brian Kigame

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Abbreviations

CEJAD	Centre for Environment Justice and Development
CPAM	Community-based Pesticide Action Monitoring
DOSHS	Directorate of Occupational Safety and Health Services
ECHA	European Chemicals Agency
EPA	Environmental Protection Agency
EU	European Union
FAO	Food and Agriculture Organization of United Nations
GHS	Globally Harmonized System of Classification and Labelling of Chemicals
HHPs	Highly hazardous pesticides
IARC	International Agency for Research on Cancer
JMPM	Joint Meeting on Pesticide Management by FAO/WHO
KRA	Kenya Revenue Authority
LMICs	Low- and middle-income countries
PAN	Pesticide Action Network
PCPB	Pest Control Products Board
PPEs	Personal protective equipment
TPHPA	Tanzania Plant Health and Pesticides Authority
WHO	World Health Organization

Executive Summary

Background

There has been growing debate on the impact of pesticides used in the country. Whereas Kenya has no publicly available list of declared HHPs, other stakeholders have identified about 195 pesticide products as HHPs using the Pesticide Action Network (PAN) International list of HHPs (Silke Bollmohr, 2023). It is estimated that 76% of the volume of pesticides used by farmers in Kenya are considered as HHPs.

The government of Kenya has taken efforts to review and address potential HHPs, leading to a number of pesticides being withdrawn from the Kenyan market, while some have been restricted. Some of the pesticides that have been recently reviewed and restricted by the Pest Control Products Board (PCPB) include; 2,4-D Amine, Abamectin, Chlorpyrifos, Dimethoate, Imidacloprid, Omethoate, Propineb, Iprodione, Oxydemeton-methyl, Mancozeb and Permethrin. Those withdrawn from Kenyan market include Acephate, Chlorothalonil, Pymetrozine, Thiacloprid, Diuron, POE Tallow Amine, Kasugamycin and pyridalyl.

Despite the efforts to manage HHPs in Kenya, information on their use and effects under local conditions remain inadequate.

The Pesticide Use Study

The **Centre for Environment Justice and Development (CEJAD)** undertook a study on the use and impacts of pesticides in Kenya, covering three regions namely, Kajiado, Kirinyaga and Nakuru. Specifically, the study sought to; (i) Identify pesticides and HHPs used by farmers in the three areas of the study (ii) Document the practices employed by farmers in the use and management of pesticides, and (iii) Assess the health and environment effects of pesticides in the farming communities. The study employed a Mixed Method Design employing both qualitative and quantitative approaches. The Community-based Pesticide Action Monitoring (CPAM) methodology was employed in this study. CPAM is a research method that actively involves communities in documenting and raising awareness about the dangers of pesticides and their effects on both human health and the environment. Data was collected using a structured questionnaire for a period of three months (June to September, 2024). A total of 1523 people were interviewed from the 3 counties. In Kajiado county, the study focused on Kajiado South sub-county. In Kirinyaga county, the study targeted the four sub-counties: Kirinyaga central, Mwea East, Kirinyaga East, and Mwea West. In Nakuru county the study covered Naivasha and Gilgil sub-counties**.**

Key Study Findings

Of the 527 products used by the respondents, 31.7% were identified as HHPs. Majority of these products were fungicides 52.1% followed by insecticides (40.1%) and herbicides (7.2%). The study results showed that Kajiado county had the highest number, 102 (35.5%) of HHPs products identified followed by Kirinyaga with 69 (31.1%) and Nakuru had the least 37 (19.1%). In total, 30 (15.6%) pesticides active ingredients were used across the three study areas.

Nearly half (42.9%) of the identified HHPs are classified as reproductive toxicants (GHS Category 1B). This implies that they can adversely affect the sexual function and fertility in adult males and females, as well as cause developmental toxicity in the offspring (cause serious harm to the developing embryo or foetus. Another 40% are classified as to human carcinogen (GHS Category 1B). A further analysis of the pesticides established that about 42.5% of the products were highly toxic to bees and/or aquatic organisms, birds, earthworms or mammals. 29 pesticide active ingredients were registered in these products, representing 15.1% of all the active ingredients.

Analysis of the pesticides used by the respondents revealed that 37.5% of the 192 identified pesticide active ingredients were banned in other countries across the globe (PAN, 2022) for health and environment reasons. Equally, looking at active ingredients, the study reveals that 23.6% of pesticides had active ingredients banned within their countries of origin. The availability of such products in the

Kenyan market raises issues of unethical trade. Governments should prohibit the export of chemicals they have prohibited nationally in line with the Global Framework on Chemicals. These pesticides should be phased out in Kenya in line with the Section 12(2), Standards Act (cap 496) of the Business Laws (Amendment) Act, 2024.

From the identified products, 91% were registered in Kenya by Pest Control Products Board (PCPB), 5.0% were registered in Tanzania by Tanzania Plant Health and Pesticides Authority (TPHPA) while 4% were not known where or whether they are registered. About 22% of the total products found in Kajiado county and 1% of products found in Kirinyaga were registered in Tanzania, indicating illegal cross border flow of pesticides, and need for close collaboration between countries to curb this problem.

The study revealed that more than half (62.2%) of the respondents had received training on pesticide use while another 37.8% had not received any training. Kajiado and Kirinyaga recorded higher number of respondents with no training on pesticide use (43.7% and 45% respectively) while Nakuru recorded the highest number of respondents (88%) who had received training.

In terms of safe pesticide use practices, about 98.4% of sampled respondents in Nakuru, 55.5% in Kirinyaga and 54.3% in Kajiado alluded to using PPES while using pesticides. The figures show that a significant number of workers in Kajiado and Kirinyaga counties, (45.7% and 44.5% respectively) did not use PPEs. In addition, even those who used PPEs did not wear appropriate and full protective gears. The widely used PPEs included boots/shoes, overalls, gloves and facemasks.

Other bad pesticide use practices identified included cases of workers re-entering sprayed fields before lapse of safe period. Nakuru county had the highest number of respondents (53.5%) re-entering the field on the same day after pesticide spraying followed by Kajiado at 31%. Burning of unwanted pesticides was the most common form of disposal. Kajiado (66%) and Kirinyaga (42%) reported the highest number of respondents who burned left over and unwanted pesticides compared to Nakuru (22.4%). Nakuru reported the highest proportion of respondents who returned empty pesticide containers to the company/distributor (54.2%).

The study established bad practices in cleaning and washing of spraying equipment by the respondents, increasing the risk of exposure to pesticide residues and contamination of the environment. The most common washing facilities were taps, irrigation drains, water containers, river, wells, ponds/lakes and others included designated areas such as soak pits and shower rooms.

In terms of effects of chemical exposure, the study reveals that 544 (36.4%) of the respondents reported they had experienced adverse effects following exposure to pesticides. The most common symptoms reported included; skin rashes, headaches, nausea, vomiting, dizziness, excessive salivation, diarrhoea, sleeplessness, difficulty in breathing and excessive sweating. Kirinyaga (41.3%) and Nakuru (40.6%) counties recorded the highest rate of the respondents who reported adverse effects from pesticide exposure compared to Nakuru (27.4%). 16.5% of the respondents in the 3 counties reported a family member suffered from chronic illnesses. The common illnesses quoted include cancer, diabetes, liver disease, learning difficulties, kidney disease and development disorders. This calls for the need to further investigate the causal link between pesticide exposure and chronic illnesses in the study areas.

Conclusions and Recommendations

Our study shows that pesticide poisoning is a problem among smallholder farmers and farm workers in Kenya. In addition, the use of HHPs among farmers is common in Kenya without proper protective gears. Judicious use of pesticides is also a problem amongst farmers, increasing the risk of exposure to people and environment. The Kenya's pesticides legal regime still allows for registration of pesticides banned in other countries for health and environment concerns thus shifting the burden of managing their risks to vulnerable farmers.

To reduce the risks and impacts of pesticides, particularly HHPs, the study makes the following recommendations;

- The Ministry of Agriculture and Pest Control Products Board (PCPB), in collaboration with ministries of health and environment and stakeholders should review and formulate policies and laws to eliminate HHPs and promote safe and affordable alternatives.
- PCPB should review the registration of all identified highly hazardous pesticides (HHPs) and those banned in other jurisdictions but still permitted in Kenya, with a view to prohibiting or restricting their use where appropriate to protect human health and the environment.
- The relevant government Ministries, Departments and Agencies (MDAs) and stakeholders should support farmers to transition to agricultural production using safer and sustainable pest management practices through trainings in safer alternatives such as agroecology, Integrated Pest Management (IPM), and biopesticides, awareness and educational programs.
- PCPB should assess the impacts of and review registration of pesticides identified to be highly toxic to bees and aquatic organisms with the view of prohibiting or restricting their use as appropriate.
- PCPB and National Environment Management Authority (NEMA), in partnership with the pesticide industry, should establish a national Extended Producer Responsibility (EPR) scheme for the safe management of pesticide containers and obsolete pesticides, in accordance with the 2024 EPR regulations.
- The Ministries of Agriculture, Environment, and Health should conduct regular post-registration monitoring and surveillance of pesticide use and its impacts to identify severe and irreversible effects under local conditions, and to support evidence-based decision-making.
- The Ministry of Agriculture and the PCPB, in collaboration with the Ministries of Health and Environment, should establish a coordinated mechanism to strengthen inter-ministerial collaboration and enhance stakeholder engagement in the management of pesticides and HHPs in Kenya.
- The Ministry of Labor and Social Protection, through the Directorate of Occupational Safety and Health Services (DOSHS), should implement a health monitoring program for flower industry workers in Kenya to identify and protect those exposed to harmful pesticides in the workplace.
- DOSHS should establish a national database to centralize all biomonitoring reports conducted on flower industry workers by companies in Kenya. This will enhance transparency, improve access to critical health information, and support informed decision-making for worker protection.
- There is need for collaboration between Kenya and Tanzania to curb illegal cross-border trade in pesticides. PCPB in collaboration Kenya Revenue Authority (KRA) should sensitize and train border control officers in identifying and curbing trade of illegal pesticides at border points.

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1 INTRODUCTION

1.1 Background

The use of pesticides to control pests and diseases in Kenya has doubled since 1990. In 2022, total pesticides use in agriculture was 3.70 million tonnes (Mt) of active ingredients, marking a 4% increase with respect to 2021, a 13% increase in a decade. Kenya used 5083 tonnes of active ingredients, a slight decline from 5465 tonnes in 2021(FAO 2024).

The use of pesticides comes with numerous health, environmental, and social implications, especially for vulnerable groups. Exposure to pesticides can cause several health effects ranging from acute poisonings to chronic illnesses. Acute poisonings of pesticides can present as nausea, vomiting, headache, and eye and skin irritation, among others. Pesticides have been linked with chronic effects such as birth defects, cancers, damage to the brains of small children, reduced intellectual capacity, neurological conditions, infertility, and endocrine disorders including diabetes, etc. Globally, 385 million cases of unintentional acute pesticides poisoning are reported every year, resulting in around 11,000 fatalities, with about 44% of farmers experiencing poisoning by pesticides annually (Boedeker et al, 2020).

A recent study by WHO reveals that more than 720,000 people die by suicides annually [1], with pesticide self-poisoning accounting for 14-20% of all global suicide cases, especially in low- and middle-income countries[2] , due to access to highly hazardous pesticides. When released to the environment, pesticides can persist for decades, posing threats to the entire ecological system. The resultant contamination of air, surrounding soil, and water sources causes massive environmental disruptions such as loss of biodiversity, including birds, and destroying beneficial insect populations that act as natural enemies of pests and pollinators, among others.

Most of the harms caused by pesticides are linked to a relatively small number of pesticides in use, categorized as highly hazardous pesticides (HHPs). HHPs are defined as pesticides that present particularly high levels of acute or chronic hazards to health or environment according to internationally accepted classification systems such as WHO or Globally Harmonized System (GHS), or their listing in relevant binding international agreements or conventions (FAO and WHO 2013, 2016). In addition, pesticides that appear to cause severe or irreversible harm to health or the environment under conditions of use in a country may be considered to be and treated as highly hazardous." According to the Food and Agriculture Organization (FAO), these pesticides constitute between 6-10% registered pesticides (FAO 2021). Therefore, acting on this small number of pesticides would remove many of the harms caused by pesticides globally (UNEP, 2023).

1.1.1 Global Action on Highly Hazardous Pesticides

Highly Hazardous Pesticides (HHPs) first received attention in 2006 when the FAO Council called for progressive phase out of HHPs (FAO, 2006). In 2008, the criteria for identifying HHPs was recommended by the FAO/WHO Joint Meeting on Pesticide Management (JMPM) (FAO/WHO, 2016). In 2015, HHPs was recognized as an issue of international concern by stakeholders at the Forth session of the International Conference on Chemicals Management, and called for concerted efforts to address them[3].

To guide countries in addressing HHPs, FAO and WHO developed guidelines on HHPs in 2016. These guidelines outline three steps process for HHPs risk reduction, including HHPs identification, risks and needs assessment, and mitigation options (FAO and WHO, 2016). More recent efforts to address HHPs globally came about between 2022 and 2024. In 2022, the Kunming-Montreal Global Biodiversity Framework (GBF) adopted by governments at the 14th Meeting of the Conference of Parties (COP15) to the Convention on Biodiversity (CBD), included a target to reduce pollution risks and negative impacts of pollution from all sources by 2030, including from pesticides and high hazardous chemicals [4].

1 https://www.who.int/news-room/fact-sheets/detail/suicide

2 https://www.who.int/news/item/17-12-2020-new-study-highlights-cost-effectiveness-of-bans-on-pesticides-as-a-suicide-prevention-strategy#:~:text=Suicide%20is%20a%20major%20global,access%20to%20highly%20hazardous%20pesticides.

3 See resolution IV/3 in Annex 1 of the report of the Fourth session of the International Conference on Chemicals Management (ICCM4). Available: https://www.saicm.org/Portals/12/documents/meetings/ICCM4/doc/K1606013_e.pdf.

4 See target 7 of the Kunming-Montreal Global Biodiversity Framework (GBF) available at: https://www.cbd.int/doc/decisions/cop-15/

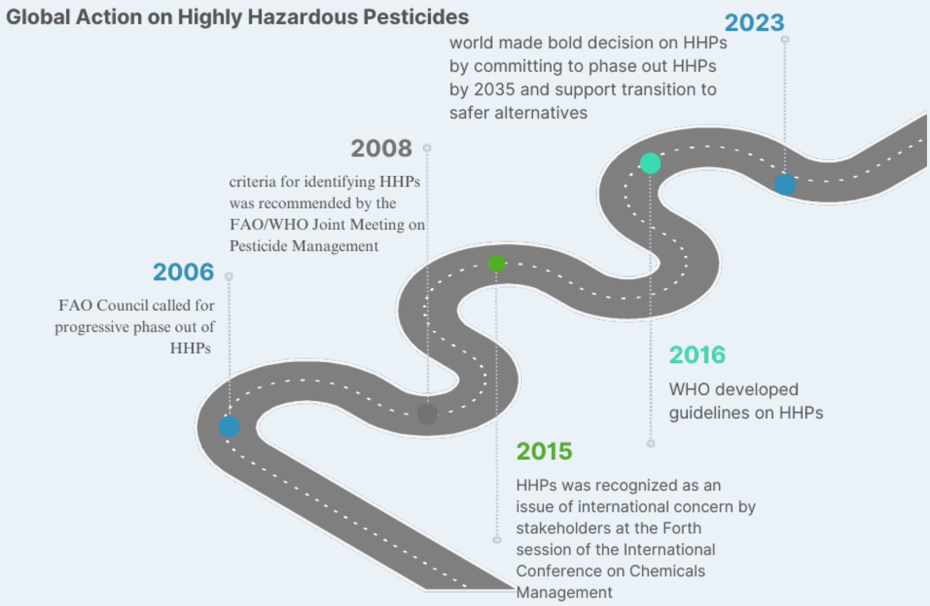

Figure 1: global action on highly hazardous pesticides

In 2023, the world made bold decision on HHPs by committing to phase out HHPs by 2035 and support transition to safer alternatives as one of the key targets of the Global Framework on Chemicals: For a planet free of harm from chemicals and wastes [5]. To facilitate global action on HHPs, the Fifth session of the International Conference on Chemicals Management (ICCM5) adopted a resolution to establish a Global Alliance on HHPs. The sixth session of the United Nations Assembly (UNEA 6) in 2014 also adopted a resolution encouraging its Member States ad all relevant stakeholders to support the work of the alliance, and to become members of the alliance.

At the regional level, there are different initiatives aimed at addressing HHPs. The Southern African Development Community (SADC) has adopted a harmonized regional strategy to phase out HHPs. East Africa Community (EAC) is also in the process of developing a strategy to guide phase out of HHPs in the region . [6]

1.1.2 Kenya scenario

Whereas Kenya has no publicly available list of declared HHPs, other stakeholders have identified some pesticides as HHPs in Kenya. Route to Food Initiative identified 195 pesticide products as HHPs using the Pesticide Action Network (PAN) International list of HHPs (Silke Bollmohr, 2023). They estimate that about 76% of the volume of pesticides used by farmers in Kenya are considered as HHPs.

The government of Kenya has also taken efforts to review and address potential HHPs, leading to a number of pesticides being withdrawn from the Kenyan market, while some have been restricted. This follows widespread recognition and call by stakeholders and the public to phase out HHPs from use in Kenya. Some of the pesticides that have been recently reviewed and restricted by the Pest Control Products Board (PCPB) include; 2,4-D Amine, Abamectin, Chlorpyrifos, Dimethoate, Imidacloprid, Omethoate, Propineb, Iprodione, Oxydemeton-methyl, Mancozeb and Permethrin. Those withdrawn from Kenyan market include Acephate, Chlorothalonil, Pymetrozine, Thiacloprid, Diuron, POE Tallow Amine, Kasugamycin and pyridalyl.

Despite the efforts to manage HHPs in Kenya, information on their use and effects under local conditions remain inadequate.

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5 See target A7 of the Global Framework on Chemicals available at: https://www.chemicalsframework.org/page/strategic-objectives-and-targets

6 https://www.fao.org/pest-and-pesticide-management/pesticide-risk-reduction/reducing-global-risk-from-hhp/fao-and-hhps/en/

1.2 Community Monitoring of Use and Impacts of Pesticides Study

CEJAD undertook a study on the use and impacts of pesticides in Kenya, covering three regions namely, Kajiado, Kirinyaga and Nakuru. The study was guided by the need for targeted studies on use and effects of pesticides in the country. This is critical in bolstering efforts by stakeholders to successfully identify and phase out HHPs in Kenya.

1.2.1 Study objectives

The aim of the study was to document the use and impacts of pesticides in the 3 counties in Kenya. Specifically, the study sought to;

i. Identify pesticides and HHPs used by farmers in the three areas of the study
ii. Document the practices employed by farmers in the use and management of pesticides
iii. Assess the health and environment effects of pesticides in the farming communities

1.2.2 Study area and context

a) Kajiado county

In Kajiado county, the study was conducted in Kajiado South constituency commonly known as Loitoktok. It covered 13 villages spread across 4 wards in Loitoktok. The wards included Kimana, Imbirikani, Kuku and Entonet/Lenkisin. The study area comprised mainly of smallholder and small-scale commercial farmers. Major crops grown in the area included tomatoes, onions, kales, cabbages, and capsicum. Flowers are also grown in the area to a small extent.

The study area lies within the Amboseli ecosystem which comprises Amboseli National Park and 6 ranches. The Park is one of the few UNESCO sites in Kenya and has a ranging biological diversity including habitat, landscape, big tusker elephants, Maasai Giraffe, an Array of ungulates, large carnivores, rich birdlife, and wildlife corridors. The Park is one of the 62 Important Bird Areas in Kenya and is globally recognized as a significant site for bird conservation.

Over the years, Amboseli Ecosystem has undergone a lot of land subdivisions, resulting in a growing number of commercial agricultural activities in the area. Kajiado county is found in Rift valley region of Kenya. It borders Nairobi and to its south borders the Tanzanian regions of Kilimanjaro and Arusha. Kajiado county features a variety of wildlife as it holds the Amboseli National Park.

b) Kirinyaga county

In Kirinyaga county, the study was conducted in Kirinyaga Central, Kirinyaga East, Mwea East and Mwea West sub-counties, and covered a total of 80 villages spread across 22 Wards (Table 2). Kirinyaga county is located south of Mt Kenya and in the central region of Kenya. The main economic activity of Kirinyaga county is agriculture which is largely done on a small scale due to land scarcity and high population. The most common crops grown in the study area included kales, tomatoes, cabbages and pepper. In addition, the county is also best known for rice production in Mwea Irrigation Scheme.

c) Nakuru county

The study was conducted in Naivasha and in Gilgil constituencies in Nakuru county. Nakuru county is located in the Rift valley region of Kenya, and hosts various tourist attractions such as lakes (Lake Nakuru, Lake Naivasha, Lake Elementaita) and craters (e.g Menengai crater). It is also rich in agriculture activities.

The study covered 9 villages across 6 wards namely; Lake View, Hells Gate, Viwandani, Olkaria, Malewa West, Gilgil and Malewa East. Naivasha constituency hosts natural resources such as Lake Naivasha, Geothermal wells in Olkaria and Hells Gate. Naivasha. Among the major economic activities in Naivasha are flower farming and horticulture. Gilgil constituency located between Naivasha and Nakuru hosts the Gilgil River. The study mostly targeted workers in the flower farms around Naivasha.

2 STUDY APPROACH AND METHODOLOGY

2.1 Study Approach

The study employed a Mixed Method Design employing both qualitative and quantitative approaches. The Community-based Pesticide Action Monitoring (CPAM) methodology developed by Pesticide Action Network Asia Pacific (PANAP) was employed in this study. CPAM is a research method that actively involves communities in documenting and raising awareness about the dangers of pesticides and their effects on both human health and the environment. This approach empowers community members to conduct research while encouraging organizing and action.

2.2 Methodology

Data was collected through face-to-face interviews with the respondents using a structured questionnaire presented on a mobile device. The questionnaire was administered by community leaders and farmers through Kobo Collect application. This data was analysed using SPSS and Microsoft excel. Prior to data collection, 10 community leaders and farmers were trained on CPAM and the questionnaire. They were also equipped with knowledge on the types and impacts of pesticides. Data was gathered within a period of 3 months (June to September, 2024).

2.2.1 Target group and selection of respondents

The study targeted smallholder farmers and farm workers in the horticultural sector, mainly vegetable and flower production, and focused on areas where pesticides were used based on intensive agricultural activities.

Purposive sampling was used to select the villages and wards while participants were selected randomly. A total of 1523 people were interviewed from the 3 counties.

