Republic of Kenya

Ministry of Agriculture and Livestock Development

STATE DEPARTMENT FOR CROP DEVELOPMENT

INTEGRATED PEST MANAGEMENT PLAN (IPMP)

FOR

NATIONAL AGRICULTURAL VALUE CHAIN DEVELOPMENT PROJECT (NAVCDP)

Revised March 2023

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ACRONYMS

AAK	Agrochemical Association of Kenya
ASTGS	Agricultural Sector Transformation and Growth Strategy
CESSCOs	County Environmental and Social Safeguards Compliance Officers
CIGs	Community Interest Groups
Covid-19	Corona Virus Disease outbreak 2019
CPCU	County Project Coordinating Unit
CPR	Comprehensive Project Report
DDT	Dichlorodiphenyl Trichloroethane
DoSHS	Directorate of Occupational Health and Safety Services
EA	Environmental Assessment
ECF	East Coast Fever
EDM	Ethyl Dibromide
EHS	Environmental Health and Safety
EIA	Environmental Impact Assessment
EMCA	Environment Management and Coordination Act
ELRP	Emergency Locust Response Project
EPRP	Emergence Preparedness and Response Plan
ESF	Environmental and Social Framework
ESIA	Environmental and Social Impact Assessment
ESMF	Environmental and Social Management Framework
ESS	Environmental and Social Safeguards
FAO	Food Agricultural Organization
FIFO	First In First Out
FLID	Farmer-Led Irrigation Development
FMD	Food and Mouth Disease
FRAC	Fungicide Resistance Action Committee
FPOs	Farmer Producer Organization
GBV	Gender Based Violence
GM	Grievance Mechanism

GoK	Government of Kenya
GRC	Grievance Redress Committee
IEC	Information Education and Communication
IPMP	Integrated Pest Management Plan
IPMP	Integrated Pest Management Plan
IRAC	Insecticide Resistance Action Committee
IVM	Integrated Vector Management
KCSAP	Kenya Climate Smart Agriculture Project
KEBS	Kenya Bureau of Standards
MoALD	Ministry of Agriculture, Livestock, Fisheries & Cooperatives
MoEF	Ministry of Environment and Forestry
MSDS	Materials Safety Data Sheets
NARIGP	National Agriculture and Rural Inclusive Growth Project
NASEP	National Agricultural Sector Extension Policy
NEMA	National Environment Management Authority
NGO	Non-Governmental Organizations
NPCU	National Project Coordination Unit
NPP	National Productivity Policy
NRM	National Resource Management
OSHA	Occupational Safety and Health Act
PATTEC	Pan-African TseTse and Trypanosomiasis Eradication campaign.
PCPB	Pest Control Products Board
PDO	Project Development Objective
PMP	Pest Management Plans
PPE	Personal Protective Equipment
PPP	Public Private Partnership
SEP	Stakeholder Engagement Plan
SME	Small and Micro Enterprises
SPR	Summary Project Report
VBDs	Vector Borne Diseases
VMGs	Vulnerable and Marginalized Groups
WB	World Bank

WHO	World Health Organization
WSH	Workplace Sexual Harassment

EXECUTIVE SUMMARRY

1) This Integrated Pest Management plan (IPMP) has been prepared for the National Agricultural Value Chain Development Project (NAVCDP), which is a World Bank financed project to Government of Kenya's (GoK) Ministry of Agriculture & Livestock Development (MoALD), State Department for Crop Development and Agricultural Research.

2) This document serves as the guide to pesticide use related project actions and activities and specifically for component 1, 2 and 3 where pesticides will be used to improve crop and livestock productivity. As per the World Bank's Environmental and Social Framework (ESF) requirements and Environmental and Social Standard 3 (ESS3), Resource Efficiency and Pollution Prevention and Management when a project involves a significant pest management issues, then an IPMP is a required environmental and social risk and impact mitigation instrument.

3) In January 2023, the Government of Kenya requested for additional counties for NAVCDP through the National Treasury Ref. "***Inclusion of Additional Counties to the National Agricultural Value Chain Development Project (NAVCDP)***", (IDA Credit. No. 7064-KE) letter dated January 23, 2023. Subsequently, the 1st ISM for NAVCDP was held on February 13-17, 2023, and The World Bank, Country Director gave an "IDA No Objection letter" on the same Ref. February 2, 2023

4) NAVCDP therefore adopted the recommended project changes that have affected the project design in the following areas:
   NAVCDP will work in 33 from 26 counties: Meru, Nyeri, Muranga, Kirinyaga, Kiambu, Embu, Machakos, Kitui, Makueni, Tharaka Nithi, Nandi, Uasin-Gishu, Trans Nzoia, Nakuru, Narok, Kajiado, Nyandarua, Kericho, Bomet, Kakamega, Busia, Bungoma, Vihiga, Homa Bay, Migori, Kisii, Siaya, Nyamira, Kisumu, Taita Taveta, Kwale, Kilifi, and Tana River. Under Urban and peri urban Agriculture, Nairobi county will be added. The added counties in the above list include: Tharaka Nithi, Bungoma, Kajiado, Vihiga, Siaya, Nyamira and Kisumu.
   a) The project will allow Saturation- in all wards of the project counties.
   b) Each county will select up to 5 value chains, however 4 must be from the 12 VC menu and one more an open county choice.
   c) Farmers Producer Organizations are value chain sensitive and will be funded directly - (FPOs will benefit from three grants: inclusion grant; Enterprise Development grant; and Value Chain Upgrading Matching grant)
   d) There will be no micro-project grants except should there be an affirmative action - instead the Common Interest Groups (CIGs) will access funds as a

revolving fund from ward-based Savings and Credit Cooperative Organizations (SACCOs).

e) Through the CDDCs, the CIGs/VMGs will also be supported with inputs to demonstrate different technologies and innovations using the FFBS model. Within the wards, it was agreed that to start with, every farmer (including the dereferencing) will be registered and subsequently both the CDDCs (for wards) and CIGs mobilization will be undertaken based on the PICD process.
f) Every ward will have a SACCO. A diagnostic will determine whether a new SACCO will be mobilized, or an existing SACCO will be leveraged upon.
g) Farmer registration, SACCO membership, and accessing SACCO funds will be value chain neutral activities.

5) NAVCDP will support a range of investments along the identified commodity value chains; Dairy, coffee, Chicken, Avocado, Mango, Banana, Irish Potatoes, Tomato Apiculture Pyrethrum, Cashew Nuts and Cotton. (i) For each of the commodities, County level as well as regional value chain development plans will be finalized, identifying set of investments crucial to the achievement of shared objectives. These plans will clearly outline pathways for private sector engagement, ecosystem investments envisaged from the regional government and Ag-tech solutions most relevant to the specific commodity and region, (ii) In the selected value chains, the capacity of the existing or new farmer groups will be built through strong community based digital extension systems, micro-investments for demonstration of production technologies and support for access to credit, (iii) Farmer Producer Organizations(FPOs) will receive infrastructure and working capital support and technical assistance to build capacity for delivering a range of services like inputs, extension and value addition to member farmers/farmer groups.

6) Productive alliance approaches will be undertaken to build market capacity of these FPOs through linkage with commercial and private sector entities like Agribusiness SMEs engaged in value addition, anchor agribusiness firms, e-commerce companies and large AG tech startups with support for business development, technical assistance, and part financing. This approach will also generate new jobs and enterprises at various levels in supported value chains, (iv) In the selected value chains, the project will also support the e-voucher program so that farmers and farmer groups could access vital input support, (v) Complementary investments at the County and National level will be supported for necessary enabling infrastructure (irrigation infrastructure, processing infrastructure or market infrastructure etc.) for enhanced agriculture commercialization (vi) Incubation and training of women and youth from local communities to emerge as Agri-entrepreneurs (Agripreneurs) will be scaled up for provision of bundled services (inputs, extension, credit and market linkages) to farmers. These are expected to emerge as meaningful private sector jobs in rural economy as Agripreneurs will earn incomes

through transaction charges from the private sector for delivery of above services. (vii) Farmer-consumer market linkages will be developed in selected urban clusters through dedicated Urban Food System pilots with end-to-end traceability mechanisms and appropriate interventions that enhance food safety, operationalizing farmer markets and institutional linkages.

7) **ESS3** requires that in the procurement of any pesticide the Borrower will assess the nature and degree of associated risks, taking into account the proposed use and the intended users. The Borrower will not use any pesticides or pesticide products or formulations unless such use is in compliance with the World Bank Group General Environmental Health and Safety Guidelines (EHSGs). In addition, the Borrower will also not use any pesticide products that contain active ingredients that are restricted under applicable international conventions or their protocols or that are listed in, or meeting, the criteria of their annexes, unless for an acceptable purpose as defined by such conventions, their protocols, or annexes, or if an exemption has been obtained by the Borrower under such conventions, their protocol, or annexes, consistent with Borrower commitments under these and other applicable international agreements.

8) The Borrower will also not use any formulated pesticide products that meet the criteria of carcinogenicity, mutagenicity, or reproductive toxicity as set forth by relevant international agencies including World Health Organization (WHO) and Food and Agriculture Organization (FAO). For any other pesticide products that pose other potentially serious risk to human health or the environment and that are identified in internationally recognized classification and labelling systems, the Borrower will not use pesticide formulations of products if: (a) the country lacks restrictions on their distribution, management, and use; or (b) they are likely to be used by, or be accessible to, lay personnel, farmers, or others without training, equipment, and facilities to handle, store, and apply these products properly

The project will finance the use of pesticides that are registered only by the Pesticide Control and Products Board (PCPB). ESS 3 outlines the criteria that apply to the selection and use of such pesticides.

9) A Pest Management Plan (PMP) has also been prepared to address use of chemicals in compliance with the World Bank environmental and social standards. The Project is preparing the IPMP to guide its subsequent implementation which will be guided by various Pesticide Policy, Legal, International Requirements and Guidelines as well as environmental and Social Risks Classification. For each sub project that intends to use pesticides specific Environmental and Social Impact Assessment (ESIAs) or standalone IPMPs /ESMPs will be prepared once the scope and location among others

are known in order to ensure compliance with the NEMA EIA/EA regulations and World Bank's ESS in order to minimise and control the release and use of hazardous materials.

10) The Environmental Management and Coordination Act (EMCA) 1999 and EMCA (amendment) 2015, classifies projects into **High, Medium, and Low** risk. It further lists projects that would fall under each of the risk classifications. The NAVCDP sub projects are categorized as **Low, Medium or High-risk** requiring preparation of SPR or CPR.

11) NAVCDP environmental and social safeguard specialists at the NPCU will screen all subproject that it will be implemented under component 1, 2 and 3. Screening will determine the environmental and social issues that the sub project might trigger, and the type and level of assessment required including which type of report to submit to NEMA. All the CPR and SPR would have to be prepared by a NEMA registered EIA/EA expert, reviewed by NPCU and submitted to World Bank for further review and clearance before sharing with NEMA for review and licensing prior to commencement of construction or operations.

12) The SPR and CPR will be reviewed by the NAVCDP/NPCU and disclosed in the MoALD website. The reports will also be disclosed in the project areas (Map 1) and made accessible to the beneficiaries. The World Bank will only review all the CPR and provide clearance, it will not review the SPRs but may request the review of the same whenever necessary. The Bank will disclose the CPRs and SPRs in its external website.

13) This framework level (IPMP) will also guide preparation of sub project level IPMPs which will be prepared by the environmental and social specialists who will be based at each of the Counties and part of the CPCU.

14) Capacity development and strengthening remains a crucial component in this IPMP and will be integrated all through the project implementation phase. The project will be implemented by the MoALD which has a long experience of implementing World Bank financed projects under the safeguards policies, these include Kenya Climate Smart Agriculture Project (KCSAP), the National Agriculture and Rural Inclusive Growth Project (NARIGP) and the Regional Pastoral Livelihood Resilience Project (RPLRP) and Emergency Locust Response Program (ELRP).

15) In order to strengthen the capacity of the NPCU, CPCU and other implementing agencies, the following capacity building efforts are recommended. The World Bank

will train the NPCU on topics highlighted in the table below. The NPCU will thereafter provide training to the CPCU on the topics outlined below. To ensure that the message and quality of training is assured, NPCU will engage consultants familiar with Bank's ESF, ESS and the other relevant instruments to support the County-based trainings.

16) World Bank recognizes that safety training is an essential component in programs involving the use of pesticides. The need for thorough training is particularly acute in developing countries and Kenya is no exception. In this regard, training of pesticide users and applicators will be a vital component of capacity building in this program. The program will, using the resources available from the NAVCDP prepare a comprehensive training manual on pesticide use and management, Integrated Pest Management (IPM) targeting different actors within the project, ranging from extension service providers, actual farmers, loaders, mixers, transporters, government staff among others.

17) The NAVCDP sub projects especially those in component 1, 2, 3 will also run extensive training programs for farmers, farmer leaders, extension workers, and stockists. These training programs where possible, will be further amplified by training that is being undertaken by other institutions such as Kenya Agricultural and Livestock Organization (KALRO), Agrochemical Association of Kenya (AAK), various Non-Governmental Organisations (NGOs), pesticide wholesalers, etc.

18) For farmers, farmer leaders, and County/Sub County extension workers, the training will be crop based with farmers being organized into groups led by a farmer leader. The method for training farmers and farmer leaders is the on-farm demonstration where farmer groups are led, step by step in growing the crop during the season from planting to harvest and increasingly into post-harvest activities and even marketing.

19) The NAVCDP will adopt a strategy where extension services stress usage of a few basic pieces of protective clothing and then working into more complete coverage after the first few have been adopted. Communities will be encouraged to form professional spray teams that would be certified and hired to apply pesticides after training. These could be more efficiently trained to wear and use protective equipment.

20) To support institutionalizing access to farm inputs through producer organizations, identified agrochemical stockists as well as credit service (Saccos) will be trained on allowable crop protection products and applicable value chains. The targeted trainings will be done at different levels by different experts from World Bank, NPCU, CPCU and SCTT, as well as outsourced Experts.

1. INTRODUCTION

1.1 1.1 Project Background

1) The project is funded by the World Bank and in compliance with the environmental and social standards, an IPMP is required because of the planned use of large quantities of pesticides. Under NAVCDP, an Environmental and Social Management Framework (ESMF) has prepared and the Bank ESS 3 require that IPMP be prepared alongside ESMF because Component 1, 2 and 3 has activities that will employ significant quantities of pesticides. The specific objectives of the IPMP are: -
    1. Establish clear procedures and methodologies on the procurement, transport, distribution and storage of the pesticides to be financed under the project
    2. Assess the potential economic, environmental and social impacts of the pest management practices
    3. Mitigate against negative impacts of pesticides on the crops, vegetation and livestock
    4. Identify capacity of the country's regulatory framework and institutions to promote and support safe, effective, environmentally and socially sound pest management practices and provide appropriate technical assistance for successful implementation of the IPMP
    5. Ensure compliance with National laws, regulations, World Bank ESS
    6. Propose a budget required to implement the IPMP
    7. Mitigate against possibilities of creating pesticide resistance due to misuse of crop protection products financed through the project

The National Agricultural Value Chain Development Project **(**NAVCDP) will support a range of investments along the identified commodity value chains; Dairy, coffee, Chicken, Avocado, Mango, Banana, Irish Potatoes, Tomato Apiculture Pyrethrum, Cashew Nuts and Cotton. (i) For each of the commodities, County level as well as regional value chain development plans will be finalized, identifying set of investments crucial to the achievement of shared objectives. These plans will clearly outline pathways for private sector engagement, ecosystem investments envisaged from the regional government and Ag-tech solutions most relevant to the specific commodity and region, (ii) In the selected value chains, the capacity of the existing or new farmer groups will be built through strong community based digital extension systems, micro-investments for demonstration

of production technologies and support for access to credit, (iii) Farmer Producer Organizations(FPOs) will receive infrastructure and working capital support and technical assistance to build capacity for delivering a range of services like inputs, extension and value addition to member farmers/farmer groups. Productive alliance approaches will be undertaken to build market capacity of these FPOs through linkage with commercial and private sector entities like Agribusiness SMEs engaged in value addition, anchor agribusiness firms, e-commerce companies and large AG tech startups with support for business development, technical assistance, and part financing. This approach will also generate new jobs and enterprises at various levels in supported value chains, (iv) In the selected value chains, the project will also support the e-voucher program so that farmers and farmer groups could access vital input support, (v) Complementary investments at the County and National level will be supported for necessary enabling infrastructure (irrigation infrastructure, processing infrastructure or market infrastructure etc.) for enhanced agriculture commercialization (vi) Incubation and training of women and youth from local communities to emerge as Agri-entrepreneurs (Agripreneurs) will be scaled up for provision of bundled services (inputs, extension, credit and market linkages) to farmers. These are expected to emerge as meaningful private sector jobs in rural economy as Agripreneurs will earn incomes through transaction charges from the private sector for delivery of above services. (vii) Farmer-consumer market linkages will be developed in selected urban clusters through dedicated Urban Food System pilots with end-to-end traceability mechanisms and appropriate interventions that enhance food safety, operationalizing farmer markets and institutional linkages.

1.2 Background of Integrated Pest Management Plan (IPMP)

2. This Integrated Pest Management Plan(IPMP) has been prepared for the National Agricultural Value Chain Development Project (NAVCDP), which is a World Bank financed project to Government of Kenya's (GoK) Ministry of Agriculture & Livestock Development (MoALD), State Department for Crop Development and Agricultural Research.

This document serves as the guide to pesticide use related project actions and activities and specifically for component 1, 2 and 3 where pesticides will be used to improve crop and livestock productivity. As per the World Bank's Environmental and Social Framework (ESF) requirements and Environmental and Social Standard 3 (ESS3), Resource Efficiency and Pollution Prevention and Management when a project involves a significant pest management issues, then an IPMP is a required environmental and social risk and impact mitigation instrument. This IPMP is prepared due to the fact that:

(i) The project may finance procurement of potentially hazardous pest control products.

(ii) There are potential concerns on the impacts of the pesticides on the environment, other life forms, and human health.

1) According to the Bank's ESS 3, for any project involving significant pest management issues or any project contemplating activities that may lead to significant pest and pesticide management issues, the Borrower will prepare a Pest Management Plan (PMP). Where projects involve recourse to pest management measures, the Borrower will give preference to Integrated Pest Management (IPM) 1 or Integrated Vector Management (IVM) approaches using combined or multiple tactics.

1.2.1 Selected Pesticides

2) **ESS3** requires that in the procurement of any pesticide the Borrower will assess the nature and degree of associated risks, taking into account the proposed use and the intended users. The Borrower will not use any pesticides or pesticide products or formulations unless such use is in compliance with the World Bank Group General Environmental Health and Safety Guidelines (EHSGs). In addition, the Borrower will also not use any pesticide products that contain active ingredients that are restricted under applicable international conventions or their protocols or that are listed in, or meeting, the criteria of their annexes, unless for an acceptable purpose as defined by such conventions, their protocols, or annexes, or if an exemption has been obtained by the Borrower under such conventions, their protocol, or annexes, consistent with Borrower commitments under these and other applicable international agreements.

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[1] IPM refers to a mix of farmer-driven, ecologically based pest control practices that seeks to reduce reliance on synthetic chemical pesticides. It involves: (a) managing pests (keeping them below economically damaging levels) rather than seeking to eradicate them; (b) integrating multiple methods (relying, to the extent possible, on nonchemical measures) to keep pest populations low; and (c) selecting and applying pesticides, when they have to be used in a way that minimizes adverse effects on beneficial organisms, humans, and the environment

4) ESS 3 outlines the following additional criteria that apply to the selection and use of such pesticides: (a) they will have negligible adverse human health effects; (b) they will be shown to be effective against the target species; and (c) they will have minimal effect on non-target species and the natural environment. The methods, timing, and frequency of pesticide application are aimed to minimize damage to natural enemies.

5) The project will finance the use of pesticides that are registered only by the Pesticide Control and Products Board (PCPB). The list of registered pesticides is available on www.pcpb.go.ke.

6) The pesticides are not restricted for distribution or use in Kenya and are not likely to be used by, or be accessible to, lay personnel, farmers, or others without training, equipment, and facilities to handle, store, and apply these products properly.

21)

Through the CDDC financing, demonstration sites and farmer field schools shall be organized for selective crop demonstrations by the service providers. Such facilities will be used to build capacity on good agricultural practices and sustainable production.

1.3 Justification and Objective of IPMP

7) ESS 3 requires that for any project involving significant pest management issues or any project contemplating activities that may lead to significant pest and pesticide management issues, the Borrower will prepare a Pest Management Plan (PMP). This IPMP is prepared to address use of chemicals that will be used in the NAVCDP under component 1, 2 and 3. The proposed activities to be financed under the project may involve the procurement of pesticides cumulatively which may involve large quantities. The project is funded by the World Bank and in compliance with the environmental and social standards. The Project is preparing the IPMP to guide the subsequent preparation of the IPMPs during implementation.

1.4 General Approach

Pesticide Policy, Legal, International Requirements and Guidelines will be used to guide the implementation of the IPMP.

8) The following legal instruments provide guidance and regulations when implementing projects that use pesticide in Kenya. Also included are international conventions and guidelines that Kenya is a signatory to with regards to pesticide use.

Policies

- The Agricultural Sector Transformation and Growth Strategy (ASTGS).
- The National Agricultural Sector Extension Policy (NASEP).
- The National Productivity Policy (NPP).

Legislations

- The Kenya Constitution, 2010 (Constitution of Kenya 2010)
- Public Health Act
- Plant Protection Act
- Pest Control Products
- Seeds and Plants Variety Act
- The Pest Control Products (Licensing of Premises) Regulations, 1984
- The Pest Control Products (Labelling, Advertising and Packaging) Regulations, 1984
- The Pest Control Products (Importation and Exportation) Regulations, 1984
- The Pharmacy and Poisons Act
- Environmental Management and Coordination Act
- Occupational Health and Safety Act
- Pest Control Products (Disposal) Regulations, 2006
- Veterinary Act
- Public Participation Act

International Conventions

- Convention on Biological Diversity (1992)
- International Plant Protection Convention of FAO (1952)
- United Nations Framework Convention on Climate Change (1992)
- Basel convection on control of transboundary movement of hazardous and disposal
- Bamako convection
- FAO guidelines on management options for empty pesticides containers
- WHO Guidelines for personal protection when handling and applying pesticides

a. Environmental and Social Risks Classification

9) The overall Environmental and Social Risk Classification of the NAVCDP is Substantial. On Component 1, 2 and 3 the main potential environmental and social risks and impacts associated with use of pesticides include: (i) transport, handling, storage of the pesticides, dosage (i.e., proper calibration of the pesticide application equipment to get the right dose of active ingredient per hectare) during treatment and disposal of used pesticide containers; (ii) risk of polluting ecologically sensitive habitats such as wetlands, national parks and water bodies; (iii) risks that pasture, local water sources and cropping areas may be contaminated; (iv) inappropriate use of pesticides; (v) potential high risk of accumulation of obsolete stocks.

10) However, given that proven proposed mitigation measures that will be put in place the Environmental Risk is considered Substantial.

22)

11) Disposal of empty crop protection containers shall be done in partnership with Agrochemical Association of Kenya (AAK), who will collect the punctured empty containers from various collection centers for appropriate disposal. Relevant training and capacity building to the end users shall be done to the individual end users and farmer producer organizations.

1.5 Methodology

12) 1.5.1 Below is a summary of the potential negative environmental and social risks and impacts that component 1, 2 and 3 may have with respect to pesticide use and proposed mitigation measures that will be considered during preparation of site-specific (sub project) spray operations.

1 Table 0-1: Summary of Mitigation Measures

RISKS RELATING TO PESTICIDE LIFE CYCLE	RISK LEVEL	MITIGATION MEASURES	RESPONSIBLE
Storage and Pesticide Management in Spray Areas			
Pilferage	H	Secure, dedicated storage facilities and, as necessary, use of security guard	MoALD/NPCU/CPCU National Police Service
		Strict auditing scheme (e.g., daily spray cards, team leader daily summary cards, supervisor daily summary cards)	
		Regular inventories	MoALD/NPCU/CPCU
Inappropriate storage practices	M	Trained storekeepers in pesticide management	MoALD/NPCU/CPCU
		Regular inspections	
		Good storage maintenance	
		Effective inspection regimes	MoALD/NPCU/CPCU
End-use of Pesticide: Human Safety			
Exposure of pesticide applicators	H	▪ Training on best practices for all categories of workers and other volunteers	MoALD/NPCU/CPCU
		▪ Use of full PPEs by all spray operators	MoALD/NPCU/CPCU
		▪ Availability and effective use of ablution facilities	MoALD/NPCU/CPCU
		▪ Clear criteria for reprimand for non-compliance	MoALD/NPCU/CPCU
		▪ Provision of first aid facilities and training of administration of first aid during exposure to pesticides.	MoALD/NPCU/CPCU
Exposure of communities	H	▪ Safe disposal of used PPE and other waste associated with pesticide application	MoALD/NPCU/CPCU
		▪ Field supervision to assure best operator practices	MoALD/NPCU/CPCU

RISKS RELATING TO PESTICIDE LIFE CYCLE	RISK LEVEL	MITIGATION MEASURES	RESPONSIBLE
		▪ Avenue for receipt of complaints	MoALD/NPCU/CPCU
		▪ Training and awareness creation targeting local communities on the effects of exposure to the pesticides and related safety precautions including accidental exposure etc	MoALD/NPCU/CPCU
		▪ Effective inspection regimes	MoALD/NPCU/CPCU
Poisoning incidents	L	▪ Staff training and Information Education and Communication (IEC) with components aimed at preventing poisoning.	MoALD/NPCU/CPCU
		▪ Enhance capacity for poison management by: o Training of all categories of farmers and workers to identify danger signs and required response o Training health workers, designate and equip district reference points for treatment of incidents of pesticide poisoning	MoALD/NPCU/CPCU
End-Use of Pesticides: Environmental Safety			
Environmental release from handling/spray activities affecting sensitive ecosystems, protected areas, national	H	▪ Application of best practices (triple wash/rinse water re-use)	MoALD/NPCU/CPCU
		▪ Construct of pits (with charcoal) to dispose reinstate.	
		▪ Prohibition of decanting into streams and open drains	
		▪ Prohibit worker washing in streams	

RISKS RELATING TO PESTICIDE LIFE CYCLE	RISK LEVEL	MITIGATION MEASURES	RESPONSIBLE
parks, wetlands, areas where organic farming is practised including bee keeping (apiculture) etc.		▪ Clear criteria for reprimand for non-compliance by spray workers	
		▪ Avoid spraying pesticides in areas where apiculture is practised ▪ Use bio-pesticides in areas where bee keeping is practised	
Pesticide Resistance development		▪ Avoid use of sublethal doses	MoALD/NPCU/CPCU
		▪ Avoid over reliance on one or few types of pesticide mode of action	
		▪ Follow the IRAC and FRAC classification to develop IPM plan.	
Non-recommended use of pesticides	M	▪ Secure storage, management and inventory system	MoALD/NPCU/CPCU
		▪ Effective enforcement	MoALD/NPCU/CPCU
		▪ Significant punitive measures against pilferage	MoALD/NPCU/CPCU National Police Service
		▪ Effective IEC on dangers and consequences of non-recommended use of pesticides	MoALD/NPCU/CPCU
Disposal			

RISKS RELATING TO PESTICIDE LIFE CYCLE	RISK LEVEL	MITIGATION MEASURES	RESPONSIBLE
Release of empty packaging materials in general environment or reused for non-recommended purposes.	H	▪ Strict auditing and accounting for empty sachet and packaging materials for sound disposal ▪ Crushing the used/empty containers and possible return to manufacturer arrangements ▪ Safe disposal of used PPEs	MoALD/NPCU/CPCU

Risk Level

High	
Medium	
Low	

1.5.2 Procedure for Preparation of Sub Project IPMPs

13) In compliance with the Bank's ESS 3, in order to minimise and control the release and use of hazardous materials, there would be need to prepare sub project specific Environmental and Social Impact Assessment (ESIAs) or standalone IPMPs /ESMPs for each sub project that intends to use pesticides once the scope and location among others are known in order to ensure compliance with the NEMA EIA/EA regulations and World Bank's ESS.

14) The Environmental Management and Coordination Act (EMCA) 1999 and EMCA (amendment) 2015, classifies projects into **High, Medium, and Low** risk. It further lists projects that would fall under each of the risk classifications. The NAVCDP sub projects are categorized as **Low, Medium or High-risk** requiring preparation of SPR or CPR.

15) NAVCDP environmental and social safeguard specialists at the NPCU will screen all subproject that it will be implemented under component 1, 2 and 3. Screening will determine the environmental and social issues that the sub project might trigger, and the type and level of assessment required including which type of report to submit to NEMA. All the CPR and SPR would have to be prepared by a NEMA registered EIA/EA expert, reviewed by NPCU and submitted to World Bank for further review and clearance before sharing with NEMA for review and licensing prior to commencement of construction or operations.

16) The SPR and CPR will be reviewed by the NAVCDP/NPCU and disclosed in the MoALD website. The reports will also be disclosed in the project areas (Map 1) and made accessible to the beneficiaries. The World Bank will only review all the CPR and provide clearance, it will not review the SPRs but may request the review of the same whenever necessary. The Bank will disclose the CPRs and SPRs in its external website.

17) This framework level (IPMP) will also guide preparation of sub project level IPMPs which will be prepared by the environmental and social specialists who will be based at each of the Counties and part of the CPCU.

1.6 Project area

h) This section presents the project area which covers 34 counties. Their detailed environment, bio-physical and social groups, culture, economic activities, etc. has been assembled as part of the baseline information. NAVCDP will work in Meru, Nyeri, Muranga, Kirinyaga, Kiambu, Embu, Machakos, Kitui, Makueni, Tharaka Nithi, Nandi, Uasin Gishu, Trans Nzoia, Nakuru, Narok, Kajiado,

Nyandarua, Kericho, Bomet, Kakamega, Busia, Bungoma, Vihiga, Homa Bay, Migori, Kisii, Siaya, Nyamira, Kisumu, Taita Taveta, Kwale, Kilifi, and Tana River, Tharaka Nithi, Bungoma, Kajiado, Vihiga, Siaya, Nyamira and Kisumu.

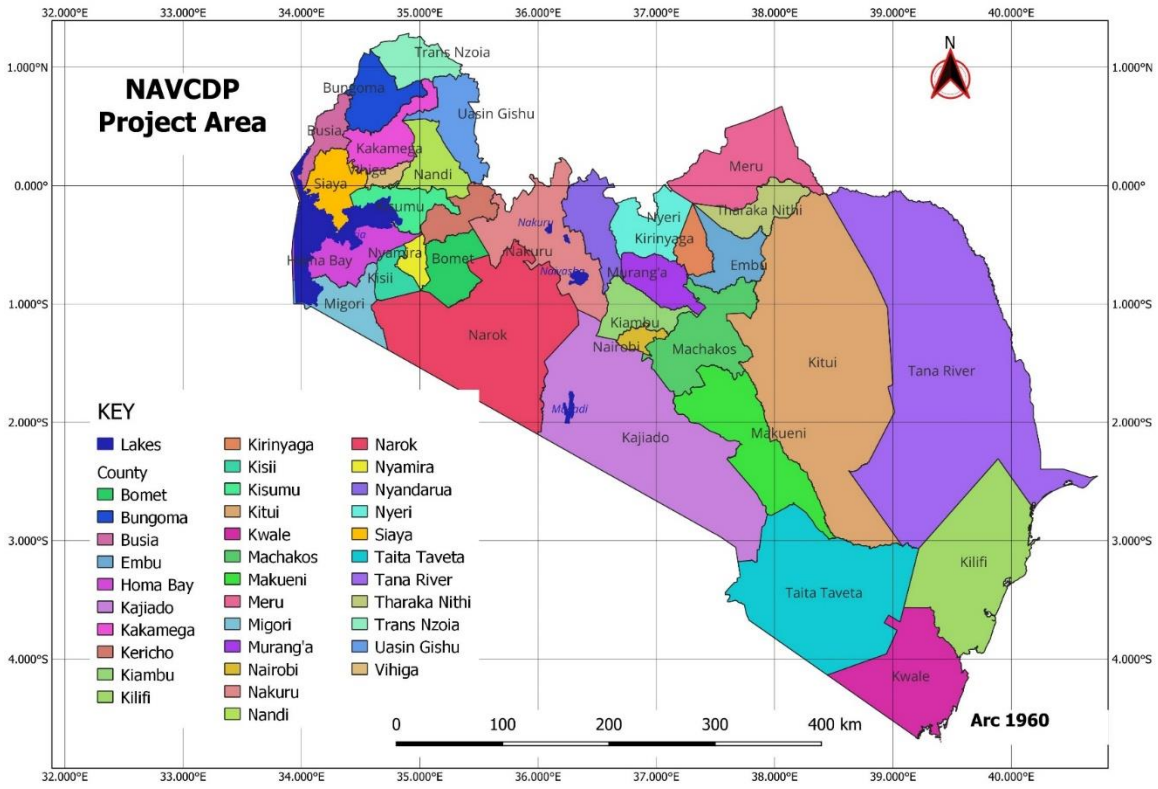


Figure 1 1: Project area of the NAVCDP

1.7 Capacity Building and Training

18) Capacity development and strengthening remains a crucial component in this IPMP and will be integrated all through the project implementation phase. The project will be implemented by the MoALD which has a long experience of implementing World Bank financed projects under the safeguards policies, these include Kenya Climate Smart Agriculture Project (KCSAP), the National Agriculture and Rural Inclusive Growth Project (NARIGP) and the Regional Pastoral Livelihood Resilience Project (RPLRP) and Emergency Locust Response Program (ELRP).

