

Republic of Kenya



**Ministry of Agriculture and Livestock Development (MoA&LD)
State Department of Crops Development**

FRAMEWORK INTEGRATED PEST MANAGEMENT (IPMP)

FOR

FOOD SYSTEMS RESILIENCE PROJECT (FSRP)

September 2023

FSRP
Integrated Pest Management Plan (IPMP)

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ACRONYMS

AAK	Agro chemical association of Kenya
ASTGS	Agricultural Sector Transformation and Growth Strategy
CESSCOs	County Environmental and Social Safeguards Compliance Officers
CIGs	Community Interest Groups
Covid-19	Corrona Virus Disease -19
CPCU	County Project Coordinating Unit
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
FPOs	Farmers 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
IVM	Integrated Vector Management
KCSAP	Kenya Climate Smart Agriculture Project
KEBS	Kenya Bureau of Standards
FSRP	Food Systems Resilience Project
MoA&LD	Ministry of Agriculture and Livestock Development
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

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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
VBDs	Vector Borne Diseases
VMGs	Vulnerable and Marginalized Groups
WB	World Bank
WHO	World Health Organization
WSH	Workplace Sexual Harassment

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EXECUTIVE SUMMARY

- 1) This Integrated Pest Management Plan (IPMP) has been prepared for the Food Systems Resilience Project (FSRP), which is a World Bank financed project to Government of Kenya's (GoK) Ministry of Agriculture and Livestock Development (MoA&LD), State Department for Crops Development.
- 2) This document serves as the guide to pesticide use related project actions and activities and specifically for component 1 and 2 where pesticides will be used to improve crop and livestock productivity. 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.
- 3) 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 project implementing and executing agencies will prepare a Pest Management Plan (PMP). Where projects involve recourse to pest management measures, the project implementing and executing agencies will give preference to Integrated Pest Management (IPM) or Integrated Vector Management (IVM) approaches using combined or multiple tactics.

a. Food Systems Resilience Project

- 4) The project will support investments in building resilient food systems, through four primary investment pathways: i) rejuvenating and rebuilding resilient agricultural and livestock production capacity ii) strengthening the availability of water and improvement of rangelands management for resilient agriculture and livestock production, iii) strengthening the integration of the production systems to domestic and regional markets and iv) establishing an enabling policy and institutional framework capable of supporting food systems resilience for Kenya. The project will finance three levels of investments - national level, county level and farmer level. The National level Investments include capacity building, technical support and policy analysis, policy coordination, technical assistance and some specific market infrastructure activities. The county level and farmer level investments will be undertaken in the following 13 counties - Baringo, Marsabit, Wajir, Mandera, Garissa, Tana River, Lamu, West Pokot, Laikipia, Isiolo, Turkana, Samburu and Elgeyo Marakwet. The project will support 300,000 crop and livestock farmers, benefit many value chain actors. It is expected that 5,000 jobs will be created through multiple pathways including expansion of FPO operations, expansion of anchor off-takers and SME operations, expansion of agri-tech provider operations, development of agripreneurs and expansion of urban agri-business linkages. The project will have a strong focus on addressing gender gaps to develop gender smart agriculture value chains through a range of integrated solutions.

b. Selected Pesticides

- 5) **ESS3** requires that in the procurement of any pesticide the project implementing and executing agencies will assess the nature and degree of associated risks, taking into account the proposed

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use and the intended users, 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 project implementing and executing agencies 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 project implementing and executing agencies under such conventions, their protocol, or annexes, consistent with project implementing and executing agencies commitments under these and other applicable international agreements.

- 6) The project implementing and executing agencies 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 project implementing and executing agencies 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
- 7) 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.
- 8) 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.
- 9) 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.

c. Justification and Objective of IPMP

- 10) 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 project implementing and executing agencies will prepare a Pest Management Plan (PMP). This IPMP is prepared to address use of chemicals under component 1 and 2. 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

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the environmental and social standards. The Project is preparing the IPMP to guide the subsequent preparation of the investment specific IPMPs during implementation.

d. Pesticide Policy, Legal, International Requirements and Guidelines

11) 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 convention on control of transboundary movement of hazardous and disposal*
- *Bamako convention*
- *FAO guidelines on management options for empty pesticides containers*
- *WHO Guidelines for personal protection when handling and applying pesticides*

e. Environmental and Social Risks Classification

The overall Environmental and Social Risk Classification of the FSRP is Substantial. On Component 1 and 2 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

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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. The activities that may require the use of pesticides are broad based crop and livestock interventions. Crop interventions include the promotion of various value chains including post-harvest practices during storage to guard against losses. Cereals, pulses, vegetables and fruits production require the use of pesticides to control pests and diseases. Livestock production (including restocking) require the use of vet drugs, vaccines and acaricides.

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f. Procedure for Preparation of Sub Project IPMPs

- 12) 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.
- 13) 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 FSRP sub projects are categorized as **Low or Medium Risk** requiring preparation of SPR or CPR.
- 14) FSRP environmental and social specialists at the CPCU in collaboration with beneficiary community and NPCU will screen all subprojects that will be implemented under component 1 and 2. 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.
- 15) The SPR and CPR will be reviewed by the FSRP/NPCU and disclosed in the MoA&LD website. The World Bank will also review CPRs and provide clearance. The reports will also be disclosed in the project areas and made accessible to the beneficiaries. The Bank will disclose the CPRs and SPRs in its external website.
- 16) This framework level IPMP will also guide preparation of sub project level IPMPs which will be prepared by the environmental and social specialists based at each of the Counties

g. Capacity Building and Training

- 17) 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 MoA&LD 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).
- 18) 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. To ensure that the message and quality of training is

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

- 19) World Bank recognizes that safety training is an essential component in programs involving the use of pesticides. . In this regard, training of pesticide users and applicators on safe use of pesticides will be a vital component of capacity building in this program targeting different actors within the project, ranging from extension service providers, actual farmers, loaders, mixers, transporters, government staff among others.
- 20) . The farmers, farm leaders and, extension workers and stockists will be trained on safe use of pesticides including handling, storage and disposal of wastes. 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.
- 21) 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 using 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.
- 22) The FSRP will adopt a strategy where extension services in the application of pesticides Communities will be encouraged to use professional spray teams established and trained on safe use of pesticides to apply pesticides. Table I.1-2 below summarises the topics and targets areas to be trained.