In Kajiado county, the study focused on Kajiado South sub-county. A total of 613 people responded to the study, mainly from Kimana and Kuku wards, as summarised in table 1 below:

Table 1: Distribution of Respondents in Kajiado South Subcounty

Ward	Village	No of Respondents	Percentage
Kimana	Oltepesi, Oloile, Namelok, Tikondo, Kirasha,Enchoro, Enkaji Naibor	290	47.3
Imbirikani	Isinet, Enkaji Naibor, Kaleriswa, Kirasha, Nemelok	71	11.6
Kuku	Shurie	238	38.8
Entonet/Lenkisin	Namelok OG	14	2.3
Total		**613**	**100.0**

In Kirinyaga county, the study targeted the four sub counties: Kirinyaga Central, Mwea East, Kirinyaga East, and Mwea West. A total of 600 respondents were reached as summarised in the table 2 below:

Table 2: Summary of Respondents Distribution in Kirinyaga County

Sub-county	Wards	No of Respondents	Percentage
Kirinyaga Central	Inoi, Kangai, Kanyekini, Kerugoya, Mutira Mutithi, Nyangati	277	46.2
Kirinyaga East	Baragwi, Kabare, Kangai, Kanyekini, Karumandi, Kerugoya	66	11.0
Mwea East	Baragwi, Gathigiriri, Kangai, Mutithi, Ngariama, Nyangati	192	32.0
Mwea West	Kangai, Murinduho, Nyangati	65	10.8
Total		**600**	**100.0**

In Nakuru county the study covered Naivasha and Gilgil sub-counties. A of 310 respondents were interviewed as summarised in the table 3 below:

Table 3: Summary of Respondents distribution in Nakuru County

Subcounty	Ward	Village	No of Respondents	Percentage
Naivasha	Lake View	Kihoto, Manera	95	30.6
	Hells Gate	Sanctuary	76	24.5
	Viwandani	Kanjo	45	14.5
	Olkaria	Kwa Muhia, DCK	39	12.6
	Malewa West	KCC	33	10.6
	Malewa East	Panda	7	2.3
Gilgil	Gilgil	Gilgil	15	4.8
Total			**310**	**100.0**

2.2.2 Data analysis and presentation

Data was cleaned and analyzed using descriptive statistics. The data has mainly been presented using tables, charts and graphs. The statistical data was augmented with qualitative data from interactions with the respondents.

2.3 Identification of HHPs

HHPs were identified using the eight HHPs criteria established by the FAO and WHO Joint Meeting on Pesticide Management (JMPM Criteria) .[7]

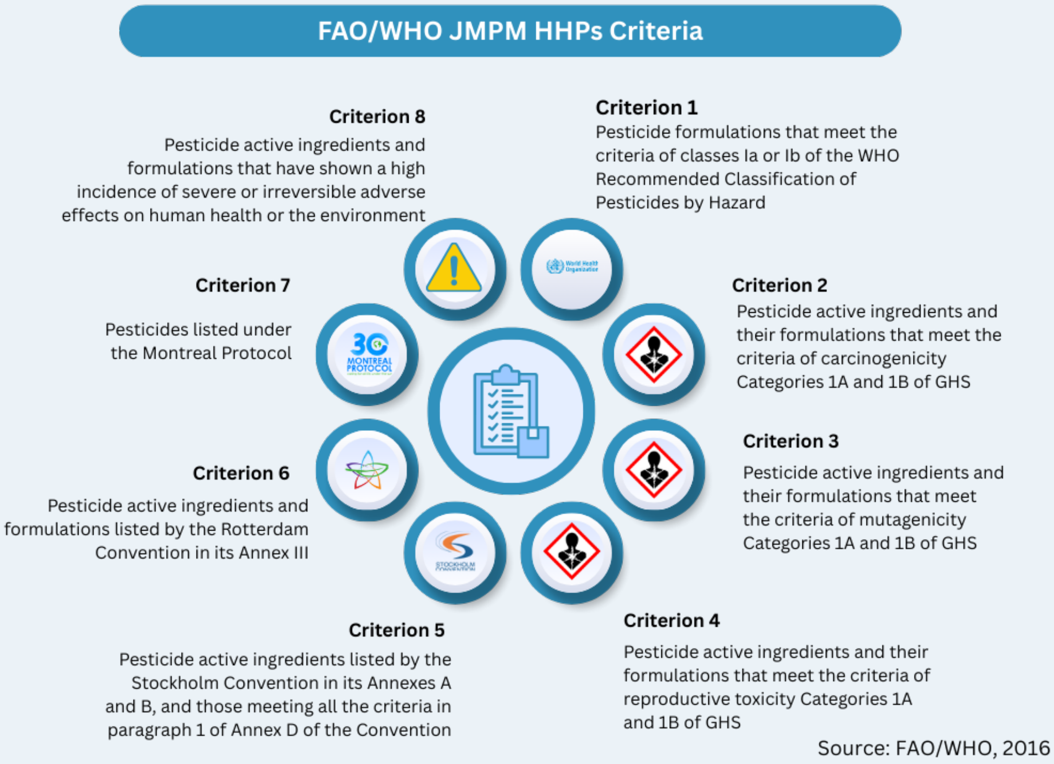

Figure 2: FAO/WHO JMPM HHPs Criteria

The report relied on information from reputable sources to classify pesticides under various criteria. For Hazard Classifications, the report relied on information from the WHO – International Agency for Research On Cancer (IARC) – Agents classified by the IARC monographs, OECD eChemPortal – Classification Search, European Chemicals Agency (ECHA) – C&L Inventory, US EPA carcinogenicity evaluation – Database for Chemical Information, WHO - Classification of Pesticide by Hazard and

7 https://www.fao.org/pesticide-registration-toolkit/special-topics/highly-hazardous-pesticides-hhp/identification-of-hhps/en/

Pesticides Properties Database by University of Hertfordshire.

For pesticide listed in the Conventions, the report relied on lists provided in the Annex III of the Rotterdam Convention, Annex A & B of the Stockholm Convention. For listing under Criterion 8, the report heavily relied on decisions by the Pest Control Products Board.

The Pesticide Action Network (PAN) International list of banned pesticides and list of HHPs were also relied upon in identifying HHPs and pesticides banned or restricted in other jurisdictions (PAN International, 2024a; PAN International, 2024b).

2.4 Limitations

While this report provides information about pesticides and HHPs used in the three study locations, it does not provide information on the volume of pesticides or HHPs used. In addition, it does not provide information linking the reported symptoms of poisonings with specific pesticides.

In regards to identification of HHPs, the report relied heavily on criteria 1-7. Criterion 8 was used to a limited extent due to lack of information on the local evidence linking identified pesticides with high incidence of severe or irreversible adverse effects on human health or the environment. However, the report has identified pesticides that could be classified under criterion 8 based on their environmental hazards.

3 STUDY FINDINGS

3.1 Socio-Demographic Characteristics of Respondents

The study sampled 1,523 respondents across the three study areas. Kajiado county had the highest number of respondents with a total of 613 (40.2%) followed by Kirinyaga with 600 (39.4%) and Nakuru with 310 respondents (20.4%).

Of these respondents, majority were males 1,223 (80.3%) while females were 300 (19.7%). Of the female respondents, 18 (6%) were pregnant while 36 (12%) were breastfeeding at the time of the study.

Majority of the respondents (86.5%) were below 50 years of age. In terms of education levels, 1,413 (92.8%) had attained some formal education, while only 110 (7.2%) of the respondents had never attended school.

Most of the respondents, 955 (62.7%) who participated in the study were farm owners or farmers followed by farm workers at 568 (37.3%). Of the farmers category, 20.8% were investors who had leased land from the locals for farming purposes but were not actively in the farms. The average household size is 4.3 across the study areas. Table 4 below summarises the key socio-demographic characteristics of respondents.

Table 4: Demographic profile of study respondentst

	Kajiado	Kirinyaga	Nakuru	Average
	n = 613	n= 600	n=310	N=1523
Sex				
Male	35.6%	29.0%	15.8%	80.3%
Female	4.7%	10.4%	4.6%	19.7%
Age				
18-35yrs	20.6%	12.5%	8.8%	41.9%
36-50yrs	5.4%	20.0%	9.3%	44.6%
50-60yrs	3.2%	5.8%	2.1%	11.2%
60yrs and above	1.7%	1.1%	0.1%	2.3%
Marital status				
Single	13.9%	6.2%	3.0%	23.0%
Married	24.6%	30.7%	15.6%	70.8%
Widowed	1.7%	2.6%	1.8%	6.1%
Education level				
Never went to school	5.9%	0.3%	1.0%	7.2%
Primary school	20.5%	10.6%	6.3%	37.4%
Secondary school	2.1%	21.9%	9.4%	43.4%
Tertiary education	1.7%	6.6%	3.7%	12.0%
Average household size (n)	**5**	**4**	**4**	**4.3**

3.2 Characterization of Labour

Among the respondents, only 18.4%, 29.7%, and 1.5% in Kajiado, Kirinyaga, and Nakuru counties were farm owners, while 9.8, 9.1, and 18.4% respectively were farm workers.

The average time spent in the farm working is 4-8 hours a day, while some spend 8-12 hours. In Nakuru and Kajiado farmers/workers work an average of 6 days a week, while in Kirinyaga the average was 5 days a week. In terms of the years, most of the respondents revealed they had worked on the farm between 1-3 years. The duration of working in a farm or company that used pesticides or where pesticides are used may have an implication on the duration of exposure to the adverse effects of pesticides.

Table 5 below summarizes the characterization of labour in the farms.

Table 5: Characterization of labour

	Kajiado	Kirinyaga	Nakuru	Average
Role				
Farmer	18.4%	29.7%	1.5%	49.6%
Farm worker	9.8%	9.1%	18.4%	37.3%
Partnership	12.15	0.5%	0.5%	13.1%
Hours in a day worked in the farm				
Less than 4hrs	2.0%	5.8%	0.7%	8.5%
4-8hrs	20.0%	24.8%	58.8%	58.8%
8-12hrs	8.3%	7.9%	21.7%	21.7%
More than 12 hrs	9.9%	1.0%	0.1%	11.0%
Average days in a week worked in the farm				
No. of days (n)	6	5	6	5.7
Years worked in the farm				
Less than 1yr	4.3%	3.7%	2.2%	20.2%
1-3yrs	12.6%	11.4%	6.2%	30.2%
3-6yrs	5.9%	9.1%	7.2%	22.2%
6-9yrs	1.7%	4.9%	3.2%	9.8%
10 years and above	5.7%	10.3%	1.6%	17.6%
Number of employees in the farm				
1_10	36.6%	35.4%	0.5%	72.5%
10_20	2.8%	3.6%	0.9%	7.3%
20_30	0.7%	0.3%	1.6%	2.6%
Above 30	0.1%	0.1%	17.5%	17.7%

On average, farms in Kajiado and Kirinyaga have 1-10 workers (36.6% and 35.4% respectively), while for Nakuru county majority indicated the farms had more than 30 employees. This may reflect the number of people who may be at risk of exposure to pesticides, especially in farms where they are applied.

3.3 Identified Pesticides and HHPs

3.3.1 Use of pesticides by respondents

The study showed that nearly all the respondents (98% of the 1523 respondents in the 3 study areas) used pesticides or worked in farms where pesticides were used or had been used. Of these, 1,212 (81.2%) were men while 280 (18.8%) were women (Table 6). This shows that both men and women were involved in the use of pesticides.

Among the 280 women who were using pesticides, 13 (4.6%) were reportedly pregnant, while another 34 (12.1%) were breastfeeding at the time of the study. This is concerning as women and children are more vulnerable to and are disproportionally impacted by pesticides (Box 1).

Table 6: Distribution of pesticide use by gender and study locations

	Kajiado	Kirinyaga	Nakuru	Average
	n=595	n=598	n=299	N=1492
Gender				
Male	35.7%	29.5%	16.0%	81.2%
Female	4.2%	10.6%	4.0%	18.8%

Box 1: Impacts of pesticides on women and children

Our study shows that both men and women were using pesticides. However, exposure to pesticides can disproportionally affect men and women. Pregnant and breast-feeding women are considered at higher risk when exposed to pesticide. The study established that of the females who used pesticides or worked in farms where pesticides were used, 4.6% of them were reportedly pregnant. Another 12% were breast feeding. This is concerning as exposure to pesticides by breastfeeding women can potentially expose their children particularly through breast milk. Exposure can also affect their unborn child as pesticides can be passed from the mother to the unborn child. Such exposures may have long-lasting devastating effects on their babies. Pesticide exposure during pregnancy has been linked to adverse pregnancy outcomes and impaired child growth in several epidemiological studies (Berkowitz etal 2003, Paudel etal 2012 and Kartini etal 2019).

3.3.2 Activities involving use of pesticides

Our study shows that the respondents from the three study locations were involved in activities that directly put them at high risk of exposure to pesticides. The most commonly reported activities across the three study areas included: spraying pesticides (75.4%); Working in fields where pesticides are being used or have been used (59.9%), and mixing/ loading/decanting pesticides (57.7%). Other activities reported included: Washing equipment used in spraying or mixing pesticides (43.4%); Washing clothes used when spraying or mixing pesticides (42.1%), and purchasing or transporting pesticides (27.7%).

In regard to locations, Kajiado (85%) and Kirinyaga (78.6%) reported a higher number of respondents who were involved in the application/spraying of pesticides compared to Nakuru (59.5%). This was also the case with Mixing/loading/decanting, where Kajiado and Kirinyaga counties recorded 70% and 72.1% respectively. In the flower farms in Naivasha, there are better controls in the use of pesticides compared to the other study locations.

The proportion of respondents who reported working in fields where pesticides were being used or had been used was evenly distributed across three study locations, with Kajiado, Kirinyaga and Nakuru reporting 59%, 59.2% and 61.5% respectively.

Kajiado reported the highest number of respondents who were involved in washing clothes used when spraying or mixing pesticides at 46% compared to Nakuru (41.5%) and Kirinyaga (38.5%). The proportion of respondents involved in washing equipment used in spraying or mixing pesticides was reportedly higher in Kirinyaga (49.2%) and Kajiado (44%) compared to Nakuru (37.2%). This could be due to high controls in the flower farms compared to vegetable farming in Kirinyaga and Kajiado.

While the average number of respondents who were involved in purchasing or transportation of pesticides was less compared to other activities, the proportion of respondents who were involved in this activity was significantly higher in Kirinyaga (58.9%) compared to Kajiado (20%) and Nakuru (4.3%) as shown in table 7 . This could be due to more involvement of respondents in Kirinyaga in the management of the farming process, including purchasing of farm inputs, compared to their counterparts in Nakuru and Kajiado, due to differences in farming systems.

Table 7: Distribution of respondents by activities involving pesticide use and study locations

Activities	Responses (%)			
	Kajiado	Kirinyaga	Nakuru	Average
Working in fields where pesticides are being used or have been used	59	59.2	61.5	59.9
Apply/Spray in the field	85	78.6	59.5	74.4
Washing clothes used when spraying or mixing pesticides	46	38.5	41.8	42.1
Washing equipment used in spraying or mixing pesticides	44	49.2	37.1	43.4
Mixing/loading/decanting	70	72.1	31.1	57.7
Purchasing or transporting	20	58.9	4.3	27.7

The study findings also show that both men and women were engaged in activities that involved the use of pesticides, a clear indication of exposure by both genders. More men were involved in all the activities compared to women; however, this may be due to a smaller number of women who responded to the survey. The study shows that of 280 women who used pesticides or worked where pesticides were sprayed, 59.3% were working in fields where pesticides are being used or had been used, 46.4% sprayed pesticides, 39.6% washed clothes used when spraying or mixing pesticides and 38.9% were involved in mixing/loading/decanting pesticides (Table 8). This shows exposure to women through activities that directly and indirectly exposed them to pesticides. Kirinyaga County recorded the highest number of females who were involved in activities that directly or indirectly exposed them to pesticides compared to those in Nakuru and Kajiado.

Table 8: Distribution of activities involving pesticides by gender

Activities	Kajiado		Kirinyaga		Nakuru		Average	
	Male	Female	Male	Female	Male	Female	Male	Female
	n=533	n=62	n=440	n=158	n=239	n=60	N=1212	N=280
Apply/ spray in the field	38.1%	13.9%	25.8%	28.9%	12.2%	3.6%	76.2%	46.4%
Mixing/ loading/ decanting	31.4%	10.0%	17.3%	26.8%	6.3%	2.1%	55.0%	38.9%
Working in fields where pesticides are being used or have been used	25.5%	12.5%	18.7%	28.6%	9.5%	18.2%	53.7%	59.3%
Washing the clothes used when spraying or mixing pesticides	18.8%	11.4%	12.5%	22.1%	8.2%	6.1%	39.4%	39.6%
Washing the equipment used in spraying or mixing pesticides	7.6%	2.9%	4.1%	9.3%	2.6%	5.4%	14.4%	17.5%
Purchasing or transporting	2.4%	2.1%	7.6%	15.7%	0.7%	1.1%	10.7%	18.9%

3.3.3 Frequency and duration of pesticide use

The study indicates that most of the farmers frequently used pesticides or worked in farms where pesticides were being sprayed or had been sprayed. Most of the respondents used pesticides on a weekly basis (62.8%), followed by those who used them on a daily basis (21%) and a monthly basis (12.4%). The study further indicates that the majority of the respondents had used pesticides for an average of 6 years (Table 9). The frequency and duration of work with pesticides can influence one's exposure and the impacts of pesticides (Box 2).

In regard to study locations, Kajiado (86.8%) and Kirinyaga (67.3%) reported the highest number of respondents who applied pesticides or worked in farms where pesticides were sprayed or had been sprayed, compared to Nakuru (34.2%). On the contrary, Nakuru (58.7%) reported a significantly higher number of respondents who used pesticides or worked in farms that were sprayed or had been sprayed compared to Kajiado (1.5%) and Kirinyaga (2.7%). The disparities observed in the frequency of use of pesticides between imply that the majority of the respondents in Nakuru (Naivasha) were flower farm workers employed as pesticide applicators or to perform other farm-related activities, such as weeding and harvesting on a daily basis, compared to their counterparts in Kajiado and Kirinyaga.

Table 9: Distribution of respondents by frequency and duration of pesticide use

Duration	Responses (%)			
	Kajiado	**Kirinyaga**	**Nakuru**	**Average**
Average years	6	7	4	5.7
Frequency of use				
Daily	1.5	2.7	58.7	21.0
Weekly	86.8	67.3	34.2	62.8
Monthly	7.8	28.2	1.3	12.4
Others	1	1.5	2.3	1.6

Box 2: Impact of duration and frequency of pesticides use on exposure

Frequency and duration worked with pesticides is an important indicator of duration of exposure. Notably, longer periods of exposure to pesticides can lead to long-term health effects. A growing body of evidence has linked long term exposure to pesticides to non-communicable diseases such as cancer, neurological disorders, reproductive disorders and endocrine disruptions (Shekhar et al, 2024) .

3.3.4 Reported pesticides and active ingredients

A total of 546 pest control products were being used by respondents at the time of the study. This included 19 (3.5%) biopesticides and 527 (96.5%) pesticides products. All the 19 biopesticides were used in the horticultural farms in Naivasha and Gilgil. Majority of the biopesticides were insecticides. (Table 10)

Table 10: Identified biopesticides

Product Name	Active ingredient and concentration
Fungicides	
Serenade ASO	Bacillus amyloliquefaciens strain QST 713 13.96 g/L
Regain	Bacillus subtilis BS-01 1x1010 cfu/ml)
Ozzoneem	Azadrachtin 1%.
Insecticides	
Nimbecidine	Azadirachtin 0.03%
Halt Neo 5% WP	Bacillilus thuringiensis 150g/L
Helitec	helicoverpa armigera SNPV8%
Eco Bb	Beauveria bassiana strain R444
Ozoneem 1%EC	Azadirachtin 1%
Flower DS 4EC	Pyrethrins 4%
Pyretone 40EC	Pyrethrin 4% (w/v)
Achook 0.15%EC	Azadirachtin 0.15% w/w
Lecatech WP	Lecanicillium lecanii J27
Limocide	Orange oil
Magneto 1%EC	Azadirachtin 0.6% + Matrine 0.4%
Nemguard 99.9%SC	Garlic Extract 99.9% v/v
Prev-am.	d-limonene 60g/l
Pyratop 75EC	Pyrethrin 75g/L
Sustain	Trichoderma asperellum
Venetrate	Burkholderia sp. strain A396

3.3.4.1 Identified pesticides

Of the 527 pesticide products, 45.7% were insecticides, 36.1% fungicides, 12.5% herbicides, 3.6% growth regulators and 2.1% (adjuvants (others) (Figure 2). The results show that insecticides and fungicides were the most commonly used pesticides in the study areas.

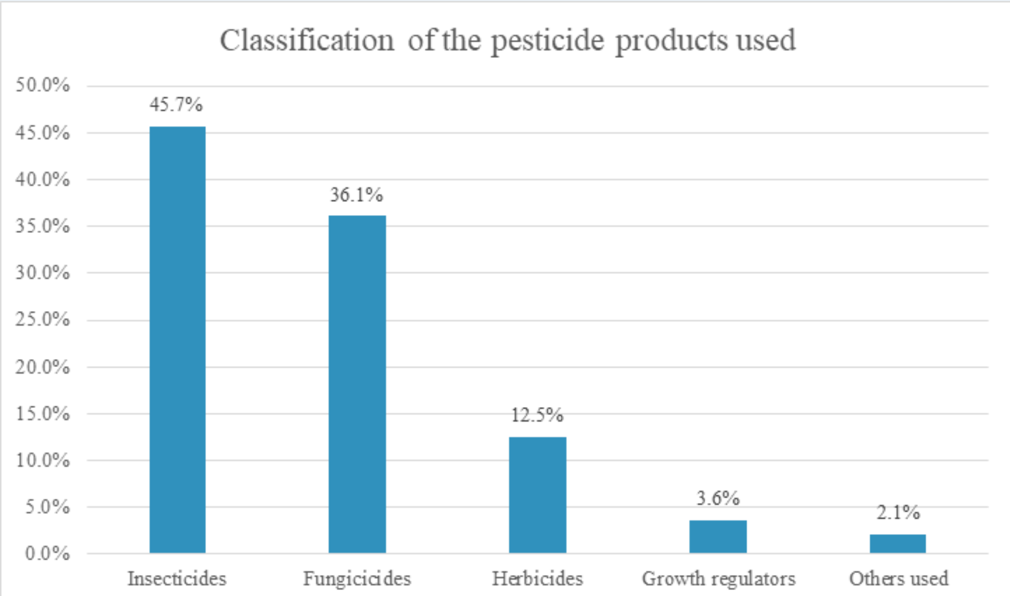

Figure 3: Classification of the pesticide products used

Kajiado county recorded the highest number of products (287) followed by Kirinyaga with 222 products and Nakuru with 194 products. The top 10 products commonly used in the areas are shown in Figure 3.

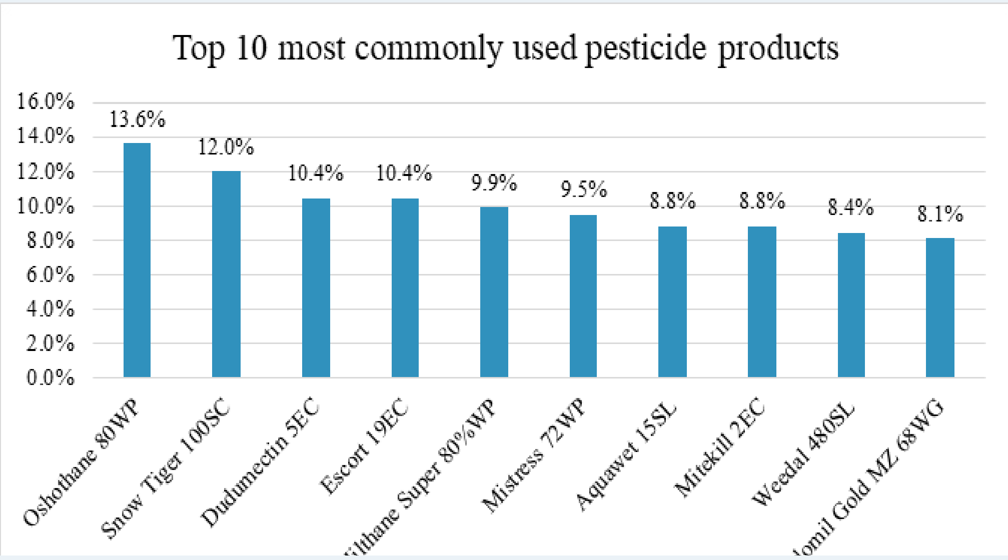

Figure 4: Top 10 most commonly used pesticide products

It was further established that 192 active ingredients were used in the 527 identified pesticide products. Of the 192 active ingredients, 74 (38.5%) were fungicides, 67 (34.9%) were insecticides, 25 (13.0%) were herbicides, 15 (7.8%) were growth regulators and 11 (5.7%) were other pesticides used. Nakuru county recorded 123 active ingredients, Kirinyaga recorded 102 and Kajiado 198 active ingredients. The top 10 most commonly used active ingredients are as shown in figure 4.