19) In order to strengthen the capacity of the NPCU, CPCU and other implementing agencies, the following capacity building efforts are recommended. The World Bank will train the NPCU on topics highlighted in the table below. The NPCU will thereafter provide training to the CPCU on the topics outlined below. To ensure that the message

and quality of training is assured, NPCU will engage consultants familiar with Bank's ESF, ESS and the other relevant instruments to support the County-based trainings.

20) World Bank recognizes that safety training is an essential component in programs involving the use of pesticides. The need for thorough training is particularly acute in developing countries and Kenya is no exception. In this regard, training of pesticide users and applicators will be a vital component of capacity building in this program. The program will, using the resources available from the NAVCDP prepare a comprehensive training manual on pesticide use and management, Integrated Pest Management (IPM) targeting different actors within the project, ranging from extension service providers, actual farmers, loaders, mixers, transporters, government staff among others.

21) The NAVCDP sub projects especially those in component 1, 2, 3 will also run extensive training programs for farmers, farmer leaders, extension workers, and stockists. These training programs where possible, will be further amplified by training that is being undertaken by other institutions such as Kenya Agricultural and Livestock Organization (KALRO), Agrochemical Association of Kenya (AAK), various Non-Governmental Organisations (NGOs), pesticide wholesalers, etc.

22) For farmers, farmer leaders, and County/Sub County extension workers, the training will be crop based with farmers being organized into groups led by a farmer leader. The method for training farmers and farmer leaders is the on-farm demonstration where farmer groups are led, step by step in growing the crop during the season from planting to harvest and increasingly into post-harvest activities and even marketing.

23) The NAVCDP will adopt a strategy where extension services stress usage of a few basic pieces of protective clothing and then working into more complete coverage after the first few have been adopted. Communities will be encouraged to form professional spray teams that would be certified and hired to apply pesticides after training. These could be more efficiently trained to wear and use protective equipment.

23)

24) To support institutionalizing access to farm inputs through producer organizations, identified agrochemical stockists as well as credit service (Saccos) will be trained on allowable crop protection products and applicable value chains.

2 Table 0-2. Capacity Building

Training Topic	Target	Trainers
World Bank ESF, ESS	NPCU	World Bank

County Project Coordinating Unit		
World Bank ESF, ESS	CPCU	NPCU
IPMP	CPCU	NPCU
Sub County Technical Teams		
World Bank ESF, ESS	Sub County Technical Teams	NPCU and CPCU
IPMP	Sub County Technical Teams	NPCU and CPCU

25) The estimated cost of capacity building and other support to implement the IPMP is given as $ 695,000 and the breakdown is summarized as follows:

1. Training workshops/seminars
2. Public awareness creation/ communication plans
3. Monitoring and evaluation exercises
4. Coordination

1.8 Public Consultations and Disclosure

26) This IPMP has been subjected to public consultation (8th, 9th and 10th November 2021) as per the National laws and World Bank ESS requirements with respect to stakeholder engagement and specifically to ESS 10, the project Stakeholders Engagement Plan (SEP) and recommendations arising from the consultation have been incorporated in this IPMP.

27) The Key issues raised during the public consultation and the full participant's lists are described in the ESMF developed for NAVCDP

1.9 Selected Pesticides

29) Resource Efficiency and Pollution Prevention and Management **(ESS3)** requires that in the procurement of any pesticide the Borrower will assess the nature and degree of associated risks, considering the proposed use and the intended users. The Borrower will not use any pesticides or pesticide products or formulations unless such use is in compliance with the World Bank's Group Environmental Health and Safety Guidelines (EHSGs). In addition, the Borrower will also not use any pesticide products that contain active ingredients that are restricted under applicable international conventions or their protocols or that are listed in, or meeting, the criteria of their annexes, unless for an acceptable purpose as defined by such conventions, their protocols, or annexes, or if an exemption has been obtained by the Borrower under such conventions, their protocol, or annexes, consistent with Borrower commitments under these and other applicable international agreements.

30) The Borrower will also not use any formulated pesticide products that meet the criteria of carcinogenicity, mutagenicity, or reproductive toxicity as set forth by relevant international agencies. For any other pesticide products that pose other potentially serious risk to human health or the environment and that are identified in internationally recognized classification and labelling systems, the Borrower will not use pesticide formulations of products if: (a) the country lacks restrictions on their distribution, management, and use; or (b) they are likely to be used by, or be accessible to, lay personnel, farmers, or others without training, equipment, and facilities to handle, store, and apply these products properly.

31) ESS 3 outlines the following additional criteria that apply to the selection and use of such pesticides: (a) they will have negligible adverse human health effects; (b) they will be shown to be effective against the target species; and (c) they will have minimal effect on non-target species and the natural environment. The methods, timing, and frequency of pesticide application are aimed to minimize damage to natural enemies. For any project involving significant pest management issues or any project contemplating activities that may lead to significant pest and pesticide management issues, the Borrower will prepare a PMP. A pest management plan will also be prepared when proposed financing of pest control products represents a large component of the project.

32) The NAVCDP will ONLY finance the use pesticides that are registered by the Pest Control Products Board (PCPB). Pesticides that are banned or restricted (see www.pcpb.co.ke) will not be used in this project.

1.10 Stakeholder Engagement

33) This chapter describes the consultations conducted during the preparation of the IPMP, the disclosure arrangements and the grievance redress mechanism in place for use during the project implementation.

34) **1.11 Stakeholder Engagement**

35) MoALD presented this IPMP as a draft to identified stakeholders (8th, 9th, and 10th November) as part of public consultation and more specifically to seek input from the stakeholders on potential impacts and mitigation measures of the NAVCDP as shown in Table 0-1. The issues raised by the stakeholders are summarised in table 2-2 below. The details of the stakeholder's deliberations are contained in the ESMF developed for NAVCDP. IPMP

36) Sometime in January 2023, the Government of Kenya requested for additional counties from 26 to 33 for NAVCDP through a National Treasury Ref. "Inclusion of Additional Counties to the National Agricultural Value Chain Development Project (NAVCDP)", (IDA Credit. No. 7064-KE) letter dated January 23, 2023. Subsequently, the 1st ISM for NAVCDP was held on February 13-17, 2023, and The World Bank, Country Director gave an IDA No Objection letter on the same Ref. February 2, 2023.

37) Therefore, NAVCDP adopted the recommended project changes that have affected the project design in the following areas:

i) NAVCDP will work in 33 from 26 counties: Nairobi, Meru, Nyeri, Muranga, Kirinyaga, Kiambu, Embu, Machakos, Kitui, Makueni, Tharaka Nithi, Nandi, Uasin Gishu, Trans Nzoia, Nakuru, Narok, Kajiado, Nyandarua, Kericho, Bomet, Kakamega, Busia, Bungoma, Vihiga, Homa Bay, Migori, Kisii, Siaya, Nyamira, Kisumu, Taita Taveta, Kwale, Kilifi, and Tana River (Map 1).

38) The added counties in the above list include: Tharaka Nithi, Bungoma, Kajiado, Vihiga, Siaya, Nyamira Nairobi and Kisumu.

j) Allow Saturation- in all wards of the project counties.

k) Each county selects up to 5 value chains, however 4 must be from the 12 VC menu and one more an open county choice.

l) FPOs are value chain sensitive and will be funded directly - (FPOs will benefit from three grants: inclusion; Enterprise Development; and Value Chain Upgrading Matching grants)

m) No micro-project grants- instead CIGs will access funds as a revolving fund from ward based SACCOs.

n) The CIGs will also be supported with inputs to demonstrate different technologies and innovations using the FFBS model. Within the wards, it was agreed that to start with, every farmer (including the georeferencing) will be registered and subsequently both the CDDCs (for wards) and CIGs mobilization will be undertaken based on the PICD process.

o) Every ward will have a SACCO. A diagnostic will determine whether a new SACCO will be mobilized, or an existing SACCO will be leveraged upon.
p) Farmer registration, SACCO membership, and accessing SACCO funds will be value chain neutral activities.
q) No grants will be provided at the CIG level and all grants to be provided will be either at the CDDC level (for selective crop demonstrations) or at the SACCO level (for revolving fund).
r) Counties to constitute new CDDCs in the new wards and restructure the old CDDCs in the existing wards.

39) Therefore, based on the above project changes, it became prudent to realign all NAVCDP ESS instruments to be in line with the project changes. This IPMP has been realigned to address the project design changes. The other NAVCDP ESS instruments include ESMF (where this IPMP is a stand-alone Annex), Resettlement Policy Framework (RPF), Vulnerable and Marginalized Framework (VMGF), Labour Management Procedures (LMP), Security Management Plan (SMP), Gender Based Violence/Sexual Exploitation Abuse and Harassment Prevention Plan (GBV/SEAHPP), Grievance Mechanism Manual (GMM), Stakeholder Engagement Plan (SEP), and Environmental and Social Commitment Plan (ESCP).

3 Table 2 1. Summary of Stakeholder Consultation Concerns

Concerns	**Response**
The project is huge in terms of investments. Where will be the place of the VMGs in this project? Will we be involved in the design?	All stakeholders will be involved in the design and implementation of each of the sub projects and including VMGs in areas where they are present.
What were the environmental risks and impacts and challenges encountered in the other projects e.g., KCSAP, NARGIP? Has a completion report for the past projects undertaken to determine the lessons learned?	The KCSAP and NARIGP has moderate environmental and social impacts which are similar to those that NAVCDP will have. Environmental and Social Impact Assessment reports were prepared for the sub projects and disclosed. These reports are available online.
At what level do we undertake the environmental impacts assessment? There are small and huge projects?	Screening will be undertaken for all the sub projects and a determination of the further environmental and social analysis made based on the screening.
We have provided our contributions at this stage and we are glad that we have been consulted. At implementation, will we be consulted?	A Stakeholder Engagement Plan has been prepared for this project and will ensure that consultation with all stakeholders is undertaken throughout the project implementation phases.

Concerns	Response
How will the use of pesticides affect the value chains between each other? Use of pesticides in potatoes ends up impacting on bees?	There is a possibility of pesticide use in one value chain adversely impacting another value chain. The IPMP developed will provide a framework for the use of pesticides.
How will the project be implemented in areas with security issues e.g., Lamu and Boni Forest? How will you address the security issues and ensure our safety?	The project has prepared a Security Management Plan which provides guidance on managing security related concerns.
Will there be disclosure of this ESMF after these consultations?	This ESMF and other related instruments will be disclosed on the websites of MoALD and by the World Bank.
Impacts associated with GHG emissions from dairy farming and mitigation measures have not been addressed. Consider biogas projects.	This is noted and will be included in the revised draft.
Pesticide container collections/disposals has not been included in the ESMF.	The adverse impacts associated with empty containers and their disposal have been described in the document including mitigation measures.
Apiculture: What safeguards exist to manage pesticide use and ensure safety of beehive. Some pesticides that are used affect honey production, how will that be considered in the new project?	All sub projects using pesticides and implemented in areas where bee farming is undertaken will be required to conduct specific analysis on the potential impacts of the pesticides on bees and develop adequate mitigation measures including not using the chemicals and seeking other alternatives. The pesticides to be used in NAVCDP will be those that are friendly to pollinators with minimum effect on non- targeted organisms
Government has minimum wages for workers which may be too low and may not attract workers. How can ensure that workers (youth employment) are not paid this low minimum wage?	A labour management procedure has been prepared for the project and will provide guidance on all labour related issues and concerns during project implementation.
What can be done concerning the high number of chemicals being used on the	NAVCDP is having IPMP as one of the framework approaches that will guide pesticide use at beneficiary level. Communities will be

Concerns	Response
farms that negatively affects humans through compromised food safety issues?	trained on safe use of chemicals and the management of pesticides, handling, storage, and transportation.
How will the project help IPs to continue conserving the environment?	The project will continue implementing SLM activities in collaboration with the IP communities and KFS
IPs are surrounded by other communities and the project might not benefit them making them not respond which may in turn affect the IPs and cause delays on coming up with responses.	IPs will be targeted during project operation and their CIGs/VMGs/POs will be considered along those of majority communities.
Encourage use of solar power in the FLIP to cut on the cost of energy and reduce pollution caused by use of fossil fuels.	Comments noted positively. NAVCDP will engage further.
Some counties have no capacities on E&S. They go ahead and hire consultants who have no or very little expertise? How will this new project help control this gap?	Counties will be advised to hire consultants handling environmental / social issues who have the requisite qualifications and experience
Public Lands and ownership: when such lands are given to communities to invest; management issues crop up later and this affects the progress of such investments. How is land being handled in this project?	The land on which the project will be implemented will be fully documented and due diligence done. NLC will also be fully involved to ensure that public land is properly availed for FPO utilization.

1.12 IPMP Disclosure

40) This IPMP will be disclosed in accordance with the ESS 10 disclosure standards after the consultations are held at the National level and with the relevant stakeholders. The IPMP will be disclosed on the website of MoALD and forwarded to the Bank for disclosure at the Bank's external website.

2 POLICY AND REGULATORY FRAMEWORK FOR PEST AND PESTICIDE MANAGEMENT

41) This chapter outlines and highlights the relevant policy and legal framework in Kenya as relates to pest and pesticide management and have a relevance to the NAVCDP.

2.1 The Legal, Regulatory and Policy Framework

2.1.1 Constitutional Provisions

42) Kenya now has a new Supreme law in form of the New Constitution which was promulgated on the 27th of August 2010 and which takes supremacy over all aspects of life and activity in the New Republic. With regard to environment, Section 42 of the Constitution states as follows: -

> Every person has the right to a clean and healthy environment which includes the right -
>
> *a) To have the environment protected for the benefit of present and future generations through legislative and other measures, particularly those contemplated in Article 69; and*
> b) *To have obligations relating to the environment fulfilled under Article 70*

43) In Sections 69 and 70, the Constitution has inter alia identified National Obligations in respect of the environment and Enforcement of Environmental Rights respectively as follows: -

44) Section 69 (1): The State shall—

a) Ensure sustainable exploitation, utilization, management and conservation of the environment and natural resources, and ensure the equitable sharing of the accruing benefits;
b) Work to achieve and maintain a tree cover of at least ten per cent of the land area of Kenya;
c) Protect and enhance intellectual property in, and indigenous knowledge of, biodiversity and the genetic resources of the communities;
d) Encourage public participation in the management, protection and conservation of the environment;
e) Protect genetic resources and biological diversity;
f) Establish systems of environmental impact assessment, environmental audit and monitoring of the environment;
g) Eliminate processes and activities that are likely to endanger the environment; and
h) Utilize the environment and natural resources for the benefit of the people of Kenya.

45) Section 69 (2) States that; -Every person has a duty to cooperate with State organs and other persons to protect and conserve the environment and ensure ecologically sustainable development and use of natural resources.

46) Section 70 provides for enforcement of environmental rights thus:
(1) If a person alleges that a right to a clean and healthy environment recognized and protected under Article 42 has been, is being or is likely to be, denied, violated, infringed or threatened, the person may apply to a court for redress in addition to any other legal remedies that are available in respect to the same matter.

47) On application under clause (1), the court may make any order, or give any directions, it considers appropriate—

a) To prevent, stop or discontinue any act or omission that is harmful to the environment;

b) To compel any public officer to take measures to prevent or discontinue any act or omission that is harmful to the environment; or

c) To provide compensation for any victim of a violation of the right to a clean and healthy environment.

48) For the purposes of this Article, an applicant does not have to demonstrate that any person has incurred loss or suffered injury.

Essentially, the new Constitution has embraced and provided further anchorage to the spirit and letter of EMCA 1999 and EMCA (amendment) Act, 2015 whose requirements for environmental protection and management have largely informed Sections 69 through to 71. In Section 72 however, the new constitution allows for enactment of laws towards enforcement of any new provisions of the Supreme Law.

2.1.2 Pest Control Products Act Chapter 346, 2012

49) ***This*** Act covers the use, application, importation and trade in pest products. It includes regulation on:

- Prescribing for the purposes of this Act the nomenclature of pests, classes and kinds of pests and pest control products;
- Prescribing the form in which applications for registration shall be made and the information to be furnished therewith;
- Respecting the registration of pest control products and establishments in which any pest control products are and led by manufacturers or dealers and prescribing the fees therefore, and respecting the procedures to be followed for the review of cases involving the refusal, suspension or cancellation of the registration of any such product or establishment;

- Prescribing the form, composition, and all other standards relating to the safe use of pest control products, including toxic residue effects;
- Respecting the manufacture or treatment of any pest control product to facilitate its recognition by change in colouration or other means;
- Respecting the standards for efficacy and safety of any pest control product;
- Respecting the manufacture, storage, distribution, display and use of any pest control product;
- Respecting the packaging, labelling and advertising of pest control products;
- Respecting the taking of samples and the making of analyses for the purposes and provisions of this Act;
- Prescribing the information to be supplied and the form of such information in respect of any pest control product that is to be imported into Kenya;
- Prescribing the circumstances and conditions under which pest control products that have met the requirements of the Cattle Cleansing Act may be deemed to be registered as prescribed under this Act;

2.1.3 Pest Control Products (Registration) Regulations, 1984

50) ***The*** Pest Control Products (Registration) Regulations, 1984 [L.N. 46/1984, L.N. 109/1984, L.N. 123/2006.] – defines the process of registering pest control products. Key features of the subsidiary legislation include:

- Section 5 - establishes the PCPB, whose functions include assessing and evaluating pest control products, and considering applications for the registration of pest control products. The pesticide to be used is registered for use in Kenya as per this regulation.
- Regulation 2 - provides definitions for various pest control products including biochemical pesticide and micro- and microbial bio pesticides
- Regulation 4 - outlines the procedure for the registration of pest control products including bio pesticide-specific registration pathways
- Regulation 7 - provides for instances when the PCPB can issue or refuse to issue a certificate of registration
- Regulation 8 - stipulates the validity period for certificates of registration
- Regulation 10 - lists instances where the PCPB may refuse to register a pest control product
- Regulation 11 - states instances where the PCPB may suspend or revoke a certificate of registration
- Regulation 14 - provides that a holder of a certificate of registration is to keep a record of all the quantities of pest control products they store, manufacture, or sell. This record is to be maintained for five years from the time it is made and must be

made available to the PCPB at such times and in such manner as the PCPB may require.

51) ***The*** PCPB publishes the list of pest control products registered in the country on its website. This list is published to stakeholders in the plant health sector in order to easily identify the pesticides that have been evaluated by the PCPB for safety, efficacy, quality and economic value. By accessing the PCPB website, any person can access categorised downloadable list of registered products, including those for use in crop production, animal health and public health. Contained in the list is information on trade names of products, their registration numbers, the name(s) of active ingredient(s) and their concentrations, formulation type, authorized uses including crops and target pests, the name of the registrant and the period of registration.

2.1.4 The Pest Control Products (Licensing of Premises) Regulations, 1984

52) ***The*** **Pest Control Products (Licensing of Premises) Regulations, 1984** [Section 15, L.N. 45/1984, L.N. 124/2006.] – Section 2 prohibits any person from using any premises for purposes of manufacturing, formulating, packaging and storing pest control products without a license issued under these regulations.

2.1.5 The Pest Control Products (Labelling, Advertising and Packaging) Regulations, 1984

53) **The Pest Control Products (Labelling, Advertising and Packaging) Regulations, 1984** [L.N. 89/1984, L.N. 127/2006.] – address the design of pesticide packages (packaging and labelling). Regulation 3 requires all pest control products to bear a label which has been approved by the PCPB. In addition, the regulation specifies the information required on the label. Regulation 9 provides for cases where the physical properties of a pest control product may not be recognized when it is being used. In such circumstances the pest control product must be denatured by means of colour, odour or other methods the PCPB may approve so as to provide a signal or warning of its presence. Regulation 11 specifies the conditions under which a pest control product shall be distributed. Regulation 13 specifies the technical requirements for packaging (e.g. packaging material shall be sufficiently durable and manufactured to contain the pest control product safely under practical conditions of storage, display and distribution). Regulation 14 states the general prohibitions (e.g. words stating, implying or inferring that a pest control product is approved, accepted or recommended by the government shall not appear on a package or label in any advertisement respecting a pest control product).

2.1.6 Pest Control Products (Importation and Exportation) Regulations, 1984

54) **The Pest Control Products (Importation and Exportation) Regulations, 1984** [L.N. 146/1984, L.N. 125/2006.] contain provisions specifically addressing the import and export of pesticides. Regulation 2 prohibits the importation and exportation of pest control products unless licensed. Regulations 4 and 5 establishes the application process for a license in respect of importation or exportation of a pest control product and how the PCPB will deal with applications and issue of licenses respectively. Regulation 8 provides for instances where the PCPB may cancel or suspend a licence (e.g. where the licensee has been convicted of an offence/has committed a breach of any of the terms or conditions of the license).

2.1.7 Pharmacy and Poisons Act Chapter 244, 2012

55) **The Pharmacy and Poisons Act contains** provisions addressing the sale of poisons for agriculture and horticulture. Section 28 prescribes the manner in which a person intending to trade in pesticides may apply to the Pharmacy and Poisons Board for a license to deal with pesticides. The section further prescribes instances when the Board may refuse to issue or renew or may revoke a license to trade in pesticides. Section 13 prescribes the safe custody of poisons. The section provides that no person engaged in a trade, business or profession shall knowingly have in their possession or under their control a poison.

2.1.8 Pest Control Products (Licensing of Premises) Regulations, 1984

56) **Pest Control Products (Licensing of Premises) Regulations, 1984** contains further provisions addressing the handling of pesticides - Regulation 7 requires that every person operating premises dealing with pesticides must have an adequate knowledge of the chemistry, toxicology, efficacy and general use of the pest control product. Further, the regulations contain provisions identifying pesticide-related activities permissible only to operators holding a valid license. Regulation 3 prescribes the application process for the licensing of premises intended to be used for manufacturing, formulating, packaging, selling or storing pest control products. Regulation 7 requires persons intending to handle, use, distribute, transport or deal in a pest control product under restricted class to apply to the PCPB for a permit as per the prescribed Form D in the schedule.

2.1.9 Pest Control Products (Disposal) Regulations, 2006

57) **Pest Control Products (Disposal) Regulations, 2006-Regulation 2** provides that those disposing pesticides for commercial purposes must be in possession of a license, and the use of any pesticide disposal method must be approved by the PCPB. Further, the Guidelines for on-farm Disposal of Pesticide Wastes and Containers, PCPB

prescribe best practice when it comes to the disposal of unwanted or unused pesticide concentrates (obsolete stock). Further, guidelines for on-farm disposal of pesticide wastes and containers, PCPB. The guidelines prescribe that pesticide containers and packaging materials should never be used to contain water, food or feed stuffs for human or animal use. Additionally, while cleaning containers, the following guidelines must be noted:

- wear protective clothing
- avoid spillages and leaks
- completely empty containers and packages before disposing
- take care to avoid splashing or creating dust
- place cleaned containers in a dry secure compound prior to disposal
- At the container disposal site:
  - Containers should be punctured after rinsing to make them unusable, and crushed to reduce bulk
  - Combustible packaging materials should be burnt in a licensed incinerator. If not possible, containers should be made unusable, reduced in bulk and buried
  - Integrity of containers to be buried should be destroyed
  - Aerosols should not be punctured

2.1.10 Plant Protection Act Chapter 324, 2012

58) **This** Act makes a provision for the prevention of the introduction and spread of pests destructive to plants. The most applicable parts of this Act to Integrated Pest Management are specified in Sec. 3, 4, 5, 6, 7 and 8. The act creates specific rules to support plant protection in various crops. These includes sugarcane (L.N.294/1962. Rule 3, Sch. 2), Maize and Sorghum (L.N.216/1956. Schedule (7 and 8), Sisal (L.N.522/1957, L.N.365/1964, L.N.153/1958, L.N.177/1959, L.N.558/1960) and Banana (Cap.178 (1948), Sub. Leg. L.N.365/1964).

2.1.11 Environment Management and Coordination Act (No. 8 of 1999), EMCA (Amendment) Act 2015, Cap 387.

59) **This** is an Act of Parliament providing for the establishment of an appropriate legal and institutional framework for the management of the environment and for matters connected therewith and incidental thereto. This Act is divided into 13 Parts, covering main areas of environmental concern as follows: Preliminary (I); General principles (II); Administration (III); Environmental planning (IV); Protection and Conservation of the Environment (V), Environmental impact assessments (EIA), audits and monitoring (VI); Environmental audit and monitoring (VII); Environmental quality standards (VIII); Environmental Restoration orders, Environmental Easements (IX);

Inspection, analysis and records (IX); Inspection Analysis and Records (X); international Treaties, Conventions and Agreements (XI) National Environment Tribunal (XII); Environmental Offences (XIII). The Act provides for the setting up of the various ESIA Regulations and Guidelines which are discussed below:

Environmental (Impact Assessment and Audit) Regulations 2003

60) **The** Environmental (Impact Assessment and Audit) Regulations 2003 state in Regulation 3 that "the Regulations should apply to all policies, plans, programmes, projects and activities specified in Part III and V of the Regulations'' basically lists the guidelines of undertaking, submission and approval of the ESIA Reports a key requirement outlined in this ESMF.

Environmental Management and Co-ordination (Waste Management) Regulations 2006

61) These are described in Legal Notice No. 121 of the Kenya Gazette Supplement No. 69 of September 2006. These Regulations apply to all categories of waste as provided in the Regulations. These include:

- *Industrial wastes;*
- *Hazardous and toxic wastes;*
- *Pesticides and toxic substances;*
- *Biomedical wastes;*
- *Radio-active substances.*

62) The proposed Project will have to abide by these regulations in dealing with waste management especially the provisions of wastes which may be generated during their construction and operation phases of the sub project investments.

Environmental Management and Coordination, (Water Quality) Regulations 2006

63) These are described in Legal Notice No. 120 of the Kenya Gazette Supplement No. 68 of September 2006. These Regulations apply to drinking water, water used for agricultural purposes, water used for recreational purposes, water used for fisheries and wildlife and water used for any other purposes. This includes the following:

- *Protection of sources of water for domestic use;*
- *Water for industrial use and effluent discharge;*
- *Water for agricultural use.*

64) These Regulations outline:

a) Quality standards for sources of domestic water;
b) Quality monitoring for sources of domestic water;
c) Standards for effluent discharge into the environment;
d) Monitoring guide for discharge into the environment;

e) Standards for effluent discharge into public sewers;
f) Monitoring for discharge of treated effluent into the environment.

65) In fulfilling the requirements of the regulations, the project proponent will have to undertake monitoring of both domestic water and wastewater and ensure compliance with the acceptable discharge standards.

Environmental Management and Coordination, Conservation of Biological Diversity (CBD) Regulations 2006

66) These regulations are described in Legal Notice No. 160 of the Kenya Gazette Supplement No. 84 of December 2006. These Regulations apply to conservation of biodiversity which includes Conservation of threatened species, Inventory and monitoring of CBD and protection of environmentally significant areas, access to genetic resources, benefit sharing and offences and penalties.

Environmental Management and Coordination (Wetlands, Riverbanks, Lake Shores and Sea Shore Management) Regulations 2009

67) These regulations provide for the protection and management of wetlands, riverbanks, lake shores and sea-shore management and detail guidelines on the same.

2.1.12 Occupational Health and Safety Act, 2007

68) This is an Act of Parliament to provide for the safety, health and welfare of workers and all persons lawfully present at workplaces, to provide for the establishment of the National Council for Occupational Safety and Health and for connected purposes. The Act has the following functions among others:

- *Secures safety and health for people legally in all workplaces by minimization of exposure of workers to hazards (gases, fumes & vapours, energies, dangerous machinery/equipment, temperatures, and biological agents) at their workplaces.*
- *Prevents employment of children in workplaces where their safety and health is at risk.*
- *Encourages entrepreneurs to set achievable safety targets for their enterprises.*
- *Promotes reporting of work-place accidents, dangerous occurrences and ill health with a view to finding out their causes and preventing of similar occurrences in future.*
- *Promotes creation of a safety culture at workplaces through education and training in occupational safety and health.*

69) Failure to comply with the OSHA, 2007 attracts penalties of up to KES 300,000- or 3-months jail term or both or penalties of KES 1,000,000-or 12-months jail term or both

for cases where death occurs and is in consequence of the employer. The Occupational Safety and Health Act (OSHA) 2007 repealed the Factories and Other Places of Work Act. Anything done under the provisions of the Factories and Other Places of Work Act including subsidiary legislation issued before the commencement of the OSHA 2007 shall be deemed to have been done under the provisions of this Act.

70) The Factories and Other Places of Work Act had over the years passed several subsidiary rules and regulations for effective implementation of the Act. All shall, as long as it is not inconsistent with OSHA 2007 remain in force until repealed or revoked by subsidiary legislation under the provisions of OSHA 2007 and shall for all purposes be deemed to have been made under this Act.

71) These regulations include:

- *The Factories (Cellulose Solutions) Rules 1957;*
- *The Factories (Wood Working Machinery) Rules 1959;*
- *The Factories (Dock) Rules 1962;*
- *The Factories (Eye Protection) Rules 1978;*
- *The Factories (Electric Power) (Special) Rules 1978;*
- *The Factories (Building Operations and Works of Engineering Construction) Rules 1984;*
- *The Factories and Other Places of Work (Health & Safety Committees) Rules 2004;*
- *The Factories and Other Places of Work (Medical Examination) Rules 2005;*
- *The Factories and Other Places of Work (Noise Prevention and Control) Rules 2005;*
- *The Factories and Other Places of Work (Fire Risk Reduction) Rules 2007;*
- *The Factories and Other Places of Work (Hazardous Substances) Rules 2007.*

72) The scope of OSHA 2007 has been expanded to cover all workplaces including offices, schools, academic institutions and plantations. It establishes codes of practices to be approved and issued by the Director, Directorate of Occupational Health and Safety (DOHS) for practical guidance of the various provisions of the Act.