Table I.1-1: 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

- 23) 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:

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

h. Public Consultations and Disclosure

- 24) This IPMP will be subjected to public consultation 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 will be incorporated in this IPMP.
- 25) The Key issues raised during the public consultation and the full participant's lists will be described in the ESMF developed for FSRP

I INTRODUCTION

I.1 Selected Pesticides

1. Resource Efficiency and Pollution Prevention and Management (**ESS3**) requires that in the procurement of any pesticide the project implementing and executing agencies will assess the nature and degree of associated risks, considering the proposed use and the intended users. The project implementing and executing agencies 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 project implementing and executing agencies 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 project implementing and executing agencies under such conventions, their protocol, or annexes, consistent with project implementing and executing agencies commitments under these and other applicable international agreements.
2. The project implementing and executing agencies 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 project implementing and executing agencies 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.
3. 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 project implementing and executing agencies 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.

4. The FSRP 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.

1.2 Aims and Objectives of IPMP

5. 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 project implementing and executing agencies will prepare Integrated Pest Management Plan (IPMP). This Integrated Pest Management Plan is prepared to address use of chemicals that will be used in the FSRP. The project is funded by the World Bank and in compliance with the environmental and social standards (ESS), an IPMP is required because of the planned use of pesticides. Under FRSP, an Environmental and Social Management Framework (ESMF) has been prepared in line with the Environmental and Social Commitment Plan (ESCP) and the Bank ESS 3, that require IPMP be prepared alongside ESMF because Component 1 and 2 will have activities that will employ significant quantities of pesticides. The Crop interventions include the promotion of various value chains including post-harvest practices during storage to guard against losses. Cereals, pulses, vegetables and fruits production require the use of pesticides to control pests and diseases. An IPMP will be prepared to mitigate the risks posed by these activities. 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

1.3 Stakeholder Engagement

6. This chapter will describe the consultations conducted during the preparation of the IPMP, the disclosure arrangements and the grievance mechanism in place for use during the project implementation.
7. MoA&LD will present this IPMP as a draft to identified stakeholders as part of public consultation and more specifically to seek input from the stakeholders on potential impacts and mitigation measures of the FSRP. The issues raised by the stakeholders will be summarised in table 2-1 below. The details of the stakeholder's deliberations will be contained in the ESMF developed for FSRP.

1.4 IPMP Disclosure

8. 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 at disclosed on the website of MoA&LD and also forwarded to the Bank for disclosure at the Bank's external website.

2 POLICY AND REGULATORY FRAMEWORK FOR PEST AND PESTICIDE MANAGEMENT

9. 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 FSRP.

2.1 The Legal, Regulatory and Policy Framework

2.1.1 Constitutional Provisions

10. 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*

11. 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: -

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.*

12. 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.

13. 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.

(2) 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.*

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

14. 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

15. 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

16. 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.

17. 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

18. 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

19. 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

20. 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

21. 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

22. 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

23. 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

24. 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.

25. 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:

2.1.12 Environmental (Impact Assessment and Audit) Regulations 2003

26. 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.

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

27. 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.*

28. 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.

2.1.12.2 Environmental Management and Coordination, (Water Quality) Regulations 2006

29. 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.*

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.*

30. 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.

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

31. 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.

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

32. These regulations provide for the protection and management of wetlands, riverbanks, lakeshores and sea-shore management and detail guidelines on the same.

2.1.13 Occupational Health and Safety Act, 2007

33. 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.*

34. 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.

35. 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.

36. 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.*

37. 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.

38. 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.*

2.1.14 Public Health Act, Chapter 242, 2012

39. 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 research 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.

2.1.15 Public Participation Act

40. 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.

2.1.16 Animal diseases ACT

The Animal diseases Act is governed under CAP 364 of the Laws of Kenya and introduces sanitary measures that may or shall be taken by public bodies responsible for animal health and holders of animals for the control of domestic diseases affecting animals (ruminants, dogs and captive wild animals) and any other animal as may be declared by the Cabinet Secretary responsible for the State Department of Livestock to an animal to which the Act shall apply. The Animal diseases Act among other things prescribes:

- Notifiable animal diseases affecting animals and humans
- What to do when a notifiable disease is suspected
- Declaration of infected areas
- Provisions affecting infected areas
- Power to prohibit importation of animals
- Slaughter of infected animals
- Disposal of carcasses of slaughtered animals
- Indemnity and payment of compensation
- Power to search for infected animals
- Power to prescribe fees
- Power to prohibit use of vaccine or drug
- Power to search and detain suspects
- Penalties payable
- What to do with seized animals in cases of breaches
- Disposal of forfeited animals

2.1.17 Terrestrial Animal Health Code (2022) of the World Organization of Animal Health (WOAH)

This code provides detailed guidelines on animal disease diagnosis, surveillance and notification, risk analysis, quality of veterinary services, disease prevention and control, trade measures, import/export procedures and veterinary certification, veterinary public health and animal welfare. The objective is to foster human and animal health through timely and accurate prevention, detection and control of zoonotic and infectious diseases. Similarly, the code lists recommendations applicable to the WOAH listed diseases and other diseases of importance to internal trade in live animals and their products as per the World Trade regulations.

2.1.18 Cattle cleansing ACT

This Act as stated in CAP 358 of the laws of Kenya regulates the cleansing of cattle, i.e. freeing and maintain free from tick infestation cattle by treating the cattle with tick-destroying agent. Every cattle owner in a cattle cleansing area shall clean all cattle within such area at such hours

on such dates and at such intervals as may from time to time be ordered in writing by an inspector and according to methods prescribed by this Act or in such manner as the Director of Veterinary Services may from time to time by notice in the Gazette prescribe. Other provisions concern the construction of dipping tanks and the treatment of cattle without a known owner.

2.2 Relevant Sector Policies

2.2.1 The Kenya Vision 2030

41. 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 policies 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

42. 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 traditional 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

43. 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

44. 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

45. 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.

2.2.6 The National Productivity Policy

46. 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.

2.2.7 The National Food and Nutritional Security Policy

47. 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.