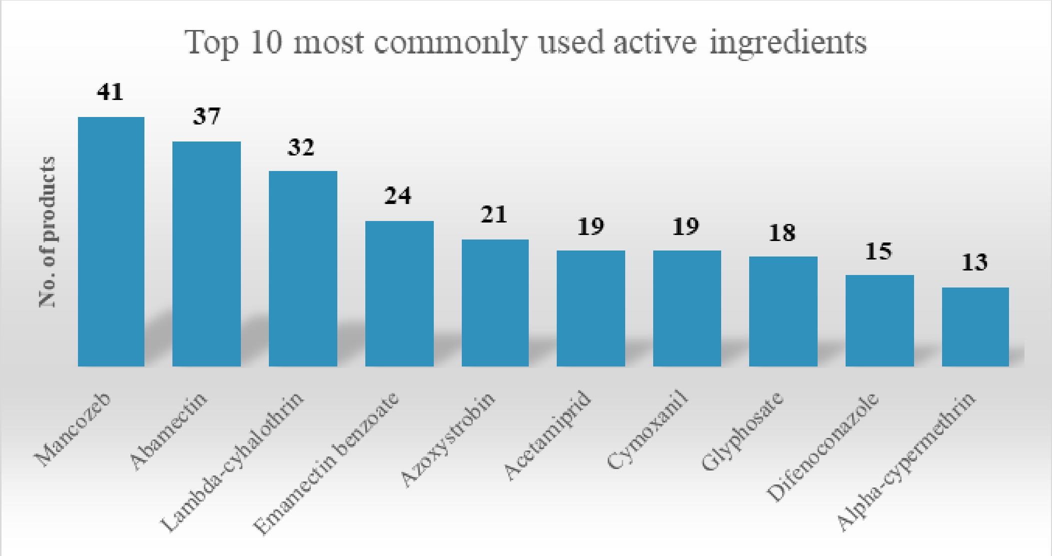

Figure 5: Top 10 most commonly used active ingredients

3.3.4.2 Pesticides used to control pests

A total of 241 insecticide products were identified by the study. The table 11 below shows the top 10 pesticides products used to control pests by the respondents and their corresponding active ingredients. The full list of the products and their active ingredients is provided in Annex 1.

Table 11: Top 10 pesticides products used to control pests by the respondents and their corresponding active ingredients

	Product	Active Ingredient
1.	Snow Tiger 100SC	Chlorfenapyr 100g/L
2.	Dudumectin 5EC	Abamectin 2%, Acetamiprid 3%
3.	Escort 19EC	Emamectin benzoate 19g/L
4.	Mitekill 2EC	Abamectin 20g/L
5.	Degree max 200EC	Alpha-cypermethrin 200g/L
6.	Pentagon 50EC	Lambda-cyhalothrin 50g/L
7.	Atom 2.5EC	Deltamethrin 25g/l
8.	Ranger 480EC	Chlorpyrifos 480g/L
9.	Twiga ace 20SL	Acetamiprid 200g/L
10.	Voltage 5EC	Lambda-cyhalothrin 50g/L

2 of the top 10 products used to control pests were registered in Tanzania and not in Kenya, pointing to illegal transboundary trade of pesticides between the two countries. **These products included Snow Tiger 100 SC and Dudumectin 5EC.**

The figure below shows the 10 commonly used pesticide active ingredients of the 67 identified active ingredients used in the 241 insecticide pesticide products.

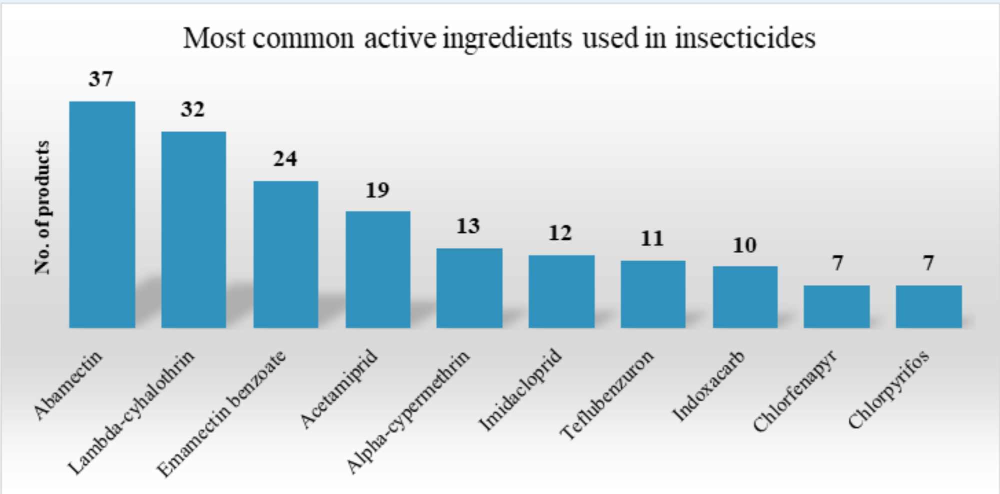

Figure 6: Most common active ingredients used in insecticides

3.3.4.3 Pesticides used to control diseases

The study identified 190 fungicides products that were being used by the respondents. The top 10 most commonly used products are shown in the table below. The full list of all the identified fungicide products and their active ingredients is shown in Annex 1.

Table 12: Top 10 most commonly used products

	Product	Active Ingredient
1.	Oshothane 80WP	Mancozeb 800g/Kg
2.	Milthane Super 80%WP	Mancozeb 800g/Kg
3.	Mistress 72WP	Cymoxanil 8% + Mancozeb 64%
4.	RidomilGold MZ 68WG	Metalaxyl-M 40g/Kg + Mancozeb 640g/Kg
5.	Botran 500SC	Carbendazim 500g/L
6.	Ortiva 250SC	Azoxystrobin 250g/L
7.	Victory 72WP	Metalaxyl 80g/Kg + Mancozeb 640g/Kg
8.	Score 250EC	Difenoconazole 250g/L
9.	Isacop 50WP	Copper Oxychloride 85%
10.	Kenthane 800WP	Mancozeb 800g/Kg

A total of 74 active ingredients were used in the 190 reported fungicide pesticide products used by the respondents. The most commonly used are as shown in the figure below.

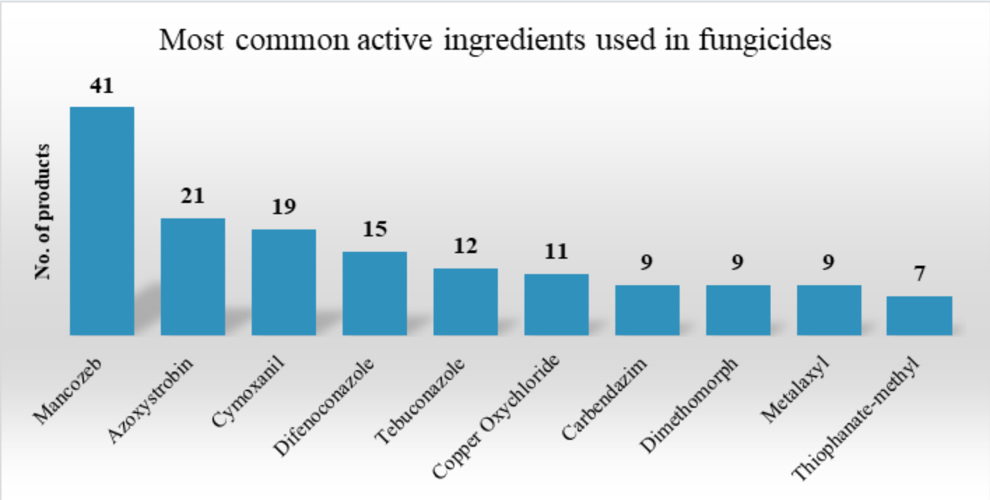

Figure 7: Most common active ingredients used in fungicides

3.3.4.4 Pesticides used to kill weeds

66 herbicides products were being used at the time of the study. The table below shows the top 10 commonly used herbicides.

Table 12: Top 10 most commonly used products

	Product	Active Ingredient
1.	Weedal 480SL	Glyphosate IPA salt 480g/L
2.	Parastar 200SL	Paraquat dichloride 200g/L
3.	Kausha 480SL	Glyphosate 480g/l
4.	Round up 360SC	Glyphosate acid 360 g/L (express. Potassium salt of glyphosate 441g/L)
5.	Pirata 100SC	Bispyribac-sodium 100g/L
6.	Bailout 330EC	Pendimethalin 330g/L
7.	Kolopa 300OD	Nicosulfuron 30 g/L + Mesotrione 70 g/L + Atrazine 200 g/L
8.	Tingatinga 380SC	Atrazine 380g/l
9.	Herbikill 200SL	Paraquat dichloride 20% w/v
10.	Beansclean 480SL	Bentazone 480g/L

Further, a total of 25 active ingredients were used in the 66 pesticide products used by respondents to control weeds. The most widely used active ingredients are as shown in the figure below.

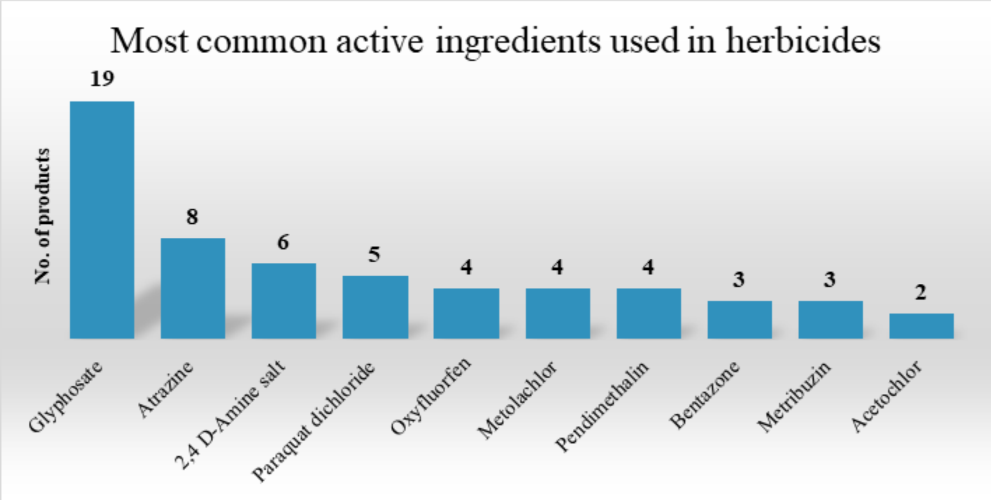

Figure 8: Most common active ingredients used in herbicides

3.3.4.5 Pesticides used to regulate growth

19 pesticides used to regulate growth were identified by the study. The most commonly used products included the following;

Table 14: Most commonly used products

	Product	Active Ingredient
1.	Tivag 40SL	Gibberelic Acid 40g/L
2.	Azatone	Alpha naphthalene acetic acid
3.	Flowergal	Boron 0.0035%, copper 0.088%, molybdenum 0.0012%, zinc0.088% and alpha naphthalene acetic acid 4.5
4.	Plantone 140SL	Sodium-1-naphthyl acetic acid 140 g/L
5.	Pluto tembe 200WG	Gibberellic acid 200g/Kg

3.3.4.6 Others used

The study identified 11 other pesticides that were used as adjuvants. Adjuvants are applied alongside other specific pesticides as wetters or stickers or spreaders to enhance their performance on crops. The most common products included the following;

Table 15: Pesticides that were used as adjuvants.

	Product	Active Ingredient
1.	Aquawet 15SL	Nonylphenol ethoxylate 15%
2.	Golden leaf	Polyalkylene oxide modified heptamethyl trisiloxone 800g/L
3.	Integra	Polyalkylene oxide modified heptamethyl trisiloxone 800g/L
4.	Edmond Gold	Organosilicone 100%
5.	Silwet gold	Trisiloxane alkoxylate (organosilicone) 80%w/w + polyalkyleneoxides 20%w/w

Aquawet 15 SL, Golden leaf and Integra, widely used adjuvants are only allowed for use on French been and roses. These pesticides were mostly used on tomatoes and vegetables, a case of misuse. This might be attributed to limited knowledge of farmers on allowed use of the product as well as limited or lack of advisory services to farmers.

3.4 Identified Highly Hazardous Pesticides (HHPs)

This section provides information about HHPs that were used by the respondents. The analysis of HHPs was based on JMPM Criteria for identifying HHPs. Due to inadequate data, the analysis was mainly based on Criteria 1-7 of the JMPM.

Of the 527 products used by the respondents, 167 (31.7%) were identified as HHPs. Majority of these products, 87 (52.1%) were fungicides followed by 68 (40.1%) insecticides and 12 (7.2%) herbicides. The study results showed that Kajiado county had the highest number, 102 (35.5%) of HHPs products identified followed by Kirinyaga with 69 (31.1%) and Nakuru had the least 37 (19.1%).

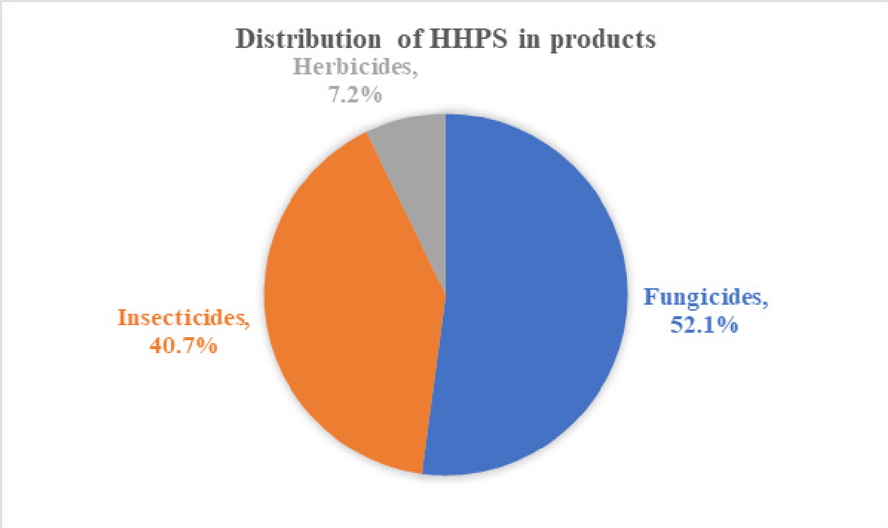

Figure 9: Distribution of HHPs in products

Table 16: Distribution of HHPs in the study areas

	Kajiado	Kirinyaga	Nakuru
	n (%)	n (%)	n (%)
Products	102 (35.5%)	69 (31.1%)	37 (19.1%)
Active ingredients	17 (17.3%)	20 (19.6%)	17 (13.8%)

In regards to pesticides active ingredients, 30 (15.6%) active ingredients were HHPs. Fungicides (46.7%) constituted most of the active ingredients followed by insecticides (36.7%) and herbicides (16.7%) were the least. (Figure 10). In the 3 counties, the percentage of HHPs in active ingredients was as follows; Kirinyaga had 20 (19.6%), Kajiado had 17 (17.3%) and Nakuru had 17 (13.8%).

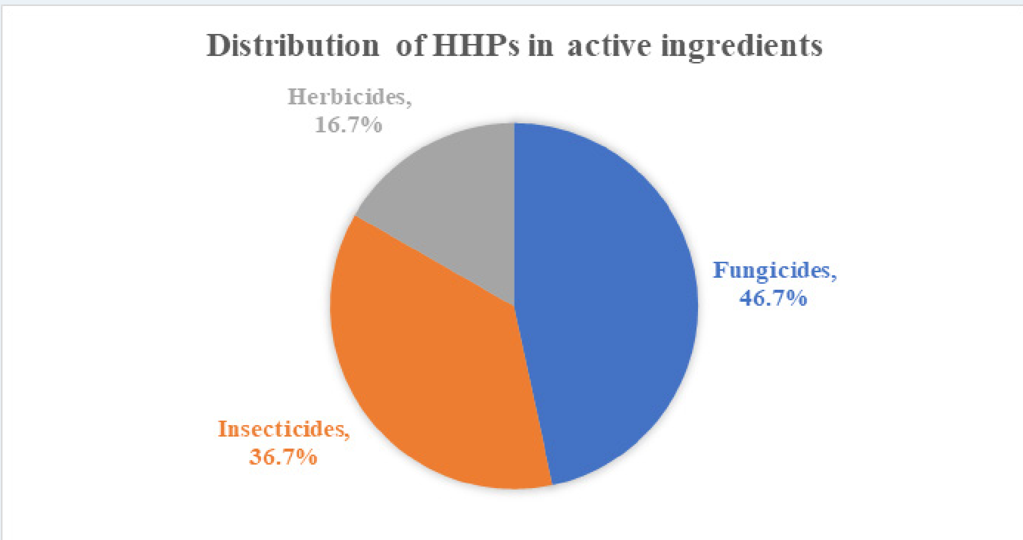

Figure 10: Distribution of HHPs in products

Nearly half (42.9%) of the identified HHPs are classified as reproductive toxicants (GHS Category 1B). This implies that they can adversely affect the sexual function and fertility in adult males and females, as well as cause developmental toxicity in the offspring (cause serious harm to the developing embryo or foetus. Another 40% are classified as to human carcinogen (GHS Category 1B). 14.3 % were identified as HHPs under criterion 8 (high incidences of adverse effects). Placing of the pesticides under this criterion was based on local evidence from literature. Only one pesticide (2.9%) fulfilled the GHS mutagenicity criteria (Figure 11).

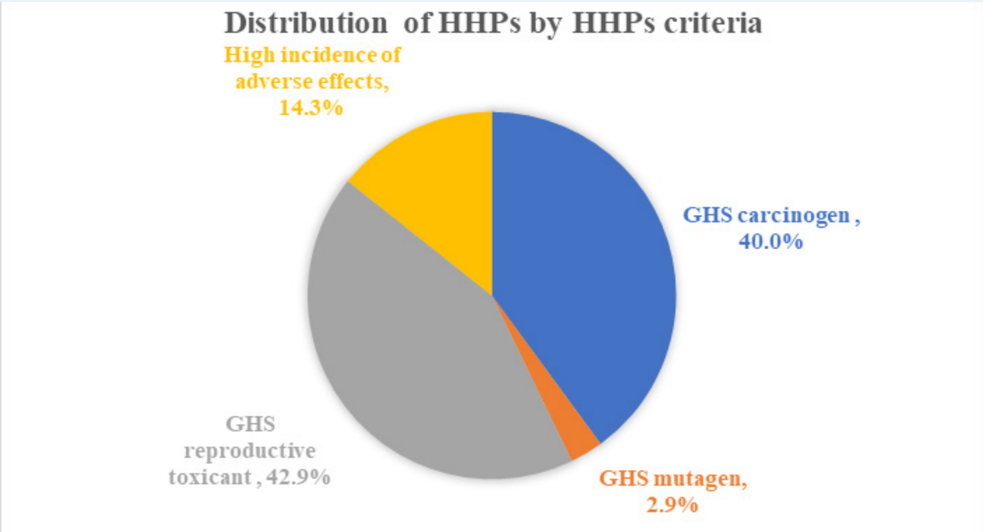

Figure 11: Distribution of HHPs by HHPs criteria

The details of identified HHPs and criteria fulfilled is presented in table 17 below.

Table 17: The details of identified HHPs and criteria fulfilled.

Active Ingredient	No. of Products	Where identified	B1. WHO class	B2. GHS carcinogen Category 1A or 1B	B3. GHS mutagen Category 1A or 1B	B4. GHS reproductive toxicant Category 1A or 1B	B5. Stockholm Convention	B6. Rotterdam Convention (Annex III)	B7. Montreal Protocol	B8. High incidence of adverse effects
Insecticides										
Abamectin	37	Kajiado, Kirinyaga, Nakuru								●
Acephate	4	Kajiado, Kirinyaga, Nakuru				●				●
Chlorpyrifos	7	Kajiado, Kirinyaga								●
Diazinon	2	Kajiado, Kirinyaga		●						
Ethoprophos	1	Kirinyaga		●						
Malathion	2	Kajiado, Kirinyaga		●						
Paraffin oil	2	Kajiado, Kirinyaga, Nakuru		●						
Thiamethoxam	7	Kajiado, Kirinyaga, Nakuru								●
Flubendiamide	1	Kajiado, Nakuru				●				
Spirodiclofen	1	Kajiado		●		●				
Dimethoate	3	Kajiado				●				
2. Fungicides										
Mancozeb	41	Kajiado, Kirinyaga, Nakuru		●		●				
Carbendazim	9	Kajiado, Kirinyaga, Nakuru			●	●				
Chlorothalonil	4	Kajiado, Kirinyaga		●						
Dimethomorph	9	Kirinyaga, Nakuru				●				
Propiconazole	3	Kajiado, Kirinyaga				●				
Thiophanate-methyl	7	Kajiado, Kirinyaga		●						
Iprovalicarb	1	Nakuru		●						
Kresoxim-methyl	1	Nakuru		●						
Iprodine	2	Nakuru		●						
Triflumizole	1	Nakuru				●				
Propineb	6	Kirinyaga, Nakuru		●						
Cyproconazole	1	Kirinyaga				●				
Epoxiconazole	1	Kirinyaga		●		●				
Flusilazole	1	Kirinyaga				●				
Herbicides										
Linuron	1	Kirinyaga, Nakuru				●				
Halosulfuron	1	Kirinyaga				●				
2,4 D amine salt	6	Kajiado, Kirinyaga, Nakuru								●
Oxyfluorfen	4	Kajiado, Nakuru		●						
Glufosinate - Ammonium	1	Nakuru				●				

The table below provides information about identified HHPs and reasons for their listing

Table 18: Information about identified HHPs and reasons for their listing

Active ingredient	Reason for listing
Insecticides	
Abamectin	Highly toxic to bees according to evaluation by Pest Control Products Board (PCPB)
Acephate	Reproductive toxicant (GHS 1B) by the Government of Japan
Chlorpyrifos	High incidences of residues in food products in Kenya
Diazinon	IARC Probably human carcinogen (2A), evidence of incidences of poisonings (human and wildlife), high food residues and high levels in sediments of freshwater systems
Flubendiamide	GHS* reproductive (1B), Government of Japan
Spirodiclofen	GHS* carcinogen (1B), Government of Japan
Dimethoate	GHS* reproductive (1B), Government of Japan
Ethoprophos	GHS* carcinogen (1B), ECHA & Government of Japan; GHS* reproductive (1B), Government of Japan
Malathion	IARC Probably human carcinogen (2A)
Paraffin oil	GHS* carcinogen (1B), ECHA
Thiamethoxam	Highly toxic to bees according to evaluation by Pest Control Products Board (PCPB)
Fungicides	
Carbendazim	Mutagenic toxicant (GHS Category 1B) and GHS Reproductive toxicant (Category 1B), EU and Government of Japan
Chlorothalonoil	EPA probable/ likely human carcinogen
Cyproconazole	GHS* reproductive (1B), ECHA
Dimethomorph	GHS* reproductive (1B), Government of Japan

Table 18: Information about identified HHPs and reasons for their listing

Active ingredient	Reason for listing
Epoxiconazole	GHS* reproductive (1B), ECHA
Thiophanate-methyl	EPA probable/likely carcinogen
Iprovalicarb	EPA probable/likely carcinogen
Kresoxim-methyl	GHS* reproductive (1B), EU and Government of Japan
Iprodine	EPA probable/likely carcinogen
Triflumizole	Reproductive toxicant (GHS 1B) EU
Flusilazole	GHS* reproductive (1B), ECHA
Mancozeb	EPA probable/likely carcinogen, GHS* reproductive (1B), EU
Propiconazole	GHS* reproductive (1B), EU and Government of Japan
Propineb	EPA probable/likely carcinogen
Herbicides	
Linuron	GHS* reproductive (1B), ECHA
Halosulfuron	GHS* reproductive (1B), ECHA
2,4 D amine salt	High incidences of residues in food products in Kenya
Oxyfluorfen	EPA probable/likely carcinogen
Glufosinate - Ammonium	GHS* reproductive (1B), ECHA

A further analysis of the pesticides established that about 42.5% of the products were highly toxic to bees and/or aquatic organisms, birds, earthworms or mammals (Table 19). 29 pesticide active ingredients were registered in these products, representing 15.1% of all the active ingredients.