73) Other parameters within the Act relevant to the project include:

1. *Duties of employers, owners or occupiers of workplace;*
2. *Establishment of safety and health committees;*
3. *Annual safety and health audit of workplaces;*
4. *Safety and Health obligations for persons who may come to premises for work and are not employees of that particular workplace;*

5. *Reporting of any accident, dangerous occurrence or occupational poisoning caused in the workplace to the area Occupational Health and Safety Office. These incidents should be entered in the General Register. In case of fatal accident information to the area Safety and Health Office should be within 24 hrs. and a written notice to the same within 7 days;*
6. *The duties of manufactures, designers, importers and suppliers to ensure that all articles and substances for use at workplace are safe and will not cause injury to health and the environment;*
7. *Duties of self-employed persons;*
8. *Duties of employed persons;*
9. *Prohibition of interference or misuse of any appliance, convenience or any other facility provided to secure Safety, Health and Welfare at work by any person (occupier, self-employed person or employed);*
10. *The administration of the Act is the responsibility of a Director and other appointed and gazetted officials (Occupational Health and Safety Officers);*
11. *The registration of all workplaces by the Director Directorate of Occupational Health and Safety (DOHS) forming the basis of his work statistics;*
12. *Machinery safety to include:*
    - *Safe use of machinery, plant and equipment;*
    - *Prime makers and transmission machines;*
    - *The maintenance, construction of fencing safeguards;*
    - *The statutory requirements of various machines, plants and equipment (hoists and lifts, chains and ropes, cranes, steam receivers and containers, air receivers, cylinders for compressed liquefied and dissolved gases and refrigeration plants).*

13. *Chemical safety including:*
    (i) Handling, transportation and disposal of chemicals and other hazardous substances;
    (ii) Importance of Materials Safety Data Sheets (MSDS);
    (iii)Labelling and marking of chemical substances;
    (iv) Classification of hazardous chemicals and substances;
    (v) Establishment and adoption of exposure limits on hazardous substances in a workplace;
    (vi) Control of air pollution, noise and vibrations;
    (vii) Redeployment on medical advice.

2.1.13 Public Health Act, Chapter 242, 2012

74) The Public Health Act provides for the protection of human health through prevention and guarding against introduction of infectious diseases into Kenya from outside, to promote public health and the prevention, limitation or suppression of infectious,

communicable or preventable diseases within Kenya, to advice and direct local authorities in regard to matters affecting the public health to promote or carry out researches and investigations in connection with the prevention or treatment of human diseases. This Act provides the impetus for a healthy environment and gives regulations to waste management, pollution and human health. The Public Health Act regulates activities detrimental to human health. The owner(s) of the premises responsible for environmental nuisances such as noise and emissions, at levels that can affect human health, are liable to prosecution under this act. An environmental nuisance is defined in the act as one that causes danger, discomfort or annoyance to the local inhabitants or which is hazardous to human health. This Act controls the activities of the project with regard to human health and ensures that the health of the surrounding community is not jeopardized by the activities of the project such as water development.

2.1.14 Public Participation Act

75) The object of this Act is to enhance, promote and Object of the facilitate public participation in governance processes and in particular to give effect to the principles of public participation as provided for in Articles 1(2), 10(2), 33(1)(a), 35, 69(1)(d), 118, 174(c) and (d), 184(1)(c), 196,201(a) and 232(1)(d) of the Constitution; promote democracy and participation of the people in accordance with Article 10 of the Constitution; promote transparency and accountability in decision making; enhance public awareness and understanding of governance processes; promote community ownership of public decisions; and promote public participation and collaboration in governance processes. The conduct of public participation shall be guided by the following principles - Principles. that the public, communities and organizations to be affected by a decision shall have a right to be consulted and involved in the decision making process; provision of effective mechanisms for the involvement of the public, communities and organizations that would be affected by or be interested in a decision; participants' equitable access to the information they need to participate in a meaningful manner; that public views shall be taken into consideration in decision making; development of appropriate feedback mechanisms; adherence to the national values under Article 10 of the Constitution; adherence to the principles of leadership and integrity set out in Chapter Six of the Constitution; adherence to the principles of public participation as may be prescribed by any written law; and promotion of sustainable decisions recognizing the needs and interests of all participants, including decision makers.

2.2 Relevant Sector Policies

2.2.1 The Kenya Vision 2030

76) The Sessional Paper Number 10 of 2012 on the Kenya Vision 2030 under the economic pillar identifies specific interventions which in the agricultural sector include increasing productivity of crops and livestock, introducing land use polices for better utilization of high and medium potential lands, developing more irrigable areas in arid and semi-arid lands for both crops and livestock, and improving market access for smallholders through better post-harvest and supply chain management. It also prioritizes flagship projects in the sector, specifically: enactment of the consolidated agricultural reform bill, fertilizer cost-reduction investment, disease-free zones, land registry, land-use master plan and arid and semi-arid lands development project. The Policy makes reference to climatic change and directs responses. The Policy under the social pillar, with respect to environmental management proposes to intensify conservation of natural resources, such as establishing voluntary carbon markets, intensify research on impact of and response to climatic change and pilot adaptation programmes.

2.2.2 Agricultural Sector Transformation and Growth Strategy

77) The Agricultural Sector Transformation and Growth Strategy (ASTGS) 2019-2029 sets out to implement the Kenya Vision 2030 in the agricultural sector. It identifies two strategic thrusts for its vision of a food-secure and prosperous nation, i.e. increasing productivity, commercialization and competitiveness of agricultural commodities and enterprises and developing and managing the key factors of production. It commits government to implement "National Climate Change Response Strategy" which would include mainstreaming of tradition early warning and mitigation systems, identification of priorities for climate adaptation and mitigation with specific measures for vulnerable groups, awareness creation, conducting of periodic climate change threat and risk assessments and their mitigation as well as research and development in the area.

2.2.3 National Climatic Change Strategy

78) The Strategy sets out to reduce the vulnerability to impacts of climatic change and to catalyse transition to cleaner, lower emission and less carbon-intensive development in the country. Government commits in the Strategy to enhance climatic resilience and adaptive capacity and put in place mechanisms for sustainable utilization of natural resources. The Strategy directs integration of climate change risk and vulnerability assessment in the Environment Impact Assessment and the Strategic Environment Assessment. It lays the blame for emissions of green-house gases largely to agriculture, more so livestock, and in land-use change and suggests deterrent taxation and friendly regulatory environments for low carbon-pollutant activities.

2.2.4 The National Agricultural Research Systems Policy

79) This policy provides the foundation for research in the agricultural sector. It aims at achieving reforms in the Kenyan agricultural research systems to support the development of an innovative, commercially oriented, and modern agricultural sector. The Policy aims at achieving objectives that include problem-solving and impact driven research agenda, fast-tracking National adoption of available technologies and knowledge and enhancing capacity to access and adopt knowledge and appropriate technologies available world-wide. It directs re-focusing of research to solve problems, the harnessing of indigenous knowledge while upholding professional ethics and the adoption of innovative methods of knowledge transfer.

2.2.5 The National Agricultural Sector Extension Policy

80) This policy implements the ASDS on matters of agricultural extension services. It directs extension service providers to apply sustainable, dynamic, innovative and effective extension approaches and methods, especially those promoting demand-driven and beneficiary led approaches in the selection of technologies and extension messages. It promotes decentralization of extension by using clientele groups (e.g. common interest groups, smallholder associations and primary cooperatives) and general public outreach for cost-effectiveness, taking into consideration the importance of indigenous knowledge and technologies.

2.3 Relevant Environmental Institutions.

81) There are other institutions dealing with environmental matters and the ones relevant to this project are illustrated in Table 3 1 below.

4 Table 3 1. Other Institutions

Agency	Role	Specific functions list (relating to pest and pesticide management)
Ministry of Agriculture		
Pest Control Products Board (PCPB)	▪ Regulates the importation, exportation, manufacture, distribution, transportation, sale, disposal and use of products used for the control of pests and mitigate potential harmful effects to the environment.	▪ Enhance compliance of pest control products to set standards and facilitate trade. ▪ Ensure safe, quality and efficacious pest control products are available to users ▪ Enhance responsible use of pest control products and food safety ▪ Improve management of pest control products lifecycle

KALRO	▪ Research in plant health issues related to pesticide	▪ Efficacy trials of agricultural pesticides for field and stored crops and fertilizers
Kenya Plant Health Inspectorate	▪ Assure the quality of agricultural inputs and produce to prevent adverse impact on the economy, the environment and human health.	▪ To protect plants from pests, weeds and invasive species coming through imports, exports and production processes. ▪ To support compliance to market requirements
Ministry of Health		
Government Chemists Department	▪ Provision of laboratory services in the fields of public and environmental health	▪ Test substances and materials for chemical composition, compliance with legal specifications and their suitability for various uses ▪ Analyses of samples for compliance to public health requirements
Directorate of Occupational Safety and Health Services (DOSHS)	▪ Ensures safety, health and welfare of workers predisposed to pesticides.	▪ Identify, evaluate and control biological and chemical factors in the work environment which may affect the safety and health of employed persons and the general environment.
Ministry of Industry, Investment and Trade		
Kenya Bureau of Standard (KEBS)	▪ Prepare standards relating to pesticides and their promotion at all levels	▪ Develop pesticide standards. Testing pesticide residues, and toxic elements in foods Certification of products

2.3.1 The National Productivity Policy

82) The Sessional Paper Number 3 of 2013 on the National Productivity Policy responds to low productivity and directs corrective measures. The Policy aims to achieve accelerated economic growth through high investment and productivity growth, being the incremental growth of 5% per year up from current less than 1%. It also aims at increased productivity awareness and consciousness level in the country from the

current level of about 1 percent to 60 percent of the population. It proposes training programmes outside the formal education system for skills transfer to the labour force. It will also support technological change and innovation.

2.3.2 The National Food and Nutritional Security Policy

83) The Sessional Paper Number 1 of 2012 on the National Food and Nutritional Security Policy aims at achieving safe food in sufficient quantity and quality to satisfy the nutritional needs for optimal Agricultural Policies & Legislation: The Policy directs the promotion of sustainable food production systems with particular attention to increasing soil fertility, agro-biodiversity, organic methods and proper range and livestock management practices. The Policy also directs that different approaches to food production are adopted based on the agro-ecological diversity which should include promoting irrigation.

2.4 World Bank Group EHS Guidelines

84) The World Bank Group Environmental Health and Safety (EHSGs) General Guidelines are technical reference documents with general and industry-specific examples of Good international Industry Practice (GIIP). The EHS General Guidelines contain the performance levels and measures that are normally acceptable to the WB Group, and that are generally considered to be achievable in new facilities at reasonable costs by existing technology. These include, EHS Guidelines for Occupational Health and Safety, EHS Guidelines for Perennial Crop Production, EHS Guidelines for Community Health and Safety (Transport of Hazardous Materials) and EHS Guidelines for pesticides manufacturing, formulation, and packaging.

2.5 International Environmental and Social Management Requirements

85) Kenya is a signatory to several international treaties and conventions that are relevant to this project. The conventions include among others; -

2.5.1 Convention on Biological Diversity, 1992

86) The Convention on Biological Diversity adopts a broad approach to conservation. It requires Parties to the Convention to adopt National strategies, plans and programs for the conservation of biological diversity, and to integrate the conservation and sustainable use of biological diversity into relevant sectoral and cross-sectoral plans, programs and policies. The proposed program is expected to conserve biodiversity, especially the rare and endangered species in the project area and its environs. In

addition, United Nations CBD provides a regulatory framework for the conservation of biological resources at the international level.

2.5.2 Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal, 1998

87) The overarching objective of the Basel Convention is to protect human health and the environment against the adverse effects of hazardous wastes. Its scope of application covers a wide range of wastes defined as "hazardous wastes" based on their origin and/or composition and their characteristics, as well as two types of wastes defined as "other wastes"- household waste and incinerator ash. Based on the concept of prior informed consent, it requires that, before an export may take place, the authorities of the State of export notify the authorities of the prospective States of import and transit, providing them with detailed information on the intended movement. The movement may only proceed if and when all States concerned have given their written consent (articles 6 and 7). The Basel Convention also provides for cooperation between parties, ranging from exchange of information on issues relevant to the implementation of the Convention to technical assistance, particularly to developing countries (articles 10 and 13).

2.5.3 Bamako Convention, 1992

88) The Bamako Convention is a treaty of African nations prohibiting the import into Africa of any hazardous waste. The convention came into force in 1998 and includes the need to dispose wastes in an environmentally sound manner.

2.5.4 International Plant Protection Convention (IPPC) of FAO, 1952

89) The IPPC is an international treaty to secure action to prevent the spread and introduction of pests of plants and plant products, and to promote appropriate measures for their control.

2.5.5 United Nations Framework Convention on Climate Change, 1992

90) The convention seeks to regulate levels of greenhouse gases (GHGs) concentration in the atmosphere, to avoid the occurrence of climate change at levels that would harm economic development, or that would impede food production activities.

2.5.6 FAO Guidelines on Good Practice for Ground Application of Pesticides, 2001

91) The guidelines are aimed at decision-makers, managers, field supervisors and spray operatives. However, it must be emphasized that in some countries, legislation is already in place to control safe and efficient pesticide use and application. Accordingly, local legislation, or voluntary codes must be the first point of reference with this set of guidelines offered as additional information. This is an important point, as compliance

with local legislation may have legal significance in the event of a claim against the poor field performance of a pesticide.

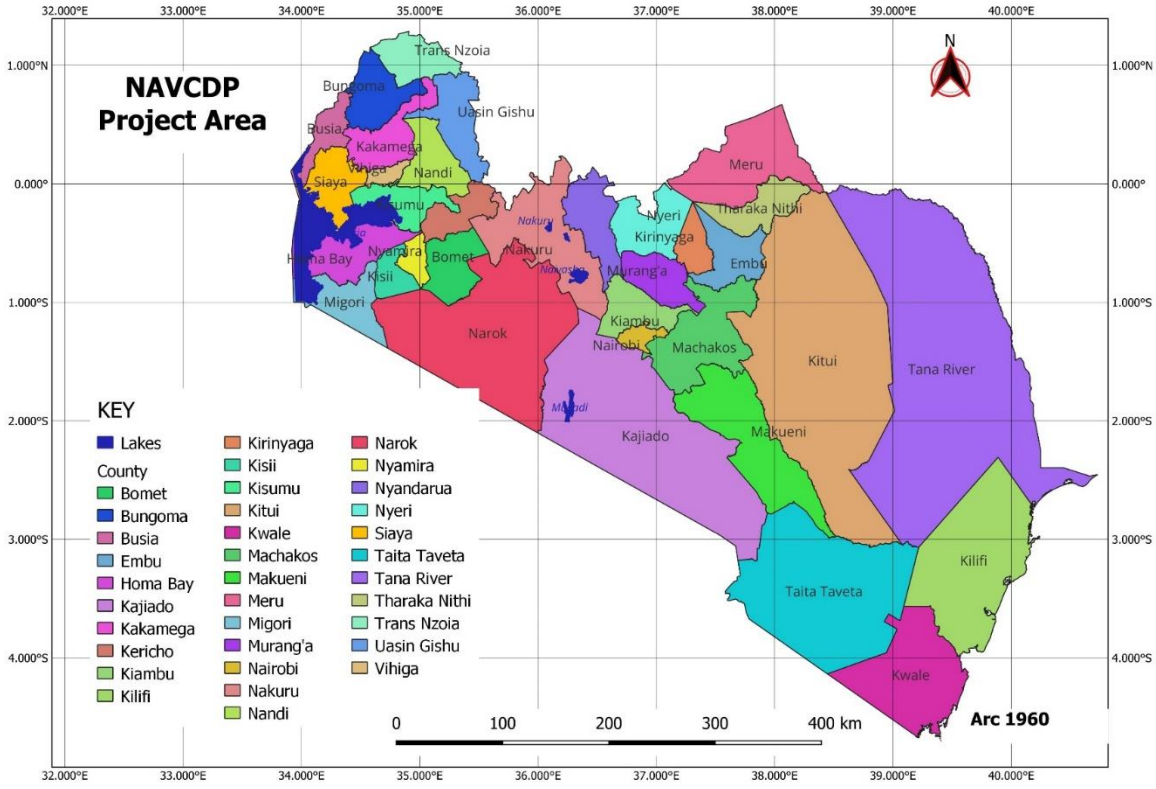
2.5.7 FAO Guidelines on Management Options for Empty Pesticide Containers, 2001

92) This guideline provides advice on the management of one-way pesticide containers following the deployment of their contents. Unless empty pesticide containers are managed correctly, they are hazardous to both mankind and the environment. There is a danger that empty containers could be reused for storing food and water, which could result in pesticide poisonings. Containers abandoned in the environment can lead to pesticide pollution in soil and groundwater. A container management scheme can minimize these risks and is part of the "life-cycle concept" as addressed in the international Code of Conduct on the Distribution and Use of Pesticides.

2.6 Applicable World Bank's Environmental and Social Standards

93) The NAVCDP is a program targeting 33 Counties in Kenya (Map 1) and it is expected to have project investments in the entire country for as long as the selected sites are feasible. In each of the counties the project will target 100 percent saturation meaning there is no specific limit to the wards that will access support. The likely or potential locations of many of the proposed investments are unknown at this point in time. In order to reduce, minimize and mitigate adverse risks and impacts and undue harm of its development projects to the environment, all Bank-financed projects are guided by applicable environmental and social standards under the Environmental and Social Framework (ESF). The following ESSs are relevant to this project and described in detail in the ESMF.

- Assessment and Management of Environmental and Social Risks and Impacts. (**ESS1**)
- Labor and Working Conditions **(ESS2)**
- Resource Efficiency and Pollution Prevention and Management **(ESS3)**
- Community Health and Safety **(ESS4)**
- Biodiversity Conservation and Sustainable Management of Living Natural Resources **(ESS 6)**
- Indigenous Peoples/Sub-Saharan African Historically Underserved Traditional Local Communities (**ESS7**)
- Stakeholder Engagement and Information Disclosure **(ESS 10)**



Map 1: Counties covered in the NAVCDP Project

3 INTEGRATED PEST MANAGEMENT PLAN

3.1 ESS 3 Pesticide Selection Requirements

94) Resource Efficiency and Pollution Prevention and Management **(ESS3)** requires that in the procurement of any pesticide the Borrower will assess the nature and degree of associated risks, taking into account the proposed use and the intended users. The Borrower will not use any pesticides or pesticide products or formulations unless such use is in compliance with the World Bank Group Environmental Health and Safety Guidelines. In addition, the Borrower will also not use any pesticide products that contain active ingredients that are restricted under applicable international conventions or their protocols or that are listed in, or meeting, the criteria of their annexes, unless for an acceptable purpose as defined by such conventions, their protocols, or annexes, or if an exemption has been obtained by the Borrower under such conventions, their protocol, or annexes, consistent with Borrower commitments under these and other applicable international agreements.

95) The Borrower will also not use any formulated pesticide products that meet the criteria of carcinogenicity, mutagenicity, or reproductive toxicity as set forth by relevant international agencies. For any other pesticide products that pose other potentially serious risk to human health or the environment and that are identified in internationally recognized classification and labelling systems, the Borrower will not use pesticide formulations of products if: (a) the country lacks restrictions on their distribution, management, and use; or (b) they are likely to be used by, or be accessible to, lay personnel, farmers, or others without training, equipment, and facilities to handle, store, and apply these products properly.

96) ESS 3 outlines the following additional criteria that apply to the selection and use of such pesticides: (a) they will have negligible adverse human health effects; (b) they will be shown to be effective against the target species; and (c) they will have minimal effect on nontarget species and the natural environment. The methods, timing, and frequency of pesticide application are aimed to minimize damage to natural enemies.

97) For any project involving significant pest management issues or any project contemplating activities that may lead to significant pest and pesticide management issues, the Borrower will prepare an IPMP. An IPMP will also be prepared when proposed financing of pest control products represents a large component of the project.

98) For all the supported value chains under NAVCDP there will be a IPMP that will detail resistance management strategy to common pests, diseases and vectors some of which are alluded to in the tables 4.1 to 4.6 below.

a. The 13 supported value chains include Dairy, Coffee, Chicken, Avocado, Banana, Mango, Irish Potatoes, Tomato, Apiculture, Pyrethrum, Cashew nuts and Cotton.
b. The common pests, diseases and vectors for each of these value chains and their management plan shall be included in the IPMP.

99) The NAVCDP will support crops and livestock production. The tables 4-1 below shows the common livestock diseases and vectors/pests.

5 ***Table 4 1.Vector-borne Parasitic Diseases of Livestock in Kenya***

Vectors	**Disease/Condition**
Ticks	East Coast Fever (ECF)
Rhipicephalus appendiculatus	ECF
Boophilus decolaratus	Anaplasmosis (Gall sickness), Babesiosis (red water)
Rhipicephelus evertsi	Babesiosis (red water)
Amblyomma variegatum	Heart water (Bush sickness)
TseTse Fly	
Glossina pallidipes	Trypanosomosis (Nagana)
Mange	
Chorioptes bovis	Pruritis
Sarcoptes	Pruritis
Biting flies	
Stomoxys calcitrans (stable fly)	Anthrax
E**ndoparasites**	
Helminths	*Helminthiasis*
Nematodes: *Haemonchus, Ostertagia, Trichostrongylus (Chaerbertia, Oesophagostomum), Nematodirus, Bunostomum (hookworm), Toxocara vitulorum, Cooperia, Dictyocaulus*	*Anaemia Unthriftiness*
Trematodes: *Fasciola hepatica, Fasciola gigantic*	*Anaemia Unthriftiness*
Cestodes: *Moeniezia genus, Cysticercus, Echinococcus granulosus*	*Anaemia Hydatidosis*
Coccidia	Coccidiosis

Trypanosomosis

100) Control of tsetse flies and Trypanosomiasis Insecticides

2) The chemicals used to control tsetse flies and drugs used to treat and control trypanosomosis are shown in Table 4-2. The combined strategy used is effective

because tse tse flies and trypanosomes are both destroyed and thus reduce infection in animals. A practical control strategy would include:

- Use of insecticides impregnated odour-baited traps and targets and spraying.
- Spraying and dipping animals and applications of pour-ons.
- Partner with PATTEC (Pan-African Tsetse and Trypanosomiasis Eradication Campaign) programme in order to reduce tsetse fly and trypanosomosis.
- Involve local communities in the long-term tsetse and trypanosomosis control.
- Use chemotherapy agents to cure and control trypanosomosis in animals. The drugs should be used carefully at the recommended dosage rates in order to educe drug resistance and maintain their anti-trypanocidal activity.
- Clear bushes on the farm regularly.

Anthrax

101) The disease is caused by Bacillus anthracis, which attacks all domestic animals and many wild animals. Anthrax is characterized by fever, swollen throat and sudden deaths in cattle, and by acute death in goats and sheep.

Control of anthrax

102) Anthrax is a notifiable disease and is controlled by the following methods;

i) Rapid diagnosis by examination of smears.
ii) Disposal of carcass by efficient and safe means such as burning or burial.
iii) Supervision of carcass until it is disposed off, with efficient methods of sterilization or using disinfectants on blood or discharges.
iv) Annual vaccination and control of movement of unvaccinated animals.
v) Milk from infected animals should not be consumed.

Black Quarter

103) Black–quarter (black–leg) is caused by Clostridium chauvoei and is an acute infectious disease of cattle and sheep. The disease is common in young cattle between 2-3 years because they are most susceptible. It is characterized by fever, depression, painful edematous swelling on the neck, chest, hip, acute lameness and death in 24 hours.

104) Control **of Black-quarter**

- Vaccinate cattle and sheep in high-risk areas with a bacterin containing C. *chauvoei.*
- Vaccinate calves between 2-6 months old.
- Treat susceptible cattle with penicillin.

Foot and Mouth Disease

105) The disease is caused by the following 7 types of picornaviridae virus, European types O, A and C, South African territories types. SAT 1, 2 and 3 and Asia type 1. Foot and mouth disease commonly affects cattle and sheep but goats and wild ruminants are susceptible. The severity of FMD depends on the strains of virus involved and immune status of the animal. The disease is characterized by fever, vesicles in the mouth and feet, salivation; drop in milk production and abortion in severe cases.

Control

106) The following control measures are used to control Foot and Mouth Disease.

- Put administrative measures in place quickly and impose quarantine in order to restrict movement of animals and their products.
- Enforce policies for the disease control in order to prevent spread of the diseases in the country and in the region.
- Rapid diagnosis and surveillance for the emergence of disease by new strains of virus which are not covered by the vaccine used.
- Use properly prepared and stored vaccines.
- Vaccinate animals regularly in order to establish immunity in the control of foot and mouth disease quadvalent vaccine containing, types A, O SAT, 1 and 2 is used to protect animals for up to 6 months.

Rift Valley Fever

107) RFV is caused by Phlebovirus and epidemics often occur after 5 years. Mosquitoes spread the disease especially during wet season. The disease is characterized by fever, anorexia, salivation, nasal discharge, diarrhoea, drop in milk production and abortion.

Control

- The disease is controlled by annual vaccination of animals using inactivated vaccine and dipping or spraying animals in order to reduce risk of mosquitoes.

108) The strategies for control of vectors and drugs used in the treatment of vector borne diseases are summarized in tables 4 2 below. The most effective strategy of controlling Vector Borne Diseases (VBD) in ruminants is to use a strategy of controlling vectors and early treatment of VBDs.

Strategies for Disease Control

The project will use different strategies for disease control as illustrated in Table 4 5.

109) The chemicals used currently to control vectors include; amitraz, pyrethroids, organophosphates and carbamates. Amitraz and pyrethroids are the most widely used chemicals to control ticks and tsetse flies in the country since they are effective and

they also control other ectoparasites in ruminants. The chemicals should be used following the recommended dose and frequency of application in order to avoid development of resistance.

110) The acaricides kill ticks in the predilection sites and breaks the life cycle of ticks. The common methods used for the application of the chemicals are given in Table 4 3 and include, dipping, hand spraying and hand dressing.

111) The problems associated with use of ectoparasiticides include high costs, environmental pollution, residues in animal products and gradual development of resistance. The main advantage of the chemicals is that they are highly effective against ectoparasites and thus reduce mortalities associated with VBDs. The study conducted indicated that majority (60 %) of dairy producers spray animals.

112) The drugs commonly used in the programme area for the treatment and control of VBDs is given in Table 4-2. The drugs are effective and are given by intramuscular or subcutaneous routes to animals. However, most of these drugs have a narrow therapeutic index and animals should be given the recommended dose in order to avoid side effects.

6 Table 4 2. Control of Vector Borne Diseases in Cattle

Tick Species	**Parasite/ Causative Agent**	**Disease Transmitted**	**Control**
Rhipicephalus Appendiculutus (Brown ear tick)	1.*Theileria parva* 2.*Anaplasma Marginale*	1.ECF 2. Anaplasmosis	Dipping, spraying, pour-on
Rhipicephalus avertis (Red-legged tick)	1.*Theileria parva* 2.*Babesia bigemina*	1.ECF 2.Babeciosis	Dipping, spraying, pour-on
Boophilus decoloratus s (Blue tick)	1.*Babesia bigemina* 2. *Anaplasma marginale*	1.Babesiosis 2. Anaplasmosis	Dipping, spraying, pour-on
Amblyomma spp. (Bont tick)	*Rickettsia ruminantium*	Heart water	Dipping, spraying, pour-on
Hyalomma spp. (Brown legged tick)	Tick toxin	Sweating sickness	Dipping, Spraying, Pour-on

Glossina pallidipes	*Trypanosoma vivax T. congolense*	Trypanosomiasis	Dipping, spraying, pour-on chemotherapy, control animal movement into risky
Mange	*Choriptes bovis Sarcoptes*	Itching Anaemia	Ecto-parasiticides
Lice	*Linognathus stenopsis*	Anaemia	Ecto-parasiticides
Fleas	*Bovicola bovis*	Anaemia Irritation	Ecto-parasiticides
Biting flies	*Stomaxys*	Irritation, Transmits anthrax	Ecto-parasiticides

7 Table 4 3. Groups of Acaricides Used to Control Vector Borne Diseases in Cattle

Vector	**Acaricides**	**Method of Application**
Ticks	Amitraz Pyrethroids Organophosphates Carbamates	Spray dip pour-on dusting
Tse tse fly	Pyrethroids Organophosphates	Spray dip
Mange	Organophosphate (Coumaphos) Ivermectin	Spay topical application
Fleas/Lice	Carbamates, Organophosphates Pyrethroids	Spray dip dust
Biting flies	Organophosphates,	Spray, dip, and dust

8 Table 4 4. Drugs Used to Treat/Control Vector Borne Diseases in Cattle

Tick Borne Diseases		
Drug	**Disease**	**Main action**
Buparvoquone	ECF	Curative
Imidocarp Oxytetracycline	Anaplasmosis	Curative
Imidocarp	Babesiosis	Curative
Tetracycline	Heartwater	Curative
Trypanosomosis in Cattle		
Drug	**Disease**	**Main action**
Diminacene Aceturate (Berenil)	T. Vivax T. congolense	Curative
Homidium Bromide (Ethidium bromide)	T. vivax T. congolence T. brucei	Curative
Isometamidium (samorin)	T. vivax T. Congolence	Curative and prophylactic
Endo-parasites of Ruminants		
Drug	**Disease**	**Main action**

Anthelmintic group; Benzimidazole	Roundworms	Broad
Substituted phenols; Oxyclosanide	Flukes	Narrow
Niclosamide	Tapeworms	Narrow
Coccidiostats; Sulphonamides	Coccidia	Curative

9 Table 4 5. Strategies for Disease Control in NAVCD Sub Projects

Vector	**Diseases**	**Control strategy**
Ticks	ECF	▪ Dip/spray animals using recommended acaricides. ▪ Apply pour-ons
	Anaplasmosis	▪ Use recommended acaricides at the dose rates and frequency.
	Babesiosis	▪ Check dip strength regularly
	Heart water	▪ Ensure proper management and maintenance of dips. ▪ Early treatment of sick animals.
Tsetse flies	Trypanosomiasis	▪ Dip/spray animals using recommended insecticides ▪ Apply pour -ons ▪ Train farmers on tsetse control ▪ Avoid grazing animals in highly infested tsetse areas ▪ Clear bushes in the farms Use drugs to treat sick animals
Mange	Pruritis	▪ Dip spray animals with insecticides ▪ Use ivermectin
Endo-parasites	Helminthiasis	▪ Use effective drugs ▪ Deworm animals before rainy season ▪ Deworm ruminant animals every 3 months. ▪ Deworm cats and dogs every 2 months ▪ Enforce meat inspection regulations and advice people to cook meat well in order to control tape worms ▪ Drain swamps in order to control *Fasciola sp*

	Coccidiosis	▪ Feed animals with clean water and feed. ▪ Isolate affected animals ▪ Use sulphonamides or Amprolium to treat animals.
Feed borne diseases	Mycotoxicosis	▪ Train farmers on good feed preparation ▪ & preservation practices. ▪ Farmers should buy feed from reputable manufacturers. ▪ Remove contaminated feed from animal compounds. ▪ Advice farmers not to feed animals with contaminated feeds. ▪ Surveillance of mycotoxins in feeds.
Plant poisoning		▪ Identify poisonous plants (eg) cestrum. ▪ Uproot plants and cultivate the farm.
Breeding diseases	Brucellosis	▪ Use artificial insemination service
	Trichomoniasis	▪ Examine bulls before using them for breeding.
	Vibriosis	▪ Surveillance of diseases ▪ Vaccinate heifers less than 8 months old ▪ Advice people to boil milk before consumption ▪ Government should subsidize AI
	Tuberculosis	▪ Slaughter animals with chronic tuberculosis
	Infertility	▪ Surveillance of diseases in the area ▪ Government should subsidize AI to levels affordable by
Other Diseases	Milk fever	▪ Give dairy animals salt lick with calcium and phosphorous

Bacterial diseases	Mastitis	▪ Advice farmers to wash udder and use milking salve ▪ Use dry cow mastitis tubes when stopping milking pregnant cows. ▪ Early diagnosis and treatment of cows with mastitis. ▪ Strip milking ▪ Frequent milking of affected udder. ▪ Simple testing before milking ▪ Cull cows with recurrent mastitis. ▪ Cull cows with recurrent mastitis.
Bacterial diseases	Anthrax	▪ Rapid diagnosis and treatment. ▪ Report suspected cases of anthrax. ▪ Annual vaccination of animals. ▪ Efficient disposal of carcasses by burning or burying.
	Black quarter	▪ Vaccinate animals in high-risk areas. ▪ Treat animals early with penicillin.
Viral diseases	LSD	▪ Disease surveillance ▪ Impose quarantine and control movement of animals ▪ Vaccinate animals regularly. ▪ Reduce contact between domestic and wild animals by fencing ▪ Vaccinate dogs and cats against rabies annually. ▪ Use properly stored vaccines. ▪ Subsidize vaccines to affordable levels by farmers. ▪ Report suspected cases of diseases

3.2 Common Fodder Pests and Common Control Measures

113) About 25-35% loss in agricultural produce is caused by pests and diseases, which can be controlled by use of pesticides. These pesticides kill or deter the destructive activity of the target organism and they posses' inherent toxicities that endanger the health of the farmers, consumers, and the environment. The NAVCD sub projects involving crop production under irrigation will involve use of pesticides. Table 4 6 below shows the type of pest and diseases and control methods for the crop value chain under NAVCDP.