2.2.8. Sessional Paper No. 3 of 2020 Livestock Policy

The broad objective of the Livestock Policy is to utilize livestock resources for food and nutrition security and improved livelihoods while safeguarding the environment. The objective will be achieved by measures to ensure : Improved management of livestock, feed and rangeland resources while promoting social inclusion and environmental resilience; Providing for animal health and food safety to facilitate access to domestic, regional and international markets; Promoting investment in agribusiness, value addition and product development in the Sector; Supporting livestock research and extension services to facilitate innovation and adoption of appropriate technologies ; Promoting cooperation and collaboration between the national and county governments in livestock development; and strengthening the legal and institutional framework

2.2.9 Sessional Paper No. 2 of 2019 Veterinary Policy

The Veterinary Policy provides a roadmap for the development of animal resources in Kenya through observation of sanitary measures. Animal resource categories in Kenya include livestock, wildlife, farmed wildlife, companion and aquatic animal species and bees. The animal resources listed above are very critical to rural livelihoods and the national economy considering that they directly and indirectly contribute over 22 per cent of the National Gross Domestic Product (GDP). This Policy addresses animal health production & welfare, food safety and trade among other concerns in livestock, wildlife, aquatic and companion animals. Animal health services are integral to the prevention, control and eradication of animal diseases that occasion huge economic losses and adversely impact livelihoods. The health of animals is among the leading priorities in animal productivity and at all stages of production must be guaranteed. Due to inadequate focus on animal health, enterprises involving food animals have low returns on investment resulting in high poverty levels in animal producing areas.

2.3 Other Relevant Institutions - Environmental

Table 2.3-2: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,	Enhance compliance of pest control products to set standards and facilitate trade.

	<p>manufacture, distribution, transportation, sale, disposal and use of products used for the control of pests and mitigate potential harmful effects to the environment.</p>	<ul style="list-style-type: none"> ■ 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	<ul style="list-style-type: none"> ■ Research in plant and animal health issues related to pesticides ■ Regulation of research on plants and animal health in other NARS 	<ul style="list-style-type: none"> ■ Efficacy trials and safety of agricultural pesticides for field and stored crops and fertilizers ■ Efficacy and safety trials for chemicals used in and on animals ■ Train stakeholders on effective control of pests affecting crops and livestock
Veterinary Medicines Directorate	<ul style="list-style-type: none"> ■ Registration of pest control products for use in livestock 	<ul style="list-style-type: none"> ■ Efficacy and safety trials of the pesticides before registration
Ministry of Health		
Government Chemists Department	<ul style="list-style-type: none"> ■ Provision of laboratory services in the fields of public and environmental health 	<ul style="list-style-type: none"> ■ 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
KEMRI	<ul style="list-style-type: none"> ■ Research on vectors which spread zoonotic diseases ■ Research on the use of pesticides to control parasitic conditions 	<ul style="list-style-type: none"> ■ Efficacy and safety trials for chemicals used in and on humans ■ Train stakeholders on effective control of pests affecting humans
Directorate of Occupational Safety and Health Services (DOSHS)	<ul style="list-style-type: none"> ■ Ensures safety, health and welfare of workers predisposed to pesticides. 	<ul style="list-style-type: none"> ■ 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)	<ul style="list-style-type: none"> ■ Prepare standards relating to pesticides and their promotion at all levels 	<ul style="list-style-type: none"> ■ Develop pesticide standards. Testing pesticide residues, and toxic elements in foods Certification of products

2.4 World Bank Group EHS Guidelines

48. 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 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 Annual 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

49. 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

50. 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

51. 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

52. 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

53. 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

54. 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

55. 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

56. 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

57. The FSRP is a program targeting 13 Counties in Kenya and expected to have project investments in the entire country for as long as the selected sites are feasible. However, the likely or potential locations of many of the proposed investments are unknown at this point in time. In order to reduce, minimise 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)**
- Land Acquisition, Restrictions on Land Use and Involuntary Resettlement **(ESS 5)**
- Biodiversity Conservation and Sustainable Management of Living Natural Resources **(ESS 6)**
- Indigenous Peoples/Sub-Saharan African Historically Underserved Traditional Local Communities **(ESS7)**
- Cultural Heritage **ESS 8)**
- Stakeholder Engagement and Information Disclosure **(ESS 10)**

3 INTEGRATED PEST MANAGEMENT PLAN

3.1 ESS 3 Pesticide Selection Requirements

58. Resource Efficiency and Pollution Prevention and Management (**ESS3**) requires that in the procurement of any pesticide the project implementing and executing agencies will assess the nature and degree of associated risks, taking into account the proposed use and the intended users. The project implementing and executing agencies 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 project implementing and executing agencies 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 project implementing and executing agencies under such conventions, their protocol, or annexes, consistent with project implementing and executing agencies commitments under these and other applicable international agreements.
59. To minimize dependence on pesticide (chemical) control options the investments will select resistant varieties and use the cultural and biological control of pests, diseases, and weeds. An effective IPM regime that comprises of the following components shall be developed:
- Identifies and assess pests, threshold levels, and control options (including those listed below), as well as risks associated with these control options.
 - Rotates crops to reduce the presence of insects, disease, or weeds in the soil or crop ecosystems.
 - Supports beneficial bio-control organisms, such as insects, birds, mites, and microbial agents, to perform biological control of pests (e.g., by providing a favorable habitat, such as bushes for nesting sites and other original vegetation that can house pest predators and parasites).
 - Favors manual, mechanical weed control and/or selective weeding.
 - Considers using mechanical controls, such as traps, barriers, light, and sound, to kill, relocate, or repel pests.
 - Uses pesticides to complement these approaches, not replace them. Prior to procuring any pesticide, assess the nature and degree of associated risks and effectiveness, taking into account the proposed use and the intended users as well as compatibility with the proposed biological control options
60. The project implementing and executing agencies 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 project implementing and

executing agencies 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.

61. 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.
62. For any project involving significant pest management issues or any project contemplating activities that may lead to significant pest and pesticide management issues, the project implementing and executing agencies will prepare an IPMP. An IPMP will also be prepared when proposed financing of pest control products represents a large component of the project.
63. The FSRP will support crops and livestock production. The tables 4 below show the common livestock diseases and vectors/pests.