Table 19: Pesticides active ingredients identified to be highly toxic to bees or aquatic organisms,birds,earthworms or mammals

Active Ingredient	No. of Products	Where identified	Highly toxic				
			Honeybees	Aquatic organisms	Birds	Earthworms	Mammals
Insecticides							
Abamectin	37	Kajiado, Kirinyaga, Nakuru	●				
Acetamiprid	19	Kajiado, Kirinyaga, Nakuru			●	●	
Alpha-cypermethrin	13	Kajiado, Kirinyaga, Nakuru	●	●			
Amitraz	1	Kirinyaga		●	●		
Beta-cyfluthrin	1	Kajiado, Kirinyaga, Nakuru	●	●			
Bifenthrin	1	Nakuru	●				
Chlorantraniliprole	2	Kirinyaga, Nakuru		●			
Chlorfenapyr	7	Kajiado, Kirinyaga, Nakuru		●	●		
Chlorpyrifos	7	Kajiado, Kirinyaga, Nakuru	●	●	●		●
Cyantraniliprole	2	Nakuru	●				
Cypermethrin	6	Kajiado, Kirinyaga	●	●			
Deltamethrin	5	Kajiado, Kirinyaga, Nakuru	●	●			●
Diafenthiuron	1	Kajiado, Kirinyaga, Nakuru	●	●			
Diazinon	2	Kajiado, Kirinyaga, Nakuru	●	●	●		
Dichlorvos	1	Nakuru	●				
Dimethoate	3	Kajiado, Kirinyaga, Nakuru	●				
Ethoprophos	1	Kirinyaga, Nakuru		●	●		●
Fenpyroximate	1	Kajiado, Nakuru		●			
Fipronil	1	Nakuru	●		●		●
Imidacloprid	12	Kajiado, Kirinyaga, Nakuru	●		●		
Lambda-cyhalothrin	32	Kajiado, Kirinyaga, Nakuru	●	●			
Malathion	2	Kajiado, Kirinyaga, Nakuru	●	●			
Pyridaben	2	Kajiado, Kirinyaga	●	●			
Sulfoxaflor	2	Kirinyaga, Nakuru	●				
Thiamethoxam	7	Kajiado, Kirinyaga, Nakuru	●				
Fungicides							
Carbendazim	9	Kajiado, Kirinyaga, Nakuru				●	
Mancozeb	41	Kajiado, Kirinyaga, Nakuru		●			
Sulphur	5	Kajiado, Kirinyaga, Nakuru		●			

Classification under criterion 8 of JMPM: Environmental hazards of identified pesticides Due to their high toxicity to the environment, these pesticides should be classified under criterion 8. Further follow up should be undertaken to establish evidence of high incidence of their effects to human health and the environment under local conditions of their use to warrant their listing under criterion 8. In the absence of local evidence of their effects to the environment, precautionary principle should be applied in the use of these pesticides. Their registration and use should be reviewed to protect pollinators (honey bees) and other organisms.

3.5 Pesticides Banned in Other Jurisdictions

Analysis of the pesticides used by the respondents revealed that 72 (37.5%) of the 192 identified pesticide active ingredients were banned in other countries across the globe (PAN, 2022). Pesticides banned in other jurisdictions for health and environment reasons should not be allowed for use in Kenya as it shifts the burden of managing the risk of such pesticides to users who cannot afford adequate protective measures. Governments should prohibit the export of chemicals they have prohibited nationally in line with the Global Framework on Chemicals. Table 20 below provides details of pesticides used in Kenya but are banned in other jurisdictions.

Table 20: Details of pesticides used in Kenya but are banned in other jurisdictions

Active Ingredient	Total bans/ Not approved	Countries
Insecticides		
Acephate	38	Bosnia &Herzegovina, China, EU, Indonesia, Malaysia, Oman, Palestine, Saudi Arabia, Serbia, Switzerland, Turkey, UK,
Alpha-cypermethrin	29	EU(n/a), UK(n/a), Turkey
Amitraz	39	Bosnia & Herzegovina, Cambodia, Egypt, EU, Iran, Oman, Palestine, Saudi arabia, Switzerland, Syrian Arab Republic, Turkey, UK
Beta-cyfluthrin	30	Colombia, EU, Morocco, Palestine, Saudi arabia, Turkey, UK, Switzerland,
Bifenthrin	30	EU, Oman, Turkey, UK,
Chlorfenapyr	32	Bosnia &Herzegovina, EU, Saudi arabia, Serbia, Turkey, UK,
Chlorpyrifos	39	Canada, Egypt, EU, Indonesia, Morocco, Palestines, Saudi arabia, Sri lanka, Switzerland, Thailand, Turkey, UK, Vietnam
Clofentezine	1	Brazil
Diafenthiuron	32	Egypt, EU(n/a), Mozambique, Switzerland, Turkey, UK(n/a)
Diazinon	39	Argentina, Bosnia & Herzegovina, Egypt, EU, India, Indonesia, Mozambique, Palestine, Saudi arabia, Sri lanka, Switzerland, Turkey, UK,
Dichlorvos	38	Bangladesh, EU, Fiji, India, Indonesia, Morocco, Nepal, Palestine, Saudi arabia, Serbia, Switzerland, Turkey, UK
Difenoconazole	1	Norway
Dimethoate	33	Cameroon, EU, Indonesia, Saudi arabia, Sri lanka, Suriname, UK
Ethoprophos	37	Cambodia, China, EU, Guinea, Mauritania, Morocco, Nicaragua, Papua New Guinea, Saudi Arabia, UK, Vietnam
Flubendiamide	1	USA
Imidacloprid	29	EU(n/a), Fiji
Lambda-cyhalothrin	29	EU, Saudi arabia, UK,
Lufenuron	28	EU(n/a), Uruguay
Malathion	32	EU, Indonesia, Palestine, Switzerland, Syrian Arab Republic, UK
Metalaxyl	1	Brazil
Methomyl	47	Benin, Cambodia, China, Colombia, EU, Guinea, Indonesia, Kuwait, LAO PDR, Malaysia, Mauritania, Morocco, Mozambique, Myanmar, Nicaragua, Saudi Arabia, Turkey, UAE, UK, Uruguay, Vietnam
Paraffin oil	28	EU(n/a), UK(n/a)
Profenofos	34	EU(n/a), Indonesia, Malaysia, Saudi arabia, Switzerland, Turkey, UK(n/a), USA(v/w)
Pymetrozine	32	EU, Morocco, Norway, Palestine, Turkey, UK
Spirodiclofen	29	EU(n/a), Morocco, UK(n/a)

Table 20: Details of pesticides used in Kenya but are banned in other jurisdictions

Active Ingredient	Total bans/ Not approved	Countries
Thiacloprid	31	EU, Morocco, Turkey, UK, USA(v/w)
Thiamethoxam	27	EU
Thiocyclam Hydrogen Ox-alate	30	EU, Switzerland, Turkey, UK
Fungicides		
Boron	28	EU(n/a), UK (n/a)
Bronopol	29	EU (n/a), Turkey, UK (n/a)
Captan	6	Cambodia, Fiji, Guinea, Oman, Saudi Arabia, Vietnam
Carbendazim	34	Egypt, EU, Morocco, Mozambique, Switzerland, Turkey, UAE, UK,
Chlorothalonil	34	Colombia, EU, Morocco, Palestine, Saudi arabia, Turkey, UK, Switzerland,
Copper	1	Saudi Arabia
Copper (I) oxide	1	Saudi Arabia
Cupric hydroxide	1	Saudi arabia
Cuprous Oxide	1	Saudi arabia
Cyproconazole	28	EU(n/a), UK(n/a)
Difenoconazole	1	Norway
Dodemorph-Acetate	1	Saudi arabia
Fenamidone	29	EU, Turkey, UK
Fluazinam	1	Norway
Flusilazole	32	Egypt, EU(n/a), Switzerland, Turkey, UK(n/a), USA(v/w)
Folpet	3	Australia, Malaysia, Saudi arabia
Hexaconazole	35	Brazil, Egypt, EU(n/a), Morocco, Palestine, Saudi arabia, Turkey, UK (n/a), Switzer-land
Iprodione	32	Egypt, EU, Morocco, Mozambique, Turkey, UK
Mancozeb	31	EU, Morocco, Saudi arabia, UAE, UK,
Metalaxyl	1	Brazil
Prochloraz	29	Brazil, EU(n/a), UK(n/a)
Propiconazole	29	EU, Turkey, UK
Propineb	31	Egypt, EU, Morocco, Turkey, UK
Sulfur	29	EU (n/a), Indonesia, UK (n/a)
Sulphur	29	EU (n/a), Indonesia, UK (n/a)
Tebuconazole	1	Palestine
Thiamethoxam	27	EU
Thiophanate Methyl	29	EU, Morocco, UK
Triadimefon	32	Egypt, EU (n/a), Saudi Arabia, Switzerland,
Triflumizole	29	EU(n/a), Morocco, UK(n/a)
Herbicides		
2,4 D-Amine salt	5	Kuwait, Mozambique, Norway, Saudi Arabia, Vietnam
Acetochlor	43	Bosnia & Herzegovina, Burkina Faso, Cabo Verde, Chad, Egypt, EU, Gambia, Guinea bissau, Mali, Mauritania, Niger, Senegal, Serbia, Switzerland, Togo, Turkey, UK.
Atrazine	44	Bosnia & Herzegovina, Cabo verde, Chad, Egypt, EU, Gambia, Mauritania, Niger, Oman, Morocco, Palestine, Senegal, Switzerland, Togo, Turkey, UAE, UK, Uruguay.
Fomesafen	29	EU (n/a), Turkey, UK (n/a)
Glufosinate - Ammonium	29	EU, Morocco, UK
Glyphosate	4	Luxembourg, Mexico, Sri lanka, Vietnam
Glyphosate acid	4	Luxembourg, Mexico, Sri lanka, Vietnam
Linuron	34	Egypt, EU, India, Morocco, Norway, Oman, Saudi arabia, UK

Table 20: Details of pesticides used in Kenya but are banned in other jurisdictions

Active Ingredient	Total bans/ Not approved	Countries
Metolachlor	31	Brazil, Egypt, EU(n/a), Turkey, UK(n/a),
Metolaclor-S	31	Brazil, Egypt, EU(n/a), Turkey, UK(n/a)
Oxyfluorfen	1	Mozambique
Paraquat	58	Burkina faso, Cabo verde, Cambodia, Chad, China, EU, Fiji, Gambia, Guinea, Guinea bissau, South Korea, Kuwait, LAO PDR, Malaysia, Mali, Mauritania, Morocco, Mozambique, Niger, Oman, Palestine, Peru, Saudi Arabia, Senegal, Sri lanka, Switzerland, Taiwan, Togo, Turkey, UAE, UK, Vietnam
Paraquat dichloride	58	Burkina faso, Cabo verde, Cambodia, Chad, China, EU, Fiji, Gambia, Guinea, Guinea bissau, South Korea, Kuwait, LAO PDR, Malaysia, Mali, Mauritania, Morocco, Mozambique, Niger, Oman, Palestine, Peru, Saudi Arabia, Senegal, Sri lanka, Switzerland, Taiwan, Togo, Turkey, UAE, UK, Vietnam
Tralkoxydim	30	EU(n/a), Turkey, UK(n/a), USA(v/w)

3.5.1 Unethical pesticide trade

Further analysis showed that 17 (23.6%) of the banned active ingredients in their countries of origin were used in the study areas. This shows that the banned pesticides are still exported in Kenya despite that they are not allowed for use in their country of origin. These pesticides should be phase out in Kenya in line with the Section 12(2), Standards Act (cap 496) of the Business Laws (Amendment) Act, 2024.

Table 21: Detailed of pesticides exported to Kenya but banned in the country of origin.

Active Ingredient	Product Name	Manufacturer	Origin
Methomyl	Metholing 90SP	Huayang China Ltd	China
Amitraz	Mitac 20EC	Arysta LifeScience SAS	France
Acephate	Lotus 75%SP	Nantong Weilike Chemical Co Ltd	China
	Otran	Jiangsu Lanfeng Biochemical Co., Ltd	China
Ethoprophos	Mocap 10GR	Bayer C. Sc	Germany
Diafenthiuron	Pegasus 500SC	Syngenta Crop Protection AG	Switzerland
Beta-cyfluthrin	Thunder OD145	Bayer AG	Germany
Alpha-cypermethrin	Fastac 10EC	BASF Agri	France
Imidacloprid	Confidor 200SL	Bayer AG	Germany
	Confidor 70WG	Bayer AG	Germany
	Thunder OD145	Bayer AG	Germany
Lambda-cyhalothrin	Karate zeon	Syngenta Crop Protection AG	UK
	Duduthrin 1.7EC	Syngenta Crop Protection AG	UK
Carbendazim	Goldazim 500SC	Arysta LifeScience Benelux Sprl	Belgium
	Rodazim 50SC	Albaugh Europe Sarl	Switzerland
Chlorothalonil	Daconil 720SC	Syngenta Crop Protection AG	Switzerland
Cyproconazole	Protect combi 280SC	Sineria Industries Ltd	Cyprus
Mancozeb	Milthane Super	Cerexagri S.A.	France
	Trinity Gold 452WP	Agria SA	Bulgaria
	Fortress gold	Agria	Bulgaria
	Zetanil 76WP	Sipcam Oxon SpA	Italy
Propineb	Antracol 70WP	Bayer CropScience AG	Germany
	Melody duo 69WG	Bayer AG	Germany
	Milraz 76WP	Bayer Crop Science AG	Germany

Table 21: Detailed of pesticides exported to Kenya but banned in the country of origin.

Active Ingredient	Product Name	Manufacturer	Origin
Paraquat dichloride	Herbstar 200SL	Jiangsu Inter-China Group Corporation	China
	Parastar 200SL	Quangx Tianyuan Biochemistry Co Ltd	China
	Cropoxone	Kenvos Biotech Co., Ltd	China
Sulphur	Sulfolac 80WP	Agrostulln GmbH	Germany
Thiamethoxam	Engeo 247SC	Syngenta	Austria

3.6 Manufacturers and Country of Origin

Pesticides reported by the respondents were manufactured by 219 different companies. The top 3 manufacturers were Syngenta, Bayer and BASF. The top 10 manufacturers of the reported pesticides are shown in the figure below. 5 of the top 10 manufacturers were based in China, 4 in Europe and 1 in India. Switzerland was the main source of pesticides exported by Syngenta while Germany was the main source of exports by Bayer.

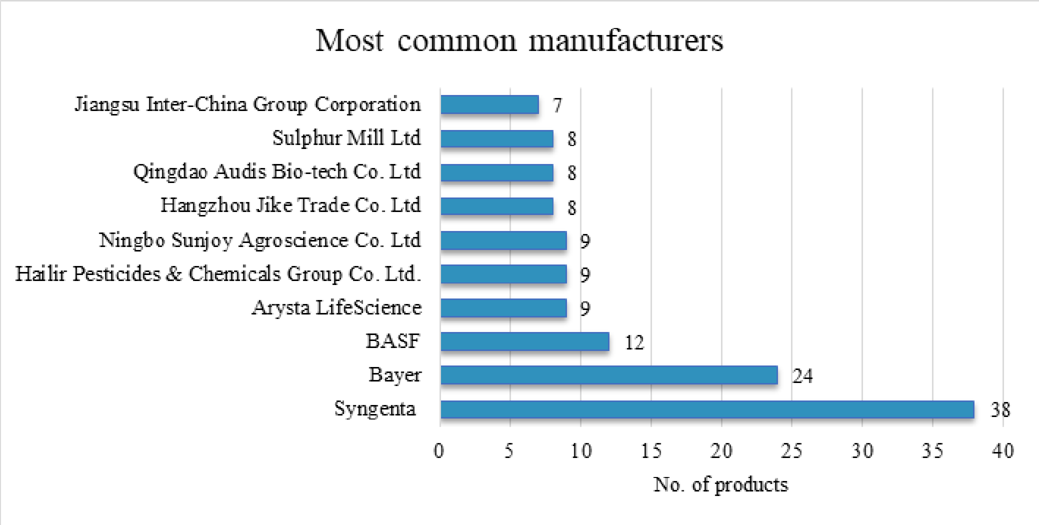

Figure 12: Most common manufacturers.

On country of origin, more than half, 268 (55.7%) of the pesticide products originated from China followed by India 65 (13.5%), Germany 30 (6.2%) and Switzerland 25 (5.2%). Other notable countries included USA (2.7%), Japan (2.5%) and UK (2.1%). This shows a shift in the production of pesticides from Europe to Asia. This may be attributed to less stringent regulations in India and China where pesticides that are banned for use in Europe can be produced in countries outside Europe and exported to the rest of the world.

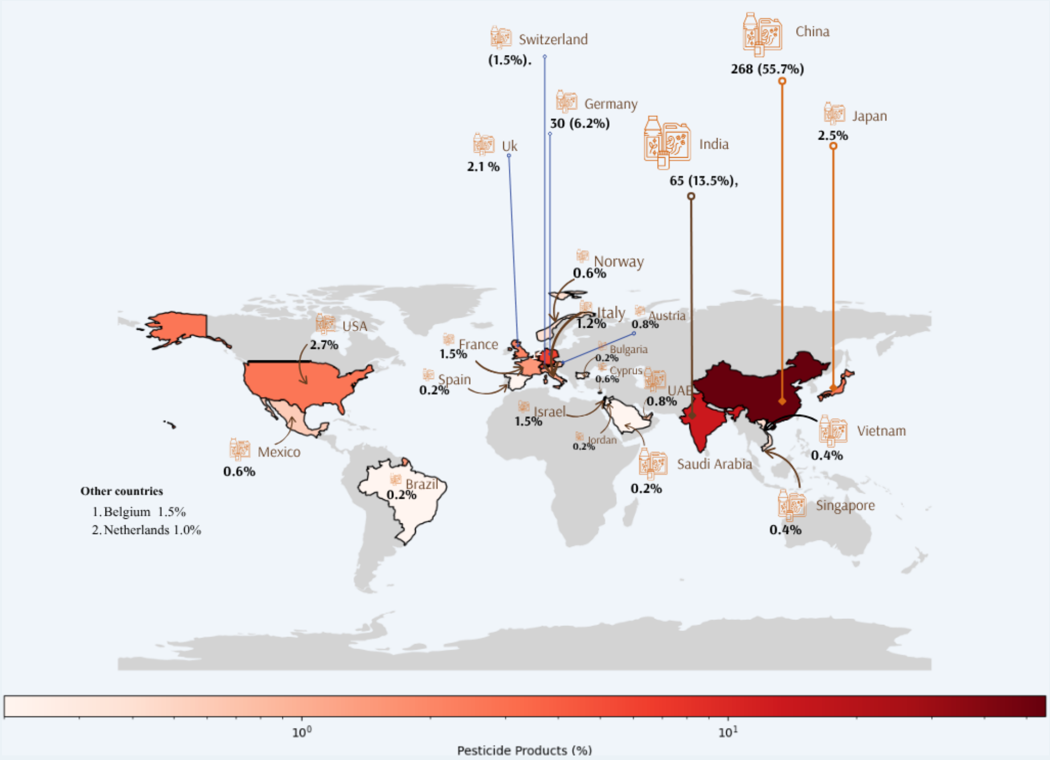

Figure 13: Country of origin of pesticides exported to Kenya.

3.6.1 Country of authorization

477 (91%) of the pesticides products were registered in Kenya by Pest Control Products Board (PCPB), 28 (5.0%) of the products were registered in Tanzania under Tanzania Plant Health and Pesticides Authority (THPA) while 22 (4%) were not known where or whether they are registered.

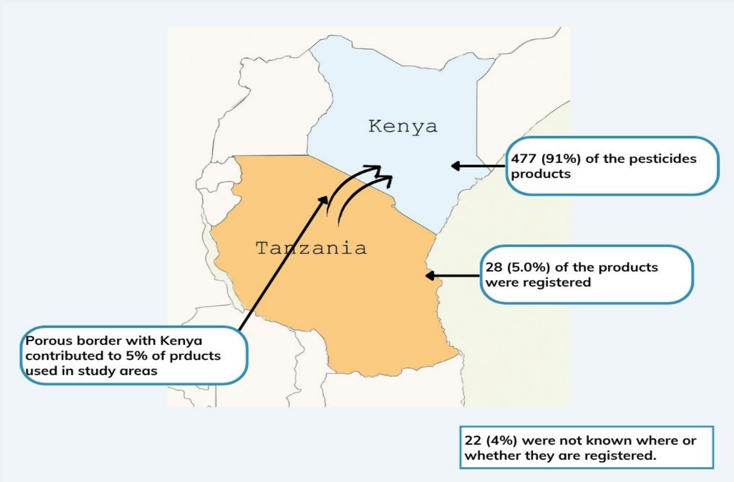

Figure 14: Country of authorization

The results show that a significant number of products (5.0%) used in the study areas came from Tanzania which could be attributed to the porous border with Kenya. This calls for cross border collaboration between pesticide regulators from Kenya and Tanzania in addressing illegal trade of pesticides. 22% of the total products found in Kajiado county and 1% of products found in Kirinyaga were registered in Tanzania.

3.7 Pesticide Use Practices

3.7.1 Type of application equipment and frequency of spraying

The study established that knapsack sprayer was the most widely used application equipment by the respondents in Kajiado and Kirinyaga counties while in Nakuru county the most common included machine pumps, knapsack sprayer, nozzles and trolleys. Generally, most of the farmers responded to spraying pesticides on a weekly basis. This shows heavy use and reliance on the conventional products in the area for farming. Others respondents indicated biweekly, monthly, regularly, among others.