10 ***Table 4 6. Type of pest and diseases and control methods for the crop value chain***

Pest	**Control**
Pyrethrum	
Pyrethrum thrips	Chemical control: • Metasystox at the rate of 1.0 litre per hectare in 400 litres of water
Onion thrips	Chemical control: • Metasystox at the rate of 1.0 litre per hectare in 400 litres of water
Green Aphids	Chemical control: • Metasystox at the rate of 1.0 litre per hectare in 400 litres of water
Mites	Chemical control: • Metasystox at the rate of 1.0 litre per hectare in 400 litres of water
Root knot nematode	• Crop rotation • Resistant varieties • Soil fumigants i.e. Basamid granular and Ethyl Dibromide (EDM) placed in soil before planting
Diseases	**Control**
Fusarium wilt - *Fusarium graminearum, Fusarium oxysporum,* and *Fusarium solani*	Cultural control: • use health plants (splits) for replanting new fields Crop rotation • Rotate pyrethrum with crops that are not hosts of these pathogens to eradicate or reduce accumulation of causative organisms Chemical control: • Dip splits in fungicides such as Ridomil reduces the spread of the disease
Rhizotonia spp	Crop rotation: • Crop rotation reduces the accumulation of causative organisms in the soil in many areas
Bud disease *Ramularia bellunensis, Alternaria spp, and Asychocyta spp*	There is no control of bud disease its incidence can be reduced by selection of resistant material in breeding programmes. During planting, diseased materials are discarded and at the end of the season plants should be cut back and stalks burned
Sclerotinia minor	Crop rotation: Rotate pyrethrum with crops that are not hosts of this pathogen to eradicate or reduce accumulation of causative organisms
Pythium spp	Crop rotation:

	Rotate pyrethrum with crops that are not hosts of this pathogen to eradicate or reduce accumulation of causative organisms
Coffee	
Cercospora leaf spot	• Avoid overwatering or watering in the late evening to reduce free moisture • Avoid overhead watering where the water can dislodge and disperse spores to uninfected plants. • Space plants to encourage air movement and reduce high humidity levels.
Coffee leaf rust	• Planting or converting susceptible coffee varieties to disease resistant cultivars such as Ruiru 11 or Batian • Timely pruning, handling and de-suckering. • Regular change of cycle (young bearing heads have some tolerance) • Spraying
Coffee berry disease (CBD)	• Fungicide applications i.e. copper-based fungicides, organic fungicides and systematic fungicides • Cultural practices i.e. pruning infected branches, destruction of infected material, removal of mummified berries, minimizing optimal microclimatic conditions for pathogen growth, and the use of competitive and antagonistic microorganisms in the plant phyllosphere.
Armillaria root rot	• Remove forest trees stumps, remove as much as possible of forest trees roots, and drench the root area with a copper fungicide. • Uproot infected part
Coffee wilt	• Frequent inspection of the crop, along with burning infected material and spraying the soil surface with 2.5% copper sulphate
Bacterial blight of coffee (BBC)	• Desucker or cut off infected twigs (at least 5 cm from the point of infection) and collecting them in buckets for burning • Observe field hygiene by disinfecting tools used for pruning infected trees with a suitable disinfectant such as spirits with 70% alcohol • Use of copper sprays especially during wet season. Spray at 2-week interval during the rains and 3 week interval after the rains. • Plant shade trees and wind breaks on exposed sides of BBC areas.

	• Avoid planting material from known BBC areas. In emergencies spray with copper just before, during and after flowering especially when this coincides with cool wet weather.
Pests	Control
White coffee stem borer	• Smoothen the trunk by removing dirt and dead bark • Paint or spray a 90 cm band with RANGER 48% EC diluted at a rate of 700ml/20 Litres of water (35ml/Litre of water).
Coffee berry borer	• Use of synthetic insecticides
Coffee root mealybug	• Uproot affected trees and burn on site • Destroy attacked suckers and do not use them as mulch • Allow infill holes to rest at least for 3 months before replanting in order for the remaining root mealybugs to die. • Neem treatments have a good effect on mealybugs
Shot hole borer	• Cut out weak branches and remove all dead wood, including prunings
Hairy caterpillars	• Lay damp hessian bags flat around the base of the tree. This will cause caterpillars to congregate underneath the bags overnight. • Lift the bags in the morning and spray the caterpillars with a good aerosol surface spray insecticide
Coffee bean beetle	• Biological control methods include using parasitoids such as Heterospilus coffeicola, attacking grubs or Prorops nasuta, attacking grubs and pupae • Proper and timely pruning accompanied by desuckering
Red coffee borer	• Biological control methods include using parasitoids such as Heterospilus coffeicola, attacking grubs or Prorops nasuta • Proper and timely pruning accompanied by desuckering.
Cotton	
African bollworm	• Practise field hygiene. Remove and destroy old crops and plant debris after harvesting or let cattle graze in the field after the picking is over. • Crop rotation with plants not related to cotton may help to reduce attack by the bollworm • Mixed cropping helps to reduce attack by bollworms; plant composition and combinations are important to optimise the

	benefits. Some plants may act as trap crops and/or may attract natural enemies that will then predate on bollworms. • Encourage natural enemies like ladybird beetles, lacewings, spiders etc. • Direct control measures are spraying with neem spray or a garlic-chilli-onion-repellent and Bt.
Cotton stainers	• Cotton stainers are attacked by a range of natural enemies. The most important are assassin bugs, ants, spiders, birds and parasitic flies. • Caging chickens in cotton plots using chicken wire may control cotton stainers; • Preventive control measures are sanitation; remove cotton plants and all its debris as well as ratoon cotton as soon as harvesting is over. Keep stores clean. Cotton should be grown strictly as an annual with a close (dead) season. Hand pick and destroy the bugs, • The baobab tree is one of the main host plants of stainer bugs. If cotton is grown where baobab occurs, the soil and trunk of the baobab tree should be sprayed to kill the nymphs hatching from eggs laid around the stem.
Cotton leaf roller	• The leaf roller is usually controlled by natural enemies, particularly parasitic wasps, spiders and praying mantis. • Removal and destruction of eggs, caterpillars, pupae and rolled leaves help to reduce damage.
Cotton leaf curl	• Plant resistant varieties • Eliminate weeds in and near cotton fields. This may have some advantage in reducing virus and insect vector reservoirs
Antracnose (Glomerella Gossypii)	• Use disease-free seeds. • Practise crop rotation. • Practise good field hygiene.
Bacterial blight	• Plant resistant varieties Use disease-free seeds • Practise crop rotation of at least 3 years with cereals or legumes • Practise good field sanitation

Bugs (Cotton seed bug, blue bug, cotton lygus)	• Natural enemies are important in the control of bugs; the most important are parasitic wasps attacking bug eggs; ants, which feed on eggs and nymphs; and various predacious bugs, spiders, birds and parasitic flies. • If heavy outbreaks of the cottonseed bug occur, the cotton should be picked as soon as the cotton bolls mature. • Neem products reportedly reduce feeding by some bugs. • Since bugs are late season pests early sowing and picking is recommended to reduce bug attack.
Helopeltis bugs	• Bugs, in particular adults are difficult to control since they can readily move from neighbouring crops or wild plants into the cotton crop. • Do not interplant cotton with crops that are host for Helopeltis bugs, such as cashew, tea, sweet potato, guava and mango. • Monitor the crop regularly. Helopeltis attack occurs very suddenly and great vigilance is very important to control this pest, particularly during the rainy season or when water is available leading to flushing (production of young shoots) when Helopeltis populations normally build up. • Natural enemies are important in the control of bugs. Conserve natural enemies. Weaver ants build nests on cashew trees providing good protection against this and other bug pests. The most important are parasitic wasps attacking bug eggs; ants, which feed on eggs and nymphs; and various predacious bugs, spiders, birds and parasitic flies. • Neem products reportedly reduce feeding by some bugs. • Since bugs are late season pests early sowing and picking are recommended to reduce bug attack.
Cutworms	• Remove weeds in and around the fields as a preventive measure to reduce the number of sites where the moths can lay eggs. Do this at least 2-3 weeks before planting. • Plough and harrow fields properly before planting to destroy eggs and expose caterpillars to birds, ants and other predators.

	• Apply neem cake or de-oiled castor cake before sowing. • Encourage the presence of birds with trees and hedges. Also promote natural enemies like spiders, ground beetles and lacewings. • Interplant with onion, garlic, peppermint or coriander, this will act as a repellent to cutworms. • Sunflowers can be planted as a trap crop.
Leafhoppers or jassids	• Use resistant varieties. A number of very hairy varieties have been bred, which are considerable less prone to leafhopper attack than those varieties whose leaves are not or only sparingly covered with hairs. By planting such resistant varieties damage by leafhoppers can be avoided to large extent. • Early sowing helps if the cotton plants have past the most susceptible plant stage during the period after the rainy season, when leafhopper population is at its peak. • Use repellent plant extracts from: neem, chilli, garlic or Lantana camara
Root-knot nematodes	• Practice crop rotation with crops not related to cotton (e.g. cereals) whereby cotton is cropped once every 3 or more years.
Spider mites	• Provide good plant growing conditions, in particular enough water; water stressed plants are prone to mite damage. • Avoid the use of broad-spectrum pesticides, which kill natural enemies and may result in mite outbreaks. • Avoid planting next to infested fields. • Sulphur preparations control mites. However, it should be noted that sulphur also kills predatory mites.
Cotton Aphids	• The cotton aphid is attacked by a range of natural enemies. The most important are ladybird beetles, hoverflies, lacewings and parasitic wasps. They usually keep aphids under control. • Healthy cotton plants can tolerate a fairly high number of aphids.

	• Avoid plant stress by giving neither too little nor too much manure. Avoid water stress and water logging. • Intercrop cotton with maize or sorghum to create a natural balance of pests and natural enemies. • Use yellow water or sticky traps. • Spraying maybe necessary in the case of high aphid infestation or if the honeydew affects the lint in open bolls. If this is the case, use plant extracts such as neem leaf and seed extracts, ginger rhizome extract, and custard apple leaf extract for control of aphids. • 3% potassium soap in acute cases; in extreme cases use nicotine extract, neem, chilli, garlic, or Lantana camara
Whiteflies	• Whiteflies are attacked by parasitic wasps and predators. Conservation of these natural enemies is important. • Yellow sticky traps are useful for monitoring whiteflies, and may help to control low populations. • Use 3% potassium soap in acute cases • Plant trap crops: e.g. Lablab niger
Damping off disease	• Use disease-free seeds. • Avoid planting during cold, wet weather.
African cotton mosaic disease	• As with most insect-vectored plant viruses, the disease pressure may be reduced by routine sanitation practices. • Also remove infected residues; this helps to reduce disease inoculum (source) and assists in lowering vector populations • Remove seasonal weeds adjacent to cotton fields and ditch banks in irrigated areas
Banana	
• **Panama Wilt-** It's a fungal disease mostly common in poorly drained soils. Initial symptoms are yellowing of lower leaves, including leaf blades and petioles	Proper drainage of the farm • In case there is serious infestations in the farm, uproot and burn the affected plants.

Mycosphaerella Leaf Spot- Early symptoms appear on the third or fourth leaf from the top. There are small spindle shaped spots on foliage with grayish and yellowish halo running parallel to veins. A small number of these enlarge, become oval; the colour also changes to dark brown.	• For effective control of the disease make sure that the farm has improved drainage, control of weeds, removal of diseased suckers and adopting correct spacing. Also copper based fungicides spray is recommended.
Banana bract mosaic virus (BBMV) - Its symptoms are spindle shaped pinkish to reddish streaks on the pseudo stem and midrib. Typical mosaic streaks on bracts, peduncle and fingers observed. It survives and spreads through aphid vectors.	• It's controlled by uprooting and destruction of affected plants together with their rhizomes.
Banana streak disease- Its symptoms are yellow streaking of leaves which become necrotic producing a black streaked appearance in older leaves. Its spread through infected planting materials and mealy bugs.	• For effective control, destroy the affected plants, use clean planting materials and control the vectors namely mealy bugs.
Infectious Chlorosis-It's a viral disease. Its symptoms are yellowish green patches and thickening of veins. Leaf sheaths also pull away from the pseudo stem easily. It manifests itself at all stages of crop growth. Due to repeated use of suckers from infected plants it leads to gradual decrease in yield and quality.	• For effective control destroy all affected plants and always plant tissues and suckers which are disease free and from certified nurseries.
Bunchy top virus\ Curly top- Symptoms occur as prominent dark green streaks on the petiole and midrib along the leaf veins. Petioles fail to elongate. Leaves are reduced in size, chlorotic, stand upright and become brittle. Flowers display mottled and streaked discoloration.	• For effective control of the disease, destroy all the affected plants and control the banana aphid vector.
Anthracnose- Symptoms at the initial stages represent small circular black spots develop on the affected leaves. The skin of the fruit turns black and shrivels and becomes covered with characteristic pink acervuli. It affects the whole finger and later the disease spreads and affects the whole bunch. Its spread through conidia of the fungi and numerous insects which frequently visit banana flowers and also spread the disease	• Its effectively controlled by removal of decaying leaves and remaining floral parts and also avoid damage to the banana tissue during harvest, packaging and storage
Mango	
Powdery mildew. The characteristic symptom of the disease is the white superficial powdery fungal growth on leaves, stalks of panicles, flowers and young fruits. The fungus parasitizes young tissues of all parts of the inflorescence, leaves and fruits.	Apply well timed fungicide sprays.

Anthracnose The disease causes serious losses to young shoots, flowers and fruits It is also affects fruits during storage. The disease produces leaf spot, blossom blight, wither tip, twig blight and fruit rot symptoms.	Use of Monterrey Agri-Fos Systemic Fungicide. The dilution rate is two teaspoons per gallon of water. Spray the tree every 14 days during the blossom period, then monthly until harvest
3. Die back- The pathogen causing dieback, tip dieback, graft union blight, twig blight, seedling rot, wood stain, stem-end rot, black root rot, fruit rot, dry rot, brown rot of panicle etc. The disease is most conspicuous during October November. It is characterized by drying back of twigs from top downwards, particularly in older trees followed by drying of leaves which gives an appearance of fire scorch. Internal browning in wood tissue is observed when it is slit open along with the long axis.	Use of Monterrey Agri-Fos Systemic Fungicide. The dilution rate is two teaspoons per gallon of water.
Phoma blight- The symptoms of the disease are noticeable only on old leaves. Initially, the lesions are angular, minute, irregular, yellow to light brown, scattered over leaf lamina.	Spray copper oxychloride (0.3%) just after appearance of the first symptoms and subsequent spray at 20 day intervals Spay fungi side containing after initial appearance followed by 0.3% miltox at 20 day intervals
Bacterial canker- The disease is noticed on leaves, leaf stalks, stems, twigs, branches and fruits, initially producing water soaked lesions, later turning into typical canker.	Treatment of bacterial canker is generally mechanical, with the infected branches being removed using sterile pruning tools.
Red rust- Red rust disease, caused by an alga, has been observed in mango growing areas. The algal attack causes reduction in photosynthetic activity and defoliation of leaves thereby lowering vitality of the host plant. The disease can easily be recognized by the rusty red spots mainly on leaves and sometimes on petioles and bark of young twigs and is epiphytic in nature	Spray of Copper-oxychloride @ 0.3% (3 g/liter) may be done in the third or fourth week to control anthracnose and red rust.
Sooty Mould- The disease is common in the orchards where mealy bug, scale insect and hopper are not controlled efficiently. The disease in the field is recognized by the presence of a black velvety coating, i.e., sooty mould on the leaf surface. In severe cases the trees turn completely black due to the presence of mould over the entire surface of twigs and leaves	Control includes spraying or dusting for sucking insects, washing off sticky coatings of sap or honeydew on plant surfaces, and avoiding the wounding of plant
Mango Malformation- Vegetative malformation: Vegetative malformation is pronounced in young seedlings. The affected seedlings develop vegetative growths which are abnormal growth, swollen and have very short internodes.	Spraying of Planofix (200 ppm) during the first week of October followed by deblossoming at bud burst stage is recommended. Single foliar applications of 1,000 ppm cobalt sulphate prior to flower bud differentiation successfully reduce the floral malformation.

Floral malformation: The flower buds are transformed into vegetative buds and a large number of small leaves and stems, which are characterized by appreciably reduced internodes and give an appearance of witches‟ broom. The flower buds seldom open and remain dull green.	
Scab- The scab fungus attack leaves, panicles, blossoms, twigs, bark of stems and mango fruits. Spots are circular, slightly angular, elongated, 2-4 mm in diameter, brown but during rainy season, lesions differ in size, shape and colour.	By Use of Benomyl, the systemic benzimidazole fungicide Reduction of inoculum is also essential for control of this disease.
Avocado	
Armillaria Root Rot Armillaria is a soil-borne fungus that causes a root and trunk rot of avocado. Wilted, downward-hanging foliage is often the first obvious symptom of Armillaria root rot. Other symptoms include foliage yellowing, leaf drop, and dieback of upper limbs. During the rainy fall and winter, groups of short-lived mushrooms often grow around the base of Armillaria-infected tree	The disease can be managed by the consistent removal of dead trees and infected stumps
Avocado Black Streak. Avocado black streak appears after prolonged periods of environmental or cultural stress, especially conditions of high salinity and insufficient water.	Maintaining plant health with good fertilizer and irrigation practices, and preventing stress
Dothiorella Canker. Dothiorella canker can affect twigs and smaller branches	Prune out dead limbs and twigs, where pycnidia (spore-forming structures) and spores of the pathogen persist. Dispose of dead wood and old fruit well away from avocado trees. Prune and harvest only during dry conditions. Apply potassium phosphonate as soil drench, foliar spray, trunk paint, trunk injection (buffered) or with irrigation water.
Phytophthora Canker The disease kills the bark and outer sapwood tissues of trees and shrubs.	Application of Phosphorous acid
Tomatoes	
Fusarium wilt The pathogen that causes Fusarium wilt (Fusarium oxysporum) is generally more common in warm areas. Symptoms include drooping leaf stems. Sometimes an entire branch may wilt, often starting with the lower portion of the plant and then progressing upwards until the whole plant collapses	There are also several biological fungicidal drenches that can be applied to soil (look for one based on the bacteria Streptomyces griseoviridis called Mycostop this is the best for treating this disease
Late Blight Late blight is caused by a fungus, and it creates irregularly shaped splotches that are slimy and water-soaked. Often, the splotches occur	Organic fungicides based on Bacillus subtilis are used and effective in preventing and treating this tomato plant disease when it's first discovered in your farm.

on the top-most leaves and stems first. Eventually, entire stems "rot" on the vine, turning black and slimy. There may also be patches of white spores on the leaf undersides.	
• **Early Blight**. This common tomato plant disease appears as bulls-eye-shaped brown spots on the lower leaves of a plant. Often the tissue around the spots will turn yellow. Eventually, infected leaves will fall off the plant. In most cases, the tomatoes will continue to ripen, even as the disease symptoms progress up the plant.	Mulch plants with a layer of newspaper topped with untreated grass clippings, straw, leaf mold, or finished compost immediately after they are planted. This mulch forms a protective barrier, preventing the soil-dwelling spores from splashing up out of the soil and onto the plant.
• **Septoria Leaf spot** appearing as tiny, round splotches on the leaves, this tomato disease (Septoria lycopersici) typically starts on the lowest leaves first. The spots have dark brown edges and lighter centers, and there are usually many spots on each leaf. Infected leaves eventually turn yellow and then brown, and fall off.	Organic fungicides based on copper or Bacillus subtilis are effective against Septoria leaf spot, especially when used as a preventative or treatment measure.
Southern Bacteria Wilt. Southern bacterial wilt (Ralstonia solanacearum) is a tomato plant disease that spreads like wildfire. It's soil-borne, but the bacteria that cause this tomato disease can travel by soil, water, plant debris, and even on clothes, tools, and skin.	There is no cure for this disease. Once confirmed, immediately remove infected plants and discard them in the trash.
Leaf Mold The fungus *Passalora fulva* causes leaf mold. It is first observed on older leaves near the soil where air movement is poor and humidity is high. The initial symptoms are pale green or yellowish spots on the upper leaf surface, which enlarge and turn a distinctive yellow	Crop residue should be removed from the field. Staking and pruning to increase air circulation helps to control the disease. Space tomato plants further apart for better air circulation between plants. Avoid wetting leaves when watering. Rotate with vegetables other than tomatoes. Using a preventative fungicide program with chlorothalonil, mancozeb, or copper fungicide, can control the disease
Bacterial Spot This disease is caused by several species of the bacterium *Xanthomonas* (but primarily by *Xanthomonas perforans*), which infect green but not red tomatoes. Peppers are also infected. The disease is more prevalent during wet seasons. Damage to the plants includes leaf and fruit spots, which result in reduced yields, defoliation, and sunscalded fruit.	Only use certified disease-free seeds and plants. Avoid areas that were planted with peppers or tomatoes during the previous year. Avoid overhead watering by using drip or furrow irrigation. Remove and dispose of all diseased plant material. Prune plants to promote air circulation. Spraying with a copper fungicide will give fairly good control of the bacterial disease. Follow the instructions on the label. See Table 1 for fungicide products for home garden use.
Potatoes	

Early Blight Early blight on potato is caused by the fungal pathogen Alternaria solani. It can be found in all potato growing areas.	Fungicide programs are the most effective means to control the disease. Most protectant fungicides recommended for late blight also have efficacy against early blight. Spray as soon as symptoms appear. These must be applied approximately every 10 days.
Late Blight Late blight is a disease of great concern. The organism responsible for late blight, Phytopthora infestans (Mont.) de Bary, is known as the "plant destroyer." Late blight has the potential to be found anywhere potatoes are grown.	Contact fungicides have proven particularly useful by coating the leaves to prevent development of the pathogen. Use at labeled dose and at regular intervals. Systemic fungicides can be used with varied levels of success following infection. Fungicides selected after infection is detected must be strain dependent. Some strains have resistance to metalaxyl/mefanoxam. In situations where the strain remains unknown, use an alternate fungicide. Infected vines can be destroyed by herbicide or burning.
Common Scab Common scab is caused by Streptomyces scabies, S. acid scabies and S. turgid scabies s is a common soil-inhabiting bacterium. Common scab has also been called russet scab, erumpent scab, and pitted scab. Unlike other bacterial diseases, this pathogen is favored by warm weather.	The disease is controlled through the use of cultural practices and foliar fungicides. Rotation to a non-host crop, such as a small grain is helpful. Irrigation in cool, cloudy conditions should be avoided. Provide adequate fertilization. Fungicides are very efficient for controlling brown leaf spot. Use contact fungicides with broad-spectrum activity. Avoid strobilurin fungicides.
Brown Rot Brown rot or bacterial wilt is a serious seed- and soil-borne disease the pathogen can survive in the soil in temperate climates and can be spread via surface water.	Fungicides are very efficient for controlling brown leaf spot. Use contact fungicides with broad-spectrum activity. Avoid strobilurin fungicides.
Powdery Meldew Powdery mildew can be a disease of economic importance in irrigated and greenhouse settings. This disease is usually only a problem in arid and semi-arid climates, but can appear anywhere. Powdery mildew has an extremely wide host range, but the potato pathotype is host-specific. Powdery mildew of potato is caused by the fungus Erysiphae cichoracearum	Elemental sulfur applied as a dust or spray is sufficient to control the disease if treated before the pathogen is widespread. If the disease is widespread, there are multiple fungicides labeled for use. Be aware of temperature restrictions and spray intervals with the fungicide of choice.
Bacteria Ring rot Wilting stems and leaves; dying leaves; lower leaves wilting first; ring of creamy yellow to brown rot visible when tuber is cut crossways	Plant only certified seed potatoes - certified seed potatoes are grown in seed beds with zero tolerance of ring rot; remove all crop debris from soil after harvest; sanitize tools and equipment regularly.
Blackleg Small, water-soaked lesions on base of stems originating from seed piece; lesions may enlarge to form a large extended lesion stretching from base of stem to canopy; tissue becomes soft and water-soaked and can be lightly brown to inky black in color; wilted, curled leaves which have a soft and slimy texture when wet.	Plant seed pieces which are the product of tissue culture; sanitize tools and equipment when cutting seed pieced to prevent bacterial contamination; avoid damaging tubers during harvest; reduce periods of leaf wetness by allowing enough time for leaves to dry throughout the day after watering
Fungal Disease emergence favors poorly draining soil; poor aeration of soil and high temperatures;	Stressed plants are more susceptible to black dot; rotate crops away from potato; do not plant infested tubers or

disease symptoms are most severe in coarse soils that are low in nitrogen	seed pieces; fertilize and water plants adequately; protective fungicides can be applied where available
Grey mold Flowers covered in gray, fuzzy mold; wedge shaped tan lesions on leaves; a slimy brown rot may be present on stems, originating from the petiole; infected tubers have wrinkly skin and tissue underneath is soft and wet; tubers often develop a gray fuzzy growth	Cultural control is very important for managing the disease, provide plants with adequate fertilizer and water; application of appropriate protective fungicides where available can provide adequate control of disease but will not treat an established infection.
Pink rot Stunted plant growth; wilting leaves; dying leaves; marked tuber decay; dark brown eyes on tuber; cut tuber turns pink after 20-30 min air exposure, then turns brown and finally black	Plant potato in well-draining soils with no history of pink rot; avoid overwatering plants; avoid wounding during harvest.
Cashewnuts	
Powdery mildew	• Pesticide application is not practised in cashew fields. However, sprays of powdered kelp, potassium / sodium bicarbonate and sulphur provide good control of powdery mildew.
Anthracnosis	• Prune dead branches and twigs and remove from the field. They constitute the principal source of infection. • Though pesticide application on cashews is not practiced in East Africa, copper based fungicides are known to be effective against anthracnose.
Cashew stem girdler	• Once a year (in November or December) collect and burn all girdled branches should be collected and burned. Only the dead or dying part of the branch above the girdle needs to be collected.
Cashew nut weevil	• Cut away bark from damaged areas of lightly infested trees and kill the larvae and pupae underneath. Repeat this every month for a further six months if required. • Destroy severely infested trees. First collect and destroy all adult weevils; then fell the tree and remove the bark to expose all larval galleries; kill all larvae and pupa and burn the tree.
Coconut bug	• Conserve natural enemies. Weaver ants nest on cashew trees deterring and feeding on coconut bugs.
Helopeltis bugs	• Monitor the crop regularly. Helopeltis attack occurs very suddenly and great vigilance is very

	important to control this pest, particularly during the rainy season or when water is available leading to flushing (production of young shoots) when Helopeltis populations normally build up. • Conserve natural enemies. Weaver ants build nests on cashew trees providing good protection against this and other bug pests. • Do not interplant cashew with crops that are host for Helopeltis bugs, such as cotton, tea, sweet potato, guava and mango.
Mealybugs	• Conserve natural enemies. Mealybugs are usually controlled by a wide range of natural enemies. However, use of pesticides may kill these natural enemies leading to mealybug outbreaks.
Thrips	• Conserve natural enemies. Anthocorid bugs are important in natural control of thrips.

3.3 Proposed Pesticides For Use in NAVCDP

114) All pesticides used that will be used by the NAVCDP sub projects will be only those registered by the Pesticide Control Products Board (PCPD) and accessible through www.pcpb.co.ke. Table 4 7 and 4 8 below shows the list of agrochemicals that are banned or restricted in the country which will not be used by the sub projects.

11 Table 4 7. Banned Pesticides in Kenya

BANNED PESTICIDES IN KENYA			
	Common name	Use	Date Banned
1.	2,4,5 T (2,4,5 – Trichloro-phenoxybutyric acid)	Herbicide	1986
2.	Chlordane	Insecticide	1986
3.	Chlordimeform	Insecticide	1986
4.	DDT (Dichlorodiphenyl Trichloroethane)	Agriculture	1986
5.	Dibromochloropropane	Soil Fumigant	1986

6.	Endrin	Insecticide	1986
7.	Ethylene dibromide	Soil Fumigant	1986
8.	Heptachlor	Insecticide	1986
9.	Toxaphene (Camphechlor)	Insecticide	1986
10.	5 Isomers of Hexachlorocyclo-hexane (HCH)	Fungicide	1986
11.	Ethyl Parathion	Insecticide ; All formulations banned except for capsule suspensions	1988
12.	Methyl Parathion	Insecticide ; All formulations banned except for capsule suspensions	1988
13.	Captafol	Fungicide	1989
14.	Aldrin	Insecticide	2004
15.	Benomyl, Carbofuran, Thiram combinations	Dustable powder formulations containing a combination of Benomyl above 7%, Carbofuran above 10% and Thiram above 15%	2004
16.	Binapacryl	Miticide/Fumigant	2004
17.	Chlorobenzilate	Miticide	2004
18.	Dieldrin	Insecticide	2004
19.	Dinoseb and Dinoseb salts	Herbicide	2004
20.	DNOC and its salts (such as Ammonium Salt, Potassium salt & Sodium Salt)	Insecticide, Fungicide, Herbicide	2004
21.	Ethylene Dichloride	Fumigant	2004
22.	Ethylene Oxide	Fumigant	2004
23.	Fluoroacetamide	Rodenticide	2004
24.	Hexachlorobenzene (HCB)	Fungicide	2004
25.	Mercury Compounds	Fungicides, seed treatment	2004
26.	Pentachlorophenol	Herbicide	2004
	Phosphamidon	Insecticide, Soluble liquid formulations of the substance that exceed 1000g active ingredient/L	2004
27.	Monocrotophos	Insecticide/Acaricide	2009
28.	All Tributylin Compounds	All compounds including tributyltin oxide, tributyltin benzoate, trybutyltin	2009

		fluoride, trybutyltin lineoleate, tributyltin methacrylate, tributyltin naphthenate, tributylin chloride	
29.	Alachlor	Herbicide.	2011
30.	Aldicarb	Nematicide/Insecticide/Acaricide.	2011
	Endosulfan	Insecticide.	2011
31.	Lindane	Insecticide.	2011
	Phorate	Insecticide.	2020
	Carbofuran	Insecticide.	2019
	Trichlorfon	Insecticide.	2019
	Dicofol	Miticide	2021

Source: PCPB Kenya

12 Table 4 8. Restricted Pesticides in Kenya

SEVERELY RESTRICTED PESTICIDES IN KENYA

Common name	**Remarks**
Benomyl, Carbofuran/Thiram combinations	Dustable powder formulations containing a combination of Benomyl below 7%, Carbofuran below 10% and Thiram below 15%.
DDT (Dichlorodiphenyl trichloroethane)	Insecticide, restricted use to Public Health only for mosquito control for indoor residual spray by Ministry of Health. Banned for agricultural use.
Ethyl Parathion	Insecticide, capsule suspension formulations allowed in 1998.
Methyl parathion	Insecticide, capsule suspension formulations allowed in 1998.
Phosphamidon	Insecticide, Soluble liquid formulations of the substance that is below1000g active ingredient/L.

Source: PCPB Kenya

3.4 Environmental and Social Risks Associated with Pesticide Use in NAVCDP

115) This section describes the environmental and social risks associated with the use of pesticides in the Project activities and the proposed mitigation measures to address the negative impacts.