Table 3.1-3: Common Vector-borne Parasitic Diseases of Livestock in Kenya

Vectors	Disease/Condition
Ticks	
<i>Rhipicephalus appendiculatus</i>	East Coast fever (ECF)
<i>Boophilus decoloratus</i>	Anaplasmosis (Gall sickness), Babesiosis (red water)
<i>Rhipicephelus evertsi</i>	Babesiosis (red water)
<i>Amblyomma variegatum</i>	Heart water (Bush sickness)
<i>Ornithodoros moubata</i>	African swine fever (ASF)
<i>Argas persicus (soft tick)</i>	Spirochaetosis
TseTse Fly	
<i>Glossina pallidipes</i>	Trypanosomosis (Nagana)
Mange	
<i>Chorioptes bovis</i>	mange in cattle and horses
<i>Sarcoptes scabiei var suis</i>	scaroptotic mange in pigs
<i>Psoroptes cuniculi</i>	Psoroptotic mange in goats
<i>Knemidocoptes mutans</i>	Scaly leg in poultry
<i>Knemidocoptes gallinae</i>	Depluming (loss of feathers) of birds
<i>Demodex canis</i>	Demodicosis (mange) in dogs

Biting flies	
<i>Stomoxys calcitrans</i> (stable fly)	Anthrax, trypanosomiasis
<i>Tabanus spp</i> (horse fly)	Trypanosomiasis, anthrax, tularemia
Culicoides	Blue tongue
Mosquitoes	Rift Valley fever
Sand flies	Visceral leishmaniasis (Kala azar) in humans
Endoparasites	
Helminths	<i>Helminthiasis</i>
Nematodes: <i>Haemonchus, Ostertagia, Trichostrongylus</i> (<i>Chaerbertia, Oesophagostomum</i>), <i>Nematodirus, Bunostomum</i> (hookworm), <i>Toxocara vitulorum, Cooperia, Dictyocaulus</i>	<i>Anaemia Unthriftiness</i>
Trematodes: <i>Fasciola hepatica, Fasciola gigantica</i>	<i>Anaemia Unthriftiness</i>
Cestodes: <i>Moeniezia</i> genus, <i>Cysticercus</i> (<i>bovis and solium</i>), <i>Echinococcus granulosus</i> (hydatidosis)	<i>Anaemia Hydatidosis</i>
Coccidia	<i>Coccidiosis</i>

3.1.1 Trypanosomosis

Control of tsetse flies and Trypanosomosis Insecticides

64. The chemicals used to control tsetse flies and drugs used to treat and control trypanosomosis are shown in Table 5-2 and 5-3. The combined strategy used is effective because tsetse 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 reduce drug resistance and maintain their anti-trypanocidal activity.
- Clear bushes on the farm regularly.

3.1.2 Anthrax

65. 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

66. 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.

3.1.3 Black Quarter

67. 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.

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.

3.1.4 Foot and Mouth Disease

68. 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

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 quadrivalent vaccine containing, types A, O SAT, 1 and 2 is used to protect animals for up to 6 months.

3.1.5 Rift Valley Fever

69. 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.

70. The strategies for control of vectors and drugs used in the treatment of vector borne diseases are summarized in tables 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.

3.2 Strategies for Disease Control

71. 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.

72. 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 5-4 and include, dipping, hand spraying and hand dressing.

73. 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.

74. The drugs commonly used in the programme area for the treatment and control of VBDs is given in Table 5-8 below. 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.

Table 3.2-4: Control of Vector Borne Diseases in Cattle

Tick Species	Parasite/ Causative Agent	Disease Transmitted	Control
<i>Rhipicephalus Appendiculatus</i> (Brown ear tick)	1. <i>Theileria parva</i> 2. <i>Anaplasma Marginale</i>	1.ECF 2. Anaplasmosis	Dipping, spraying, pour-on
<i>Rhipicephalus avertis</i> (Red-legged tick)	1. <i>Theileria parva</i> 2. <i>Babesia bigemina</i>	1.ECF 2.Babeciosis	Dipping, spraying, pour-on
<i>Boophilus decoloratus</i> s (Blue tick)	1. <i>Babesia bigemina</i> 2. <i>Anaplasma marginale</i>	1.Babesiosis 2.Anaplasmosis	Dipping, spraying, pour-on
<i>Amblyomma spp.</i> (Bont tick)	<i>Rickettsia ruminantium</i>	Heart water	Dipping, spraying, pour-on
<i>Hyalomma spp.</i> (Brown legged tick)	Tick toxin	Sweating sickness	Dipping, Spraying, Pour-on
<i>Glossina pallidipes</i>	<i>Trypanosoma vivax</i> <i>T. congolense</i>	Trypanosomosis	Dipping, spraying, pour-on chemotherapy, control animal movement into risky areas.
Mange	<i>Choriptes bovis</i> <i>Sarcoptes</i>	Itching Anaemia	Ecto-parasiticides
Lice	<i>Linognathus stenopsis</i>	Anaemia	Ecto-parasiticides
Fleas	<i>Bovicola bovis</i>	Anaemia Irritation	Ecto-parasiticides
Biting flies	<i>Stomaxys</i>	Irritation, Transmits anthrax	Ecto-parasiticides

Table 3.2-5: Groups of Acaricides Used to Control Vector Borne Diseases in Cattle

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

Table 3.2-6: 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. congolense T. brucei	Curative
Isometamidium (samorin)	T. vivax T. Congolense	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

Table 3.2-7: Strategies for Control of common livestock diseases in FSRP Sub Projects

Vector	Diseases	Control strategy
Ticks	ECF	<ul style="list-style-type: none"> ▪ Dip/spray animals using recommended acaricides. ▪ Apply pour-ons