3.7.2 Use of personal protective clothing (PPE)

More than half (68.9%) of the respondents in all three study areas reported using PPEs during pesticide application. The use of PPE was higher in Nakuru (98.4%) followed by Kirinyaga (55.5%) and Kajiado (54.3%). The high use of PPEs in Nakuru can be attributed to the large number of contract farm workers, as most are provided with PPEs by their employers.

In Kajiado and Kirinyaga counties, 45.7% and 44.5% of the respondents respectively did not use PPEs. In addition, even those who use PPEs did not wear appropriate and full protective gears. The widely used PPEs included boots/shoes, overalls, gloves and facemasks.

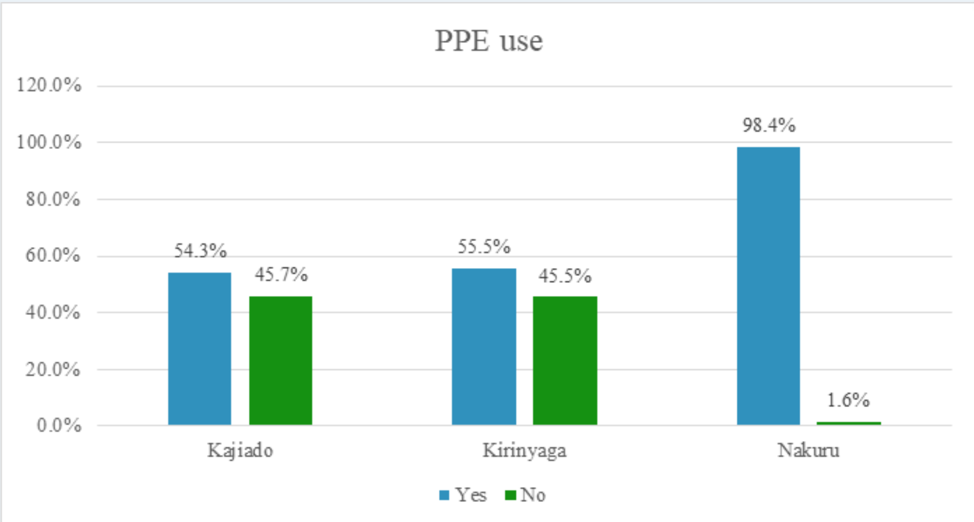

Figure 15: PPE use.

Box 3: Reasons for not using PPEs

The reasons reported by the respondents for not using PPEs were:

- PPEs were not available
- PPEs were too expensive
- PPEs were uncomfortable.

3.7.3 Re-entry to the field after pesticide spraying

It was reported that 514 (34%) of the respondents re-entered the field after pesticide spraying after one day, 451 (29.8%) re-entered the same day, 321 (21.2%) after 3 days and another proportion of 227 (15%) reported re-entering after 2 days. Nakuru county had the highest number of respondents (53.5%) re-entering the field on the same day after pesticide spraying followed by Kajiado at 31%.

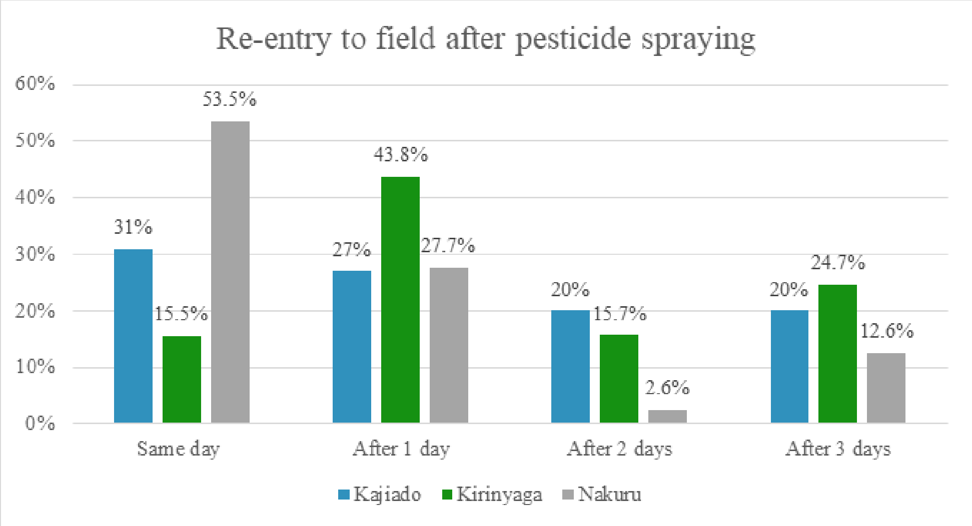

Figure 16: Re-entry to field after pesticide spraying

The respondents who entered the fields on the same day after spraying were at the highest risk of exposure to pesticide residues. The results indicates that slight over a third of the respondents did not observe re-entry interval with Nakuru being the most affected.

3.8 Pesticides Disposal, Storage and Cleaning Practices

3.8.1 Disposal practices

The main method of disposing leftover and unwanted pesticides among the respondents was burning (43.7%). Other methods included returning to company/distributor (19.3%), burying in the soil (16.3%), throwing in the river (12.7%), throwing in the field (12%) and keeping in the grain store 9%) (Table 22).

Kajiado (66%) and Kirinyaga (42%) reported the highest number of respondents who burned left over and unwanted pesticides compared to Nakuru (22.4%). Conversely, Nakuru reported the highest proportion of respondents who returned empty pesticide containers to the company/distributor (54.2%) compared to Kajiado and Kirinyaga (Table 22). This shows that most flower farms in Naivasha had contracted license hazardous waste handlers in line with the Waste Management Regulations of 2006.

Table 22: Distribution practices for unwanted and leftover pesticides

Disposal method	Responses (%)			
	Kajiado	Kirinyaga	Nakuru	Average
Returned to company/ distributor	2.3	1.3	54.2	19.3
Used until it is finished	56	46.8	42.5	48.4
Burned	66.7	42	22.4	43.7
Buried	9.2	18.2	21.4	16.3
Other	7.1	5.5	18.7	10.4
Kept in the grain store	19.5	3.2	4.3	9.0
Thrown in the river	2.6	0.7	3	2.1
Kept in the home	24.1	11.9	2	12.7
Thrown in the field	18.2	16.2	1.7	12.0

Burning (55.4%) was also the most common method of disposing empty pesticide containers. Other methods reported included returning to company/distributor (25.5%), burying in the soil (21.5%), putting in rubbish/trash (16.8%) and throwing in open fields (14.6%). Another 13% of the respondents disposed them in pit latrines or rivers or having them collected by waste pickers. Others included throwing in pit latrines or rivers or having them collected by waste pickers (Table 23).

Nakuru (63.5%) led in the number of respondents who returned empty pesticide containers to companies while Kajiado (79.1%) and Kirinyaga (63.3%) led in the number of respondents who manly disposed of empty pesticide containers through burning.

Table 23: Disposal methods for empty pesticide containers

Disposal method	Responses (%)			
	Kajiado	Kirinyaga	Nakuru	Average
Returned to company/distributor	4.4	8.5	63.5	25.5
Put in rubbish/trash	16	8.5	25.8	16.8
Burned	79.1	63.3	23.9	55.4
Others	4.6	11.5	22.9	13.0
Buried	11.1	30.8	22.6	21.5
Thrown in the open field	24.6	18.3	1	14.6

The study established that respondents did not dispose of left over pesticides, obsolete pesticides and empty pesticide containers in a proper manner, thus potentially increasing the risk of exposure to human health and the environment. It was observed that take back schemes were not common in the study areas. The manufacturers of pesticides should implement an extended producer responsibility scheme for obsolete pesticides and empty pesticide containers to reduce their risks to human health and the environment in line with the Extended Producer Responsibility (EPR) regulations, 2024. They should also educate and train the farmers on proper management and disposal of pesticides and empty pesticide constrainers.

3.8.2 Storage practices

Nearly all the respondents (97.2%) reported that the pesticides were locked away from children. A high proportion of the respondents (95.3%) affirmed that pesticides were separated from other items. This shows that there was minimal risk of exposure to pesticides by children or contamination of food and other items by pesticides at home.

3.8.3 Washing and cleaning of equipment

The study results indicate that the most of the respondents in the 3 counties washed their equipment in the farm, at the watercourse/irrigation drain, at home and in ponds. Others reports that they did not wash the equipment.

Table 24: Places of washing equipment

Places of washing	Responses (%)			
	Kajiado	Kirinyaga	Nakuru	Average
At home	25.8	45.4	1.7	24.3
At the well	6.9	0.8	20.4	9.4
In the farm	62.6	36.3	32.1	43.7
In the cement kilt	1	4.5	2.3	2.6
In the pond	10.6	4.7	24.4	13.2
At the watercourse/irrigation drain	37.7	28.6	29.4	31.9
I do not wash	15.7	1.2	4	7.0
Others	1.5	0.5	41.1	14.4

The study established bad practices in cleaning and washing of spraying equipment by the respondents, increasing the risk of exposure to pesticide residues and contamination of the environment. For instance, washing the equipment in water courses can lead to poisonings of livestock and human beings who depend on water from such sources. Additionally, it can affect the aquatic ecosystem.

3.8.4 Washing facilities

Majority of the respondents, 1167 (76.6%) had facilities for washing hand and body after pesticide application while 356 (23.4%) did not have any facilities. The most common washing facilities were taps, irrigation drains, water containers, river, wells, ponds/lakes and others included designated areas such as soak pits and shower rooms.

Table 25::Availability of washing facilities

Washing facilities	Responses (%)			
	Kajiado	Kirinyaga	Nakuru	Average
Availability (Yes)	64.8	80	90.2	78.3
Nature of facilities				
Taps	35.8	45.5	88.4	56.6
Irrigation drains/furrows	53.4	40.2	31.2	41.6
Water containers	61.7	23.4	19.5	34.9
River	17.4	16.9	16.4	16.9
Wells	10.1	5	22.9	12.7
Ponds/lakes	7.6	0.9	21.2	9.9
Others	13.4	1.1	12	8.8

The results indicate that there were no proper washing facilities for pesticides applicators and people who handled pesticides. The lack of proper washing facilities can potentially increase exposure to pesticides, even to people who do not directly handle pesticides such as children and other household members through take -home pesticides.

3.9 Spray Drifts

3.9.1 Distance lived from the farm

Majority of the respondents, 534 (35.1%) reported that they lived within the farm, 407 (26.7%) lived less than a kilometre from the farm, 194 (12.7%) lived within 3-4km from the farm, 189 (12.4%) lived within 1-2km from the farm while 199 (13.1%) lived more than 4km from the farm. Kajiado county had the highest number of respondents who lived within and less than 1km from the farm (81%). The findings indicate a high risk of exposure for the majority of the respondents through drifts. More importantly, those that lived on the farm were at the highest risk of exposure though drift.

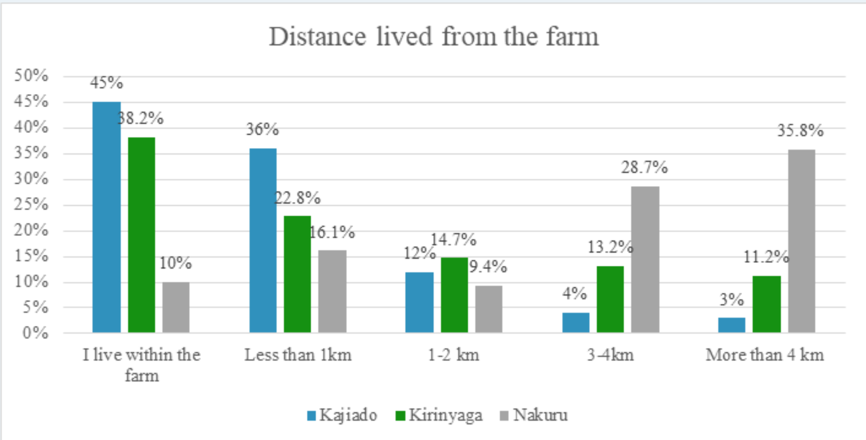

Figure 17: Distance lived from the farm

3.9.2 Wind direction

The study reveals that almost half, 616 (41.3%) of the respondents just sprayed randomly, 294 (19.7%) sprayed against the wind direction while 582 (39%) sprayed along the wind direction. This implies that majority, 910 (61%) did not spray pesticides correctly during a windy day. Nakuru county had the highest number of respondents who sprayed randomly (52.3%) while Kajiado county reported most cases of spraying against the wind (28.9%).

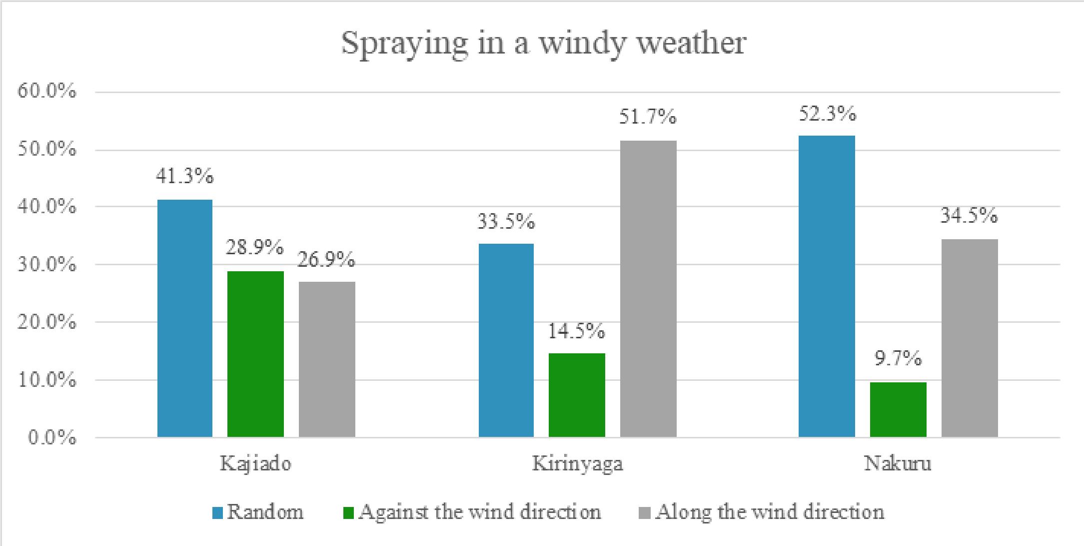

Figure 18: Spraying in a windy weather.

Wind direction is very important to consider when applying pesticides. Applying pesticides in the direction of the wind reduces chances of exposure to pesticides through drift while spraying against the wind can cause pesticides to blow back to the applicator/sprayer.

3.10 Access to Information, Trainings and Awareness of Hazards

3.10.1 Pesticides labels

The study established that majority, 1221 (82.2%) had access to pesticides labels while 265 (17.8%) did not. Nakuru county (66.9%) had the least number of respondents who had access to the pesticides' labels. The results indicate that majority of the respondents had access to and used the label. The label offers useful information to the user, including information on their hazards, application rate, correct use of the product, disposal method and first aid measures. Farmers should be educated and sensitized on the importance of reading the label before purchasing and using pesticides

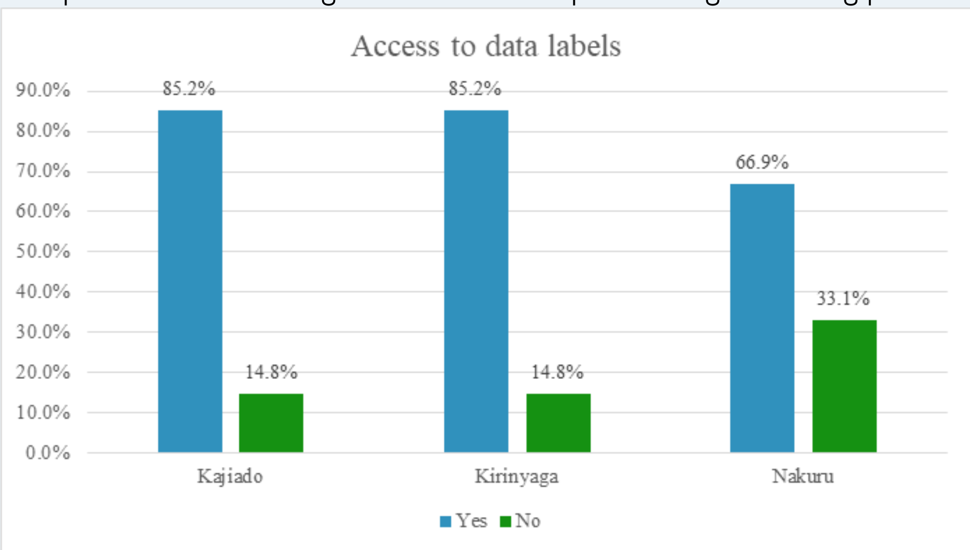

Figure 19: Access to data labels

Majority of those who had access to the label indicated they usually read them and found the information useful. Furthermore, it was established that majority of the labels were written in Kiswahili or English language. The information was found to be readable and big enough to read. These findings indicates that most of the manufacturers of pesticides used in the area adhered to the labelling requirements[8] .

3.10.2 Training on pesticide use and handling

More than half, 928 (62.2%) of the respondents had received training on pesticide use while another 564 (37.8%) had not received any training. Kajiado (43.7%) and Kirinyaga (45%) recorded higher number of respondents with no training on pesticide use while Nakuru (88%) recorded the highest number of respondents who had received training. This can be attributed to regular trainings organized by the flower farms.

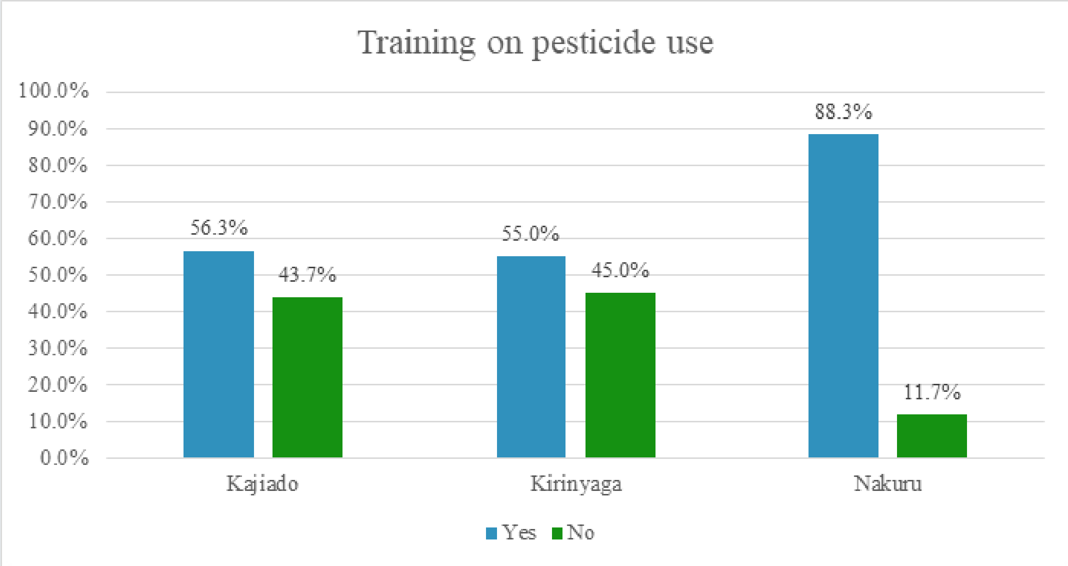

Figure 20: Training on pesticide use

In terms of where the respondents received the training, most reported modes of training included field demonstrations (65.2%), seminars (55.5%), agrovet shops (27.2%) and courses (23.1%).

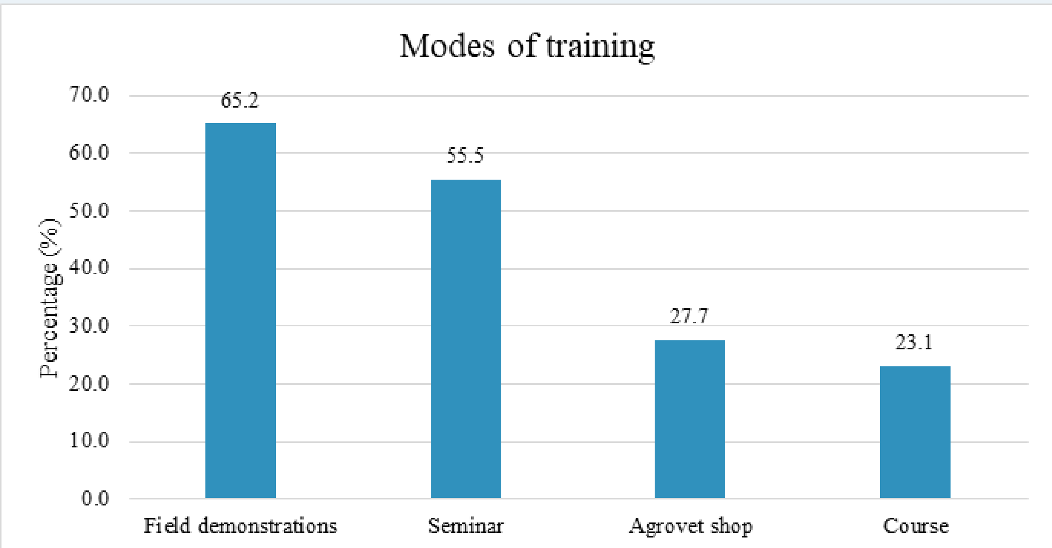

Figure 21: Modes of training

8 Section 6 of the Pest Control Products (Labelling, Advertisement and Packaging) regulations 2024.

3.10.3 Purchase/use of Obsolete Pesticides

The use of obsolete pesticides was not a problem in the 3 counties. A high proportion of the respondents, 1097 (72%) stated that they had never purchased or used expired/obsolete pesticides with only 145 (9.5%) of the respondents stating otherwise. Another, 281 (18.5%) of the respondents were not aware whether they had purchased or used an expired or obsolete pesticide in the past.

The results shows that most of the respondents were not exposed to pesticides through purchase or use of expired or obsolete pesticides. However, awareness creation is still needed to educate the farmers in the study on the need to check the expiry date of pesticides before purchasing or using them.

3.10.4 Decanting of pesticides

727 (47.7%) of the respondents in the 3 counties admitted to decanting pesticides into other containers. In addition, 469 (30.8%) of the respondents reportedly reused the original pesticides containers for other uses. The containers were mainly used for water and food storage, package for food items, household items and for making toys, decorations and handicrafts.

Kajiado (60.5%) and Nakuru (46.5%) counties had the highest rates of decanting pesticides and reuse of the original containers indicating that it is a problem in the two areas as compared to Kirinyaga county.