3.4.1 Impacts Occupational Health and Safety

116) The pesticide application personnel (storekeepers, applicators) will be exposed during transport, handling, measuring, pouring, spraying. Personnel may be further at risk when handling the concentrate pesticide, this is especially during filling and re-filling of knapsack spray kits. The exposure time of these personnel is directly related to the frequency of the activity. Exposure can also be due to deposits of pesticides

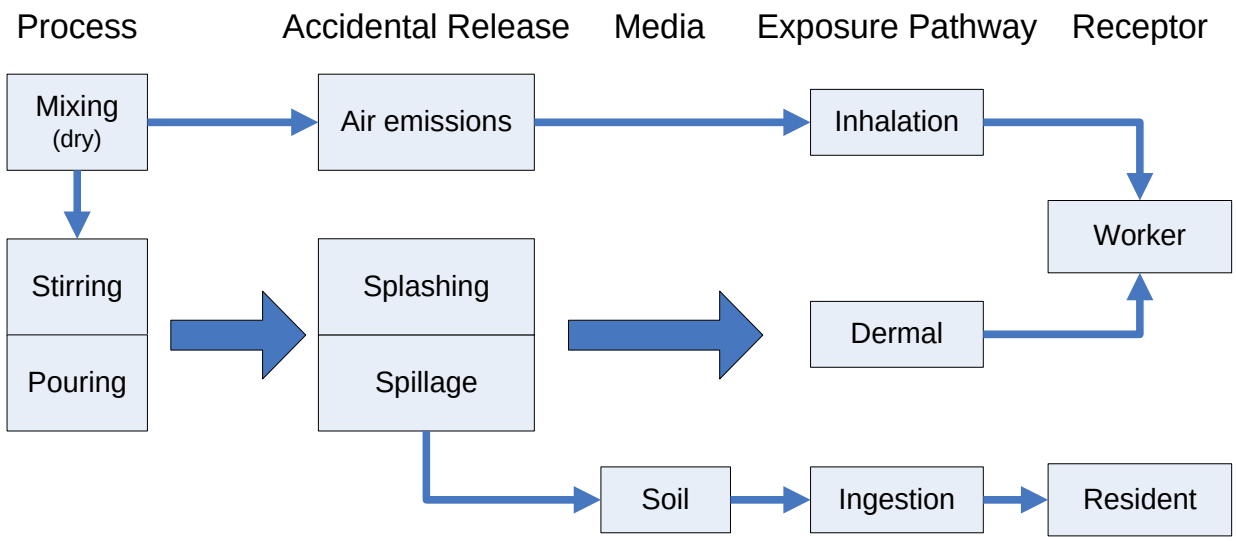
from spraying which is dependent on atmospheric factors like wind velocity and direction, temperature, relative humidity, and the likelihood of rain. Pesticides enter the body through various pathways:

- Ingestion/swallowing through the mouth, accidental or deliberate
- Dermal, through the skin when handling, measuring, and pouring
- Inhalation of small particles or dust when handling and spraying.

Pre-Application Exposure Pathway

117) Preparing pesticide solutions will involve in some cases pouring and mixing the pesticide in cans or other equipment to ensure ample mix with the water or other soluble matters. The process of mixing the pesticide can lead to exposures via inhalation, dermal contact, and incidental ingestion, mostly from releases of pesticide vapors, and solutions. Vapor releases can occur when liquid concentrated emulsions are diluted. Workers can inhale the vapors or the particulates or be exposed through dermal contact. Spills could also pose significant risk, especially for children who ingest the resulting residues that are left on surfaces such as floors. **Figure 4-1** below shows the possible modes of exposure during preparation of pesticides.

1 Figure 4 1. Conceptual Model for Possible Exposure Pathways from Preparation of Pesticide

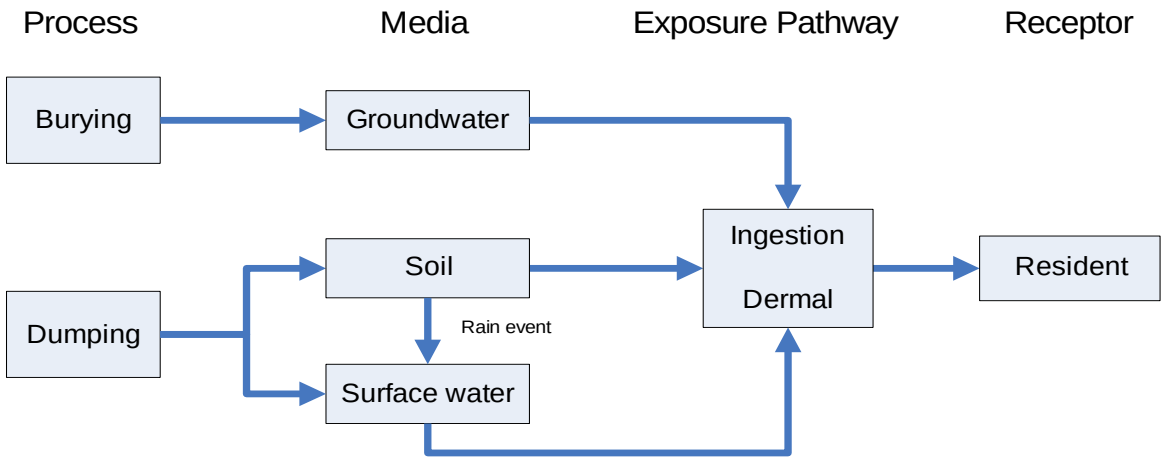


Application Exposure Pathway

118) Inhalation of aerosol vapors during spraying is the main process for worker exposure during pesticide application. Farmers, or pesticide handlers are mainly exposed through dermal contact with sprayed surfaces and incidental ingestion of pesticides. Leaky equipment can also lead to pesticide exposure through dermal contact and incidental ingestion by children who may come in contact with the spills before they are cleaned up.

Exposure during Disposal

119) Disposal is a key issue in any intervention that utilizes pesticides, especially during the decontamination process and disposal of the liquid effluent that will arise from washing and progressive rinse. Both burying and dumping can lead to dermal exposure to residents who come in contact with the soil or water in which the pesticide was disposed. Ingestion exposure can occur from drinking contaminated surface water. Once the excess formulation gets into the soil, the pesticide can reach the groundwater, which may be used as a water supply via household wells. Residents may then be exposed to this contaminated water by ingestion or by dermal contact when it is used for cleaning or drinking purposes.



2 Figure 4 2. Conceptual Model for Possible Exposure Pathways from Disposal of Pesticide Formulations

- Broad-brimmed hat/helmet
- Face shield or goggles (face shield preferable)
- Respirators-disposable and replaced on a daily basis
- 2 sets of cotton overalls per spray operator
- Nitrile rubber, neoprene, PVC or butyl rubber gloves, without inside lining, long enough to cover forearm and replaced if torn or if wear and tear is noticed
- Rubber boots

- Washing exposed parts of the body after work and before eating, smoking etc.
- No eating, smoking, and drinking while spraying
- Training on EPRP and awareness of the details of the pesticide Material Safety Data Sheets (MSDS) for all the operators, medical teams, transporters, storekeepers

120) The following drugs (see table 4 9) are recommended for use in case of exposure to the pesticides. The project should try and reach out to Ministry of Health and ensure

that all the health facilities around the project sites are stocked with these recommended drugs and that all the staff responsible receives training on emergency treatment to pesticide exposure.

13 Table 4 9. Drugs Recommended for Treatment of exposure

Name of drug	Active ingredients
Promethazine	Promethazine Hydrocloride
Panadol	Paracetamol
Diazepam	Benzodiazapine/Diazapam
Lorazepam	Lorazepam
Calamine cream	Calamine, zinc oxide, glycerol, phenol, purified water, sodium citrate, betonite,
Vit E	Tocopherol, fragrance, mineral oil, deionized water, sodium hydroxide, stearic acid
Hydrocortisone cream	1% hydrocortisone
Salbutamol	Salbutamol 100 mcg, suspended inert aerosol
Salbutamol tablets	Salbutamol sulphate 4 mg
Activated Charcoal	Activated Charcoal

121) All the pesticide applicators/farmers will receive detailed training on the emergency steps to take if accidental exposure of the chemical occurs through ingestion, eye or dermal contact with the chemical. This training will be conducted by NAVCDP in collaboration with existing health officers and will include of drills to test knowledge of the operators. The following are basic first aid procedure for which the NAVCDP/NPCU will train all the pesticide applicators as part of handling pesticide poisoning.

Follow the first aid instructions on the pesticide label. Take the pesticide can or label to the doctor or medical practitioner if seeking medical assistance.

For poison on skin:

- *Remove contaminated clothing and drench skin with water*
- *Cleanse skin and hair thoroughly with detergent and water*
- *Dry victim and wrap in blanket*

For chemical burns:

- *Remove contaminated clothing*
- *Wash with large amounts of running water*
- *Cover burned area immediately with loose, clean soft cloth*

- *Do NOT apply ointments, greases, powders or other medications to burn*

Poison in Eye:

- *Wash eye quickly but gently*
- *Hold eyelid open and wash with gentle stream of clean running water for 15 minutes or more*
- *Do NOT use chemicals or medicines in the water; they may worsen the injury*

Inhaled Poison:

- *Carry victim to fresh air immediately*
- *Open all windows and doors*
- *Loosen tight clothing*
- *Apply artificial respiration if the victim is not breathing or victim's skin is grey or blue. If the victim is in an enclosed area, do not enter without proper protective clothing and equipment. If proper protection is not available, call for emergency equipment from your fire department.*

Poison in mouth or swallowed:

- *Rinse mouth with plenty of water.*
- *Give victim large amounts (up to 1 litre) of milk or water to drink.*
- *Induce vomiting only if the pesticide label instructs you to do so.*

3.4.2 Impacts on Non-Target Organism

122) Pesticides are by their nature bio-poisons and whereas they are beneficial against pests (targets) their use may inadvertently harm other organisms (non-targets) leading to significant biodiversity losses. Loss of biodiversity makes ecosystems more vulnerable to changes in the environment, with lower genetic diversity and fewer species to support fundamental ecosystem functions such as pollination. All but the biologically based pesticides being recommended are broad spectrum in effect, thus will have negative impacts on beneficial arthropods in the case of insect and mite pests. Insecticides can also kill herbivorous arthropods feeding on weeds. Bees pollinate a number of crops that are not only sensitive when flying but also can carry contaminated pollen and nectar to the hive potentially killing off the whole colony.

123) The hazard to non-target organisms is dependent upon a pesticide's acute and chronic toxicity, and is also a function of the rate at which the pesticide breaks down (half-life) under various scenarios (aqueous or in-soil, UV exposure, etc.) in the environment. In addition, many pesticides break down to toxic daughter products that have their own half-life. Impacts to fish and other aquatic animals may be reduced through prevention of contamination to waterways and bodies. Care must be exercised with raw material, formulated product, wash waters, and used containers or other

wastes. Properly located, constructed and maintained soak pits should be utilized for washing down PPE and application equipment in order to avoid runoff to water bodies. Choice of toxicity class III and IV pesticides will pose less danger than class I and II, which are not being recommended.

124) The potential NAVCDP pesticides' toxicity details are discussed below and indicate known toxicity to fish and bees. Impacts to fish and other aquatic animals may be reduced through prevention of contamination to ponds, waterways, and drains with raw material, formulated product, wash waters, or used containers.

Summary of Toxicity of pesticides to Avifauna, Aquatic life, mammals and insects by Class;-

Pyrethroids

- All pyrethroids are highly toxic to bees and highly toxic to fish and other aquatic organisms, except deltamethrin, which has low toxicity to other aquatic organisms.
- Birds are least affected by bifenthrin (low to medium toxicity). All other pyrethroids have very low toxicity to birds.
- Pyrethroids are highly toxic to mammals. bifenthrin, has low to medium toxicity.
- In terms of persistency in the environment, only bifenthrin is persistent. The rest of the pyrethroids have low to medium persistency.
- Bifenthrin does not accumulate in the environment. There is potential for bioaccumulation in aquatic organisms for other pyrethroids.

Carbamates

- Carbamates are highly toxic to bees.
- In addition to other aquatic organisms they are also highly toxic to mammals and birds. Acute symptoms of propoxur poisoning in birds include eye tearing, salivation, muscle in coordination, diarrhoea, and trembling. Depending on the type of bird, poisoning signs can appear within 5 minutes of exposure, with deaths occurring between 5 and 45 minutes, or overnight. On the other hand, this insecticide has very low toxic properties on fish.
- In general, carbamates have low to medium indications for persistency in the environment and bioaccumulation in organisms

Organophosphates

- Organophosphates have different characteristics and impacts on different organisms depending on the type of insecticide.
- Fenitrothion has low toxicity on mammals and fish and is not persistent in the environment. However, it is highly toxic to bees, birds and other aquatic organisms, like crustaceans and aquatic insects and has a medium toxicity to aquatic worms. It has moderate to medium potential to bio accumulate in organisms.
- Malathion is only highly toxic to bees. It has very low impacts on fish and other aquatic organism and has very low potential to persist in the environment or bio-accumulate in organisms. It shows low to medium toxicity on mammals and birds.
- Pirimiphos-methyl is highly toxic to fish and other aquatic organisms and has a high potential to persist in the environment. It has low to medium toxic effects on mammals and bees. It does not bio-accumulate in organisms.

125) Table 4 10 below illustrates the degree of toxicity of selected pesticide classes to birdlife, aquatic life and bees, and includes the degree of persistence in the environment and potential for bioaccumulation.

14 **Table 4 10. Pesticide Toxicity**

Pesticide	Mammal	Bird	Fish	Other Aquatic	Bee	Persistence	Bioaccumulate1
Pyrethroids							
Carbamates							
Organophosphates							

Source: IVM PEA

[1] Bioaccumulation in the environment, not in mammalian bodies (mammalian detoxification produces different results).

[2] Low toxicity, but high chronic or bioaccumulation effect on raptors, pelicans.

Key	
High Toxicity	
Medium to High Toxicity	
Medium Toxicity	
Low to Medium Toxicity	
Low Toxicity	
Data Not Found	

Mitigation measures

- Avoidance of agro-ecological areas and regions with critical habitats and livelihoods through mapping of spray areas prior to spraying.
- Judicious choice of pesticides which includes selection and use of bio-pesticides in/near potentially sensitive areas.
- Optimum calibration of spraying equipment to reduce excess application of pesticide
- Proper disposal of used containers or other wastes in accordance with FAO Container Disposal Guidelines
- Establishment of soak pits for effluent wastes disposal
- Warnings must be given in ample time to beekeepers, owners of adjacent crops, livestock owners and those responsible for nearby environmentally sensitive sites.Proper timimg of spraying to avoid pesticides moving to undesired destinations.

3.4.3 Impacts on Ecologically Sensitive Environments

126) Application of pesticides are likely to contaminate ecologically sensitive environments including surface water bodies, wetlands, pasture land and therefore impacting on the aquatic and terrestrial life as well as livelihoods of communities dependent on the resources as sources of food and ecosystem services.

Mitigation Measures

127) The management measures will strictly adhere to FAO guidelines, WBG WHS general guidleines and Kenya's regulations as illustrated in table below.

15 **Table 4 11. Ecologically and Agronomically Sensitive Areas and their Management Measures**

Ecologically and agronomically sensitive areas	Management Measures
National parks; nature reserves; internationally protected areas (Map 2)	No spraying in these ecosystems
Important (inland) fisheries areas; mangrove forests	No spraying in these ecosystems
Important fruit-growing areas; beekeeping areas	No pesticide applications during flowering of fruit trees; only pesticides with very low hazard to bees; set up information system to warn beekeepers of upcoming treatments.
Areas with export crop or livestock production	Only pesticide that do not pose problems with export maximum residue limits
Areas with organic farming	Only low hazard pesticide

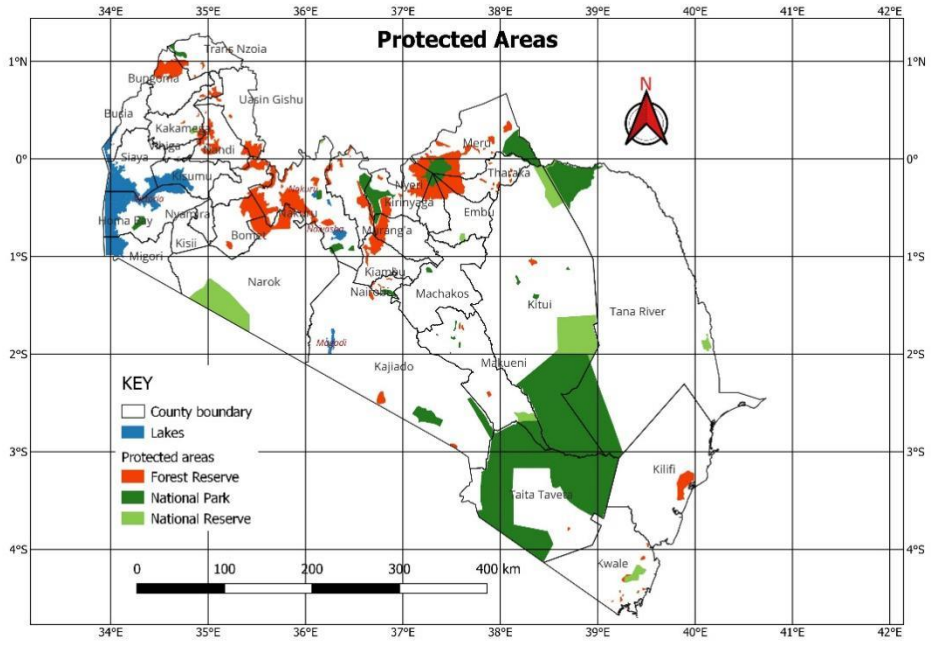


Figure 3 1: Landuse systems in the project area

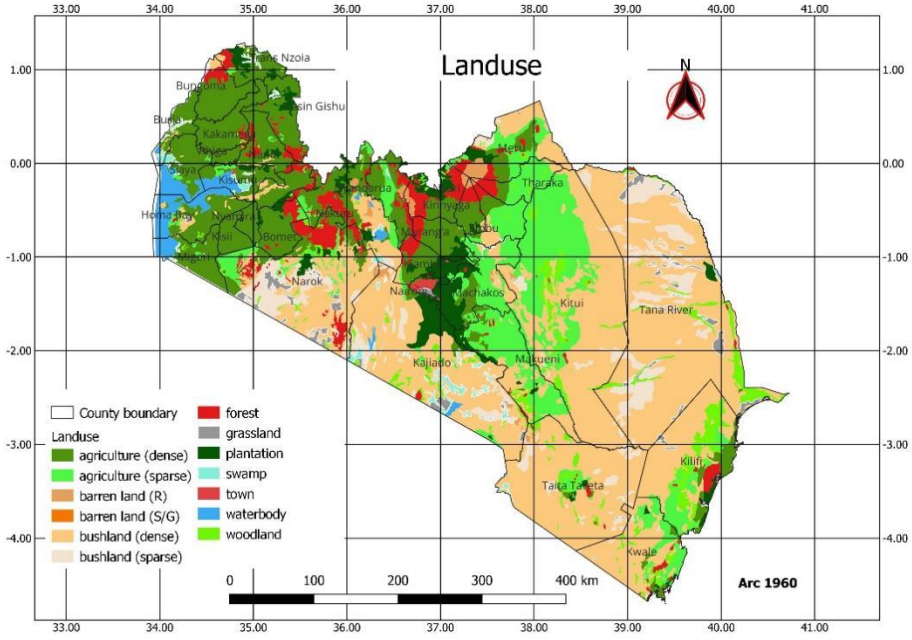


Figure 3 2: Landuse systems in the project area

Storage and Store Siting Impacts

128) Poor pesticide storage facilities could lead to exposure and contamination of the bio-physical environment as well as human health risks due to contact. Pesticides should be stored in a secure and well-ventilated dedicated store away from flammable liquids and any ignition source. Proper pesticide storage and inventory (stock control) practices makes it easier to track pesticide use and avoid overstocking which leads to disposal challenges and obsolete stocks.

129) It also lowers the risk of chemical fires, explosions, or spills that contaminate surface water, ground water and soil. The storage requirements should be as detailed in the safety data sheet and the labels. Since pest outbreaks are erratic and difficult to predict, there is a danger that more pesticides than needed may be ordered leading to stockpiles. Stocks of obsolete pesticides pose a serious health and environmental problem. To avoid theft and unauthorized access to the pesticides, the areas should be well secured and guarded, and accessed by one main entrance and an emergency exit.

130) The store facilities should be located away from water sources to avoid contamination by accidental spills. Storage building construction should comply with local codes. The areas where the stores are sited should not be prone to floods and should be lifted from the ground level to avoid storm run-off passing through the store. The store should be adequately ventilated either mechanically or naturally to ensure there are no dead-air spaces in the store.

Mitigation Measures

- All primary pesticide storage facilities will be double-padlocked and guarded
- All the storage facilities will be located away from nearby watercourses, domestic wells, markets, schools, hospitals etc.
- Soap and clean water will be available at all times in all the facilities
- A trained storekeeper will be hired to manage each facility
- Recommended pesticide stacking position and height in the warehouse as provided in the FAO Storage and Stock Control Manual will be followed
- All the warehouses will have at least two exit access routes in case of fire outbreak
- A fire extinguisher will be available in the storage facilities and all workers will be trained on how to use the available firefighting facilities.
- Warning notices will be placed outside of the store in both English and the local language(s) with a hazard symbol (skull and crossbones sign), and also a caution symbol against unauthorized entry
- All pesticides will be used and any remnants will be stored under lock and key until the next round of application.

- Application of First In/First Out (FIFO) approach in pesticide distribution will be practiced avoiding accumulation of expired pesticides
- Storage facilities are accessed by authorized personnel only
- Pesticide stacking position and height in the warehouse is followed
- The central warehouses have more than 3 exit access routes in case of fire outbreak.
- Develop and implement Occupational Health and Safety Plan for addressing impacts of exposure on store operational staff including among others; provision of PPEs, and training on use of PPEs, use of fire extinguishers
- Develop and implement EPRP at the stores including provision of training on emergency response by the store management team.

3.4.4 Solid Waste Impacts

131) Empty pesticide containers, used PPEs and cleaning materials are still considered toxic under the Basel Convention and therefore require disposal to conform to toxic waste disposal regimes. Standard procedure for solid waste disposal (includes among others empty containers, torn gloves, broken barrels) are included as Annex A.

132) The pesticide waste includes used safety equipment, used protective clothing, material used to absorb spills, pesticide containers, obsolete pesticides etc. The sources of waste for pesticides include:

- Caking due to poor methods of storage.
- Unidentifiable products due to lack of labels.
- Expired products
- Contaminated items (soils, clothing etc.).
- Empty pesticide containers.

133) Unless these wastes are managed correctly, they are hazardous and present a risk to communities as well as the bio-physical environment if contact and exposure is made. There is a danger that empty containers could be re-used for instance in the storing food and water, which could result in pesticide poisonings (FAO/WHO, 2008). Containers abandoned in the environment can lead to pesticide pollution in soil and groundwater. Empty pesticide containers and small quantities of unused or unwanted pesticides constitute hazardous waste and mechanisms need to be put in place to facilitate sound management of this waste. These mechanisms should be compliant with FAO guidelines (FAO, 1999). The mechanisms ensure that:

- Containers are decontaminated directly following the use of their contents by a triple rinse;
- Inappropriate use of the empty containers is prevented;
- Containers are then punctured to avoid re-use and stored awaiting disposal by an approved waste handler.

134) To avoid the accidental exposure of pesticides to both people and environment, the following mitigation measures are recommended:

Mitigation Measures

- Development and implement of Waste Management Plan-A Waste Management Plan has been developed as an annex A to the framework level IPMP and will be used as reference when developing sub project specific Waste Management Plans before pesticide application activities commence.
- Adopt FAO Guidelines on Management Options for Empty Pesticide Containers).
- Provide training on waste management including container disposal methods to farmers
- Implement the **Triple Rinse** approach to decontaminating the containers. Before storage and subsequent disposal, the containers must be rinsed thoroughly, and wash water emptied back to the spraying or mixing tanks. Empty pesticide containers should be triple rinsed, punctured and disposed of in an environmentally sound manner in compliance with FAO guidance.
- Empty containers must NOT be re-used
- Ensuring adequate pesticide shelf-life prior to purchase to avoid obsoleteness.
- Put in place a tracking mechanism to ensure safe final disposal of the pesticide's containers.

3.4.5 Effluent Waste Impacts

135) The pesticide effluent waste includes surplus diluted spray solution, rinsate among others.

136) Unless these wastes are managed correctly, they are hazardous to both mankind and the environment. Contaminated effluent wastes could have adverse impacts on the communities and bio-physical environment as a result of exposure. The following mitigation measures are recommended:

Mitigation Measures

- Development of Waste Management Plan- A Waste Management Plan has been developed as an annex to the framework level IPMP and will be used as reference when developing spay area specific Waste Management Plans.
- Adopt FAO guidelines for disposal of pesticide wastes
- Provide training on waste management including disposal methods of effluent wastes (rinsate) to all spray teams
- Rinsate and wash water should be emptied back to the spraying or mixing tanks

3.4.6 Community Health and Safety

137) No segment of the population is completely protected against exposure to pesticides and the potentially serious health effects, especially to high risk groups (WHO, 1990). Members of the public, not directly involved with the spray operation, may also be affected by pesticide application so the MoALD may have a mandatory obligation to issue "prior warnings" to any person or organization that might be affected or concerned. People exposed to pesticides may suffer short-term acute health effects such as nausea, headaches, sore eyes, skin rashes and dizziness (FAO, 2008)

Mitigation Measures

- Develop and implement Stakeholder Engagement Plan (SEP) to guide engagement activities with the communities. A SEP has been developed for the project.
- Develop and implement Grievance Management (GM). A GM has been developed for the project and is described in the ESMF.
- Warnings must be given in ample time to beekeepers, owners of adjacent crops, livestock owners and those responsible for nearby environmentally sensitive sites.
- Citizen engagement, community empowerment, mobilization and participation will be critical to developing community-led responses that will address immediate concerns and build resilience going forward. These have been illustrated in Table 2 1.
- Ensure that the project executers and host community are able to address the grievances on access and equity within the agreed GM.
- Public awareness (communications) campaigns will keep the public informed about possible environmental and health effects of pesticides.
- Due to COVID-19 pandemic, World Bank has developed guidance note for consultations i.e. Technical Note: Public Consultations and Stakeholder Engagement in WB-supported operations when there are constraints on conducting public meetings March 20, 2020. Consultations and engagement during project implementation will adopt the guidelines in the technical note.
- Adhere to the GoK's Ministry of Health protocols on COVID-19

3.4.7 Accidental Release of Pesticides

138) Accidental releases may occur during transportation, storage, handling, and application of pesticides hence categorized as unplanned events. If such spillage occurs, this may result in a fire (pesticides are flammable), injury to humans and livestock (exposure), contamination of (receptors like water, flora, soils) and risks to fauna (exposure). Prompt informed and rapid action must follow the accident to contain and minimize any adverse effects.

Mitigation Measures

- An EPRP has been developed as part of this framework IPMP-annex B and will be referenced when developing sub project specific EPRPs to manage accidental spills during transportation or application.

- Training on EPRP and awareness of the details of the pesticide MSDS for all the operators, medical teams, transporters, storekeepers, and field control team
- Develop and implement Waste Management Plan for management of pesticide wastes including obsolete pesticides (A waste Management Plan has been developed as part of the framework level IPMP and will be used to prepare spray areas specific waste management plans)
- Engagement with local health facilities to support community and project staff in cases of exposure
- Pesticide transporters and users must be trained and be familiar with recommendations detailed on the product Material Safety Data Sheet and procedures to be followed.
- Records must be kept of all incidents and remedial action taken.
- Training on EPRP and awareness of the details of the pesticide MSDS for all the operators, medical teams, transporters, storekeepers and field control team
- Chemical stores must be kept secure at all times. Proper storage of pesticides in accordance with FAO guidelines (Guidelines on retail distribution of pesticides with particular reference to storage and handling at the point of supply to users in developing countries) should be ensured for all supplies.
- Use of PPE by spray teams and storekeepers

3.5 Integrated Pest Management Plan

Mitigation Measures

139) An Occupational Health and Safety Plan should be developed for each sub project/spray operation as part of the sub project IPMP. Prior to conducting spray operations, once a spray area/activity has been identified and mapped, the CPCU (with the guidance of the County Environmental Safeguards Officer) will be required to prepare sub project IPMP which will include OHS plan.

- Implement Emergency Preparedness and Response Plan which is part of this framework IPMP. For each sub project operation, a spray specific Emergency Preparedness and Response Plan (EPRP) will be prepared as part of the IPMP.
- Use of appropriate Personal Protective Equipment (PPE) that will prevent penetration of the pesticide. Personnel must use a respirator/fresh-air mask. These PPEs will be replaced frequently whenever wear and tear is identified or reported. Below are the PPE to be provided and as guided by WHO and FAO guidelines for PPE in pesticide application.