		<ul style="list-style-type: none"> ▪ ITM method (immunization) ▪ Keep tick tolerant cattle breeds
	Anaplasmosis	<ul style="list-style-type: none"> ▪ Use recommended acaricides at the dose rates and frequency. ▪ Chemotherapy
	Babesiosis	<ul style="list-style-type: none"> ▪ Use recommended acaricides at the dose rates and frequency. ▪ Chemotherapy
	Heart water	<ul style="list-style-type: none"> ▪ Use recommended acaricides at the dose rates and frequency. ▪ Early treatment of sick animals.
Tsetse flies	Trypanasomosis	<ul style="list-style-type: none"> ▪ 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 ▪ Rear resistant breeds
Zoonotic diseases	Anthrax	<ul style="list-style-type: none"> ▪ Vaccinate animal herds ▪ Practice intensive production systems ▪ Train farmers and general the general public on potential ways the disease spreads
	Trypanosomiasis	<ul style="list-style-type: none"> ▪ Vector control ▪ Chemotherapy and chemoprophylaxis ▪ Rear resistant breeds e.g. Orma Boran ▪ Use treated nets around cow sheds
	Rabies	<ul style="list-style-type: none"> ▪ Vaccination of dogs and other pets ▪ Management of dog populations ▪ Train the public on the potential ways rabies is spread
	Brucellosis	<ul style="list-style-type: none"> ▪ Emphasis the use of artificial insemination ▪ Vaccination of heifers ▪ Train the public on the spread of brucellosis and associated dangers ▪ Enhance hygienic practices ▪ Consume properly cooked milk and meat
	Rift Valley fever (RVF)	<ul style="list-style-type: none"> ▪ Control of mosquitoes and other biting flies ▪ Vaccinate domestic animals

		<ul style="list-style-type: none"> ▪ Train the public on the way RFV spreads
	Hydatidosis	<ul style="list-style-type: none"> ▪ Properly inspect meat ▪ Proper disposal of condemned offals ▪ Enhance hygienic practices ▪ Deworm dogs to eliminate <i>Echinococcus granulosus</i> ▪ Train the public on how the disease spreads and possible dangers
	Cysticercosis	<ul style="list-style-type: none"> ▪ Proper meat inspection ▪ Timely treatment of infected humans ▪ Proper waste disposal (use latrines)
Mange	Pruritis	<ul style="list-style-type: none"> ▪ Dip spray animals with insecticides ▪ Use ivermectin
Endo-parasites	Helminthiasis	<ul style="list-style-type: none"> ▪ Use effective dewormers ▪ Enforce meat inspection regulations and advice people to cook meat well in order to control tape worms ▪ Pasture management strategies ▪ Drain swamps in order to control <i>Fasciola sp</i>
	Coccidiosis	<ul style="list-style-type: none"> ▪ Feed animals with clean water and feed. ▪ Isolate affected animals ▪ Use sulphonamides to treat animals.
Feed borne diseases	Mycotoxicosis	<ul style="list-style-type: none"> ▪ 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		<ul style="list-style-type: none"> ▪ Identify poisonous plants (eg) cestrum. ▪ Uproot plants and cultivate the farm.
Breeding diseases	Brucellosis	<ul style="list-style-type: none"> ▪ Use artificial insemination service
	Trichomoniasis	<ul style="list-style-type: none"> ▪ Examine bulls before using them for breeding.
	Vibriosis	<ul style="list-style-type: none"> ▪ Surveillance of diseases ▪ Vaccinate heifers less than 8 months old ▪ Advice people to boil milk before consumption

		<ul style="list-style-type: none"> ▪ Government should subsidize AI services in order to reduce high cost of AI.
	Infertility	<ul style="list-style-type: none"> ▪ Surveillance of diseases in the area ▪ Government should subsidize AI to levels affordable by farmers
Other Diseases	Milk fever	<ul style="list-style-type: none"> ▪ Give dairy animals salt lick with calcium and phosphorous
Production diseases	Mastitis	<ul style="list-style-type: none"> ▪ 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. ▪ Improve hygienic standards ▪ Cull cows with recurrent mastitis.
Bacterial diseases	Anthrax	<ul style="list-style-type: none"> ▪ Rapid diagnosis and treatment. ▪ Report suspected cases of anthrax. ▪ Annual vaccination of animals. ▪ Efficient disposal of carcasses by burning or burying.
	Black quarter	<ul style="list-style-type: none"> ▪ Vaccinate animals in high-risk areas. ▪ Treat animals early with penicillin.
Viral diseases	LSD	<ul style="list-style-type: none"> ▪ 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

3.3 Common crop and Fodder Pests and diseases

75. 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 possess inherent toxicities that endanger the health of the farmers, consumers, and the environment. The FSRP sub projects involving crop production under irrigation will involve use of pesticides. Table 9 below shows the type of pest and diseases and control methods for various crop

Table 3.3-8: Type of pest and diseases and control methods for the crops

Pest	Control
Maize	
African maize stalk borer	Control: <ul style="list-style-type: none"> • Remove and destroy (burn) the remnants of previous crop • Plant early in the season at the onset of rains when leafhopper (MSV vector) populations should be lower • Rotate maize with non-cereals such as legumes e.g. soyabeans and beans. • Use registered crop protection products. Refer to PCPB website for more information on what registered products are available
Fall armyworm <i>Spodoptera frugiperda</i>	Control: <ul style="list-style-type: none"> • Remove and destroy (burn) the remnants of previous crop • Plant early in the season at the onset of rains when leafhopper (MSV vector) populations should be lower • Rotate maize with non-cereals such as legumes e.g. soyabeans and beans. • Use registered crop protection products. Refer to PCPB website for more information on what registered products are available
Diseases	Control
Maize lethal necrosis disease	Cultural control:

<p>Vectors spread the disease, transmitting it from plant to plant and field to field. The most common vectors are maize thrips, rootworms, and leaf beetles.</p>	<ul style="list-style-type: none"> • use certified health seeds for planting new fields <p>Crop rotation</p> <ul style="list-style-type: none"> • Rotate maize with crops that are not hosts of these pathogens to eradicate or reduce accumulation of causative organisms • Manage the vectors by spraying recommended products
Sorghum	
<p>Downy Mildew (<i>Sclerothora macrospora</i>) Infections occur when fields become flooded and are common to young plants. Initial symptoms appear under cool condition, as a white greyish ash develops on lower side of the leaf causing young leaves to mottle resembling viral infection.</p>	<ul style="list-style-type: none"> • 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.
<p>Seedling blights- Damping off (<i>Pythium, Rhizoctonia, Fusarium, Aspergillus</i>)</p>	<ul style="list-style-type: none"> • Plant quality certified seeds dressed with Imidacloprid based fungicides, Thiamethoxam based products, Thiram based products
<p>Sorghum leaf blight (<i>Exserohilum turticum</i>)</p>	<ul style="list-style-type: none"> • Destroy crop residues and volunteer plants after harvest in the farm, practice crop rotation and use tolerant/resistant varieties to manage the disease
<p>Common leaf rust (<i>Puccinia sorghi</i>)</p>	<ul style="list-style-type: none"> • Plant tolerant varieties, plant early in the season to avoid and escape the disease, Plough in crop residue after harvest of every season, use clean certified sorghum seed from a reliable source and rotate sorghum crop with beans, faba bean, chickpea at least every 2-3 years. Remove lower leaves which are infested to improve air circulation.
<p>Head Smut/ Loose kernel smut (<i>Sporisorium reilianum</i>)</p>	<ul style="list-style-type: none"> • Avoid planting in soils with disease history. Plough deep to bury crop debris, plant clean and certified seed. Rouge out plants infected with smut and destroy by burning. Seed dress the seeds with thiamethoxam, metalaxyl and

	difenoconazole based products (Apron star 42WS)
Armyworms	<ul style="list-style-type: none"> • Use insecticides such as cypermerthrin at manufacturer's recommended rates and also use of biological control agents (natural enemies) to manage the armyworms.
Aphids (<i>Rhopalosiphum maidis</i>)	<ul style="list-style-type: none"> • Mixed cropping or use of trap crops is recommended, use predators and parasites like ladybirds and hover fly. In case of early and heavy infestation, chemical spray with systemic insecticides e.g. (cypermethrin) and imidacloprid based may be used.
Millet	
Millet stem borer (<i>Coniesta ignefusalis</i>)	<ul style="list-style-type: none"> • Use resistant varieties if locally available. • Early Planting • Intercropping millet with non-host crops, such as cowpeas • Use Cypermethrin based pesticides • Field sanitation
African armyworm (<i>Spodoptera exempta</i>)	<ul style="list-style-type: none"> • Use Cypermethrin based pesticides • Field sanitation
Millet head miner (<i>Heliocheilus albipunctella</i>)	<ul style="list-style-type: none"> • Deep plough to expose residual larva to sun and natural enemies • Late plant by 2 weeks for short cycle millets varieties
Shoot fly (<i>Atherigon asoccata</i>)	<ul style="list-style-type: none"> • Practice good crop husbandry • Use high seeding rates during planting to achieve the desired optimum plant population, • Practice crop rotation and intercropping with sunflower, cotton or legumes. • Plant early about 7 to 10 days before the onset of rains to enable the crop escape shoot fly high population densities at the onset of the rain. • Plant with phosphatic and nitrogen fertilizer

	<ul style="list-style-type: none"> • Avoid animal manure since it attracts the flies.
Aphids (<i>Rhopalosiphum mayidis</i>)	<ul style="list-style-type: none"> • Keep the field clean from alternate hosts such as milkweed. Observe correct planting space to avoid high plant density. • Maintain flowering hedge around the farm to enhance natural enemy conservation. • Spray with biopesticides such as Neem based product “Achook that contains Azaditachtin”. • Seed dress with Thiamethoxam (Cruiser), Imidacloprid (Gaucho) based products. • Spray with chlorypirifos based insecticides to control aphids
Birds	<ul style="list-style-type: none"> • Physical control by humans • Use of sound bells • Early harvesting •
Downy Mildew/ Green ear disease	<ul style="list-style-type: none"> • Provide good drainage • Crop rotation • Proper field • Apply chemical sprays of mancozeb and cymoxanil based products.
Ergot (<i>Claviceps</i> spp)	<ul style="list-style-type: none"> • Field sanitation, • Plant resistant varieties • Remove affected panicles, • Use clean seeds and • Practice crop rotation with pulses
Millet Smut (<i>Moesziomyces penicilliraea</i>) (Infected floret ovaries are converted into sori that are oval and conical appearance)	<ul style="list-style-type: none"> • Use of resistant varieties to manage the disease, • Rotate with non-cereal family for a minimum of 3 seasons • Plough deep during land preparation at least 2 months before planting. • Practice field hygiene and sanitation.
Beans	

<p>Bean flies (<i>Ophiomyia phaseoli</i> and related species)</p>	<ul style="list-style-type: none"> • Bean fly numbers tend to be low during the early stages of the growing season and increase with time. • Avoid planting near other susceptible legumes • Practice crop rotation • On heavy attack spray repellants such as neem extract (<i>Azadiractin</i>)
<p>Legume aphid (<i>Aphis craccivora</i>)</p>	<ul style="list-style-type: none"> • Plant early • Ensure weed free plots • Avoid excess nitrogen • Conserve natural enemies
<p>Foliage beetles (<i>Ootheca</i> spp.)</p>	<ul style="list-style-type: none"> • Post-harvest tillage to expose the grubs in the soil to the sun and to predators • Rotate with non-host plants • On heavy attack spray repellants such as neem extract (<i>Azadiractin</i>)
<p>Pod-borers (African bollworm)</p>	<ul style="list-style-type: none"> • Monitor the crops frequently • Biopesticides such as Bt or neem products usually give good control of pod borers, provided they are applied to the young caterpillars before they enter into the pods.
<p>Storage pests: Bean bruchid (<i>Acanthoscelides obtectus</i>)</p>	<ul style="list-style-type: none"> • Ensure grains are dried to 12% moisture content prior to storage • good storage hygiene. Remove infested residues from last season's harvest • Use improved storage structures • When small lots of beans are stored, daily turning of the storage container can significantly reduce infestation
<p>Bacterial leaf diseases and halo blight (<i>Xanthomonas phaseoli</i> pv. <i>Phaseoli</i>, <i>Pseudomonas syringae</i> pv. <i>Phaseolicola</i>)</p>	<ul style="list-style-type: none"> • Plant disease resistant varieties. • Do not work in plants when wet. • Use clean certified seeds • Practice crop rotation

Flower or blister beetles (<i>Mylabris oculata</i>)	<ul style="list-style-type: none"> • Hand-pick and destroy adult beetles to keep the numbers in check. However, care should be taken, since when disturbed, blister beetles can release a liquid that burn the skin. Whenever possible wear gloves to protect the hands
Flower thrips (<i>Frankliniella</i> spp., <i>Caliothrips</i> spp. <i>And fasciatus</i> and <i>Megalurotrhips sjostedti</i>)	<ul style="list-style-type: none"> • Keep orchards and bordering areas free of weed hosts to reduce bean thrips movement • Use yellow and blue sticky cards to monitor their numbers • Avoid spraying harsh chemicals to encourage the natural enemies • Use botanicals such as neem extract or citrus extract to repel them • Use insecticides if the populatiosn are above economic thresholds.
Cutworms	<ul style="list-style-type: none"> • 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.
Root-knot nematodes	<ul style="list-style-type: none"> • Practice crop rotation with crops not related to cotton (e.g. cereals) whereby cotton is cropped once every 3 or more years.