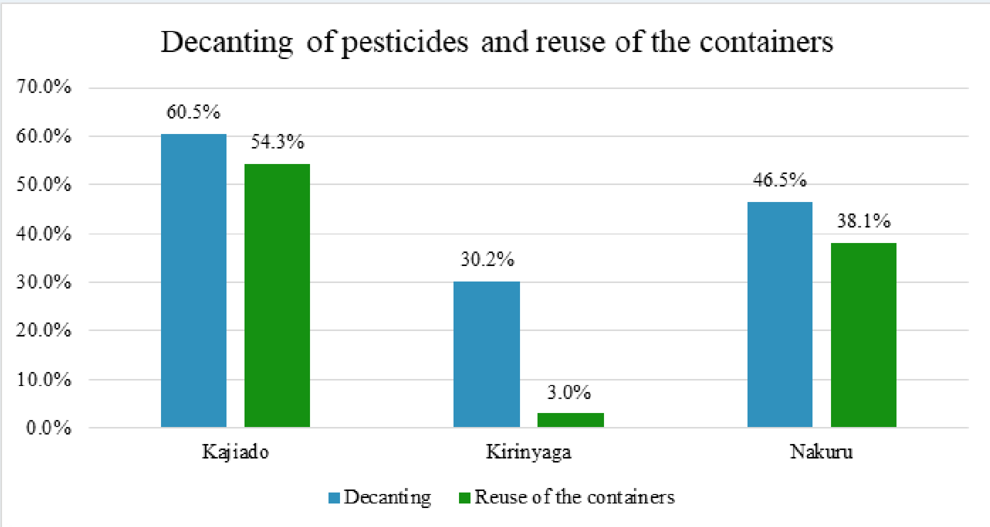

Figure 22: Decanting of pesticides and reuse of the containers

Empty pesticide containers should never be used as they still contain pesticide residues. The use of these containers for other purposes indicates a high risk of accidental poisonings particularly when used to store food, water or package food items. Recycling of the containers to make decorations, handcrafts and toys present a high risk of exposure to children thus should highly be discouraged.

3.10.5 Spillages

A high proportion, 1066 (70.6%) of the respondents in the 3 counties indicated that they had direct exposure when using pesticides such as spills while 444 (29.4%) indicated they have never had. Kajiado county recorded the highest rate 87.9% of the direct exposure followed by Kirinyaga county at 63.7%.

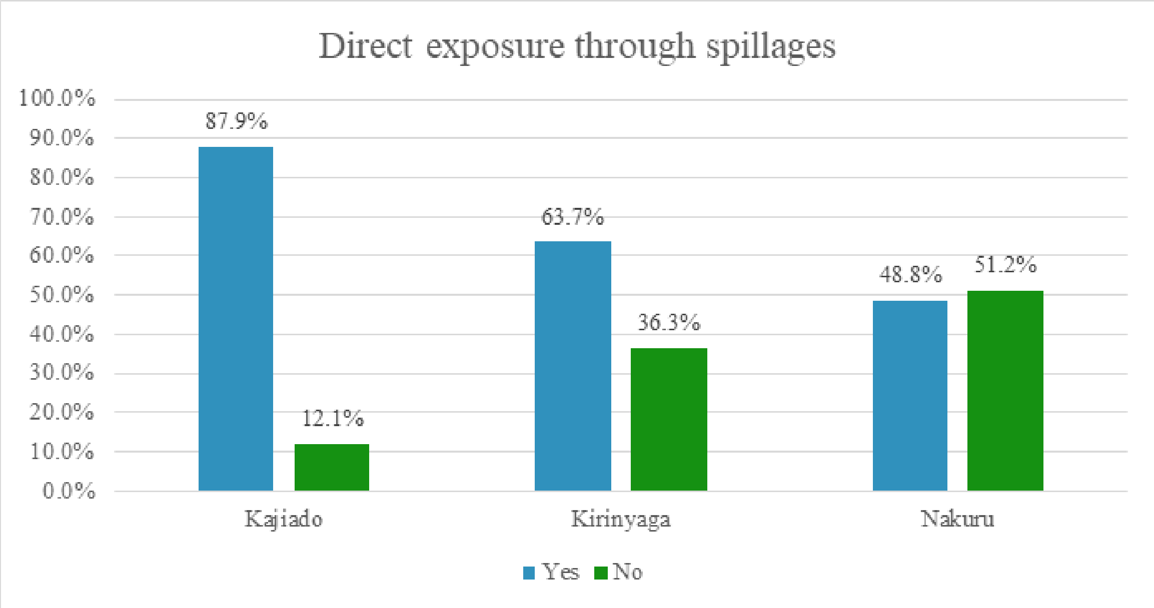

Figure 23: Direct exposure through spillages

Most of the direct exposure, 70.5% occurred during spraying, 57.1% during mixing and 24% during loading. Other respondents reported that they were exposed while working in the farms where pesticides are being used as well as while washing the spraying equipment.

The study established that respondents were exposed mainly because of faulty spray equipment, change in wind direction, decanting while mixing, loose bottle cap, falling while spraying and faulty packaging.

3.11 Health Effects

3.11.1 Reported adverse effects

About 544 (36.4%) of the respondents reported they had experienced adverse effects following exposure to pesticides. The most common symptoms reported included; skin rashes, headaches, nausea, vomiting, dizziness, excessive salivation, diarrhoea, sleeplessness, difficulty in breathing and excessive sweating. Kirinyaga (41.3%) and Nakuru (40.6%) counties recorded the highest rate of the respondents who reported adverse effects from pesticide exposure compared to Nakuru (27.4%).

Table 26: Acute effects experienced after pesticide exposure

Acute effects	Responses (%)			
	Kajiado	Kirinyaga	Nakuru	Average
Experienced (Yes)	40.6	41.3	27.4	36.4
Skin rashes	59.5	48.4	85.9	64.6
Headache	57.9	63.3	45.9	55.7
Nausea	47	14.5	48.2	36.6
Vomiting	40.1	10.9	31.8	27.6
Dizziness	32	48.8	45.9	42.2
Excessive salivation	30.4	0.8	21.2	17.5
Diarrhea	29.6	1.2	50.6	27.1

3.11.2 Chronic illnesses at household level

About 248 (16.5%) in the 3 counties reported that they/their family suffered from chronic illnesses. The illnesses mainly reported included cancer, diabetes, liver disease, learning difficulties, kidney disease and development disorders. Kajiado county recorded the highest rate at 166 (28%) followed by Kirinyaga county at 73 (12.2%) and Nakuru county recording the least at 9 (2.9%).

Table: 27: Chronic illnesses at household level

Chronic illnesses	Responses (%)			
	Kajiado	Kirinyaga	Nakuru	Average
Have (Yes)	28	12.2	2.9	14.4
Cancer	13.1	5.7	4.8	7.9
Diabetes	15.2	12.2	7.4	11.6
Liver disease	8.6	1.5	4.2	4.8
Learning difficulties	2	0.7	3.9	2.2
Kidney disease	9.3	1.2	4.5	5.0
Development disorder (mental & physical)	0.3	0.8	5.2	2.1

The chronic illness reported by the respondents may be indicators for long term exposure to pesticides. Further studies are need to investigate whether there is an association between the reported illness and exposure to pesticides in the study area.

3.11.3 Pesticides and suicide

Only 97 (6.4%) reported that there have been cases of suicides with pesticides in the study areas. Kirinyaga county had the most cases at 50 (8.3%) followed by Kajiado county at 37 (6%) and Nakuru county with the least cases at 10 (3.2%). Although the results imply that pesticide suicide is not a major problem, further investigation of pesticide poisonings and suicides is needed in the study areas to understand the extent of the problem.

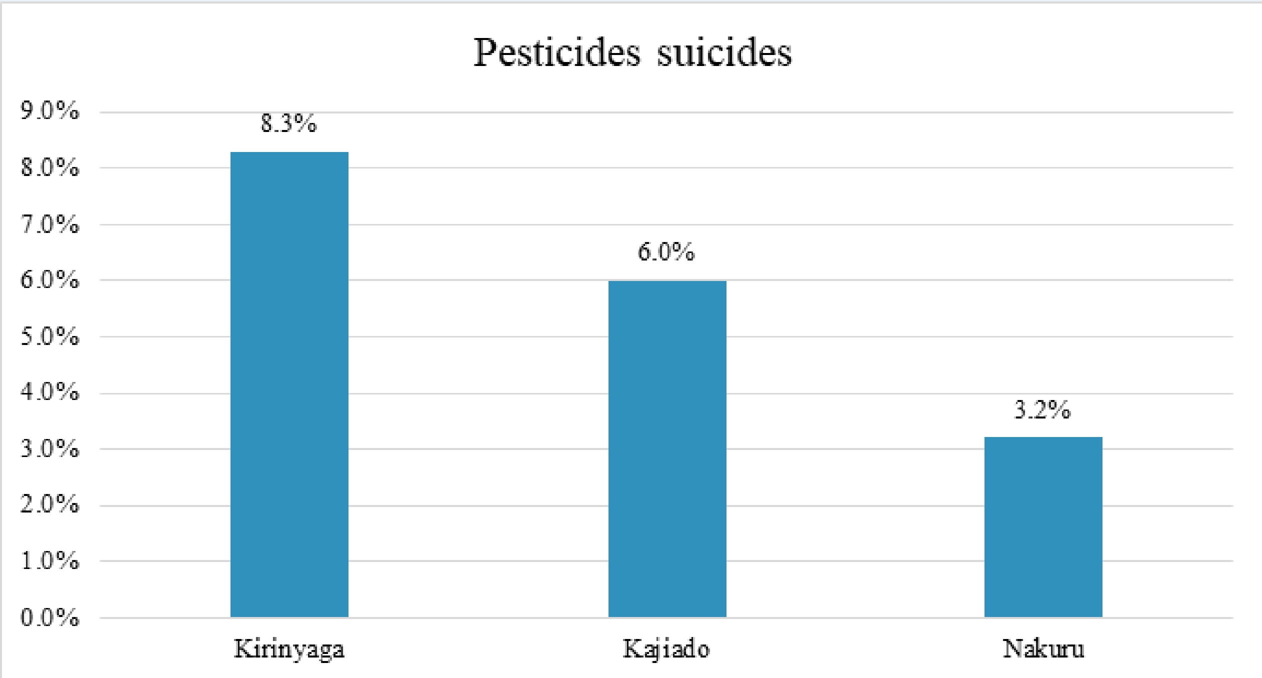

Figure 24: Pesticides suicides

3.12 Environmental Effects

3.12.1 Poisoning of wildlife

Only 155 (7.6%) of the respondents indicated that there have been cases of poisonings or killing of wild animals using pesticides in the areas. Nakuru county recorded the most cases at 52 (16.8%) of wildlife poisonings followed by Kirinyaga county at 43 (7.2%) and Kajiado county at 20 (3.3%).

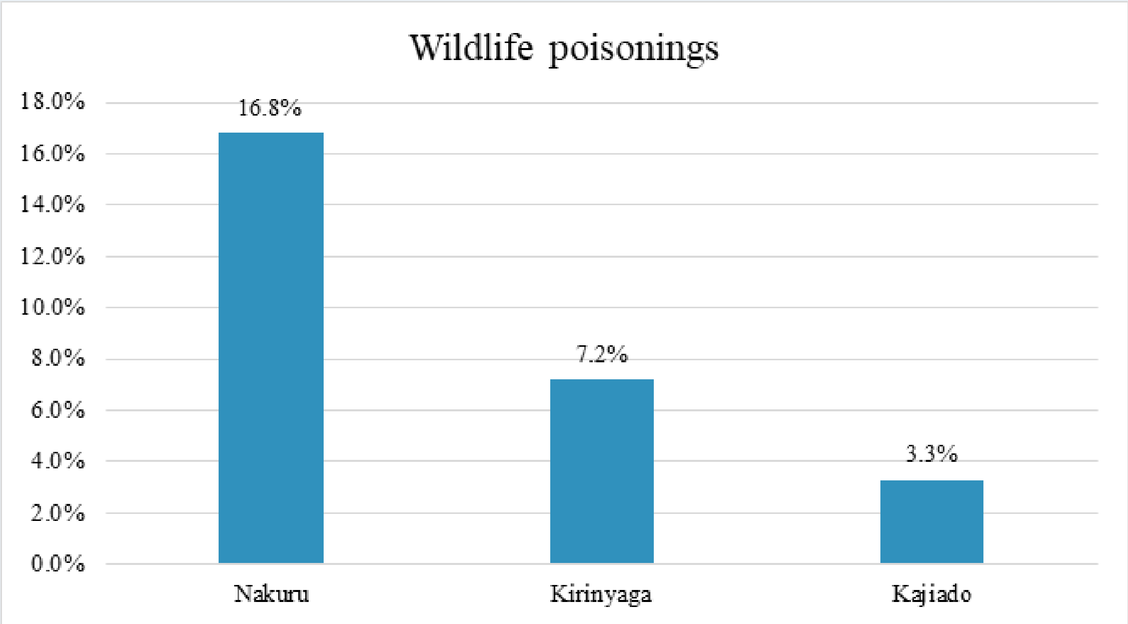

Figure 25: Wildlife poisonings

4 CONCLUSION AND RECOMMENDATIONS

4.1 Conclusions

The following conclusions can be drawn from our study:

- **Overreliance on pesticides:** The study established an intensive use of pesticides in the study areas as nearly all the respondents reported that they used pesticides or worked in farms where pesticides were applied. Both men and women used pesticides.
- **Widespread use of HHPs:** HHPs were widely used in the study area, and mainly included fungicides and insecticides. HHPs comprised about 32% of all the products used in the study area. Most of the HHPs are human carcinogens and reproductive toxicants while other are environmental toxicants and mutagens.
- **Widespread use of banned pesticides:** Our study shows that pesticides banned in other jurisdictions continue to be imported and used in Kenya despite their negative impacts on human health and the environment. About 38% of the identified pesticide active ingredients were banned in other countries, with a good number of them (20%) specifically banned in the country of origin, a clear case of double standards.
- **Illegal transborder trade:** Our study points to a problem of illegal transboundary trade of pesticides between the Kenya- Tanzania boarder as some pesticides (5%) used in the study area were sourced from Tanzania but not registered in Kenya, Kajiado is the hotspot of illegal trade and use of pesticides from Tanzania.
- **High risk of exposure through various activities:** Most of the respondents engaged in activities that directly placed them at high risk of exposure such as spraying of pesticides, mixing, loading and decanting of pesticides, and re-entry into sprayed farms without regard to re-entry intervals. Others were also exposure through spray drifts as most farmers and workers sprayed pesticides with no regard to wind direction while many others lived within the farms where the spraying took place.
- **Limited PPEs use:** Our study indicates that while many respondents used PPEs, full and proper PPEs were not used. Many other respondents, particularly those in Kajiado and Kirinyaga did not use PPEs because they were largely not available, expensive and uncomfortable.
- **Low awareness and knowledge on hazards:** Most farmers and workers were not trained on pesticide use and handling hence had inadequate understanding of the hazards posed by pesticides.
- **Poor pesticide management practices:** Our study shows that pesticides were poorly managed, especially in Kajiado and Kirinyaga. A significant proportion of respondents reused pesticides containers for water and food storage or packaging or decanted pesticides while burning was the main method of disposing empty containers and obsolete pesticides.
- **Lack of proper washing facilities:** Our study shows that farmers do not have proper facilities for washing pesticide application equipment, personal protection clothing as well as bodies after spraying, increasing the risk of exposure and contamination of environment. Most facilities used included taps, irrigation drains, water containers, river, wells, ponds and lakes.
- **Unintentional poisoning:** Our study indicate that a significant number (36%) of farmers and farm workers had directly been poisoned by pesticides in the course of their work. Others also reported that they/their family members had suffered from chronic illnesses such as diabetes and cancer, indicating potential long-term effects of pesticide exposure but requires further investigation.
- **Potential problem of intentional poisoning:** Our study indicates a potential underlaying problem of self-harm with pesticides as well as using of pesticides to intentionally poison wildlife potentially due to human-wildlife conflict particularly in Kajiado. This requires further investigation.

4.2 Recommendations

On the basis of the findings of the survey, the study makes the following recommendations:

1. That the Ministry of Agriculture and Pest Control Products Board (PCPB), in collaboration with ministries of health and environment and stakeholders should review and formulate policies and laws to eliminate HHPs and promote safe and affordable alternatives.
2. PCPB should review the registration of all identified highly hazardous pesticides (HHPs) and those banned in other jurisdictions but still permitted in Kenya, with a view to prohibiting or restricting their use where appropriate to protect human health and the environment
3. Stakeholders should support farmers to reduce dependency on chemical pesticides through awareness on the risks of HHPs and training in safer alternatives such as agroecology, Integrated Pest Management (IPM), and biopesticides.
4. The relevant government Ministries, Departments and Agencies (MDAs) should promote access to knowledge and information relevant to sustainable agricultural practices including pest and disease management.
5. PCPB should assess the impacts of and review registration of pesticides identified to be highly toxic to bees and aquatic organisms with the view of prohibiting or restricting their use as appropriate.
6. PCPB and National Environment Management Authority (NEMA), in partnership with the pesticide industry, should establish a national Extended Producer Responsibility (EPR) scheme for the safe management of pesticide containers and obsolete pesticides, in accordance with the 2024 EPR regulations.
7. The Ministries of Agriculture, Environment, and Health should conduct regular post-registration monitoring and surveillance of pesticide use and its impacts to identify severe and irreversible effects under local conditions, and to support evidence-based decision-making.
8. The Ministry of Agriculture and the PCPB, in collaboration with the Ministries of Health and Environment, should establish a coordinated mechanism to strengthen inter-ministerial collaboration and enhance stakeholder engagement in the management of pesticides and HHPs in Kenya.
9. The Ministry of Labor and Social Protection, through the Directorate of Occupational Safety and Health Services (DOSHS), should implement a health monitoring program for flower industry workers in Kenya to identify and protect those exposed to harmful pesticides in the workplace
10. DOSHS should establish a national database to centralize all biomonitoring reports conducted on flower industry workers by companies in Kenya. This will enhance transparency, improve access to critical health information, and support informed decision-making for worker protection.
11. There is need for collaboration between Kenya and Tanzania to curb illegal cross-border trade in pesticides. PCPB in collaboration Kenya Revenue Authority (KRA) should sensitize and train border control officers in identifying and curbing trade of illegal pesticides at border points.

5 REFERENCES

1. **Boedeker, W., Watts, M., Clausing, P. et al. RETRACTED ARTICLE:** *The global distribution of acute unintentional pesticide poisoning: estimations based on a systematic review.BMC Public Health 20, 1875 (2020).* https://doi.org/10.1186/s12889-020-09939-0.
2. **Food and Agriculture Organization of the United Nations (2024)** – with major processing by Our World in Data. "Total pesticide use – UN FAO" [dataset]. *Food and Agriculture Organization of the United Nations, "Land, Inputs and Sustainability: Pesticides Use"* [original data]. Retrieved August 21, 2025 from https://archive.ourworldindata.org/20250718-111234/grapher/pesticide-use-tonnes.html (archived on July 18, 2025).
3. **Food and Agriculture Organization of the United Nations (2021).** *Finding alternatives to HHPs. Experiences from African, Caribbean and Pacific Countries.* Online side event during the online segment of the COPs (29 July 2021). Available at www.brsmeas.org/2021COPs/Sideevents/tabid/8867/language/en-US/Default.aspx. Accessed July 10, 2025.
4. **FAO (2006). Report of the Council of FAO**. *Hundred and Thirty-first Session Rome, 20-25 November 2006*. Available: https://openknowledge.fao.org/server/api/core/bitstreams/31179a20-0900-4bcc-a577-85bb60743111/content. Accessed July 10, 2025
5. **Food and Agriculture Organization of the United Nations**, WHO. International Code of Conduct on Pesticide Management: *guidelines on highly hazardous pesticides. 2016*. http://www.fao. org/3/a-i5566e.pdf Accessed July 10, 2025
6. **FAO &WHP (2016). International Code of Conduct on Pesticide Management.** *Guidelines on Highly Hazardous Pesticides. Available* at: https://openknowledge.fao.org/server/api/core/bitstreams/7c65af6a-52ca-4e44-8c57-4303d076bea4/content . Accessed July 10, 2025.
7. **Pesticide Action Network (PAN) International (2024a)**. *PAN List of HHPs*. Available: https://pan-international.org/wp-content/uploads/PAN_HHP_List.pdf. Accessed August 14th, 2025
8. **Pesticide Action Network (PAN) International (2024b)**. *Consolidated list of banned pesticide*s. Available:https://pan-international.org/pan-international-consolidated-list-of-banned-pesticides/. Accessed August 14th, 2025
9. **Route to Food Initiative (2023)**. *Hazardous Pesticides Report*. Available at: https://ke.boell.org/sites/default/files/2023-09/data-and-facts_highly-hazardous-pesticides-in-kenya-1.pdf. Accessed, July 10, 2025
10. **United Nations Environment Programme (2023**). Guidelines on Alternatives to Highly Hazardous Pesticides, Geneva.