3.5.1 Pre-Spray Phase

16 Pre-spray potential impacts have been listed in Table 4 12 below.

Table 4 12. Pre-Spray Phase Potential Impacts

PRE-SPRAY PHASE POTENTIAL IMPACTS		
IMPACT/ISSUES	**MITIGATION MEASURES**	**RESPONSIBLE PARTY**
Accidental spills of pesticides during road transportation to warehouse.	▪ Ensure that the drivers identified to haul the pesticide to the spray sites are well trained on adherence to road safety procedures and to the FAO standards and guidelines for the storage and transport of pesticides. ▪ Ensure that only road worthy vehicles are selected for the transportation with qualified drivers.	▪ MoALD/NPCU ▪ CPCU
Possible environmental contamination caused by warehouse exposure due to poor siting of warehouses, pilferage and vermin attack of the stored pesticides before spraying.	▪ Ensure the selected warehouse is sited away from a flood plain area, water course, wells, schools, markets.	▪ MoALD/NPCU ▪ CPCU
	▪ Secure the selected warehouse and apply all the guidelines for Storage and Stock Control manual by FAO.	▪ MoALD/NPCU ▪ CPCU
Accidental fires and injuries in the warehouses	▪ All warehouses must be equipped with a fire extinguisher, thermometer, exit doors and warning signs, and proper stacking position and height as stipulated in the FAO Storage and Stock Control Manual.	▪ MoALD/NPCU ▪ CPCU
	▪ All the workers handling pesticides or other products and equipment in the storage facilities must all have PPE including goggles, gloves, boots, overall, dust masks etc.	▪ MoALD/NPCU ▪ CPCU
	▪ All spray operators/farmers and store managers must be trained on how to operate the fire extinguishers and what to do in case of fire outbreaks.	▪ MoALD/NPCU ▪ CPCU

	▪ Develop Emergency Preparedness and Response Plan	

3.5.2 Spray Phase

140) Potential impacts during the spraying phase is listed in Table 4 13 below

Table 4 13. Potential impacts and mitigation during spraying phase

SPRAY PHASE POTENTIAL IMPACTS AND MITIGATION			
IMPACT TYPE	**IMPACT/ISSUES**	**MITIGATION MEASURES**	**RESPONSIBLE PARTY**
Occupational Health and Safety Impacts	Spray operators/farmers, drivers, storekeepers' exposure due to negligence, lack of PPEs, or un-intentional exposure caused by accidents or limited pesticide knowledge.	▪ Ensure PPEs provided to all the workers, receive adequate training on a regular basis on the proper use of PPE. ▪ Train the team leaders, sprayers, supervisors and storekeepers on emergency procedures to take if exposure occurs accidentally ▪ Prohibition of eating, drinking and smoking during work; ▪ Ensure that only road worthy vehicles are selected for the transportation with qualified drivers. ▪ Training on EPRP and awareness of the details of the pesticide Safety Data Sheets ▪ Training on purpose and properties of the pesticides ▪ Training on security issues, including implications of the pesticides getting into the wrong hands. ▪ Training on steps to take in case of an accident or emergency (according to FAO standards) ▪ Training on handling vehicle contamination	▪ MoALD/NPCU ▪ CPCU
Surface Water Contamination	Contamination of surface water bodies directly or indirectly through runoff from soil. Impact on the aquatic life as well as community livelihoods.	▪ Avoidance of areas or regions with surface water bodies that are critical to habitats and livelihoods through mapping of spray areas prior to spraying (screening). ▪ Optimum calibration of spraying equipment to reduce excess application of pesticide.	▪ MoALD/NPCU ▪ CPCU

SPRAY PHASE POTENTIAL IMPACTS AND MITIGATION			
IMPACT TYPE	**IMPACT/ISSUES**	**MITIGATION MEASURES**	**RESPONSIBLE PARTY**
	Possible release of the pesticides into the water bodies from accidental spills during the transportation, application of the pesticides.	■ Implementing EPRP to manage accidental spills during transportation or application. ■ Pesticide applicators will never wash themselves, their overalls, or their PPE in any water bodies, or where wash water will drain to water bodies.	
Soil and Ground Water Contamination	Pesticides can cause beneficial soil microorganisms to decline thereby affecting soil quality. Contamination of soil during the disposal of containers. Contamination of soil is detrimental to food security as it impacts directly on agriculture.	■ Avoidance of agro-ecological areas and regions with surface water bodies that are critical to habitats and livelihoods through mapping of spray areas prior to spraying (screening). ■ Optimum calibration of spraying equipment to reduce excess application of pesticide ■ Calibration of sprayer nozzles to ensure only required amounts of pesticide are released ■ Implement EPRP to manage accidental spills during transportation or application ■ Proper management and disposal of obsolete pesticides ■ Proper disposal of pesticide containers	■ MoALD/NPCU ■ CPCU
Impacts on ecological sensitive habitats	Application of pesticides can create a potential risk of polluting ecologically sensitive habitats such as wetlands, National parks reserves, forests, pasture grasslands, and water bodies.	■ Avoidance of sensitive habitats and livelihoods through mapping of spray areas prior to spraying (screening). ■ Judicious choice of pesticides (i.e. Bio pesticides could be used in/near potentially sensitive areas instead of fenitrothion pesticides). ■ Optimum calibration of spraying equipment to reduce excess application of pesticide ■ Carrying out environmental monitoring	■ MoALD/NPCU ■ CPCU
Solid Waste Impacts	Empty pesticide containers and used PPEs are considered toxic under the Basel	■ Develop Waste Management Plans ■ Provide training on waste management including container disposal methods to all spray teams	■ MoALD/NPCU ■ CPCU

SPRAY PHASE POTENTIAL IMPACTS AND MITIGATION			
IMPACT TYPE	**IMPACT/ISSUES**	**MITIGATION MEASURES**	**RESPONSIBLE PARTY**
	Convention and therefore require disposal to conform to toxic waste disposal regimes.	■ Implement the Triple Rinse approach to decontaminate the containers. Before puncturing and disposal in compliance with FAO guidance ■ Empty containers must NOT be re-used ■ Ensuring adequate pesticide shelf-life prior to purchase to avoid obsoleteness. The remaining shelf-life of procured pesticides should be at sufficient to permit all stock to be used before expiry and within the scope of the project. ■ Establishing a tracking system for solids wastes (containers) etc. where all containers must be returned to the store and accounted for. ■ Establishing stores for holding empty containers prior to collection and disposal. ■ Ministry to have container crusher on specific field location to enable the crushing of the containers on site	
Effluent Waste Impacts	The pesticide effluent waste includes surplus diluted spray solution, rinsate among others. These are hazardous to both mankind and the environment. Contaminated effluent wastes could have adverse impacts on the communities and bio-physical environment.	■ Rinsate and wash water should be emptied back to the spraying or mixing tanks ■ Establish soak pits (with charcoal to filter, adsorb and retain the pesticides)	■ MoALD/NPCU ■ CPCU ■ Spray Applicators
Community Health and Safety	Communities exposed to pesticides may suffer short-term	■ Use biopesticides in areas where apiaries are located instead of synthetic pesticides	■ MoALD/NPCU ■ CPCU

SPRAY PHASE POTENTIAL IMPACTS AND MITIGATION			
IMPACT TYPE	**IMPACT/ISSUES**	**MITIGATION MEASURES**	**RESPONSIBLE PARTY**
	acute health effects such as nausea, headaches, sore eyes, skin rashes and dizziness.	■ Have regular public interaction forums, paying particular attention to the needs of persons with disabilities, indigenous persons and other members of vulnerable groups, where communities in areas which have been treated with the pesticides are informed in a language and communications medium they understand, and which is accessible to them about: ▪ How to safely navigate pesticide effects on plants, livestock, and water systems ▪ Follow the timelines after spraying of crops for harvesting and selling or consuming ▪ Follow timelines for milking dariy cows after spraying and for slaughter ▪ Dangers of reusing empty containers ■ Ensure that the project executers and host community are able to address the grievances on access and equity within the agreed GM. ■ Public awareness (communications) campaigns will keep the public informed about possible environmental and health effects of pesticides. ■ Ensuring treatment medicines for pesticide exposure are available ■ Ensure first Aid kits are available in the storage facilities and the transport vehicles	
Accidental Release of Pesticides	If such spillage occurs, this may result in a fire (pesticides are flammable), injury to humans and livestock	■ Only vehicles correctly equipped to carry pesticides must be used for transportation. ■ Pesticide transporters and users must be trained and be familiar with recommendations detailed on the	■ MoALD/NPCU ■ CPCU

SPRAY PHASE POTENTIAL IMPACTS AND MITIGATION			
IMPACT TYPE	**IMPACT/ISSUES**	**MITIGATION MEASURES**	**RESPONSIBLE PARTY**
	(exposure), contamination of (receptors like water, flora, soils) and risks to fauna (exposure).	product Material Safety Data Sheet and procedures to be followed. ■ Preparation of an EPRP which has details of all appropriate authorities that must be notified (Environment, Water, Police, Fire Department etc.) ■ Records must be kept of all incidents and remedial action taken. ■ Training on EPRP and awareness of the details of the pesticide MSDS for all the operators, medical teams, transporters, storekeepers and field control team ■ Absorbent material to contain chemical spills must be available. ■ Chemical stores must be kept secure at all times. Proper storage of pesticides in accordance with FAO guidelines should be ensured for all supplies. ■ Appropriate fire extinguishers must be provided for all locations where substantial quantities of pesticide are transported, stored or mixed. ■ Use of PPE by spray teams and storekeepers	
Livelihood and Food Security Impacts	Pesticide can poison aquatic resources if they find their way into ecosystems. The contamination pathways are through surface run offs, deposit on off target organisms, bioaccumulation also builds the contamination in the animals through their feeding pathways and water intake.	■ Avoidance of agro-ecological areas and regions with that are critical to habitats and livelihoods through mapping of spray areas prior to spraying (screening). Do not spray in protectd areas. ■ Judicious choice of pesticides which includes choice of using biopesticides in/near potentially sensitive areas (water bodies, pastureland, protected areas) etc. ■ Warnings must be given in ample time to beekeepers, owners of adjacent crops, livestock owners and those responsible for nearby environmentally sensitive sites. ■ Optimum calibration of spraying equipment to reduce excess application of pesticide	■ MoALD/NPCU ■ CPCU

SPRAY PHASE POTENTIAL IMPACTS AND MITIGATION			
IMPACT TYPE	**IMPACT/ISSUES**	**MITIGATION MEASURES**	**RESPONSIBLE PARTY**
		■ Have regular public interaction forums, paying particular attention to the needs of persons with disabilities, indigenous persons and other members of vulnerable groups, where communities in areas which have been treated with the pesticides. are informed in a language and communications medium they understand, and which is accessible to them about: ○ How to safely navigate pesticide effects on plants, livestock, and water systems ○ Follow the timelines after spraying of crops for harvesting and selling or consuming ○ Follow timelines for milking dariy cows after spraying and for slaughter ○ Dangers of reusing empty containers ■ Ensure that the project executers and host community are able to address the grievances on access and equity within the agreed GM. ■ Public awareness (communications) campaigns will keep the public informed about possible environmental and health effects of pesticides, before.	
Impacts to Birds, Fishes, and Other Organisms	Pesticide application can have an impact on organisms other than the target pest. Loss of biodiversity makes ecosystems more vulnerable to changes in the environment.	■ Avoidance of agro-ecological areas and regions with critical to habitats and livelihoods through mapping of spray areas prior to spraying (screening). ■ Judicious choice of pesticides which includes selection and use of bio-pesticides in/near potentially sensitive areas.	■ MoALD/NPCU ■ CPCU

SPRAY PHASE POTENTIAL IMPACTS AND MITIGATION			
IMPACT TYPE	**IMPACT/ISSUES**	**MITIGATION MEASURES**	**RESPONSIBLE PARTY**
		■ Optimum calibration of spraying equipment to reduce excess application of pesticide ■ Proper disposal of used containers or other wastes in accordance with FAO Container Disposal Guidelines ■ Establishment of soak pits for effluent wastes disposal ■ Warnings must be given in ample time to beekeepers, owners of adjacent crops, livestock owners and those responsible for nearby environmentally sensitive sites.	
Storage and Store Siting	Poor siting and design of pesticide storage facilities could lead to exposure and contamination of the bio-physical environment as well as human health risks due to contact. Pesticides should be received and recorded, before storing in a secure and well-ventilated dedicated store away from stores of flammable liquids and any ignition source. The store facilities should be located away from water sources to avoid contamination by accidental spills. Storage building construction should comply with local codes.	■ All primary pesticide storage facilities will be double-padlocked and guarded ■ All the storage facilities will be located away from nearby watercourses, domestic wells, markets, schools, hospitals etc. ■ Soap and clean water will be available at all times in all the facilities ■ A trained storekeeper will be hired to manage each facility on store inventory ■ Recommended pesticide stacking position and height in the warehouse as provided in the FAO Storage and Stock Control Manual will be followed ■ All the warehouses will have at least two exit access routes in case of fire outbreak ■ A fire extinguisher will be available in the storage facilities and all workers will be trained on how to use the available firefighting facilities. ■ Warning notices will be placed outside of the store in both English and the local language(s) with a hazard symbol (skull and crossbones sign), and also a caution symbol against unauthorized entry	■ MoALD/NPCU ■ CPCU

SPRAY PHASE POTENTIAL IMPACTS AND MITIGATION			
IMPACT TYPE	**IMPACT/ISSUES**	**MITIGATION MEASURES**	**RESPONSIBLE PARTY**
	The areas where the stores are sited should not be prone to floods and should be lifted from the ground level to avoid storm run-off passing through the store. The store should be adequately ventilated either mechanically or naturally to ensure there are no dead-air spaces in the store.	■ All pesticides will be used and any remnants will be stored under lock and key until the next round of application. ■ Application of FIFO) approach in pesticide distribution will be practiced avoiding accumulation of expired pesticides ■ Storage facilities are accessed by authorized personnel only ■ Pesticide stacking position and height in the warehouse is followed ■ The central warehouses have more than 3 exit access routes in case of fire outbreak	
Pilferage of Pesticides	Pesticides falling in the wrong hands due to pilfering have potential for exposure.	■ Maintenance of record of all the stock coming in and out of the storage facilities so that all the stock can be traced accordingly. This is a mechanism aimed at preventing pilferage of pesticides. ■ Pesticide products should always be kept in a secured storage area that is accessible only to those who are trained to use these products, such as storekeepers and licensed applicators. ■ Pesticides should be kept securely and contained during transport and storage to reduce theft, vandalism, or the possible misuse of products. ■ If pesticides are vandalized or stolen, call the police at once, so they can put it on record. ■ Report the incident to the PCPB regulatory body. ■ All the storekeepers and managers will be trained on sound store keeping practices and procedures. ■ The trainings will be organized through the auspices of the PCPB	■ MoALD/NPCU ■ CPCU ■ Store Managers ■ Pesticide Applicators

SPRAY PHASE POTENTIAL IMPACTS AND MITIGATION			
IMPACT TYPE	**IMPACT/ISSUES**	**MITIGATION MEASURES**	**RESPONSIBLE PARTY**
		and Agrochemicals Association of Kenya. ■ At the end of the spray round, unused pesticide will be kept under lock and seal until such a time that they can be re-used for further spraying and if expired they will be disposed in accordance to international disposal requirements for obsolete pesticides. ■ Spray operators (spray operators must sign out all pesticide received daily and return empty sachets at the end of the day, see Distribution) ■ Drivers transporting insecticide will be trained according to the guidelines listed in Pesticide Procedures. ■ Use of inventory card containing, lot number, quantities, end of spray round reconciliation of stock	

3.5.3 Post Spray Phase

141) The potential impacts and mitigation measuring after the spraying phase are listed in Table 4 14.

Table 4 14: Potential Impacts and Mitigation during post spraying phase.

POST SPRAYING PHASE POTENTIAL IMPACTS AND MITIGATION		
IMPACT/ISSUES	**MITIGATION MEASURES**	**RESPONSIBLE PARTY**
Pilferage and Community Exposure, Environmental Contamination from any remaining pesticides not used	■ Keep storage facilities up to standards described in FAO Pesticide storage and stock control manual; Storage of all pesticides, empty packaging, barrels and tubs in storage facilities ■ NPCU and CPCU to monitor implementation of IPMPs and ESMPs	■ MoALD/NPCU ■ CPCU
Community Exposure from vehicles and secondary warehouses	■ End-of-program cleaning/decontamination of interior and exterior of vehicles ■ End-of-program cleaning/decontamination of the interior of all warehouses.	■ MoALD/NPCU ■ CPCU ■ Pesticide Applicators

POST SPRAYING PHASE POTENTIAL IMPACTS AND MITIGATION		
IMPACT/ISSUES	**MITIGATION MEASURES**	**RESPONSIBLE PARTY**
	■ Collection of all the solid wastes at the secondary storage facilities and transferring to central warehouse. ■ NPCU and CPCU to monitor implementation of IPMPs and ESMPs	
Environmental Contamination and Resident Exposure from spray disposal activities	■ Sprayer progressive rinse, spray operator bathing, washing of overalls, PPE and cloths used to cover furniture, ■ Ensure that a soak pit (with charcoal) is constructed for disposing residual water after clean-up ■ Storage of empty sachets until disposal option selected by the country. ■ Procurement and distribution of barrels for progressive rinse, and wash-tubs for personal hygiene; ■ NPCU and CPCU to monitor implementation of IPMPs and ESMPs	■ MoALD/NPCU ■ CPCU ■ Pesticide Applicators
Residential exposure from contact with secondary warehouses	■ Decontaminate by cleaning all the secondary warehouses to ensure that exposure incidents are minimized. ■ Collect all the solid waste to the central warehouses for further disposal ■ NPCU and CPCU to monitor implementation of IPMPs and ESMPs	■ MoALD/NPCU ■ CPCU ■ Pesticide Applicators

3.6 Monitoring Indicators

3.6.1 **Table 4 15. Pre-Spray Phase**

PRE- SPRAY PHASE MONITORING INDICATORS			
IMPACT/ISSUES	**MONITORING INDICATORS**	**MONITORING FREQUENCY**	**RESPONSIBLE PARTY**
Accidental Spills of pesticides during road transportation to warehouse and spray sites **(Human Health and Environmental impacts)**	■ Number of road accidents and spills reported ■ Records showing drivers training ■ Evidence of road worthy vehicles certificate from the transport authority ■ Copies of driver's license as proof of qualification	■ Once before the selection of vehicles and drivers preferably before the training.	■ MoALD/NPCU ■ CPCU ■ Pesticide Applicators
Possible environmental contamination caused	Storage facility located outside of floodplain,	■ Once before the spray operations begin	■ MoALD/NPCU ■ CPCU

PRE- SPRAY PHASE MONITORING INDICATORS			
IMPACT/ISSUES	**MONITORING INDICATORS**	**MONITORING FREQUENCY**	**RESPONSIBLE PARTY**
by warehouse exposure due to poor siting of warehouses, pilferage and vermin attack of the stored pesticides before spraying	away from nearby schools, hospitals, water courses	■ Quarterly monitoring of warehouse condition to identify any structure defects for repair	
	Storage facilities fulfils the FAO Storage and Stock Control Manual	■ Once before the spray operations begin ■ Quarterly monitoring on warehouse condition to identify any structure defects for repair	■ MoALD/NPCU ■ CPCU
Accidental Fires and injuries in the Warehouses	Presence of firefighting equipment, thermometers, warning signs and at least 3 exits access in the warehouse Cases of fire successfully arrested	■ Once before the spray operations begin ■ Annual monitoring of extinguisher to ensure it is in good condition	■ MoALD/NPCU ■ CPCU
	Availability of PPE to all the workers/farmers .	■ Daily monitoring and supervision of all operators accessing the warehouse	■ CPCU
	Training in fire prevention and fighting Existence of an Emergency Response Plan	■ Once before the spray operations begin	■ MoALD/NPCU ■ CPCU

3.6.2 Table 4 16. Spray Phase

SPRAY PHASE MONITORING INDICATORS				
IMPACT TYPE	**IMPACT/ISSUES**	**MONITORING INDICATORS**	**MONITORING FREQUENCY**	**RESPONSIBLE PARTY**
Occupational Health and Safety Impacts	Spray operators, drivers, storekeepers and flagmen exposure due to negligence, lack of PPEs, or un-intentional exposure caused by accidents	■ Record indicating training has been conducted on, Emergency procedures, PPE use ■ Ability to respond as required when exposure	■ Training to be undertaken once during the overall spraying period	■ MoALD/NPCU ■ CPCU

SPRAY PHASE MONITORING INDICATORS				
IMPACT TYPE	**IMPACT/ISSUES**	**MONITORING INDICATORS**	**MONITORING FREQUENCY**	**RESPONSIBLE PARTY**
		incidents are encountered. ■ Availability and level of utilization of PPE for all spray teams including storekeepers, drivers ■ All non-compliance documented for corrective action		
Occupational Health and Safety Impacts	Additional Transporter Training	■ Records to indicate training has been conducted ■ Occupational Health and Safety Policy– including on use of PPE, Training ■ Labour Management Procedures ■ Training Records	■ Training undertaken before commencement of duty	■ MoALD/NPCU ■ CPCU ■ County Health Department
Impacts on Ecological Sensitive Habitats	Application of pesticides can create a potential risk of polluting ecologically sensitive habitats such as wetlands, National parks reserves, forests, pasture grasslands, and water bodies.	■ Maps showing sensitive areas and choice of pesticide used	■ Mapping done before, field control activities	■ MoALD/NPCU ■ CPCU
Solid Waste Impacts	Empty pesticide containers are considered toxic	■ Training records on waste handling	■ Check on training	■ MoALD/NPCU ■ CPCU

SPRAY PHASE MONITORING INDICATORS				
IMPACT TYPE	**IMPACT/ISSUES**	**MONITORING INDICATORS**	**MONITORING FREQUENCY**	**RESPONSIBLE PARTY**
	under the Basel Convention and therefore require disposal to conform to toxic waste disposal regimes.	■ Empty containers decontaminated (triple rinse) and punctured ■ Waste collected by a licensed waste handler	records before activities ■ Reconciliation of inventory for remaining stock of pesticides and empty containers after field monitoring activities	
Effluent Waste Impacts	The pesticide effluent waste includes surplus diluted spray solution, rinsate among others. These are hazardous to both mankind and the environment. Contaminated effluent wastes could have adverse impacts on the communities and bio-physical environment.	■ Soak-pits with charcoal available to take store rinse water and at end-of-day clean up points for effluent waste collection.	■ Once before commencement and periodically to check if charcoal is used up.	■ MoALD/NPCU ■ CPCU
Community Health and Safety	People exposed to pesticides may suffer short-term acute health effects such as nausea, headaches, sore eyes, skin rashes and dizziness.	■ Routine weekly checks of waste management arrangements should be undertaken. ■ Availability of exposure treatment medicine in the hospitals ■ Percentage of treatment medicines	■ Periodically monitor availability and expiry dates of the medicines	■ MoALD/NPCU ■ CPCU

SPRAY PHASE MONITORING INDICATORS				
IMPACT TYPE	**IMPACT/ISSUES**	**MONITORING INDICATORS**	**MONITORING FREQUENCY**	**RESPONSIBLE PARTY**
		available at health facilities ■ Availability of first aid kits in storage facilities and hired vehicles ■ Public awareness (communications) campaigns ■ Records of the GM		
Accidental Release of Pesticides	If such spillage occurs, this may result in a fire (pesticides are flammable), injury to humans and livestock (exposure), contamination of (receptors like water, flora, soils) and risks to fauna (exposure).	■ EPRP in place and relevant staff are familiar with the Plan. ■ Contact list of first responders available at storage site, transportation vehicles and with the field personnel ■ Records of stock tracing ■ Training records of transporters and sprayers ■ Incident records maintained ■ MSDS of pesticide available in the store and in the transport vehicles ■ Pesticide stores secure	■ Check list of first responders contacts before commencement of activities ■ Reconcile quantities (stock) of pesticide leaving and returning to warehouse for every spraying activity ■ Ensure store is manned at all times	■ MoALD/NPCU ■ CPCU
Livelihood and Food Security Impacts	Pesticide can poison aquatic resources if they find their way into ecosystems.	■ Agro-ecological zones mapped out and biopesticides	■ Before and after commencement field	■ MoALD/NPCU ■ CPCU

SPRAY PHASE MONITORING INDICATORS				
IMPACT TYPE	**IMPACT/ISSUES**	**MONITORING INDICATORS**	**MONITORING FREQUENCY**	**RESPONSIBLE PARTY**
	The contamination pathways are through surface run offs, deposit on off target organisms, bioaccumulation also builds the contamination in the animals through their feeding pathways and water intake.	selected for those areas ■ Socio-economic status of community before and after field control activities	control activities	
Impacts to Birds, Fishes, and Other Organisms	Pesticide application can have an impact on organisms other than the target pest. Loss of biodiversity makes ecosystems more vulnerable to changes in the environment.	■ Sensitive habitats mapped out before spraying	■ Before and after commencement of field control activities	■ MoALD/NPCU ■ CPCU
Storage and Store Siting	Poor siting and design of pesticide storage facilities could lead to exposure and contamination of the bio-physical environment as well as human health risks due to contact. Pesticides should be received and recorded, before storing in a secure and well-ventilated dedicated store	■ Storage facility located outside of floodplain, away from nearby schools, hospitals, water courses ■ Storage facilities fulfills the FAO Storage and Stock Control Manual ■ Presence of firefighting equipment, thermometers, warning signs and at least two	■ Once before the spray operations begin ■ Periodic monitoring on warehouse condition to identify any structure defects ■ Periodic monitoring of extinguisher to ensure it is in good condition	■ MoALD/NPCU ■ CPCU

SPRAY PHASE MONITORING INDICATORS				
IMPACT TYPE	**IMPACT/ISSUES**	**MONITORING INDICATORS**	**MONITORING FREQUENCY**	**RESPONSIBLE PARTY**
	away from stores of flammable liquids and any ignition source.	exits access in the warehouse ■ Adequate natural (or mechanical) ventilation available on site ■ Training records on fire prevention and fighting		
Pilferage of Pesticides	Pesticides should be kept securely and contained during transport and storage to reduce theft, vandalism, or the possible misuse of products. Pesticides falling in the wrong hands due to pilfering have potential for exposure, Pesticide products should always be kept in a secured storage area that is accessible only to those who are trained to use these products, such as storekeepers and licensed applicators.	■ Store Inventory Records ■ Signed Stock cards showing pesticide movements ■ Training records ■ Record and location of obsolete pesticides ■ Guards and other security controls	■ Daily accounting of pesticide and tally of used sachet ■ Periodic monitoring of the inventory/stock taking	■ MoALD/NPCU ■ CPCU ■ National Police Service

3.6.3 Table 4 17. Post Spray Phase

POST SPRAY PHASE MONITORING INDICATORS			
IMPACT/ISSUES	**MONITORING INDICATORS**	**MONITORING FREQUENCY**	**RESPONSIBLE PARTY**
Pilferage and Community Exposure, Environmental Contamination from any remaining pesticides not used	■ Presence of a dedicated and trained storekeeper ■ Stock records up-to-date ■ Facility double-padlocked and guarded ■ Facility physically secure Stock reconciliation ■ Cases of theft or pilferage reported	■ Daily stock reconciliation ■ Periodic monitoring of the warehouse to ensure that it does not have structural problems.	■ MoALD/NPCU ■ CPCU
Community exposure from vehicles and secondary warehouses	■ Evidence of interiors and exteriors of vehicles cleaned ■ Evidence of cleaning of all the secondary warehouses ■ Cases of passenger exposure	■ Daily ■ Secondary warehouses will be cleaned at the end of spray operations however daily cleaning of the warehouses will be done for hygiene reasons	■ MoALD/NPCU ■ CPCU
Environmental contamination and resident exposure from spray disposal activities	■ Reported cases of residential exposure ■ Evidence of progressive rinsing during all post spray clean ups ■ Evidence of soak pits in all the return sites for clean-up designed and constructed in	■ Daily	■ MoALD/NPCU ■ CPCU

POST SPRAY PHASE MONITORING INDICATORS			
IMPACT/ISSUES	**MONITORING INDICATORS**	**MONITORING FREQUENCY**	**RESPONSIBLE PARTY**
	the acceptable format ■ Evidence of empty containers awaiting recapture by manufacture		
Environmental contamination and resident exposure from spray disposal activities	■ Reported cases of residential exposure ■ Evidence of progressive rinsing during all post spray clean ups ■ Evidence of soak pits in all the return sites for clean-up designed and constructed in the acceptable format ■ Evidence of empty containers triple rinsed and punctured	■ Daily	■ MoALD/NPCU ■ CPCU
Residential Exposure from contact with secondary warehouses	■ Level of decontamination of warehouses after spray operations end	■ Decontamination to occur at the end of the spray operations. ■ Daily cleaning and collection of waste to be undertaken.	■ MoALD/NPCU ■ CPCU

4 IPMP IMPLEMENTATION ARRANGEMENT

142) The Component 1, 2 and 3 of the project will be implemented by the MoALD through a two-tiered institutional arrangement: National, and County levels. This IPMP will be implemented by the coordination units established at the National and County levels.

- **National Project Coordination Unit: -** A National Project Coordination Unit (NPCU) has been established comprising of officers responsible for day-to-day implementation of activities under the leadership of the National Project Coordinator (NPC). These include National Project Coordinator, Environmental Specialist, Social Standards Specialists, GBV Expert, Grievance Redress Expert, Monitoring and Evaluation Specialist, Financial and Procurement Specialists.
- **County Project Coordination Unit: -** A County Project Coordinating Unit (CPCU) will be established headed by the County Project Coordinator (CPC) who will also double as either the Crops or Livestock Specialist. The CPCU members will include, the CPC, Livestock/Crops Specialists, an Environmental Specialist and Social Specialist, Monitoring and Evaluation Specialist, Finance and Procurement Officers. The CPCU will engage services of technical experts on need basis.

143) The table below summarizes the roles of the other various actors to be involved in the IPMP implementation.

17 Table 4 18. Institutional arrangement for Implementing the PMP

Institution	**Roles/Responsibilities**
MoALD	Lead agency responsible for coordination, capacity building and resource mobilization Also leads on implementing this IPMP
County Governments	Provide coordination at the County Level Implement the IPMP
World Bank	Financial support
AAK	Capacity building on safe use of pesticides Disposal of empty pesticide containers

4.1 Environmental and Social Risk Management Instruments

144) The Environmental Management and Coordination Act (EMCA) 1999 and EMCA (amendment) 2015, classifies projects into **High, Medium, and Low** risk. It further lists projects that would fall under each of the risk classifications. The NAVCDP sub projects are categorized as **Low, Medium,** or **High**-risk requiring preparation of SPR or CPR. NEMA ESIA procedures are outlined in NAVCDP ESMF.

145) NAVCDP environmental and social safeguard specialists at the NPCU will screen all subproject that it will be implement under component 1, 2 and 3. Screening will determine the environmental and social issues that the subproject might trigger, and the type and level of assessment required including which type of report to submit to NEMA.

4.1.1 Screening

146) Screening of sub projects using a screening checklist will commence as soon as the specific sub project details are known including nature and scope, proposed location, and area among other parameters. The screening process could result in any of the following determination: -

1. Development of Comprehensive Project Report/ESIA
2. Development of Summary Project Report (ESMP) or
3. No further environmental study

4.1.2 Who prepares a Screening Checklist?

147) The Bank also requires that sub project investments are screened in order to decide as to whether Summary Project Report or Comprehensive Project Report or no further environmental studies are needed for sub project investments under the NAVCDP.

148) The screening will be prepared by the Project Management Committee for each sub project. The PMC will be supported in the screening process by a county safeguards committee which will include: - County Environmental and Social Safeguards Compliance Officers (CESSCOs); representative from the County Social Services; representative of NEMA County Office and representative of County Agricultural Office.

4.1.3 Review of Screening Checklist

149) The screening checklist form will be submitted to the NAVCDP environmental and social safeguards specialists at the NPCU for review. Thereafter, based on the review, the NPCU will seek official clarification from NEMA by submitting the screening form on whether to prepare:

(a) Development of Comprehensive Project Report/ESIA
(b) Development of Summary Project Report (ESMP)

4.1.4 Projects Classification and ESIA Report Preparation

150) Legal Notice 31 and 32 prescribes the risk classification of projects to include Low, Medium, and High and provides guidance on what ESIA report to prepare based on the

risk classification. All projects that are classified as Low or Medium risk are required to submit a SPR to NEMA while High Risk projects are required to submit CPR. The NAVDP sub projects are likely to be classified as Low, Medium or High Risk as outlined in the table 4 19.

Table 4 19. Project Classification according to Legal Notice 31 and 32

Classification	Sub Project Type	Report
High	• Irrigation Projects • Spraying of farm produce	CPR
Medium Risk	• Irrigation Projects • Spraying of farm produce	SPR

4.1.5 Development of ESIA Reports

151) Based on the guidance by NEMA on whether to prepare SPR or CPR for sub projects, NAVCDP will prepare draft Terms of Reference (ToRs) for ESIAs which will include IPMP. NAVCDP will competitively select NEMA registered lead experts to prepare SPR or CPR for subprojects.

4.1.6 Review of the ESIA Report

152) This IPMP has been developed for this project and as part of the ESMF and remains the principal instrument that will guide application and use of pesticides in this project. This IPMP will be used to guide the preparation of sub project level IPMPs prior to undertaking spray activities in a selected area (s) within the 33 Counties.

153) The sub project IPMPs which are part of SPR or CPR will be reviewed by the NAVCDP/NPCU and disclosed in the MoALD website. The reports will also be disclosed in the project areas and made accessible to the beneficiaries. The World Bank will only review all the CPR and provide clearance, it will not review the SPRs but may request the review of the same whenever necessary. The Bank will disclose the CPRs and SPRs in its external website. NEMA will review the SPRs and CPRs for every sub project submitted by NAVCDP. The reports will be submitted to NEMA for review and approval.

154) The contents of the IPMPs reports will include the following; -

- Introduction and nature of the project;
- Stakeholder Engagement
- Baseline data (location of the project including the bio-physical and socio-economic characteristic of area that may be affected by the project's activities;

- Policy, Legal and Regulatory Framework For Pest and Pesticide Management In Kenya
- Integrated Pest Management Plan (who is involved? Sites involved, type(s) of pesticides to be procured, volumes involved, application methods, who to apply, time of application, PPEs required, capacity building needs/when to train? Who to be train, ToTs involved, etc.). These are illustrated in Table 0-2.
- Resistance management strategy for each value chain in line with the FRAC and IRAC guidelines
- Institutional Arrangements and Coordination Mechanism, and M&E
- GM operationalization
- Annex (OHS Plan, Waste Management Plan, Emergency Preparedness)

4.2 Capacity Building

155) World Bank recognizes that safety training is an essential component in programs involving the use of pesticides. The need for thorough training is particularly acute in developing countries, where the level of education and awareness of applicators/farmers may vary from place to place.

156) In this regard, training of pesticide users and applicators will be a vital component of capacity building in this project as illustrated in Table 0-2. The project will, using the available resources to prepare a comprehensive training manual on pesticide use and management, targeting different actors within the project, ranging from extension service providers, actual farmers, loaders, mixers, transporters, government staff among others.