Spider mites	<ul style="list-style-type: none"> • 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.
Whiteflies	<ul style="list-style-type: none"> • 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
Mango	
<p>Powdery mildew. The characteristic symptom of the disease is the white superficial powdery fungal growth on leaves, stalks of panicles, flowers and young fruits.</p> <p>The fungus parasitizes young tissues of all parts of the inflorescence, leaves and fruits.</p>	Apply well timed fungicide sprays.
<p>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.</p>	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
<p>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</p>	Use of Monterrey Agri-Fos Systemic Fungicide. The dilution rate is two teaspoons per gallon of water.

<p>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.</p>	
<p>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.</p>	<p>Spray copper oxychloride (0.3%) just after appearance of the first symptoms and subsequent spray at 20 day intervals Spray fungi side containing after initial appearance followed by 0.3% miltox at 20 day intervals</p>
<p>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.</p>	<p>Treatment of bacterial canker is generally mechanical, with the infected branches being removed using sterile pruning tools.</p>
<p>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</p>	<p>Spray of Copper-oxychloride @ 0.3% (3 g/liter) may be done in the third or fourth week to control anthracnose and red rust.</p>
<p>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</p>	<p>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</p>
<p>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.</p>	<p>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.</p>

<p>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.</p>	
<p>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.</p>	<p>By Use of Benomyl, the systemic benzimidazole fungicide Reduction of inoculum is also essential for control of this disease.</p>
<p>Tomatoes</p>	
<p>Fusarium wilt The pathogen that causes Fusarium wilt (<i>Fusarium oxysporum</i>) 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</p>	<p>There are also several biological fungicidal drenches that can be applied to soil (look for one based on the bacteria <i>Streptomyces griseoviridis</i> called Mycostop this is the best for treating this disease</p>
<p>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 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.</p>	<p>Organic fungicides based on <i>Bacillus subtilis</i> are used and effective in preventing and treating this tomato plant disease when it's first discovered in your farm.</p>
<p>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.</p>	<p>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.</p>
<p>Septoria Leaf spot appearing as tiny, round splotches on the leaves, this tomato disease</p>	<p>Organic fungicides based on copper or <i>Bacillus subtilis</i> are effective against <i>Septoria</i> leaf spot,</p>

<p>(<i>Septoria lycopersici</i>) 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.</p>	<p>especially when used as a preventative or treatment measure.</p>
<p>Southern Bacteria Wilt. Southern bacterial wilt (<i>Ralstonia solanacearum</i>) 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.</p>	<p>There is no cure for this disease. Once confirmed, immediately remove infected plants and discard them in the trash.</p>
<p>Leaf Mold The fungus <i>Passalora fulva</i> 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</p>	<p>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</p>
<p>Bacterial Spot This disease is caused by several species of the bacterium <i>Xanthomonas</i> (but primarily by <i>Xanthomonas perforans</i>), 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.</p>	<p>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 I for fungicide products for home garden use.</p>
<p>Cassava</p>	
<p>Cassava green mites</p>	<ul style="list-style-type: none"> • Plant on the onset of the rainy season to encourage vigorous growth • Intercrop cassava with pigeon pea in triple and double rows • Apply 5-7 tons of manure in a hectare, to maintain the soil fertility.

	<ul style="list-style-type: none"> • Use of predatory mites – they can control and reduce green mite population
<p>Scales The stems dry up and break easily in the wind. Cuttings infested by scales do not root and lead to failure of plant establishment. Scales also attack tubers rendering them unsuitable for the market</p>	<ul style="list-style-type: none"> • The most important control of scale infestation is the use of clean and healthy planting material. • Cuttings should be inspected for scale infestation before considered for planting. • Practice crop rotation to break infestation cycles. Cassava fields should not be established close to these host plants if the area has a history of scale infestation • Practice field sanitation, mainly the removal of infested stems and old stems after harvest.
<p>Cassava hornworm Larvae generally eat the younger leaves of cassava, often stripping the growing shoots. In severe attacks, the whole plant and/or the entire field can be defoliated</p>	<ul style="list-style-type: none"> • Biological control using <i>Baculovirus erinnyis</i>, <i>Bacillus thuringiensis</i> • Monitor fields, looking for hornworms and their damage. • If there are many hornworms, kill them with an insecticide using a pyrethroid or microbial insecticide
<p>Termites Initial damage is wilting when the termites attack the roots of seedling and/or older plant. A plant dies when they tunnel inside the taproot, stem, and branches because they disrupt the distribution and movement of nutrients in the plant's vascular system. Early symptoms are soil tunnels</p>	<ul style="list-style-type: none"> • Burning plant residues on top of termites' mound would suffocate them. • Destroy the termites' nest, locate and kill the queen, and pour boiling water or burn dried grass straws (any plant debris) to kill the rest. • For the 'worker termites', locate their soil runways/ tunnels and destroy these either by hand tilling or by flooding.
<p>Whiteflies Whiteflies, both the larvae and adults, pierce and suck the sap of the leaves which causes the weakening and early wilting of the plant resulting in reduced plant growth. Their feeding may also cause yellowing, drying, premature dropping of leaves that result in plant death. They produce honeydews that serve as the substrates for the growth of black sooty molds on leaves and fruit. The mold reduces</p>	<ul style="list-style-type: none"> • Use of yellow sticky traps cards per 300 meters squared and replace them once per week • Several biological control agents are commercially available such as • <i>Amblyseius swinskii</i>, <i>Beauveria bassiana</i>, <i>Iecanicilium lecanii</i>, <i>Eretromocerus</i> wasp • Use of repellants such as neem extracts, garlic extracts, • Use biorationals such as citrus extracts, Soap products such as Savona.