6 ANNEXES

Annex 1: List of the products and their active ingredients

Product name	Active ingredient and concentration
Insecticides	
Abalone 18EC	Abamectin 18g/L
Abamite 2% EC	Abamectin 20g/L
Abasi 5 EC	Abamectin 50g/L
Acetak 200SL	Acetamiprid 200g/L
Acetak top 700WG	Acetamiprid 700 g/kg
Achook 0.15%EC	Azadirachtin 0.15% w/w
Acoster 5EC	Abamectin 50g/L
Actara 25WG	Thiamethoxam 250g/Kg
Actellic 25EC	Pirimiphos-methyl 250g/L
Adafone	Fosthiazate 200g/l
Adaforce 20EW	Fosthiazate 200g/l
Afifen 10.8EC	Pyriproxifen 100 g/L
Agrimec 18 EC	Abamectin 18g/L
AirForce one 25EC	Lambda-cyhalothrin 25g/L
Albaz 10EC	Alpha-cypermethrin 100g/L
Alfatox 10EC	Alpha-cypermethrin 100g/L
Almite 2.0 EC	Abamectin 20g/L
Alonze 50EC	Abamectin 50 g/L
Alpha Cymba 10 EC	Alpha-cypermethrin 100g/L
Alphaguard 10EC	Alpha-cypermethrin 100g/L
Alphakill 100EC	Alpha-cypermethrin 100g/L
Alphascope 10 EC	Alpha-cypermethrin 100g/L
Alphashield 100 EC	Alpha-cypermethrin 100EC
Alphasin	Alpha-cypermethrin 100g/L
Alphasumu 10 EC	Alpha-cypermethrin 100g/L
Altair 50WDG	Acetamiprid 500 g/Kg
Amafos	Chlorpyrifos 480g/l
Amaron	Emamectin Benzoate 5% SG
Amazing top 100WDG	Abamectin 20 g/Kg + Acetamiprid 80 g/Kg
Amigad 5.7WDG	Emamectin benzoate 57g/Kg
Amino Gold	Polyalkyleneoxide modified heptamethyltrisiloxane (organosilicone) 800g/L
Amito 5.7WDG	Emamectin benzoate 57g/Kg
Apex 40 EC	Abamectin 10g/L, Acetamiprid 30g/L
Apollo 50SC	Clofentezine 500g/L
Applaud 40%SC	Buprofezin 400g/L
Apron Star 42WS	Thiamethoxam 20g/Kg + Metalaxyl M 20g/Kg + Difenoconazole 2g/Kg
Aragon 220ZC	Thiamethoxam 126 g/L + Lambda cyhalothrin 94 g/L
Arima 30SC	Cyenopyrafen 300g/L
Aster extrim 20SL	Acetamiprid 150g/L + Cypermethrin 50g/L
Atom 2.5EC	Deltamethrin 25g/L

Product name	Active ingredient and concentration
Attacker 150SC	Indoxacarb 150g/L
Avaunt 150EC	Indoxacarb 150g/L
Avid 1.8EC	Abamectin 18g/L
Avirmec 1.8EC	Abamectin 18g/L
Barrot 700WDG	Imidacloprid 700g/Kg
Basis 050SC	Abamectin 50g/L
Belt 480SC	Flubendiamide 480g/L
Benevia TM 100D	Cyantraniliprole 100g/L
Benocarb 100SC	Indoxacarb 85g/L + Emamectin benzoate 15g/L
Bentil 23EC	Emamectin Benzoate 23 g/L
Bestacron 720EC	Profenofos 720g/l
Bestox 100SC	Alpha-Cypermethrin 100g/L
Big Mantis 300WP	Cyromazine 50 g/L + Monosultap 250 g/L
Biograde 300SL	Tea saponin 300g/L
Biomat	Matrine 13g/l
Botatox 10EC	Alpha-cypermethrin 100g/L
Calrate 5EC	Lambda- cyhalothrin 50g/L
Calypso 480SC	Thiacloprid 480g/L
Campostella 330SC	Abamectin 30g/L, Spirodiclofen 300g/L
Capture 247SC	Lambda- cyhalothrin 106g/L + Thiamethoxam 141g/L
Chess	Pymetrozine 500g/l
Chordata 10.2EC	Abamectin 20 g/L, Pyridaben 100 g/L
Click 200SL	Imidacloprid 200g/L
Clomite 500SC	Clofentezine 500g/L
Closer 240SC	Sulfoxaflor 240g/L
Comgen	
Confidor 200SL	Imidacloprid 200g/L
Confidor 70WG	Imidacloprid 700g/l
Contest 2.3%EC	Emamectin Benzoate 23 g/L
Coragen 20SC	Chlorantraniliprole 200g/L
Cypertox 25EC	Lambda cyhalothrin 25g/L
D-mek 18EC	Abamectin 18g/L
Danisaraba 20SC	Cyflumetofen 200g/L
Decis 2.5EC	Deltamethrin 25g/L
Degree max 200EC	Alpha-cypermethrin 200 g/L
Delegate 250WG	Spinetoram 250g/Kg
Den gold	N/A
Diazol 60EC	Diazinon 600g/L
Dimate 40EC	Dimethoate 40%
Dimiprid 200SL	Imidacloprid 200g/L
Divipan	Dichlorvos
Dizon 60EC	Diazinon 600g/L
DKDIME 40EC	Dimethoate 40%
Dudu - Acelamectin 5%EC	Abamectin 2% + Acetamiprid 3%

Product name	Active ingredient and concentration
Dudu Agrikill 29SC	Chlorfenapyr 200g/L ,Emamectin benzoate 40g/L, Lambda-cyhalothrin 50g/L
Dudu fenapyr 100SC	Chlorfenapyr 100g/L
Dudu fenos 440Ec	Profenofos 400g/L + cypermethrin 40g/L
Dudu Will 315EC	Chlorpyrifos 300g/l+lambda -cyhalothrin 15g/L
Dudu-Acelamectin 5% EC	Abamectin 2%, Acetamiprid 3%
Dudumectin 5EC	Abamectin 2%, Acetamiprid 3%
Duduthrin 1.75EC	Lambda-cyhalothrin 17.5g/L
Duduthrin 5EC	Lambda-cyhalothrin 50g/L
Duss 10EC	Pyriproxyfen 100g/L
Dynamec 1.8EC	Abamectin 18g/L
EABCL Admire 70WDG	Imidacloprid 700g/kg
EABCL VITAL 350SC	Imidacloprid 350g/L
Eco Bb	Beauveria bassiana strain R444
Ecsort 19EC	Emamectin benzoate 19g/L
Electra 120EC	Acetamiprid 100 g/L + Emamectin Benzoate 20 g/L
Em-Actin 57SC	Emamectin Benzoate 57g/L
Emerald 200SL	Imidacloprid 200g/L
Emmaron 30SC	Emamectin Benzoate 10g/L, Lufenuron 20g/L
Endsect 150SC	Pyriproxyfen 75g/L, Flonicamid 75g/L
Engeo 247SC	Thiamethoxam 141 g/L+ Lambda-cylothrin 106 g/L
Escort 19EC	Emamectin benzoate 19g/L
Evik 500SP	Thiocyclam Hydrogen Oxalate 50% w/w
Evisect	Thiocyclam 50% w/w of thiocyclam-hydrogenoxalate
Fastac 10EC	Alpha-cypermethrin 100g/L
Fenari 120SC	Emamectin benzoate 20 g/L, Chlorfenapyr 100 g/L
Fidelity 400WG	Sulfoxaflor 300 g/Kg + Spinetoram 100 g/Kg
Fireworks 90SC	Indoxacarb 60g/L, Abamectin 30g/L
Firm fix	N/A
Floramite 240SC	Bifenazate 240g/L
Flower DS 4EC	Pyrethrins 4%
Foscap 105GR	Abamectin 5g/kg + Fosthiazate 100 g/kg
Fulfill	Pymetrozine 50%
Garland max 30WP	Cyromazine 50g/L + Monosultap 250g/L
General 90SC	Emamectin benzoate 15g/l, Indoxacarb 75g/l
Genomite 200EC	Pyridaben 20% w/v
Gladius 10SC	Flometoquin 106 g/L
Golan 20SP	Acetamiprid 200g/L

Product name	Active ingredient and concentration
GoldBan 505EC	Chlorpyrifos 500g/l, Cypermethrin 5g/l
Gradometor 480EC	Chlorpyrifos 480g/L
Hable 5WG	Emamectin benzoate 50g/Kg
Halothrin 2.5EC	Lambda-cyhalothrin 25g/L
Halt Neo 5% WP	Bacillilus thuringiensis 150g/L
Helitec	helicoverpa armigera SNPV8%
Herole Plus 12SC	Chlorfenapyr 100g/L, Emamectin Benzoate 20g/L
Hinder 500SP	Thiocyclam hydrogen oxalate 500 g/kg
Hitman-2	Emamectin Benzoate 15 g/L + Indoxacarb 75 g/L
Indoking 300SC	Indoxacarb 300 g/L
Jackpot 5EC	Lambda-cyhalothrin 50g/L
Karate zeon	Lambda-cyhalothrin 50g/L
Katrin 2.5%EC	Deltamethrin 25g/L
Kinetic 100EW	Lamba-cyhalothrin 100g/L
Kingcode Elite 50EC	Acetamiprid 35g/L, Lambda- cyhalothrin 15g/L
Knockout 500SC	Clofentezine 500g/L
Konzano 50EC	Abamectin 50g/L
Lambdastar 5%EC	Lambda-cyhalothrin 5%
Lambdex	Lambda-cyhalothrin 50g/L
Lancer 130SC	Imidacloprid 100 g/L+ Lambda cyhalothrin 30g/L
Laracare 5% ME	Lambda- cyhalothrin 50g/L
Lasting 250SC	Lambda-cyhalothrin 250g/L
Lecatech WP	Lecanicillium lecanii J27
Legacy 5%EC	Lufenuron 50g/L
Levo 2.4SL	Oxymatrine 2.4%
Lexus 247SC	Lambda- cyhalothrin 106g/L + Thiamethoxam 141g/L
Limocide	Orange oil
Locus 150WG	Acetamiprid 120 g/Kg, Lambda-cyhalothrin 30 g/Kg
Lotus 75%SP	Acephate 750 g/kg
Magic 50EC	Malathion 500g/L
Magicforce	Lambda-Cyhalothrin 15 g/L + Dimethoate 300 g/L
Magneto 1%EC	Azadirachtin 0.6% + Matrine 0.4%
Magnum (filwet gold liquid)	Organosilicone (Polyether modified Trisiloxane 80%)
Maha Karanje Oil	
Mainspring 200SC	Cyantraniliprole 200 g/L
Match 050EC	Lufenuron 50g/L
May 50EC	Lufenuron 50g/L
Medal 25WDG	Thiamethoxam 250g/Kg
Metholing 90SP	Methomyl 90% w/w
Mighty 50ME	Abamectin 50g/L
Mitac 20EC	Amitraz 200g/L
Mitekill 2EC	Abamectin 20g/L

Product name	Active ingredient and concentration
Miteking 1.8EC	Abamectin 18g/L
Mocap 10GR	Ethoprophos 100g/Kg
Mospilan 20SP	Acetamiprid 200g/kg
Movento 100SC	Spirotetramat 100 g/l
Nano gold 280WP	Thiocyclam Hydrogen Oxalate 250 g/kg + Acetamiprid 30 g/kg
Negatron ultra liquid	N/A
Nemguard 99.9%SC	Garlic Extract 99.9% v/v
Neudosan 51%SL	Pottassium salts of fatty acids, 510 g/L
Nimbecidine	Azadirachtin 0.03%
Nomolt 150SC	Teflubenzuron 150g/L
Oberon speed 240SC	Abamectin 11.4 g/L + Spiromefisen 228.6 g/L
Occasion star 200SC	Indoxacarb 160g/L + Emmamectin benzoate 40g/L
Orizon 150CS	Abamectin 30 g/L + Imidacloprid 120 g/L
Orthene 97% Pellet	Acephate 970g/Kg
Ortus 5SC	Fenpyroximate 50g/L
Oshothion 50EC	Malathion 50% w/v
Otran	Acephate 970g/Kg
Ozoneem 1%EC	Azadirachtin 1%
Password 5.7%WDG	Emamectin benzoate 57 g/Kg
Pegasus 500SC	Diafenthiuron 500g/L
Pentagon 50EC	Lambda-cyhalothrin 50g/L
Perfect 1.92EC	Emamectin benzoate 19.2g/L
Pinnacle	Thiamethoxam (neonicotinoid) 240 g/l
Pirimor 50DG	Pirimicarb 50% w/w
PODEX - CHROMAFEN-ZIDE 5%SC	
Polyking 440 EC	Profenofos 400g/L + Cypermethrin 40g/L
Power tiger 100SC	Chlorfenapyr 100g/L
Presento 200SP	Acetamiprid 200g/Kg
President GOLD 20 DP	Pirimiphos-methyl 18g/Kg + Deltamethrin 2g/Kg
Prev-am.	d-limonene 60g/l
Profecron 720EC	Profenofos 720g/l
Profen 10.8EC	Pyriproxyfen 108g/L
Profile 440EC	Profenofos 400g/L, Cypermethrin 40g/L
Prosper 440EC	Profenofos 40% , Cypermethrin 4%
Protap 500WP	Buprofezin 100g/kg + Monosultap 400 g/kg
Prove 1.92EC	Emamectin benzoate 19.2g/L
Punch	Abamectin 1.8% EC
Pursuit 6%EC	Emamectin benzoate 10g/L, Lambda-cyhalothrin 50g/L
Pyratop 75EC	Pyrethrin 75g/L
Pyretone 40EC	Pyrethrin 4% (w/v)
Quiksil	Organosilicone 100%

Product name	Active ingredient and concentration
Radiant 120SC	Spinetoram 120g/L
Ranger 480EC	Chlorpyrifos 480g/L
Rapid 120EC	Acetamiprid 100g/L, Emamectin Benzoate 20g/L
Reaper 10%EW	Lamba-cyhalothrin 100g/L
Reeva 5EC	Lambda- cyhalothrin 50g/L
Referee 50EC	Lufenuron 50g/L
Regime 480EC	Chlorpyrifos 480 g/L
Relay 150SC	Emamectin Benzoate 50 g/L + Indoxacarb 100 g/L
Romectin 1.8EC	Abamectin 18g/L
Ruler 50%SP	Cyromazine 500g/kg
Runner 240SC	Methoxyfenozide 240g/L
Saf-t side 800EC	Paraffin Oil 80%
Secure 240SC	Chlorfenapyr 240g/L
Segatron ultra liquid	Paraffin oil 98%
Shotgun 20%SP	Acetamiprid 200g/kg
Silmite	Organosilicone 100%
Silvergold	Organisilcone
Sivanto prime 200SL	Flupyradifurone 200g/L
Snow tiger 100SC	Chlorofenapyr 100g/L
Solaris 90SC	Indoxacarb 60g/L , Abamectin 30g/L
Spidor 240SC	Spirodiclofen 240g/L
Spidor Max 300SC	Abamectin 30 g/l, Spirodiclofen 27 g/L
Starthene Plus 97%DF	Acephate 97%
Stirrup 257SC	Lambda-cyhalothrin 106g/L, Thiamethoxam 141 g/L
Sulban 48EC	Chlorpyrifos 480g/L
Summit 120SC	Abamectin 20 g/L , Thiamethoxam 100 g/L
Supreme IT	bifenthrin
Sustain	Trichoderma asperellum
Swift 5EC	Lambda-cyhalothrin 5%
Sword 200SC	Fipronil 200 g/L
Tarantula 1.8EC	Abamectin 18g/L
Taurus 500SC	Thiocyclam hydrogen oxalate 500g/Kg
Teebek	
Teppeki 50WG	Flonicamid 500g/Kg
Thrips Kranti	
Thunder OD145	Imidacloprid 100g/L, Beta-cyfluthrin 45g/L
Tihan 175OD	Spirotetramat 75g/L, Flubendiamide 100 g/L
Tracer 480SC	Spinosad 480g/L
Trigard 75WP	Cyromazine 75% w/w
Trilogy 050EC	Hydrophobic
TRIPSO 50EC	Lufenuron 50g/L

Product name	Active ingredient and concentration
Twiga Ace 20SL	Acetamiprid 200g/L
Twigamectin	Abamectin 18g/L
Uphold 360SC	Spinoteram 60 g/L + Methoxy-fenozide 300 g/L
Veltor 150CS	Abamectin 30 g/L + Imidacloprid 120 g/L
Velum Prime	Fluopyram 500g/kg
Vendex 50EC	Lambda-cyhalothrin 50g/L
Venetrate	Burkholderia sp. strain A396
Verkotin 1.8EC	Abamectin 18g/L
Voliam targo	Chlorantraniliprole 45 g/L + Abamec-tin 18g/L
Voltage 5EC	Lambda-cyhalothrin 50g/L
Wilcron 720EC	Profenofos 720g/L
Winner 100EC	Deltamethrin 100 g/L
Zythum 30WP	Cyromazine 50g/L + Monosultap 250g/L
Fungicides	
Absolute 400SC	Azoxystrobin 250 g/L + Difenocona-zole 150 g/L
Absolute star 400SC	Azoxystrobin 250 g/L + Difenocona-zole 150 g/L
Absolute Star 500SC	Azoxystrobin 250 g/L + Difenocona-zole 150 g/L
Acrobat MZ 69%WP	Dimethomorph 90g/Kg + Mancozeb 600g/Kg
Afribat 69WP	Dimethomorph 9% + Mancozeb 60%
Afrizeb Super 50WP	Thiophanate-methyl 150g/kg + Man-cozeb 350g/kg
Agrilax 72WP	Metalaxyl 8% + Mancozeb 64%
Agrixyl 407SL	Metalaxyl 70g/L + Mono & Di-potassi-um salts of phosphoric acid 400g/L
Agromax 720WP	Cymoxanil 80g/l +Mancozeb 640g/l
Agvanta 500SC	Azoxystrobin 250g/L + Flutriafol 250g/L
Amidil 68WDG	Metalaxyl-M-40g/Kg + 640g/Kg Mancozeb
Amistar 250SC	Azoxystrobin 250g/l
Antracol 70WP	Propineb 70% m/m
Apron star 42WS	Thiamethoxam 20g/Kg + Metalaxyl M 20g/Kg + Difenoconazole 2g/Kg
Atmos 200SC	Cyazofamid 200 g/L
Autogear 25%WP	Metalaxyl 150g/kg + Propamocarb Hydrochloride 100g/kg
Azobin 325SC	Azoxystrobin 200g/L + Difenocona-zole 125g/L
Azolaxyl 390SC	Azoxystrobin 282 g/L + Metalaxyl-M 108 g/L
Azoxy top 325SC	Azoxystrobin 200g/L + Difenocona-zole 125g/L
Banjo 500SC	Fluazinam 500g/L
Bellis 38%WG	Boscalid 252g/Kg + Pyraclostrobin 128g/Kg

Product name	Active ingredient and concentration
Bench 300EC	Difenoconazole 150 g/L + Propicona-zole 150 g/L
Biothane 80WP	Mancozeb 800g/Kg
Blight Force 72WP	Mancozeb 640g/kg + Cymoxanil 80g/kg
Botathane 800WP	Mancozeb 800g/Kg
Botran 500SC	Carbendazim 500g/L
Botreat 430SC	Tebuconazole 430g/L
Botri act 700SC	Thiophanate-methyl 700g/L
Bravia 325SC	Azoxystrobin 200g/L + Difenocona-zole 125g/L
Bugati 500SC	Azoxystrobin 200 g/L + Tebuconazole 300 g/L
Carbozim 500SC	Carbendazim 500g/L
Caretaker duo 300EC	Difenoconazole 150 g/L + Propicona-zole 150 g/L
Carzal 250EC	Pyraclostrobin 250 g/L
Champflo	Copper hydroxide 42.74% equivalent to 24.4% metallic copper
Champion 50WP	Cupric hydroxide 77% (Equivalent to 50% Metallic Copper)
Chariot 500SC	Carbendazim 500g/L
Chloroforce 500SC	Chlorothalonil 500g/l
Collis 300SC	Boscalid 200g/L + Kresoxim-methyl 100g/L
Combremix 50WP	Copper oxychloride 500g/kg
Consento 450SC	Fenamidone 75g/L +Propamocarb hydrochloride 375 g/L
Control 70WDG	Thiophanate methyl 70%w/w
Copchem 50WP	Copper Oxychloride 50% Metallic Copper
Covver 76WP	Cymoxanil 700g/Kg + propineb 60g/Kg
Cuprocaffaro 37.5WDG	Copper Oxychloride 37.5%
Curfew 100EC	Penconazole 100g/L
Cynara 72WP	Mancozeb 640g/Kg + Cymoxanil 80g/Kg
Dachlor 720SC	Chlorothalonil 720g/kg
Daconil 720SC	Chlorothalonil 720g/L
Devisulphur 80WP	Sulphur 800g/Kg
Discovery 400SC	Flusilazole 125g/L + Carbendazim 275g/L
Dolphin 260WDG	Diethofencarb 160 g/kg + Pyrimeth-anil 100 g/kg
Domain 25%EC	Difenoconazole 250g/L
Downlightor 72WP	Mancozeb 64% + Cymoxanil 8%
Eazole 250EC	Tebuconazole 250g/L
Effect 700WP	Thiophanate-methyl 700 g/kg
Emthane 45WP	Mancozeb 800g/Kg
Enrich	Di-bromo di-nitro propane 1, 3 diol
Enrich BM	Bronopol 27%w/w
Equation pro	Famoxadime 225g/Kg + Cymoxanil 300g/L

Product name	Active ingredient and concentration
Eupirimate 25EC	Bupirimate 250g/L
Eurothane 800WP	Mancozeb 800g/Kg
Evade 80WP	Mancozeb 800g/Kg
Evito T 477SC	Fluoxastrobin 200 g/L + Tebuconazole 277g/L
Falcon 430SC	Tebuconazole 430 g/L
Farmerzeb 80WP	Mancozeb 800g/Kg
Fivestar 325SC	Difenoconazole 125 g/L + Azoxystrobin 200 g/L
Folicur 250EW	Tebuconazole 250g/L
Fortress gold 72WP	Mancozeb 640g/Kg + Cymoxanil 80g/Kg
Fostonic 80WP	Fosetyl-Aluminium 833.3g/Kg
Funginex	Pyrimethanil 400g/L
Fungiwil 50SC	Hexaconazole 50g/l
Fungo force 72WP	Metalaxyl 8% +mancozeb 64% WP
Funguran OH 50WP	Copper hydroxide 77% w/w equivalent to 50% metallic copper
Gearlock tarbo 250WP	Metalaxyl 150g/L + Propamocarb hydrochloride 100g/Kg
Gillan N 60WG	Azoxystrobin 200 g/kg + Dimethomorph 400 g/Kg
Goldazim 500SC	Carbendazim 500g/L
Green cop 500WP	Copper oxychloride, 500g/kg
Hetor 72WP	Mancozeb 680g/kg + Metalaxyl 80g/kg
Impulse 500EC	Spiroxamine 500g/L
Infinito 687.5SC	Fluopicolide 62.5g/L+ Propamocarb hydrochloride 625g/L
Iperion 50WP	Copper Oxychloride - 85% equivalent to 50% metallic copper
Isacop 50WP	Copper Oxychloride 85% Equivalent to 50% Metallic Copper
Kenthane 800WP	Mancozeb 800g/Kg
Klassic 5%EC	Hexaconazole 50g/L
Komesha 76Wp	Propineb 700 g/kg + Cymoxanil 60 g/kg
Kusabi 300SC	Pyriofenone 300 g/L
Luna sensation 500SC	Fluopyram 250g/L + Trifloxystrobin 250g/L
Luna tranquility 500SC	Fluopyram 125g/L + Pyrimethanil 375g/L
Mancovil 5SC	Hexaconazole 5% SC
Master line	Calcium 302%+7%+6%boron
Mastercop 60SC	Copper Sulphate Pentahydrate 236 g/L equivalent to 60 g/L copper
Masterkinga 72WP	Mancozeb 640g/kg+Cymoxanil 80g
Matco 72WP	Metalaxyl 80g/Kg + Mancozeb 640g/Kg
Melody duo 69WG	Propineb 600g/Kg + Iprovalicarb 90g/Kg
Meltatox 385EC	Dodemorph-Acetate 385g/L
Metaprop 25%WP	Metalaxyl 150g/kg + Propamocarb hydrochloride 100g/kg

Product name	Active ingredient and concentration
Milestone 250SC	Azoxystrobin 250g/L
Milraz 76WP	Propineb 70% + Cymoxanil 6%
Milthane Super 80%WP	Mancozeb 800g/Kg
Mistress 72WP	Cymoxanil 8% + Mancozeb 64%
Moithane 800WP	Mancozeb 800g/Kg
Nativo 300SC	Trifloxystrobin 100 g/L + and Tebuconazole 200g/L
Ngumi 500SC	Carbendazim 500g/L
Nimrod 25EC	Bupirimate 250g/L
Nordox Express 720WP	Copper (I) oxide 600 g/Kg + Dimethomorph 120 g/Kg
Nordox super 75WP	Cuprous Oxide (Equivalent to 75% metallic copper)
Noviguard 72%WP	Mancozeb 640g/kg + Cymoxanil 80g/kg
Orizole 250EC	Tebuconazole 250g/L
Ortiva 250SC	Azoxystrobin 250g/L
Ortiva top 325SC	Azoxystrobin 250g/L+Difenoconazole 125g/L
Orvego TM 525SC	Dimethomorph 225g/L+Ametoctradin 300g/L
Oshothane 80WP	Mancozeb 800g/Kg
Oshothane plus	Mancozeb 750g/Kg
Othello 25WDG	Azoxystrobin 250g/kg
Overall 500SC	Iprodione 500g/L
Pearl 500SC	Carbendazim 500g/L
Picatina Flora 250SC	Pydiflumetofen 100 g/L + Fludioxonil 150 g/L
Piranah 200SC	Prochloraz 100 g/L + Iprodione 100 g/L
Polar 50 WSG	Polyoxin AL (Complex 50% w/w)
Potphos 500SL	Potassium phosphite 500 g/L
Powerdif 250EC	Difenoconazole 250mg/L
Priaxor 225EC	Fluxapyroxad 75 g/L + Pyraclostrobin 150 g/L
Proactive 300EC	Difenoconazole 150 g/L + Propiconazole 150 g/L
Procure 480SC	Triflumizole 480gm/L
Prolectus 50WG	Fenpyrazamine 500g/kg
Propeller 722SL	Propamocarb hydrochloride 722 g/L
Protacol 80WP	Propineb 800 g/kg
Protect combi 280SC	Azoxystrobin 200 g/L + Cyproconazole 80g/L
Quadris 50WG	Azoxystrobin 500g/Kg
Raincozeb 80WP	Mancozeb 800g/Kg
Ransom 600WP	Carbendazim 570 g/Kg + Triadimefon 30g/Kg
Regain	Bacillus subtilis BS-01 1x1010 cfu/ml)
Revus 250SC	Mandipropamid 250g/L
Ridomil gold MZ 68WG	Metalaxyl-M 40g/Kg + Mancozeb 640g/Kg
Rodazim 50SC	Carbendazim 500g/L