157) The NAVCDP will extensive training programs for farmers, farmer leaders, extension workers, and stockists. These training programs should if possible will be further amplified by training that is being undertaken by other institutions such as MoALD, KALRO, other NGOs, pesticide wholesalers, etc. Key training and awareness creation topics will include but not limited to among others

1. **Chemical knowledge:** registration, correct use, application procedures and label specifications. This training includes an in-depth review of label information, as well as a discussion of chemical concentrations, application rates, equipment calibration and maintenance, application intervals, and demonstrations of proper equipment use.
2. **Pest knowledge:** farmers will be trained to recognize crop and animal pests and damaging threshold levels, as well as key cultural practices to promote seed health, and when pesticide use is necessary and appropriate.

3. **Storage:** proper storage of chemicals in relation to other structures on the property. The need for a separate, clearly marked and locked facility will be emphasized for exclusive storage of farm chemicals. Pesticides should be kept away from food for human or animal consumption or sources of drinking water. Pesticides should always be stored in their original containers.
4. **Transport:** safe transport of pesticides will be discussed (i.e. not using public transportation if possible, keeping chemicals in a closed environment, how to avoid punctures and torn bags, etc).
5. **Worker protection:** Types of PPE, when they should be worn and why, and how they should be cared for. The basic PPE recommended for all pesticide applications includes long-sleeved shirts, long pants, shoes and socks. According to the toxicity and label directions of spinosad, chemical-resistant gloves, aprons, and masks may be required, and will be provided.
6. **Safety practices:** proper mixing techniques, the importance of reusing rinse water for mixing, and the importance of not contaminating water sources. The types of containers used in chemical preparation, their proper use, cleaning and storage will be addressed. Applicators will be taught not to eat, drink or smoke while applying pesticides.
7. **First aid and medical facilities:** first aid materials must be made available (soap, clean water and a towel) especially in case of spills. Participants will be taught to identify the primary symptoms of chemical exposure and what do to in an emergency.
8. **Waste Management:** how to clean up and safely dispose of any chemical not used. For liquids, empty containers will be rinsed 3 times, and emptied into the spray tank as part of the application mixture. When the product is used completely, chemical containers should be triple-rinsed and punctured before being buried. Containers should NEVER be reused.
9. **Protection of drinking water:** Training will emphasize the importance of protecting potable water sources and avoiding contamination of ground and surface waters. Participants will be trained to identify their drinking water source, and to keep all pesticides away from that source. Characteristics of the water source and mitigation measures to avoid contamination will be addressed.
10. **Environmental safety:** the importance of protecting natural resources and the proper use of pesticides to avoid environmental contamination and impacts on non-target organisms will be addressed. An additional training phase will be targeted towards women and children who may come into the production fields or who may be exposed to residues on the clothing of their spouses at home. Basic training materials in local languages, with illustrations will be developed for this purpose.

Table 4 20: Integrated pest management training framework

Integrated pest management training framework		
Hierarchy	**Target areas of training**	**Responsible**
NPCU	• Integrated Pest Management Plan (IPMP) • Pesticide Value chain Actors • Monitoring and evaluation of IPM programs • Waste management • Safe use and handling of pesticides • Occupation Safety and Health (OSH) • Institutional arrangements for Quarantine, pesticides and pest management • Policy and regulatory framework	NPCU
CPCU	• Integrated Pest Management Plan (IPMP) • Pesticide Value chain Actors • Monitoring and evaluation of IPM programs • Waste management • Safe use and handling of pesticides • Occupation Safety and Health (OSH) • Institutional arrangements for Quarantine, pesticides and pest management • Policy and regulatory framework	NPCU
Project implementing team	• Integrated Pest Management Plan (IPMP) • Pesticide Value chain Actors • Monitoring and evaluation of IPM programs • Waste management • Safe use and handling of pesticides • Occupation Safety and Health (OSH) • Common pest and disease identification and management • Pesticide resistance management	NPCU
Farmers, farmer groups	• Integrated Pest Management Plan (IPMP) • Pesticide Value chain Actors • Monitoring and evaluation of IPM programs • Waste management • Safe use and handling of pesticides • Occupation Safety and Health (OSH) • Common pest and disease identification and management • Pesticide resistance management	NPCU

4.3 IPMP Implementation Budget

158) The estimated total cost for IPMP implementation is indicated in the 6-2 below. The programme management team of NAVCDP will be responsible in the implementation of this IPMP and estimated costs for the various activities under this program will be built in the budget.

159) The core activities will be as follows:

Coordination

a) Development of IPM packages for the NAVCDP investments
b) IPM orientation workshops
c) Training of trainers and Farmer groups training
d) Public awareness and promoting the adoption of IPM practices
e) Field guides/training materials for production, purchase and distribution
f) Farmers field days
g) Field visits and study tours
h) Database for human-health and environmental contamination
i) Crop pest surveillance and updating pest/disease database at KEPHIS
j) Annual workshops on progress and lesson learnt
k) Participatory IPM research and development
l) Monitoring and evaluation

18 Table 5 2.Tentative cost estimates of budgetary requirements (USD)

Line item	Year 1	Year 2	Year 3	Year 4	Total
Capacity Building					
IPM orientation	5,000	5,000	5,000	5,000	20,000
TOT	20,000	10,000	10,000	10,000	50,000
FG training	10,000	10,000	10,000	10,000	40,000
Database	5,000	5,000	5,000	5,000	20,000
Surveillance	15,000	10,000	5,000	5,000	35,000
Workshop	20,000	10,000	10,000	10,000	50,000
					215,000
Research & Development					
Participatory IPM	30,000	10,000	5,000	5,000	50,000
Field days	40,000	20,000	5,000	5,000	70,000
					120,000
Advisory Services					
Field guides/IPM materials	10,000	10,000	10,000	10,000	40,000
Public awareness	10,000	10,000	10,000	10,000	40,000
Pest specialist	25,000	25,000	25,000	25,000	100,000

M&E	30,000	30,000	30,000	30,000	120,000
Coordination	15,000	15,000	15,000	15,000	60,000
					360,000

5 REFERENCE

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6 ANNEXES

Annex A. Pesticide Waste Management Plan for NAVCDP

Background

This Pesticide Waste Management Plan has been prepared for the National Agricultural Value Chain Development Project (NAVCDP) which will use pesticides to support crop and livestock value chains. The NAVCDP is a World Bank financed project to Government of Kenya's (GoK), Ministry of Agriculture & Livestock Development (MoALD). The document has been prepared for the project and should be read alongside the Integrated Pesticide Management Framework in Table 4 20.

Statutory Requirements For Waste Management in Kenya

Kenya has waste management regulations cited as the Environmental Management and Co-ordination (Waste Management) Regulations, 2006. These regulations govern the transportation and disposal of wastes including hazardous wastes which pesticide wastes are categorized as such. The management of pesticide wastes from the NAVCDP will comply to the regulations as cited.

Acknowledging that there are international regulations for management of pesticide wastes including FAO and WHO guidelines and for which Kenya is a signatory to, the NAVCDP will use these regulations as and when needed and in particular when the Kenyan regulations are less stringent.

Improper disposal of pesticide waste, such as unused chemicals and empty pesticide containers, can create serious harm to humans and animals; it may also lead to irreversible environmental damage. Six types of pesticide wastes that will be generated by the NAVCDP and will require proper disposal are:

- Empty pesticide containers,
- Excess pesticide mixture that are left unused after an application,
- Unused pesticide,
- Obsolete pesticide,
- Rinse water from containers and application equipment,
- Material generated from cleanup of spills and leaks, and
- Contaminated personal protective equipment.

1. **Empty Containers**

Empty containers of pesticide often still have residues of pesticides inside them. So, even after they are used and emptied, they are considered hazardous waste that can cause damage to the environment and to human and animal health. Empty containers, when re–used to store water and

food, may lead to poisoning and those left in the environment will generate pesticide contamination in soils and underground water sources.

Mitigation/Disposal Measures

- All used and empty containers should be labelled and have a "used" date on them.
- Empty containers will be decontaminated by either triple rinsing or pressure rinsing. Triple rinsing empty containers is the recommended method by the FAO and involves washing out the container three times. Triple rinsing can remove over 99.99% or more of pesticide residue. Similar result can be achieved with integrated pressure rinsing using specialized spray equipment.
- Triple rinsing or pressure washing should be done immediately after emptying the container to prevent any improper use of the containers.
- Empty paper and plastic bags will be shaken clean and triple rinsed before disposal.
- Holes will be punctured in containers to make sure they cannot be re–used for any other purpose.
- Unrinsed pesticide containers must be stored separately from properly rinsed containers and must be treated as if they contained pesticide.
- Unrinsed containers must be capped, stored upright in a roofed or covered secure (locked) area and on an impervious surface.
- There should be no visible or noticeable pesticide residue on either the inside or outside of the container.
- All rinsate should be removed from the inside of the container following rinsing procedures.
- Empty containers meeting the above criteria will be stored in locked storage until proper disposal. Such containers will be stored separate from unrinsed pesticide containers.
- Empty containers will never be left open: Evaporation of wastes can create a hazard—containers will be kept closed until they are ready to be cleaned.

How to properly clean empty pesticide containers

Unrinsed pesticide containers can still hold enough material to harm people and the environment. Care should be taken in cleaning such containers.

- Workers should be trained on cleaning the pesticide containers; they should read and understand all safety and environmental precautions on the product label.
- They should wear PPE, such as goggles or face shields, chemical–resistant aprons, gloves and chemical–resistant boots or shoes.
- Ensure different pesticide rinsates are not mixed together.
- Every container that has been rinsed should be labeled clearly with the rinse date.
- Rinsate should not be dumped on the ground or into storm drain.

Triple Rinsing Empty Containers (plastic and metal containers)

- Empty the container's contents into a spray tank, turning the container so that any product trapped in the handle can flow out. Once flow is down to a drip, drain the container an additional 30 seconds.
- Immediately begin rinsing. Do not wait, or the product may become difficult to remove.
- Fill the empty container one-quarter full of clean water.
- Replace the cap on the container. With the container opening facing to your left, shake the container about 6 inches left to right. Shake the container about twice per second for 30 seconds.
- Drain rinse water into spray tank as described above.
- Fill the empty container one-quarter full of clean water a second time.
- Recap the container. With the opening of the container pointed toward the ground, shake the container about 6 inches up and down. Then drain the rinse water into the spray tank.
- Finally, fill the empty container one-quarter full for a third time with clean water. Recap the container. With the container in the normal upright position, shake the container about 6 inches up and down. Pour the rinse water into the spray tank.
- Carefully rinse residue from the outside of the container into the spray tank.
- Carefully rinse cap over spray tank opening.
- Look closely at the container inside and out to make sure that all pesticide has been removed; if not, rinse until all pesticide is removed—then allow the containers to dr.
- Store rinsed containers where they will be protected from rain until they can be disposed of properly.
- Puncture the container at least three times with 1–inch holes on the top and bottom and then have the container crushed.

Disposal of Empty Pesticide Container

The final step is to dispose of the rinsed pesticide container properly. Improperly disposed empty pesticide containers can still pose an environmental hazard and is a source of pollution. Disposal options vary and depend on the container construction (metal, plastic, or paper) and the availability of facilities for disposing of or recycling the pesticide containers.

Mitigation/Disposal Measures

- Empty containers will be punctured on the top, side and bottom to prevent future use. They will then be crushed, rendering them incapable of holding any liquid.
- Empty containers should not be burned even when cleaned because the fire may generate environmentally persistent toxic emissions.
- Empty containers should not be buried either. Burying the empty containers potentially uses up scarce land and can be a danger to animals. Furthermore, plastic containers are

highly stable and do not biodegrade, so, if buried, they will remain intact indefinitely.

- Clean secondary packaging, such as pallets and outer cardboard cartons, which have not come into direct contact with pesticides can be assumed to be uncontaminated. This can be disposed of as municipal waste.
- Empty containers should be transported by a NEMA licensed transporter of waste and disposed in a NEMA licensed disposal site.

2. Excess Pesticide Mixture

Excess mixture is diluted pesticide that is leftover in the spray tank after a pesticide application. It is important to properly dispose of any excess mixture. This means getting rid of the chemical so that poses no harmful effect to the environment, as well as people and animals.

Mitigation /Disposal Measures

- Avoid excess mixtures by measuring and calibrating correctly.
- Fill the spray tank with only the amount of pesticide required to do the job.
- Spray excess mixture on a different site if possible.

3. Excess Product

Excess product is unused pesticide that is still good but no longer needed arising from the applicator buying excessive amounts.

Mitigation/Disposal Measures

- Good stock management: buy only pesticide that is needed for one season or single use.
- Determine if you can safely go over the job and use up the amount that may be leftover, particularly if the pesticide is being used on weeds or on insects.
- Determine if there is another party that can use the excess product.
- Check with supplier or manufacturer of product to see if they will take excess product back.
- Check with the relevant government agency if there is a waste collection program where the agency collects excess products.
- If unable to return product, dig a hole 50 cm deep and cover the bottom of the pit with a 25 to 40 mm layer of hydrated lime or charcoal. Then pour the unwanted pesticide into the hole and cover hole with soil.

4. Obsolete Pesticides

Obsolete pesticides are pesticides that cannot be used for the purpose for which they were intended and must be processed for destruction so as to render them harmless. Pesticides become obsolete when they have been banned-and it is therefore illegal to use them; because they have deteriorated physically or chemically so that they are no longer in the form they were supplied in; or after they have lost their pesticidal properties and are no longer effective against pests. Obsolete pesticides can be potentially more hazardous than new pesticides. Thus, care should be taken in handling obsolete pesticides.

Mitigation/Disposal Measures

- Ensure comprehensive stock control and inventory: avoid purchasing excess pesticides that cannot be used before they deteriorate.
- Buy the correct pesticide for the project.
- Store pesticide properly to avoid damages to pesticide caused by poor storage or handling.
- Regularly check condition of the pesticides and their storage containers.
- Ensure proper labeling of pesticides so that pesticides are not incorrectly considered to be obsolete.
- Determine if recently purchased pesticide that is not needed can be used in a different project before it becomes obsolete.
- Check with supplier or manufacturer of product to see if they will take product back
- Check with the relevant government agency if there is a waste collection program where the agency collects excess products.
- If unable to return product, dig a hole 50 cm deep and cover the bottom of the pit with a 25 to 40 mm layer of hydrated lime. Then pour the unwanted pesticide into the hole and cover the hole with soil. This may apply for small quantities of pesticides. For large quantities, MoALD will utilize the FAO guidelines for disposal of obsolete pesticides.

5. Rinse Material from Containers and Spray

Improperly disposed rinse water from pesticide application equipment has great potential for causing ground and surface water contamination, as well as harm to humans and animals, because it still contains pesticide residue. Proper procedures should be observed to avoid contamination from pesticide rinse water.

Mitigation/Disposal Measures

- Applicators will minimize rinse water by washing equipment only when necessary.
- Rinse the pesticide container or spray equipment over an impermeable surface and in a way that allows recovery of the rinsate.
- If the rinsate contains no debris, it can be used the same day as part (up to 5%) of the water (or other liquid) portion of the next spray mixture of that chemical.
- Apply rinsate to the original site, provided registered rates are not exceeded and the application is consistent with label directions.
- If none of the above condition applies, dig a hole 50 cm deep and cover the bottom of the pit with a 25 to 40 mm layer of hydrated lime. Then pour the unwanted pesticide into the hole and cover the hole with soil. This will be applicable to small quantities of rinsate.
- Applicators will not discharge rinse water to the ground, roadway, septic system, ditches, streams, toilets, sink, or water bodies to avoid pollution.
- The best way to dispose of the rinsate (rinse water used to remove pesticide residue from a container) is to add it to the spray mixture and apply it according to the label directions.

Rinsate can also be collected to sue later in a spray mix or for disposal.

6. Pesticide Spill Clean–Up Material

When handling pesticides, accidents happen. When they do, proper clean-up of the spillage is essential to remove all health and environmental hazards created by the spill. But that is not all, the material used to collect and clean up spills and leaks of pesticide must also be properly managed to prevent environmental contamination. Generally, materials such as sawdust, clay, shredded newspaper, absorbent pads, or other absorbents can be used to absorb liquid pesticides and water/detergent mixtures used to clean pesticide stained surfaces. If improperly disposed, such material can cause harm to humans who come into contact with it, as well as harm to the environment.

Mitigation/Disposal Measures

- Once liquid spills have been absorbed, sweep up and collect the contaminated absorbent materials, and seal them in a heavy–duty plastic bag or metal bucket for disposal.
- Use a plastic dustpan to sweep up spills. Metal dustpans can spark and ignite flammable pesticides.
- Sweep up dry pesticide spills for reuse. It may be applied to a labeled use site or stored for future use if the pesticide has not become wet or contaminated with soil or other debris. Otherwise, collect the dry spill in a heavy-duty plastic bag for disposal.
- Discard any PPEs that may have been contaminated in the clean–up process.

7. Contaminated Personal Protective Equipment

It is not uncommon for personal protective equipment (PPE) such as overalls, goggles, boots, and gloves, to be used in protecting the wearer from dangerous pesticides. Because PPEs are designed to keep dangerous pesticides away from the mouth, nose, and skin of the person wearing it, they end up collecting the contaminants. It is therefore important to take steps to ensure the PPEs are disposed in a manner that ensures that contaminants are not released in an area where they could cause harm.

Mitigation/Disposal Measures

- Keep pesticide–contaminated PPEs away from other clothing or laundry and wash it separately; No handler should take their contaminated PPE home with them.
- If PPE will be reused, clean it before each day of reuse according to the instructions from the PPE manufacturer unless the pesticide labeling specifies otherwise.
- If there are no instructions or requirements, wash PPE meticulously in detergent and hot water.
- Items that cannot be washed by a washer and dryer, such as goggles, boots, and gloves, should be thoroughly handwashed. Wear protective gloves when handling such contaminated items.

- Thoroughly dry the clean PPE before it is stored or put it in a well–ventilated place to dry.
- Store clean PPE separately from personal clothing and away from pesticide–contaminated areas.
- Properly cleaned PPE can then be disposed of as regular garbage.
- If washing of clothing or boots fails to remove the waste, then such material must be destroyed. They should be packed in sturdy bags and returned to the control base where proper destruction should be undertaken. Proper destruction can include burning of the material if it is material that can be burned without excess environmental degradation. Clothing or PPE can also be buried.
- Handler employers must discard coveralls or other absorbent materials that have been drenched or heavily contaminated with an undiluted pesticide that has the signal word "DANGER" or "WARNING" on the labeling. These contaminated items must not be reused.
- PPE that has been damaged or designated as one-time use or has expired or reached its use limit should also be destroyed.
- In instances where disposable PPE garments are not contaminated by anything other than normal dirt and dust, it is worth the time and effort to participate in a disposable protective clothing recycling program in order to reduce the rather large environmental impact of all that PPE ending up in landfills where it will never biodegrade.

Pesticide Waste Management Plan

IMPACT TYPE	IMPACT/ISSUES	MITIGATION MEASURES	MONITORING	RESPONSIBILITY
Occupational Health and Safety Impacts	▪ Improper disposal of pesticide waste can create serious harm to applicators and other workers involved through exposure.	▪ Provide PPE including training on proper use and storage. ▪ Provide emergency transport to medical facility in case of pesticide exposure. ▪ Provide healthcare staff with any information about the pesticide(s) to which the person may have been exposed. ▪ Provide medicine to treat pesticide poisoning. ▪ Train workers on first aid for pesticide exposure. ▪ Keep workers who are not responsible for pesticide waste management out of the pesticide rinsing as well as the storage and disposal zones. ▪ Provide regular training on handling pesticide waste. ▪ Monitor handlers working with pesticide waste.	▪ PPEs provided and workers trained on proper use. ▪ Training manual prepared ▪ Training on handling and using pesticides as well as first aid training held. ▪ Healthcare workers provided with pesticide information. ▪ Medicine stocked with hospital ▪ Emergency transport vehicle provided. ▪ Emergency phone number provided.	■ MoALD/NPCU ■ CPCU
Community Health and Safety Impacts	▪ Improper disposal of pesticide waste can also cause serious harm to community members through exposure. ▪ Communities exposed to pesticides may suffer short-term acute health effects such as nausea, headaches, sore eyes, skin rashes and dizziness.	▪ Awareness creation to the community on pesticide waste dangers and how to protect from pesticide waste. Training should also include dangers of reusing empty pesticide containers. ▪ Provide emergency transport to medical facility in case of pesticide exposure. ▪ Train on emergency first aid response and ensure first aid kits are available in storage facilities and transport vehicles. ▪ Ensuring treatment medicines for pesticide exposure are available at the medical center.	▪ Training manual prepared ▪ Training on pesticide dangers conducted. ▪ Healthcare workers provided with pesticide information. ▪ Medicine stocked with hospital ▪ Emergency transport vehicle provided. ▪ Emergency phone number provided. ▪ Proper storage structure of pesticides constructed and locked. ▪ Warning signs at pesticide	■ MoALD/NPCU ■ CPCU ■ County Health Department

IMPACT TYPE	IMPACT/ISSUES	MITIGATION MEASURES	MONITORING	RESPONSIBILITY
		▪ Ensure proper storage of pesticide waste containers, put warning signs on pesticide storage areas. ▪ Label pesticide empty pesticide containers as dangerous and containing waste. ▪ Lock storage facilities for empty pesticide containers. ▪ Fence the storage area to avoid community entry and if possible, have a guard on duty. ▪ Properly discard PPEs such as goggles or boots; ensure that community members are unable to access them. ▪ Ensure that the project executers and host community are able to address the grievances on access and equity within the agreed GM.	storage area provided. ▪ Pesticide containers labelled as dangerous, including empty containers. ▪ PPE disposal system situated. ▪ Community based grievance redressal mechanism set up.	
Surface Water Contamination Surface water contamination can result from empty contaminated pesticide containers, used and contaminated PPEs, obsolete pesticide waste, excess and unused pesticide mixture, spill response material, and pesticide rinsate.	▪ Contamination of surface water bodies directly or indirectly through runoff from soil. ▪ Impact on the aquatic life as well as community livelihoods. ▪ Possible release of the pesticides into the water bodies from accidental spills during the transportation, cleaning, storage and disposal of pesticide containers.	▪ Provide training on waste management including container disposal methods to all spray teams ▪ Implement the Triple Rinse approach to decontaminate the containers. ▪ Empty containers must NOT be re-used ▪ Establishing a tracking system for solids wastes (containers) etc. where all containers must be returned to the store and accounted for. ▪ Establishing storage for holding empty containers prior to collection and disposal. ▪ Rinsate and wash water should be emptied back to the spraying or mixing tanks. ▪ Establish soak pits (with charcoal to filter, adsorb and retain the pesticides)	▪ Training manual prepared ▪ Training on proper pesticide disposal done. ▪ Triple rinse cleaning method consistently applied. ▪ Empty containers properly disposed of. ▪ Comprehensive stock and inventory done. ▪ Tracking system for containers established. ▪ Proper storage structure of pesticides constructed and locked.	▪ MoALD/NPCU ▪ CPCU

IMPACT TYPE	IMPACT/ISSUES	MITIGATION MEASURES	MONITORING	RESPONSIBILITY
		▪ Pesticide applicators will never wash themselves, their overalls, or their PPE in any water bodies, or where wash water will drain to water bodies.		
Impacts on Ecological Sensitive Habitats	Application of pesticides can create a potential risk of polluting ecologically sensitive habitats such as wetlands, National parks reserves, forests, pasture grasslands, and water bodies.	• Provide training on waste management including container disposal methods to all spray teams • Implement the Triple Rinse approach to decontaminate the containers. • Empty containers must NOT be re-used • Establishing a tracking system for solids wastes (containers) etc. where all containers must be returned to the store and accounted for. • Establishing storage for holding empty containers prior to collection and disposal. • Rinsate and wash water should be emptied back to the spraying or mixing tanks. • Establish soak pits (with charcoal to filter, adsorb and retain the pesticides).	▪ Training manual prepared ▪ Training on proper pesticide disposal done. ▪ Triple rinse cleaning method consistently applied. ▪ Empty containers properly disposed of. ▪ Comprehensive stock and inventory done. ▪ Tracking system for containers established. ▪ Proper storage structure of pesticides constructed and locked.	▪ MoALD/NPCU ▪ CPCU
Accidental Release of Pesticides Waste e.g. obsolete/unused/excess pesticide mixture	If such spillage occurs, this may result in a fire (pesticides are flammable), injury to humans and livestock (exposure), contamination of (receptors like water, flora, soils) and risks to fauna (exposure).	▪ Only vehicles correctly equipped to carry pesticides waste must be used for transportation. ▪ Pesticide transporters and users must be trained and be familiar with recommendations detailed on the product Material Safety Data Sheet and procedures to be followed. ▪ Preparation of an EPRP which has details of all appropriate authorities	▪ Documentation made on type of vehicle. ▪ Training manuals prepared ▪ Training videos made ▪ EPRP documentation done. ▪ Documentation of absorbent material made. ▪ PPE provided and workers trained on use.	▪ MoALD/NPCU ▪ CPCU

IMPACT TYPE	IMPACT/ISSUES	MITIGATION MEASURES	MONITORING	RESPONSIBILITY
		that must be notified (Environment, Water, Police, Fire Department etc.) ▪ Records must be kept of all incidents and remedial action taken. ▪ Training on EPRP and awareness of the details of the pesticide MSDS for all the operators, medical teams, transporters, storekeepers and field control team ▪ Absorbent material to contain chemical spills must be available at the filling site. ▪ Chemical stores must be kept secure at all times. Proper storage of pesticides in accordance with FAO guidelines should be ensured for all supplies. ▪ Appropriate fire extinguishers must be provided for all locations where substantial quantities of pesticide are transported, stored or mixed. ▪ Use of PPE by spray teams and storekeepers	▪ Material to contain chemical spills provided. ▪ Record keeping mechanism in place.	
Livelihood and Food Security Impacts	▪ Pesticide can poison aquatic resources if they find their way into ecosystems. ▪ The contamination pathways are through surface run offs, deposit on off target organisms, bioaccumulation also builds the contamination in the animals through their feeding pathways and water intake.	▪ Provide training on waste management including container disposal methods to all spray teams ▪ Implement the Triple Rinse approach to decontaminate the containers. ▪ Empty containers must NOT be re-used ▪ Establishing a tracking system for solids wastes (containers) etc. where all containers must be returned to the store and accounted for. ▪ Establishing storage for holding empty containers prior to collection and disposal.	▪ Training manual prepared ▪ Training on proper pesticide disposal done. ▪ Triple rinse cleaning method consistently applied. ▪ Empty containers properly disposed of. ▪ Comprehensive stock and inventory done. ▪ Tracking system for containers established. ▪ Proper storage structure of pesticides constructed and locked.	▪ MoALD/NPCU ▪ CPCU

IMPACT TYPE	IMPACT/ISSUES	MITIGATION MEASURES	MONITORING	RESPONSIBILITY
		▪ Rinsate and wash water should be emptied back to the spraying or mixing tanks. ▪ Establish soak pits (with charcoal to filter, adsorb and retain the pesticides).		
Storage and Store Siting	▪ Poor siting and design of pesticide storage facilities including pesticide waste storage could lead to exposure and contamination of the bio-physical environment as well as human health risks due to contact. ▪	▪ The store facilities should be located away from water sources to avoid contamination by accidental spills. ▪ All primary pesticide storage facilities will be double-padlocked and guarded ▪ All the storage facilities will be located away from nearby watercourses, domestic wells, markets, schools, hospitals etc. ▪ Soap and clean water will be available at all times in all the facilities. ▪ A trained storekeeper will be hired to manage each facility. ▪ Recommended pesticide stacking position and height in the warehouse as provided in the FAO Storage and Stock Control Manual will be followed. ▪ All the warehouses will have at least two exit access routes in case of fire outbreak. ▪ A fire extinguisher will be available in the storage facilities and all workers will be trained on how to use the available firefighting facilities. ▪ Warning notices will be placed outside of the store in both English and the local language (s) with a hazard symbol (skull and crossbones sign), and a caution symbol against unauthorized entry	▪ Storage units constructed ▪ Security manuals of storage units. ▪ Inventory sheet of available cleaning agents. ▪ Storage and warehouse plans.	■ MoALD/NPCU ■ CPCU

IMPACT TYPE	IMPACT/ISSUES	MITIGATION MEASURES	MONITORING	RESPONSIBILITY
		▪ Storage facilities are accessed by authorized personnel only		
Stealing of Empty Pesticide Containers	Empty pesticide containers can attract some people who may want to steal them and use them for storage. Stolen empty containers may still prove harmful to community members especially if they still contain waste residue.	▪ Maintenance of record of all the stock coming in and out of the storage facilities so that all the stock can be traced accordingly. This is a mechanism aimed at preventing pilferage of pesticides. ▪ Pesticide products including empty containers ready for disposal should always be kept in a secured storage area that is accessible only to those who are trained to use these products, such as storekeepers and licensed applicators. ▪ If pesticides storage facility is vandalized and waste containers stolen, the police should be called at once, so they can initiate an investigation. ▪ Report the incident to NEMA. ▪ All the storekeepers and managers will be trained on sound store keeping practices and procedures. ▪ At the end of the spray round, unused pesticide will be kept under lock and seal until such a time that they can be re-used for further spraying and if expired they will be disposed in accordance to international disposal requirements for obsolete pesticides. ▪ Spray Operators (spray operators must sign out all pesticide received daily and return empty containers at the end of the day,) ▪ Drivers transporting pesticides will be trained according to the guidelines	▪ Inventory records maintained. ▪ Training manuals. ▪ Training videos ▪ Storage manuals.	■ MoALD/NPCU ■ CPCU

IMPACT TYPE	IMPACT/ISSUES	MITIGATION MEASURES	MONITORING	RESPONSIBILITY
		listed in Pesticide Procedures in case of spills of excess pesticides; obsolete pesticides etc.		

Annex B. Pesticide Emergency Preparedness and Response Plan (EPRP) for NAVCDP.

Background

This document has been prepared for the project and should be read alongside the Integrated Pesticide Management site Plans. Pesticide related emergencies include primarily accidental spills and leakages (including pesticide wastes) that can occur during transportation, application and storage and are likely to contaminate the bio-physical and socio-economic environment including human health impacts and risks with adverse consequences. This EPRP will be used by the CPCUs to guide in development of sub project specific EPRP for identified spray areas. CPCU will develop sub project EPRP prior to commencement of spray operations.

Pesticide Spills, Leakages and Fires

A spill is an accidental release of any amount of pesticide (including pesticide waste), small or large. Spills may be relatively minor, involving one or a few leaking containers but can also be major, such as when a sprayer overturns spilling its contents, or when a truck overturns.

Pesticides are toxic to humans and other living organisms. Pesticides spills can contaminate ground and surface water, soil and air; damage plants; injure livestock, wildlife; and endanger the health of the applicator and emergency responders as well as the public/communities. Pesticide spills and fires may also cause financial loss due to cleanup, liability claims, and fines assessed by government agencies. There are three common ways pesticide spills occur:

1. Pesticides spills **during transportation**
2. Pesticide spills **during storage**
3. Pesticide spills **during mixing and application**

A. Management of Pesticide Spills During Transportation

Before pesticides arrive at the spraying site, they have to be transported. Transport related accidents can occur during transport from manufacturer or distributor to the project storage, or from the storage area to the point of use. Transport spills are mostly attributable to vehicle accident, damaged containers, or improperly secured containers tumbling or falling off moving vehicles. A transportation spill can result in serious personal injury to the transport vehicle operators, as well as to the immediate public. Moreover, spills on roadways can enter waterways and cause serious environmental damage. Care should therefore be taken to prevent such mishap. When transporting pesticides, the project will observe the following procedures:

i. Vehicle Safety

- Pesticides will only be transported in the back of a flatbed truck. The flatbed truck

will have side and tail racks and if possible, the pesticide will be placed in locked compartments.

- The truck bed will have steel/plastic beds for easier cleanup if a spill occurs.
- Transport vehicles will be kept in good working condition and will be inspected before any trip: brakes, tires, fluids, lights, etc., will be regularly checked.
- Only employees tasked with transportation of pesticides will be allowed to ride in the cab of the truck. No employee shall ride in the back with the pesticides.
- The pesticide truck shall not be left unattended when transporting pesticides. This ensures there is someone present in the event of an emergency and also protects against any trespass by a member of the public.
- A sign indicating "Chemical Storage Warning – Authorized Persons Only" should be prominently displayed on the vehicle, preferably in English, Swahili, and local vernacular language, especially in the event the vehicle is left unattended or parked.
- A cell phone will be in the vehicle at all times for emergency assistance. In addition, transport vehicle will have emergency contact numbers such as fire, police and hospital displayed in the vehicle cab.
- A spill kit will be maintained in the vehicle. The spill kit will contain hydrated lime, activated carbon, bleach, absorbent materials, containment "snakes", tools (shovel, scoops, dustpans), warnings signs, ropes, storage bags, etc.
- The vehicle shall also have two pairs of PPE kits. The PPE kits shall include chemical resistant gloves, coveralls, splash goggles, respirator, boots etc.

ii. Pesticide Transportation

- Containers will be inspected upon loading for leaks; ensure all caps, plugs, and other openings are tightly closed and that there are no pesticides on the outside of the containers.
- Pesticides shall be transported in containers with intact, undamaged, and readable labels.
- An inventory log will be taken before departure and immediately upon arrival.
- Containers will be handled only by trained employees (wearing PPE) to prevent damage.
- Containers will be anchored securely to keep them from rolling or sliding.
- Care will be taken to protect containers from extreme temperature during transport.

iii. Vehicle Operators

- The transport vehicle shall have two operators: a driver and an assistant who shall ride in the cab of the truck.
- Vehicle operators shall be trained in basic emergency response procedures for containing pesticide spills. This includes training on notifying authorities in the event of a spill.

- Vehicle operators will be supplied with and trained on PPE use. Pesticides should never be handled without proper PPE.
- Drivers shall be trained to drive courteously and cautiously at all times. Drivers carrying pesticide should drive at or below the speed limit and should adjust speed with changing weather. Vehicle operators will not use phones or electronic gadgets when driving the car.
- Vehicle operators will not smoke cigarettes or use any drugs/alcohol while transporting pesticides.
- Unauthorized persons will not ride in the pesticide transport vehicle.
- Vehicle operators will regularly inspect the pesticide containers in the course of transportation to ensure they are properly secured.

6.1 Vehicle operators should have a copy of each product being transported in the vehicle prior to leaving the loading area. The information should include the active ingredients in the pesticide, how to offer first aid in case of exposure, as well as storage and disposal procedures, and emergency phone numbers.

Mitigating/Responding to Pesticide Spills During Transportation

As careful as people try to be, pesticide spills can and do occur. The spill may be minor, involving only few drips from a container, or it may be major, involving large amounts of pesticide. Regardless of the magnitude of the spill, the overall objectives of a proper response will involve applying three steps, or the "Three C's" of spill management:

1. CONTROL the spill.
2. CONTAIN the spill.
3. CLEAN IT UP.

1. <u>CONTROLLING THE SPILL</u>

a) ***Protect yourself*****: -**Workers operating the transport vehicle should wear appropriate PPE (chemical resistant gloves, chemical resistant coveralls, footwear, eye protection, respirator, etc.) before contacting the spill or breathing its fumes.

b) ***Stop the source of the Spill*****: -**Workers operating the transport vehicle will be trained to act immediately to control the source of the spill. If it can be done safely, the vehicle operators should plug the leak, place a leaky container inside a larger one, or do whatever necessary to limit the size and duration of the initial leak.

c) ***Protect others*****: -** Workers operating the vehicle will be trained in offering first aid to anyone exposed to the contamination. They should then secure the site by isolating the spill area. Spill site should not be left unattended until pesticide is cleaned up and area is decontaminated; Rope, cordon, or mark off the site, warn the public to keep well back. If necessary, obtain assistance from the base, police or security unit.

2. CONTAINING THE SPILL

a) ***Confine the spill***: -As soon as the source of the leak is under control, workers operating the transport vehicle should move quickly to keep the spill in a small area as possible. For small spills, use containment "snakes" to surround the spill and keep it confined. For larger spills, use a shovel, rake, or other tool to make a dike or use soil, sand, or other absorbent material on the spill. Spill may be covered by a plastic tarp especially if it is solid material. Any absorbent material used in confining the spill as well as plastic covers must be disposed of properly as pesticide waste.

b) ***Protect water sources***: -Workers should prevent spill from reaching any water source such as ditch, drain, well, sinkhole, river, etc., by blocking or redirecting it. If spill contaminates a stream, pond, or other waterway, it must be immediately report to the relevant authorities.

c) ***Report the spill***: - Workers should call relevant authorities as well as the project base supervisor to report spill.

- If it is a large spill that is potentially flammable, workers must call the fire department for assistance.
- If the spill may expose the public to pesticides or pesticide residues, workers must contact public health officials.
- If anyone is poisoned by contacting the spill or there is suspected exposure that may lead to poisoning, a call to the hospital emergency room should be made and the hospital should be provide with relevant information about the pesticide.
- Workers should have the product label and any other relevant information about the pesticide being transported for the benefit of emergency responders.

3. CLEANING THE SPILL

a) ***Sweep up absorbent material –*** Workers should wear appropriate PPE. Sweep up any absorbent materials and other contaminated items and place them in a leak–proof container such as an empty containers. Add absorbent as necessary until all the liquid is absorbed.

b) ***Decontaminate area***: -If the pesticide was spilled on an impervious surface, use a heavy–duty detergent to clean and decontaminate the area.

- Work the cleaning material into the spill area with a coarse broom. Then add fresh absorbent material to soak up the now contaminate cleaning solution. Repeat process as needed to ensure that the area is thoroughly decontaminated.
- If minor spill occurred on soil, apply activated charcoal to contaminated soil.
- For larger spills on soil, remove topsoil 2–3 inches, until no visible stain or

odor is observed. Cover the remaining soil with at least two inches of lime, then cover the fresh topsoil.

c) ***Clean equipment and vehicle***: - Workers must clean any equipment and vehicles contaminated either as a result of the original accident or during clean–up procedure.
   - Workers cleaning transport vehicle and equipment must wear proper PPE.
   - Porous material and equipment that cannot be effectively decontaminated must be discarded properly as pesticide waste.

d) ***Decontaminate yourself*****: -** Workers must clean themselves as soon as they are finished with the spill and equipment cleanup.
   - Workers must wash thoroughly with detergent and water.
   - Any part of skin that might have been exposed must be washed. Face, neck, hands and forearms must be washed.

e) ***Document larger spills***: -For all large spills that take place during transportation, keep a record of the containment and cleanup activities as well as a record of conversations with authorities and public about the spill.
   - Photograph any damage as well as the cleanup process if possible.
   - Report the spill to appropriate agency, when necessary.

B. Management of Pesticide Spills During Storage

Spills during storage are mostly due to damaged containers, improper storage conditions, and in some instances, due to natural causes such as flooding. Stored pesticide may also ignite causing fire. As such, serious human exposure and environmental contamination can occur if pesticides are improperly stored. Proper storage of pesticides will therefore protect workers, the environment, and the people who live and work near the storage area from potential spills and exposure.

In addition, proper storage prolongs pesticide chemical shelf–life by preventing damages from temperature extremes or excess moisture. Proper storage also safeguards pesticide from theft, vandalism and unauthorized use. When storing pesticides, the following procedures will be observed:

1. ***Site*****: –** Pesticide storage facilities should be located away from human and livestock habitat and will be in an area that is not known to flood
   - The facility should be preferably away from water bodies
   - The storage facility should be built as a separate structure dedicated for pesticide storage and should not be used as an office space.
   - The storage facility should be further situated such that runoff from spills and leaks cannot contaminate surface water, drains, wells, etc.
2. ***Storage Area Exterior:*** **-** Storage facility should be preferably built with fireproof

material and the floor should be waterproof.

- Facility should be secured against theft, vandalism, and unauthorized access.
- Warning signs shall be visibly posted around the storage facility in English, Kiswahili and local vernacular language. As an example, the warning signs shall state "DANGER – PESTICIDES –KEEP OUT." The warning signs shall be placed on walls, doors, and windows. Signs should be legible, at least 50 feet from the building.

3. ***Storage Area Interior:*** - Pesticides, especially liquids ones, should preferably be stored on a waterproof cement floor.
    - Storage buildings should only be used for purposes of storing pesticides, nothing else.
    - Building interior should be well lighted and dry.
    - Proper ventilation should be observed: Buildings should be equipped with exhaust fans to prevent vapor accumulation, and heat buildup (vent fans so that no people, animals, or plants are exposed to the fumes).
    - Temperature should be controlled: Interior should be insulated to help maintain a constant room temperature (pesticides should never freeze or become excessively hot) Insulate according to the temperature recommended on the pesticide label.
    - Storage should consist of metal shelves with lips for storing pesticides off the floor (wooden shelves are unacceptable because they can absorb spilled pesticides; containers should be kept on pallets).
    - Storage building should include an area for storing properly rinsed, empty containers awaiting disposal.
    - Liquid pesticide and highly toxic pesticides should be stored on low shelves to minimize the potential for exposure if the containers are broken or begin to leak.
    - Storage building should have fire extinguishers near the door where it is accessible. It should also be fitted with fire warnings such as smoke detectors or alarms.
    - Storage building should have a secured outside shutoff for all electrical and water systems.
    - Emergency phone numbers will be posted at each phone in the storage and on the walls of storage facility; the numbers shall include numbers for police/fire/ambulance, hospital numbers, and emergency workplace team.
    - An up–to–date inventory of all the stored pesticides shall be physically and electronically kept, each container will be marked with its purchase and use dates.
    - Storage buildings hall include a fully equipped first aid kit.

Mitigating/Responding to Pesticide Spills During Storage

Pesticide that is spilled during storage should be dealt with the same way as any spill that occurs during transport. Workers should employ the three C's—Contain, Control, Cleanup.

1. **Wear PPE**: Only trained personnel should be involved in the spill cleanup.
   - Workers must put on PPE, including chemical resistant gloves, respirators, and overalls.
   - Workers must not smoke, drink or eat during the clean–up.
2. **Control the spill:** Workers should identify the source of the spill and stop the spill as quickly as possible by restoring the container to its upright position, closing a leaky valve or hose, or putting a secondary container in place to catch the leaking solution.
   - Pesticide bags that are broken or soaked through need to be carefully placed in a secondary container, such as a drum or a heavy plastic bag.
3. **Contain the spread:** When the leak has been stopped, contain the spread of the spill by creating dams of absorbent material in the path of the spilled liquid.
   - If it is a large spill that potentially affects people living in the immediate vicinity of the spill, emergency authorities should be notified, and such persons should be immediately evacuated.
4. **Cleanup:** begin prompt clean up as soon as the situation has been stabilized. Quick response to a spill will prevent the chemical from leaching or washing away in a rainstorm.
   - If possible, use a fan for ventilation during cleanup.
   - Use absorbent material such as clay, pet littler, vermiculite, absorbent pillows, or activated charcoal to capture the spilled liquid.
   - Absorbent material should then be swept or shoveled into a plastic or steel container and disposed as pesticide waste.
   - Cover dry pesticide spill with plastic tarp, and if possible, have them collected and put back in an empty storage container.
5. **Decontaminate the area:** - If the pesticide was spilled on an impervious floor, use a heavy–duty detergent to clean and decontaminate the area.
   - Work cleaning material into the spill area with a coarse broom. Then add fresh absorbent material to soak up the now contaminate cleaning solution. Repeat process as needed to ensure that the area is thoroughly decontaminated.
   - If minor spill occurred on soil, apply activated charcoal to contaminated soil.
   - For larger spills on soil, remove topsoil 2–3 inches, until no visible stain or odor is observed. Cover the remaining soil with at least two inches of lime, then cover the fresh topsoil.
6. **Decontaminate yourself: -** Workers must clean themselves as soon as they are finished with the spill and equipment cleanup.
   - Workers must wash thoroughly with detergent and water.

- Any part of skin that might have been exposed to the pesticide must be washed. Face, neck, hands and forearms must also be washed.
- Workers should decontaminate all equipment that was used in cleaning the spill and dispose any waste appropriately as pesticide waste.

7. **Report the spill:** - If the spill contaminated a water source, workers should report it as soon as possible to the relevant regulatory authority such as the National Environmental Management Authority (NEMA).
    - Spill should also be reported to the project base immediately.

Management of Pesticide Fires During Storage

Fires involving pesticides are extreme hazards; some pesticides are flammable, some are explosive. All pesticides are likely to produce highly toxic fumes when burned. These fumes may be harmful to people (including firefighters), animals, or plants. Runoff water from fighting a fire is likely to contain pesticide residue. This may contaminate soil, sewers, streams, lakes, wells, or other water sources. Because of the potential harm of pesticide fires, specific steps that should be taken to reduce or prevent them include:

1. Ensuring the storage structure adheres to the National Fire Code, National Building Code, National Electrical Codes, etc.
2. Posting signs on all storage entrances to show that pesticides are present.
3. Installing fire and smoke detectors in the storage area.
4. Refraining from the use of open flames for welding, burning, cutting, or heating in the pesticide storage site.
5. Keeping fire extinguishers near the storage area.
6. Keeping a list of stored pesticides in an easy to reach location away from the storage area.
7. Keep emergency phone numbers handy.

Mitigating/Responding to Pesticide Fire During Storage

In the event of a storage pesticide fire, prompt and responsible action is essential.

1. Depending on the size of the fire, workers should immediately evacuate the premises.
2. Workers may attempt to extinguish fire using fire extinguishers if there is no risk to them from the fire and if it is a smaller fire. For small fires, workers may also use fog, foam, or dry powder. If only water is available, use it as a fine spray or fog. Use only as much water as absolutely necessary. Do not use water jets because they can break bags and glass containers. If using water to fight pesticide fires, workers should not to spread the contamination to the surrounding area through water runoff.
3. Workers should immediately notify the fire department and inform the firefighters of the nature of the pesticides involved in the fire.
4. Workers should provide emergency-response personnel with safety data sheets (SDS), which include vital technical and emergency information.

5. Workers should isolate the area by keeping people away. Establish a security perimeter to discourage onlookers.
6. If significant smoke is generated, workers should evacuate all people and animals in the vicinity, especially those downwind.
7. Contain small fires with fog, foam, or dry powder. If only water is available, use it as a fine spray or fog. Use only as much water as absolutely necessary. Do not use water jets because they can break bags and glass containers. If using water to fight pesticide fires, be careful not to spread the contamination to the surrounding area through water runoff.
8. Workers should ensure water and spilled chemicals are being contained. For larger fires, workers should consider withdrawing and allowing the fire to burn out. This option is preferred over the use of water to fight the fire since use of water can lead to widespread environmental contamination. If runoff water cannot be avoided, build dikes to contain the contaminated water.
9. Workers should clean all equipment and all clothing exposed to the fire. All personnel involved should shower after fighting the fire.

C. Management of Pesticide Spills During Mixing and Application

Spills that occur during the mixing process are often due to human error, while spills during the application of the pesticide often arises from equipment malfunction. During mixing and application, the applicator is the one likely to be dangerously exposed to the pesticides. There is risk of the pesticide splashing on the skin, eyes and body of the applicator, as wells as the possibility of inhalation. To ensure safety, workers should observe the following when mixing and applying pesticides.

1. Pesticide applicators must always wear PPE before mixing and applying pesticides.
2. Applicators should never eat, drink, or smoke while handling pesticides.
3. Only workers who are approved to be at the mixing and application site should be allowed access to the area.
4. Good washing facilities should be maintained at the pesticide mixing and application site and applicators must wash after mixing or applying pesticides.
5. Applicators should review the label of each pesticide before opening the pesticide container to ensure familiarity with mixing and usage instructions.
6. Pesticide mixing area should be away from other people, livestock, plants etc.
7. Applicators should be trained in proper pesticide application techniques.
8. Pesticides should not be mixed in areas where a spill or overflow could enter a water supply.
9. If possible, pesticides should be mixed on a concrete pad so that spilled pesticide can be removed and not absorbed in the ground.
10. If mixing indoors, ensure adequate ventilation and light.
11. Only mix pesticides when the weather conditions are appropriate. Avoid rainy weather or extreme heat.

12. When pouring from a container, keep the container at or below eye level to avoid splashing or spilling on your face or on your protective clothing.
13. To prevent unnecessary spills, close container after each use.
14. A spill kit will be maintained at the mixing and application site. The spill kit will contain hydrated lime, activated carbon, bleach, absorbent materials, containment "snakes", tools (shovel, scoops, dustpans), warnings signs, ropes, storage bags, etc.

Mitigating/Responding to Pesticide Spills During Mixing and Application

The most hazardous activities involving pesticides are mixing and loading of concentrates. Use no more than the amount called for to prevent injury to applicator, exposed plants and/or animals and to prevent excess residues. Do not combine pesticides unless the combination is called for on the label or you have consulted an authority. In the event of a spill during mixing and application, apply the three C's—Contain, Control and Clean up.

1. **Wear PPE**: Only trained personnel should be involved in the spill cleanup.
   - Workers must put on PPE, including chemical resistant gloves, respirators, and overalls.
   - Workers must not smoke, drink or eat during the clean–up
2. **Contain the spill: -** Workers should do everything possible to immediately identify the source of the leak or spill.
   - If it is a toppled container, workers should restore the container to its upright position. If there is any leaky hose or valve, a secondary container should be put in place to catch the leaking solution.
   - If the material is a liquid, construct a dam to prevent it from spreading.
   - Pesticide bags that are broken or soaked through need to be carefully placed in a secondary container, such as a drum or a heavy plastic bag.
3. **Control the spill: -**When the leak has been stopped, contain the spread of the spill by creating dams of absorbent material in the path of the spilled liquid.
   - If it is a large spill that potentially affects people living in the immediate vicinity of the spill, emergency authorities should be notified, and such persons should be immediately evacuated
   - Isolate the contaminated area. Rope off the area or use chalk to draw a line around it. Keep people at least 30 feet away from the spill.
4. **Clean up the spill: -** After the spill is under control, workers should begin prompt clean up. Quick response to a spill will prevent the chemical from leaching or washing away in a rainstorm.
   - Use absorbent material such as clay, pet littler, vermiculite, absorbent pillows, or activated charcoal to capture the spilled liquid.
   - Absorbent material should then be swept or shoveled into a plastic or steel container and disposed as pesticide waste.
   - Cover dry pesticide spill with plastic tarp, and if possible, have them collected and

put back in an empty storage container.

5. **Decontaminate the area: -** If the pesticide was spilled on an impervious floor, use a heavy–duty detergent to clean and decontaminate the area.
   - Work cleaning material into the spill area with a coarse broom. Then add fresh absorbent material to soak up the now contaminate cleaning solution. Repeat process as needed to ensure that the area is thoroughly decontaminated.
   - If minor spill occurred on soil, apply activated charcoal to contaminated soil.
   - For larger spills on soil, remove topsoil 2–3 inches, until no visible stain or odor is observed. Cover the remaining soil with at least two inches of lime, then cover the fresh topsoil.
6. **Decontaminate yourself: -** Workers must clean themselves as soon as they are finished with the spill and equipment cleanup.
   - Workers must wash thoroughly with detergent and water.
   - Any part of skin that might have been exposed to the pesticide must be washed. Face, neck, hands and forearms must also be washed.
   - Workers should decontaminate all equipment that was used in cleaning the spill and dispose any waste appropriately as pesticide waste.
7. **Decontaminate equipment*:*** - Workers must decontaminate any equipment that was contaminated either as a result of the original accident or during clean–up procedure. Workers must wear PPE. Porous material such as brooms and sponges and equipment that cannot be effectively decontaminated must be discarded properly as pesticide waste.
8. **Report the spill: -** If the spill contaminated a water source, workers should report it as soon as possible to the relevant regulatory authority such as the National Environmental Management Authority (NEMA).

Emergency Preparedness Response Plan				
IMPACT TYPE	**IMPACT/ISSUES**	**MITIGATION MEASURES**	**MONITORING**	**RESPONSIBILITY**
Precautions to void harmful impacts of pesticide spills on Occupational Health and Safety Impacts Pesticide spills can cause serious sometimes deadly to workers involved in transport, storage, mixing and applying pesticides.	Pesticide spills that occur during transport, storage or mixing and application can create serious harm to applicators and other workers who are exposed to the spill.	▪ Provide PPE including training on proper use and storage. ▪ Provide training on handling pesticides and cleaning spills, including training on fire safety. ▪ Provide emergency transport to medical facility in case of pesticide exposure. ▪ Provide first aid kit. ▪ Provide healthcare staff with any information about the pesticide(s) to which the person may have been exposed. ▪ Provide medicine to treat pesticide exposure. ▪ Train workers on first aid for pesticide exposure. ▪ Provide regular training on handling pesticides. ▪ Monitor handlers working with pesticide waste. ▪ Provide washing facilities in the storage and mixing site for those exposed to pesticides during cleanup.	▪ PPEs provided and workers trained on proper use. ▪ Training manual prepared ▪ Training on handling and using pesticides as well as first aid training held. ▪ Healthcare workers provided with pesticide information. ▪ Medicine stocked with hospital ▪ Emergency transport vehicle provided. ▪ Emergency phone numbers provided. ▪ Wash facilities built. ▪ First aid kit provided in the transport vehicle, storage facility and mixing location.	▪ MoALD/NPCU ▪ CPCU
Precautions to avoid harmful impacts of pesticide spills on Community Health and Safety Impacts Pesticide spills can cause serious sometimes deadly harm to community members who get exposed to the pesticide during transport, storage, mixing and applying pesticides.	Exposure	▪ Awareness creation to the community on pesticide waste dangers and how to protect from pesticide spills. Training should also include dangers of accessing sites where there has been a spill. ▪ Provide emergency transport to medical facility in case of pesticide exposure. ▪ Train workers and community members residing close to storage location on emergency first aid response and ensure first aid kits are available in storage facilities and transport vehicles. ▪ Ensure treatment medicines for pesticide exposure are available at the medical center.	▪ Training manual prepared ▪ Training on pesticide dangers conducted. ▪ Healthcare workers provided with pesticide information. ▪ Medicine stocked with hospital ▪ Emergency transport vehicle provided. ▪ Emergency phone number provided. ▪ Proper storage structure of pesticides constructed and	▪ MoALD/NPCU ▪ CPCU

Emergency Preparedness Response Plan				
IMPACT TYPE	**IMPACT/ISSUES**	**MITIGATION MEASURES**	**MONITORING**	**RESPONSIBILITY**
		▪ Ensure proper storage of pesticide inside storage building. ▪ Install warning signs on pesticide storage structure. ▪ Ensure site of storage is situated away from community members. ▪ Label empty pesticide containers as dangerous and not for use. ▪ Build storage facility with fire resistant material to help prevent spread of fires and provide fire alarms ▪ Lock storage facilities. Fence the storage area to avoid community entry and if possible, have a guard on duty. ▪ Properly discard PPEs such as goggles or boots; ensure that community members are unable to access the discarded material. ▪ Ensure that the project executers and host community are able to address the grievances when a spill occurs.	locked. ▪ Warning signs at pesticide storage area provided in English, Swahili, and local language. ▪ Pesticide containers labelled as dangerous, including empty containers. ▪ PPE disposal system situated. ▪ Community based grievance redressal mechanism set up. ▪ Storage facility constructed from fire resistant material. ▪ Fire alarm monitoring set up.	
Precautions to avoid harmful impacts of pesticide spill on surface water contamination Surface water contamination can result directly or indirectly from spills and leakages running into the water. Such contamination impacts aquatic life as well as community livelihoods.	Exposure from spill of the pesticides into the water bodies during transportation, storage or mixing and application.	▪ Provide training on the three C's- Control, Contain, Cleanup. ▪ Reinstate and wash water should be emptied back to the spraying or mixing tanks. ▪ Establish soak pits (with charcoal to filter, adsorb and retain the pesticides) ▪ Pesticide applicators will never wash themselves, their overalls, or their PPE in any water bodies, or where wash water will drain to water bodies. ▪ Train workers to ensure that they avoid spill going to waterways. ▪ Build storage facility away from water ways.	▪ Training manual prepared. ▪ Training on the "three C's" done. ▪ Comprehensive stock and inventory done. ▪ Tracking system for containers established. ▪ Storage structure located away from water ways.	▪ MoALD/NPCU ▪ CPCU

Emergency Preparedness Response Plan				
IMPACT TYPE	**IMPACT/ISSUES**	**MITIGATION MEASURES**	**MONITORING**	**RESPONSIBILITY**
Precautions to avoid harmful impacts of spill on ecological sensitive habitats Pesticide spills can create a potential risk of polluting ecologically sensitive habitats such as wetlands, National parks reserves, forests, pasture grasslands, and water bodies.	Exposure from spill of the pesticides into ecological sensitive habitats during transportation, storage or mixing and application.	• Identifying and map out sensitive ecological and agronomical areas and avoid pesticide application in those areas. • Site storage away from ecologically sensitive areas. • Provide training on the three C's- Control, Contain, Cleanup.	▪ Map identifying sensitive ecological areas prepared. ▪ Training sessions held focussing on "no spray" areas. ▪ Training manual prepared. ▪ Training on the "three C's" done ▪ Storage structure located away from ecologically sensitive area.	▪ MoALD/NPCU ▪ CPCU
Precautions to avoid risk of spills during transportation If spillage occurs during transportation, it may cause harm to workers, the public and the environment. Transport spills may also result in a fire (pesticides are flammable), causing injury to humans and livestock(exposure), contamination of water, flora, soils, and risks to fauna (exposure).	Exposure	▪ Only vehicles correctly equipped to carry pesticides must be used for transportation. ▪ Keep current on preventive maintenance. ▪ Make sure vehicle has first aid kit including current medication. ▪ Pesticide transporters and users must be trained and be familiar with recommendations detailed on the product Material Safety Data Sheet and procedures to be followed. ▪ Preparation of an EPRP which has details of all appropriate authorities that must be notified (Environment, Water, Police, Fire Department etc.) ▪ Records must be kept of all incidents and remedial action taken. ▪ Training on EPRP and awareness of the details of the pesticide MSDS for all the operators, medical teams, transporters, storekeepers and field control team ▪ Absorbent material to contain chemical spills must be available in the vehicle.	▪ Documentation made on type of vehicle used to carry pesticides. ▪ Training manuals prepared ▪ Training videos made ▪ EPRP documentation done. ▪ Documentation of absorbent material made. ▪ PPE provided and workers trained on use. ▪ Material to contain chemical spills provided. ▪ Record keeping mechanism in place. ▪ Spill kit provided ▪ Emergency numbers placed on vehicle ▪ Cell phone for emergency in vehicle.	MoALD/NPCU CPCU

Emergency Preparedness Response Plan				
IMPACT TYPE	**IMPACT/ISSUES**	**MITIGATION MEASURES**	**MONITORING**	**RESPONSIBILITY**
		▪ Fire extinguishers must be kept in the transport vehicle ▪ PPE and spill kit must be kept in the vehicle. ▪ Inspect containers before loading. ▪ Make sure containers are properly secured.		
Precautions to avoid risk of spill during storage Spillage occurring during may cause harm to workers, the public and the environment. Storage spills may also result in a fire (pesticides are flammable), causing injury to humans and livestock(exposure), contamination of water, flora, soils and risks to fauna (exposure). Poor siting and design of pesticide storage facilities could lead to exposure and contamination of the bio-physical environment as well as human health risks due to contact	Exposure / spills	▪ All primary pesticide storage facilities will be double-padlocked and guarded ▪ All the storage facilities will be located away from nearby watercourses, domestic wells, markets, schools, hospitals etc. ▪ Soap and clean water will be available at all times in all the facilities. ▪ A trained storekeeper will be hired to manage each facility. ▪ Recommended pesticide stacking position and height in the warehouse as provided in the FAO Storage and Stock Control Manual will be followed. ▪ Storage will have at least two exit access routes in case of fire outbreak. ▪ Storage will be properly ventilated and lighted. ▪ A fire extinguisher will be available in the storage facilities and all workers will be trained on how to use the available firefighting facilities. ▪ Warning notices will be placed outside of the store in both English and the local language(s) with a hazard symbol (skull and crossbones sign), and also a caution symbol against unauthorized entry ▪ All pesticides will be used and any remnants will be stored under lock and key until the next round of application.	▪ Storage units constructed away from water sources ▪ Security manuals of storage units. ▪ Inventory sheet of available cleaning agents. ▪ Storage and warehouse plans. ▪ Fire extinguishers provided ▪ Emergency numbers provided. ▪ Security agents for storage hired. ▪ Spill kit ▪ Washing station	▪ MoALD/NPCU ▪ CPCU

Emergency Preparedness Response Plan				
IMPACT TYPE	**IMPACT/ISSUES**	**MITIGATION MEASURES**	**MONITORING**	**RESPONSIBILITY**
		▪ Application of First In/First Out (FIFO) approach in pesticide distribution will be practiced avoiding accumulation of expired pesticides. ▪ Storage facilities are accessed by authorized personnel only ▪ Pesticide stacking position and height in the warehouse is followed. ▪ The central warehouses have more than 3 exit access routes in case of fire outbreak. ▪ Have a spill kit in the storage area. ▪ Have a washing station close to the storage area.		
Precautions to avoid risk of spill during Mixing and Application of pesticides Spills occur during the mixing process due to human error, or equipment malfunction. There is risk of the pesticide splashing on the skin, eyes and body of the applicator, as wells as the possibility of inhalation.	Exposure / spills	▪ Wear PPE such as face shield or goggles, chemical resistant rubber gloves, apron, long sleeves, pants, and chemical resistant rubber boots. ▪ Fill tank halfway with water, add pesticide, then finish filling tank. ▪ Use only recommended amounts. ▪ Close container after use. ▪ Wash or decontaminate after handling pesticides. ▪ Do not spray during inclement weather. ▪ Read label before mixing. ▪ Do not mix more than needed.	▪ PPE provided ▪ Training manuals on proper pesticide application and mixing. ▪ Spill kit provided.	▪ MoALD/NPCU ▪ CPCU
Precautions to reduce risks during pesticide spill clean–up risks	Contamination /exposure	▪ Wash all personal protective equipment in the field with soap and water then wash again with warm soapy water at the station. ▪ Return all equipment to proper storage area. ▪ Bathe or shower as soon as possible after coming into contact with pesticide. ▪ Wash clothing separate from other laundry. ▪ In case of a spill apply the “three C’s”		▪ MoALD/NPCU ▪ CPCU

Emergency Preparedness Response Plan				
IMPACT TYPE	**IMPACT/ISSUES**	**MITIGATION MEASURES**	**MONITORING**	**RESPONSIBILITY**
		▪ Provide first aid kit ▪ Provide emergency to hospitals ▪ Provide medicine to hospitals for treatment of pesticide exposure		
Precautions to reduce pesticide fire hazards	Exposure/spills	▪ Store combustible pesticides away from heating sources. ▪ Install a fire detection system. ▪ Train employees to use a fire extinguisher. ▪ Train o first aid and provide first aid equipment, ▪ Provide spill kit. ▪ Provide fire extinguishers and emergency phone numbers. ▪ Build with fire resistant material. ▪ Notify fire department ▪ Provide emergency response teams with SDSs, labels, the emergency plan, and a site map. ▪ Establish a security perimeter to discourage onlookers. ▪ Contain contaminated runoff water and leaking pesticide onsite by building berms. ▪ Consult with emergency responders to decide whether to allow the fire to burn out.	▪ Fire detector and alarm installed ▪ Training manual on fire ▪ Storage layout manual ▪ Storage construction plan ▪ Emergency numbers provided ▪ Fire extinguishers installed. ▪ First aid training manuals ▪ Spill kit documented ▪ PPE documented	▪ MoALD/NPCU ▪ CPCU