Product name	Active ingredient and concentration
Rovral	Iprodione 250g/L
SABCOP - 50	Copper Oxychloride 50% WP
Samaya kop 50WP	Copper Oxychloride - 85%
Saplas 500SL	Polyoxin B 340g/L
Scala 40SC	Pyrimethanil 400g/L
Score 250EC	Difenoconazole 250g/L
Senator 800WP	Mancozeb 800g/Kg
Senstrobin 25WDG	Azoxystrobin 250g/Kg
Serenade ASO	Bacillus amyloliquefaciens strain QST 713 13.96 g/L
Silvzole 430SC	Tebuconazole 430 g/L
SKIPPER 720WP	Mancozeb 64% + Cymoxanil 8%
Skysil Gold	Organosilicone 100%
Snow Power 45%WP	Cymoxanil 4%, mancozeb12%, copper oxychloride 29%
Solvit 175EW	Fenpropidin 125g/L+ Penconazole 50g/L
Sphinx extra	Folpet 600g/kg + Dimethomorph 113g/kg
Spinex 500EC	Spiroxamine 500g/L
Stage 250EW	Tebuconazole 250g/L
StarGem 80WP	Mancozeb 800g/Kg
STEEL EXTRA 50WP	Copper Oxychloride 50% w/w
Sulfolac 80WP	Sulphur 800 g/kg
Sulphur gold 80WDG	Sulphur 800g/kg
Sunscreen Film	N/A
Supakinga 72WP	Mancozeb 640g/kg + Cymoxanil 80g/kg
Supercop	Copper sulphate 50g/l
Tabibu 500SC	Thiophanate Methyl 400g/L + Hexaconazole 100g/L
Tajiri 720WP	Mancozeb 64% + Cymoxanil 8%
Tancap 80WG	Captan 800 g/Kg
Taylor 720WP	Mancozeb 640 g/Kg + Cymoxanil 80 g/Kg
Tedda 25EW	Tebuconazole 250g/L
Teldor 50WG	Fenhexamid 500g/Kg
Thiovit Jet	Sulphur (elemental) 80%w/w
Thrive 25%wp	Metalaxyl 150g/kg + Propamocarb Hydrochloride 100g/kg
Topaz 25EW	Tebuconazole 25% w/w
Topcop 50%WP	Copper Oxychloride 85%
Topguard 500SC	Thiophanate-methyl 500g/kg
Topwonder 500SC	Thiophanate-methyl 500 g/L
Trinity Gold 452WP	Copper oxychloride 290g/L + Cymoxanil 42g/L+ Mancozeb 120g/L
Trustmate extreme 300EC	Bupirimate 200 g/L + Penconazole 100 g/L
Twiga - epox 250SC	Epoxiconazole 250g/L
Twigalaxyl 720WP	Mancozeb 640g/Kg+ Metalaxyl 80g/Kg
Twigathalonil 720SC	Chlorothalonil 720g/L
Tythine 80WP	Mancozeb 80g/L
UNIGO 50% SC	Fluazinam 400 g/L + Metalaxyl-M 100 g/L
Victory 72WP	Metalaxyl 80g/Kg + Mancozeb 640g/Kg
Vidalia 69WP	Mancozeb 600g/kg + Dimethomorph 90g/kg
Vitra 40WG	Copper hydroxide 66.7% w/w
Vondozeb 75DG	Mancozeb 750g/Kg
Wetsulf	Sulphur 80% w/w
Wetsulf jet 80%WDG	Sulfur 800 g/kg
Zetanil 76WP	Mancozeb 700g/kg + Cymoxanil 60g/kg
Zodiac star 30WDG	Azoxystrobin 200g/kg + Dimethomorph 100g/kg
Zyban 500SC	Carbendazim 500g/L
ZYBAN 500SC	Carbendazim 500g/L
Herbicides	
Agil 100EC	Propaquizafop 100g/L
Agromine 860 SL	2,4 D-Amine salt 860 g/L
Ambar 480SC	Metribuzin 480g/L
Amino Care 720SL	2,4 Dimethyl ammonium salt 720g/l
Atrazine	Atrazine 4%
Axial 045EC	Pinoxaden 45g/L + Cloquintocet Mexyl
B-safi 180EC	Fomesafen 55 g/L + Quizalop-p-ethyl 15 g/L + Clomazone 110 g/L
Bailout 330EC	Pendimethalin 330 g/L
Basta 200SL	Glufosinate - Ammonium 200g/L
Beanpro 480SL	Bentazone 480g/L
Beansclean 480SL	Bentazone 480g/L
Bentagran Top 240EC	Bentazone 150 g/L + Fomesafen 70 g/L + Quizalofop- p ethyl 20 g/L
Burnwid 480SL	Glyphosate acid 360g/L (as Isopropylamine salt 480g/L)
Catapult 480SL	Glyphosate IPA Salt 480g/L
Clamp down 480SL	Glyphosate acid 360g/L(as Isopropylamine salt 480g/L)
Commander 240 EC	Oxyfluorfen 240g/L
Cropoxone	Paraquat dichloride 200g/l
D-AMINE 72SL	Dimethyl amine salt of 2,4 Dimechlorophenyl acetic acid
Dicopur d 720SL	Dimethylamine salt of 2,4- Dichlorophenyl Acetic Acid (2,4-D)-720g/L salt
Dual gold 960EC	Metolaclor-S 960g/L
Force up 41%SL	Glyphosate-isopropylamine salt 41%
Force up 480SL	Glyphosate 480g/l
Galigan 240EC	Oxyfluorfen 240g/L
Glycel 480SL	Glyphosate 480g/L (as Isopropylamine salt 40.60% w/w
Glypro 480SL	Glyphosate acid 360g/L

Product name	Active ingredient and concentration
Governor 580SE	Acetochlor 340g/L + Mesotrione 40g/L +Atrazine 200g/L
Herbikill 200SL	Paraquat dichloride 20% w/v
Herbstar 200SL	Paraquat dichloride 27.6%
Hotline 450SC	Linuron 450g/l
J2, 4-D 860SL	2,4 Dimethylamine 860g/l
Jangwa700WP	Metribuzin 700g/kg
Kausha 480SL	Glyphosate acid 360g/L (as Isopropylamine salt 480g/L)
Keepwatch 450CS	Pendimethalin 450g/L
Kolopa 300OD	Nicosulfuron 30 g/L + Mesotrione 70 g/L + Atrazine 200 g/L
Lockdown 720EC	Metolachlor 720 g/L
Maguguma Top 500SC	Atrazine 200g/L + Metolachlor 300g/L
Maizepro 500SC	Atrazine 200g/L + Metolachlor 300g/L
Mr bean plus	Bentazone 480g/L
Novisate 480SL	Glyphosate 480g/l
Oxen Gold 515EC	Pendimethalin 175g/L + Oxyfluorfen 40g/L + Acetochlor 300g/L
Oxyfen 24%EC	Oxyfluorfen 240g/l
Paraeforce	Paraquat dichloride 200g/l
Parastar 200SL	Paraquat dichloride 200g/L
Perfecto 450SE	Atrazine 200g/L + Metolachlor 250 g/L
Pirata 100SC	Bispyribac-sodium 100g/L
Potasun 5EC	Quizalofop-P-Ethyl 50 g/L
Primagram gold 660SC	S-Metalochlor 290g/L + Atrazine 370g/L
Ridout 480SL	Glyphosate 480g/l
Rondo 480SL	Glyphosate 480g/l
Round Up Turbo	Glyphosate acid 450g/L
Roundup 360SC	Glyphosate acid 360 g/L (express. Potassium salt of glyphosate 441g/L)
Sencor 480SC	Metribuzin 480g/L
Serbian 75wg	Halosulfuron 750g/kg
Spencer 260OD	Mesotrione 40g/ L + Nicosulfuron 20g/L + Atrazine 200 g/L
Tingatinga 380SC	Atrazine 380g/l
Tingatinga top 500SC	Atrazine 200g/L + Metolachlor 300g/L
Touchdown 450SL	Glyphosate acid 450g/L
Touchdown forte 500SL	Glyphosate 500g/L
Touchdown forte 500SL	Glyphosate 500g/L
Twigamethalin 50EC	Pendimethalin 500g/L
Weedal 480SL	Glyphosate IPA salt 480g/L
Weedex 41%SL	Glyphosate IPA Salt, 41% w/v
Weedless 480SL	Glyphosate IPA salt 480g/L
Weedsol	Isopropylamine salt of glyphosate 480g/l

Product name	Active ingredient and concentration
Widamine 720AS	2,4 Dimethyl ammonium salt 720g/l

Growth regulators

Azatone	Alpha naphthalene acetic acid
Biozyme	Natural plant extracts 78%
Citi shooter	Cytokinins, auxins
Cytomone	Cyto hormones
Fastfos	Mono&Di potassium phosphate
Flowatone 4.5% SL	synthetic auxins
Flower plus	Alpha naphthalene acetic acid
Flowergal	Boron 0.0035%,copper 0.088%,molybdenum 0.0012%zinc0.088% and alpha naphthalene acetic acid 4.5%
G- ONE	Fulvic aid
Green max	Zinc, Alpha
Liquid gypsum	Gypsum
Megagrow	Giberellic acid
Nutri Genic	Potassium,Auxins
Osa tuber	Stabilized orthosilicic acid (OSA) measured as SL,K,Zn,Mo,inositol,stabilisers,osmolute,Dm water Ph(1% solution)
Planofix	Alpha Napthyl Acetic Acid 4.5 SL (4.5 % w/w)
Plantone 140SL	Sodium-1-naphthyl acetic acid 140 g/L
Pluto tembe 200WG	Gibberellic acid 200g/Kg
Tivag 40SL	Gibberelic Acid 40 g/L
Verno	Copper 300kg + Zinc 300g/kg
Others used	
Agraisc	Alkylphenol ethene oxide condensate 87%w/w
Amisil	Polyether trisiloxane (organosilicone) 800g/L
Aquawet 15SL	Nonylphenol ethoxylate 15%
Biomat	Matrine 13g/l
Edmond gold	Organosilicone 100% (Polyalkleneoxide modified heptamethyltrisiloxane 83% w/w + allyl and propenyl isomers of the polyalkyleneoxide 17% w/w)
Goldenleaf	Polyalkylene oxide modified heptamethyl trisiloxone 800g/L
HiSPEID 100SC	Organosilicone 100% (polyalkyleneoxide modified methylorganosilicone)
Integra	Polyalkylene oxide modified heptamethyl trisiloxone 800g/L
Silwet Gold	Trisiloxane alkoxylate (organosilicone) 80%w/w + polyalkyleneoxides 20%w/w
Skysil Gold	Organosilicone 100%
Wangle liquid	Polyether-modified trisiloxane 850 g/L

5.2 Annex 2: Manufacturers and country of origin

Manufacturer	Country of Origin
Adama Agan Ltd	Israel
Adama Makhteshim Ltd	Israel, Netherlands
Agria SA	Bulgaria
Agrimore Enterprise Ltd	China
Agriscience	USA
Agroshine Hangzhou Chemical Co. Ltd	China
Agrostulln GmbH	Germany
Agrow Allied Ventures PVT Ltd	India
Albaugh Europe Sarl	Switzerland
Amoolya	India
Anhui Fengle Agrochemical Co., Limited	China
Anhui Guangxin Agrochemical Co. Ltd	China
Anhui Huaxing Chemical Industry Co., Ltd	China
Anhui Zhongbang Biological Engineering Co Ltd	China
Anhui zhongshan chemical industry group co ltd	China
Arysta LifeScience	India, Belgium, USA, France
Ashoka Agri Solutions, India	India
Asiatic Agricultural Industries	Singapore
Atul Limited	India
BASF	France, Germany, USA
Bayer AG	Belgium, Germany, Mexico
Beijing Sinofarm Technology Co Ltd	China
Beijing Yoloo Bio-Technology Corp., Ltd	China
Bharat Insecticide Ltd	India
Bios Cropcare PVT LVC	India
Brandt Consolidated Inc	USA
CAC Nantong Chemical Co. Ltd	China
Cerexagri S.A.	France
Changzhou Wintafone Chemicals Co. Ltd	China
Cong Ty TNHH Alfa (Sai Gon)	Vietnam
Coromandel International Ltd	India
Corteva Agriscience, LLC	USA, UK
Cosaco GmbH	Germany
Crop care enterprises	N/A
Crystal Crop Protection	China
Dow Agrosciences	USA
Du Pont De Nemours	France
Du pont Platte Chemical Company	USA
DuPont Electronic Polymers	USA
E.I. Du Pont Nemours & Co	USA
EX Biosciences Europe N.V	Belgium
Fluence Topsen Co. Ltd	China
FMC Chemicals sprl	Belgium
FMC Corporation	USA
FMC Mobile Manufacturing Center	USA
Gharda Chemicals Ltd	India
Goldchance Fluence Industries Ltd	China
Haili Guixi Chemical Pesticide Co., Ltd	China
Hailir Pesticides & Chemicals Group Co. Ltd.	China
Hangzhou Jike Trade Co. Ltd	China
Hangzhou Udragon Chemical Co. Ltd	China
Hebei Lishijie Biotechnlogy Co Ltd	China
Hebei Shuangji Chemical Co., Ltd	China
Hebei Sony Chemicals Ltd	China
Hebei Veyong Bio-Chemical Co. Ltd	China
Hebei Vian Biochem Co. Ltd	China
Hebei Xingbai Agricultural Technology Co. Ltd	China
Hemani Industries Ltd	India
Hengshui Jingmei Chemical Industry Co Ltd	China
Henyang Sciencreat Chemicals Co Ltd	China
Heranba Industries Ltd	India
Hipak Africa co	N/A
Huayang China Ltd	China
Hubei Lvtiandi Technology Co Ltd	
Hubei Sanonda International	China
Hunan Farmland Crop Science	China
Indofil Industries Ltd	India
Industrias Quimicas del Valles, S.A.	Spain
Ingenieria Industrial, S.A. de C.V.	Mexico
Invecta-Agro Ltd	Cyprus
IOMCC Private Ltd	India
Isago S.P.A.	Italy
Ishihara Sangyo Kaisha Ltd	Japan
JADE	UAE
Jangsu Lanfeng Biochemical Co., Ltd	China
Jiangsu Aijin Agrochemical Co., Ltd	China

Manufacturer	Country of Origin
Jiangsu Baoling Chemical Co. Ltd	China
Jiangsu Fengdeng Pesticide Co. Ltd	China
Jiangsu Fengshan Group Co. Ltd	China
Jiangsu Fengyuan Biological Engineering Co Ltd	China
Jiangsu Flag Chemical Industry Co. Ltd	China
Jiangsu Huangma Agrochemicals Co. Ltd	China
Jiangsu Huifeng Agrochemical Co. Ltd	China
Jiangsu Inter-China Group Corporation	China
Jiangsu International Group Limited	UAE
Jiangsu Kuaida Agrochemical Co., Ltd	China
Jiangsu Lanfeng Biochemical Co., Ltd	China
Jiangsu New Energy Crop Protection Co Ltd	China
Jiangsu Qiaoji Biochem co Ltd	China
Jiangsu Sandi Chemistry Co Ltd	China
Jiangsu Sevencontinent Green Chemical Co. Ltd	China
Jiangsu Subin Agrochemical Co., Ltd	China
Jiangsu Tianrong Group Co.,Ltd	China
Jiangsu United Agrochemical Co. Ltd	China
Jiangxi Hito Chemical Co Ltd	China
Jiangxi Sprin Agrichemical Co. Ltd	China
Jiangxi Sprin Agrichemical Co. Ltd.	China
Jiangxi Zhongxun Agro-Chemical Co. Ltd	China
Jiangxia Heyi chemicals Co. Ltd	China
Jiangyin Milagro	China
Jiangyin Milagro Chemical Co Ltd	China
Jinan Shibang Agrochem Co. Ltd	China
Jingbo Agrochemical Technology Co. Ltd	China
Jizhou Kaiming Pesticide Co., Ltd	China
Kaken Pharmaceutical Co. Ltd	Japan
Kenvos Biotech Co., Ltd	China
King Chemical Company Limited	China

Manufacturer	Country of Origin
Kingtai Chemicals Co. Ltd	China
Kundan Pestichem Pvt. Ltd	India
Laoting Yoloo Bio-Technology Co. Ltd	China
Limin Chemical Co., Ltd	China
M/S Agrow Allied Ventures Pvt. Ltd	India
M/S Shyam Chemicals PVT. Ltd	India
Makdavid Chemical Industry	China
Meghmani Organics Ltd.	India
Momentive Performance Material GmbH	Germany
NACL Industries Limited	India
Nanjing Agrochemica	China
Nanjing Essence Fine-Chemical Co., Ltd	China
Nanjing Fengshan Chemicals Co. Ltd	China
Nantong Baoye Chemical Co Ltd	China
Nantong Jiangshan agrochemical & chemicals limited	China
Nantong Shizhuang Chemical Co. Ltd	China
Nantong Weilike Chemical Co Ltd	China
National EST	Saudi Arabia
Nihon Nohyako Co. Ltd	Japan, Germany
Ningbo Sunjoy Agroscience Co. Ltd	China
Ningbo Yihwei Chemical Co. Ltd	China
Ningxia Wynca Technology Co Ltd	China
Nippon Kayaku Co. Ltd	Japan
Nippon Soda Co.	Japan
Nissan Chemical Industries Ltd	Japan
Nordox Industrier AS	Norway
Nufarm Gmbh & Co	Austria
Oasis AgroSciences Ltd	China
OAT Agrio Co. Ltd	Japan
Osho Chemical Industries Ltd	Kenya
Parijat industries Ltd	India
Platform Agrotech Co Ltd	China
PRM life science PVT Ltd	India
Qingdao Audis Bio-tech Co., Ltd	China
Qingdao Hibong industrial	China
Qingdao Higrow Chemicals Co Ltd	China
Qingdao KXY Chemical Co Ltd	China
Qingdao star Cropscience Co. Ltd	China
Raj Petro Specialities PVT Ltd	India

Manufacturer	Country of Origin
Real IPM Company (K) Ltd	Kenya
SABLE COMBINE (ZAMBIA) LTD	Zambia
sagro Copper S.R.L.	Italy
sagro S.P.A.	Italy
Servatis S.A	Brazil
Shaanxi Hengrun Chemical Industry Co. Ltd	China
Shaanxi Hengtian Chem-Tech Co. Ltd	China
Shaanxi Meibang pesticide	China
Shaanxi Meibang Pharmaceutical Group Co. Ltd	China
Shaanxi Sunger Road Bio-Sciences Co. Ltd	China
Shandong A & Fine Agrochemicals Co Ltd	China
Shandong Binnong Technology Co Ltd	China
Shandong Cynda Chemical Co Ltd	China
Shandong Hailir Chemical Co Ltd	China
Shandong Heyi Biological Technology Co. Ltd	China
Shandong Sino-Agri United Biotechnology Co., Ltd	China
Shandong Sinomey Chemicals Co. Ltd	China
Shandong Sont-ian Chemical Co.Ltd	China
Shandong United Pesticide Industry Co. Ltd	China
Shandong Weifang Rainbow Chemical Co. Ltd	China
Shandong Weifang Shuangxing Pesticide Co., Ltd	China
Shandong Zhongxin Chemistry Co Ltd	China
Shanghai Agro-Tech Co. Ltd	China
Shanghai Heben-Eastsun Medicaments Co. Ltd.	China
Shanghai Hui Song (H & S) Agro-Solution Co., Ltd.	China
Shanghai Shengning Pesticides Co. Ltd	China
Shanghai Yuelian Biotech Co Ltd	China
Sharda international Ltd	India
Shenyang Harvest Agrochemicals Co Ltd	China
Shenyang Sciencreat Chemicals Co Ltd	China
Shijiazhuang Longhui Fine Chemical Co Ltd	China
Shijiazhuang Xingbai Bioengineering Co., Ltd	China
Sichuan Leshan Fuhua Tongda Agro-Chemical Technology Company Ltd,	China
Sineria	China, Cyprus, Netherlands
Sinochem Hebei Corporation	China
Sinochem Ningbo Ltd	China
Sipcam Oxon SpA	Italy
Snow International	China
Sulphur Mill Ltd	India
Sumitomo Chemicals Co. Ltd	Japan
Suzhou Chems Chemical Co Ltd	China
Swal Corporation Ltd.	India
Syngenta Ltd	UK, Switzerland, Austria, China, Netherlands
T. Stanes & Company	India
Tagros Chemicals Ltd	India
Taizhou Dapeng Pharmaceutical Industry Co. Ltd	China
Topiary Equipment and Chemicals LLP	India
United Bio-Shanghai & Shanghai Pharmaceautical (Xiayi) Co Ltd	China
UPL Ltd	India
Van Iperen International	Netherlands
W.Neudorff GMBH	Germany
Wemax Agro Ltd	China
Willowood United	China
Wuxi Xinan Pesticides Co Ltd	China
Xi an Mpc Stock Co Ltd	China
XIAN MPC Stock Co. ltd	China
Yongnong Biosciences Co Ltd	China
Yunnan Guangming Neem Industry Development Co ltd	China
Zhanhua Goalsun Fine Chemical Co. Ltd	China
Zhanhua Goalsun Fine Chemical Co. Ltd	China
Zheijiang Runhe Organic Silicon New Material Co. Ltd	China
Zhejiang Biok Biotechnology Co. Ltd	China
Zhejiang Bosst CropScience Co. Ltd	China
Zhejiang Chemical Institute technology Co. Ltd	China
Zhejiang Henben Pesticide & Chemical Co Ltd	China
Zhejiang Jinfanda Biochemical Co. Ltd	China
Zhejiang Qianjiang Biochemical Co. Ltd	China
Zhejiang Sega Science and Technology Co., Ltd	China

Manufacturer	Country of Origin
Zhejiang Tide Cropscience Co Ltd	China
Zhejiang Xinnong Chemical Co., Ltd	China
Zhejiang Yifan Chemical Group Co. Ltd	China
Zhejiang Zhongshan Chemical Industry Ltd	China
Zheng shi chemical Ltd	China
Zhengzhou Zheng Shi Chemical Co., Ltd	China
Zibo Zhoucun Suifeng Pesticides & Chemical Ltd	China


KIRINYA

Centre for Environment Justice and Development (CEJAD) is a public interest Non-Governmental Organization in Kenya. CEJAD works to promote sound management of chemicals and waste in order to protect the environment and human health, especially vulnerable populations. CEJAD is an accredited NGO to UNEP and undertakes advocacy programs seeking to eliminate exposure to toxic chemicals by both humans and the environment.

CEJAD

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