<p>photosynthesis causing the poor plant growth of the plant. Whitefly is the most important carrier of plant viruses that causes diseases</p>	<ul style="list-style-type: none"> • Various pesticides are commercially available such as neonicotinoids, Pyrethroids, abamectins, etc
<p>Cassava mosaic virus disease An infected leaf has white or pale-yellow or pale-green spots and is often twisted, distorted, and stunted. The leaflets have uniformed or localized mosaic pattern. Heavily infested plant is distorted, retarded, and stunted.</p>	<ul style="list-style-type: none"> • Control whiteflies as they are the carriers of the disease. • Use of virus free planting materials • Selection of resistant varieties • Remove diseased plants showing symptoms of the disease and destroy them. This will help reduce the spread of diseases on farms • Plants with signs of infection with CMD need to be uprooted and burned immediately before the disease spreads to larger areas of the field
<p>Cassava Brown Streak Disease (CBSD) Leaves show severe yellowing that affects only mature leaves. Dark-brown necrotic and rotting areas within the tuber, and a reduced tuber size</p>	<ul style="list-style-type: none"> • Use of tolerant varieties, • Selection of disease-free planting material • Control of vector pests (whitefly, mealybug, Cassava green mite)
Green Gram	
<p>Cut worms (<i>Agrotis sp.</i>)</p>	<ul style="list-style-type: none"> • A minor pest but where population is high, the larvae can be baited with straw mixed with an insecticide and molasses and sprayed within the field. • Plough to expose caterpillars to predators and to desiccation by the sun, apply ash around the plant. • Use neem based botanical insecticides such as Nimbecidine at 20ml in 20L of water. • Use Lambda Cyhalothrin 25g/Kg based products such as Karate at 20g in 20L of water.
<p>Root knot Nematodes (<i>Meloidogyne sp.</i>)</p>	<ul style="list-style-type: none"> • Do not plant where vegetables have been grown previously, after preparation of the farm, burn the topsoil using dry leaves or other waste plant material. • Solarise seedbeds if possible, use biofumigation with crops from other families,

	<p>use nematicidal compounds of this decomposing process do kill nematodes.</p> <ul style="list-style-type: none"> • Maintain high levels of organic matter (manure and compost) in the soil, incorporate neem cake powder into the soil. Rotate green grams with onions, baby corn, sweet corn, maize, millet, sorghum, sesame, cassava or Sudan grass among other crops. • A rotation system called "Strong" is recommended for management of root-knot nematodes. Use trap crops such as marigold (<i>Tagetes</i> spp.).
Aphids (<i>aphis craccivora</i>)	<ul style="list-style-type: none"> • Early planting, scout regularly for aphids and destroy and bury infested plant materials which will reduce the number of aphids in the field, destroy volunteer crops, practise crop rotation, sticky traps, and yellow water. Spray soapy solution (10-15 tablespoon full of liquid soap in 20lt of water), Use neem based botanical insecticides such as Nimbecidine at 20ml in 20L of water.
Pod Borers (African bollworm, Legume Pod borer, Lima Pod borer)	<ul style="list-style-type: none"> • Monitor the crops frequently as there is only a brief period from hatching to entering buds or pods handpick and destroy the caterpillars. Bio-pesticides such as Bt or neem products usually give good control of pod borers, provided they are applied to the young caterpillars before they enter into the pods.
Spiny pod borer (<i>Etiellazinckenella</i>)	<ul style="list-style-type: none"> • Deep ploughing within 2-3 years to eliminate quiescent pupa is recommended. Early sowing short duration varieties. Grow tall sorghum as a companion crop to serve as biological bird perches. Collect and destroy larvae and adults. Install pheromone traps at a distance of 50 m @ 5 traps/ha for each insect pest. Conserve natural enemies like <i>Tetrastichus</i> sp., <i>Braconhebetor</i>, <i>Phanerotoma</i> sp. and <i>P. hendecasisella</i>

Powdery Mildew (<i>Erysiphe polygoni</i>)	<ul style="list-style-type: none"> • Practise early planting, crop rotation with non-legumes for 2-3 seasons. Observe high field hygiene, uproot and destroy severely infected plants to reduce inoculum in the field. Avoid overhead irrigation to reduce humidity which promotes disease spread. Apply sulphur based protective fungicides at a rate of 30g/10ltrs water, e.g. Jet, Cosavet DF, Flosul Plus, Wetsulf WP or spray with Triadimefon at a rate of 40gm/20ltrs water at 10-14 day intervals, e.g. Bayleton WP25, and Edimefon 25 WP. Spray the crop with botanicals base bio-fungicides for example Neem oil 3% twice at 10 days interval from the initial disease appearance
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3.4 Proposed Pesticides For Use in FSRP

76. All pesticides used that will be used by the FSRP Investments will be those registered by the Pesticide Control Products Board (PCPB) and accessible through www.pcpb.co.ke. Such products will have the WHO recommended classification by hazard as described in the WHO pesticides classification guidelines of 2019 that can be accessible through this link [WHO Pesticide Classification guidelines, 2019](#). Table 10 and 11 below shows the list of agrochemicals that are banned or restricted in the country which will not be used by investments. Persistent Organic Pollutants (POPs) listed in Annex A, B and C of the The Stockholm Convention will not be used by the investments. Table 12 below is a list of POPs in that will not be used in any FSRP project. The Investments will also avoid products listed in annex III of the Rotterdam Convention as listed in the database found on this link; [Annex III chemicals](#). Registered Biopesticides shall be used as an altanative aimed at preventing or reducing use of convectional pesticides. Database of such products can be found on the PCPB database of [PCPB registered biopesticides](#).

Table 3.4-9: 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 Hexachlorocyclohexane (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 Tributyltin Compounds	All compounds including tributyltin oxide, tributyltin benzoate, tributyltin fluoride, tributyltin lineoleate, tributyltin methacrylate, tributyltin naphthenate, tributyltin chloride	2009
29.	Alachlor	Herbicide.	2011
30.	Aldicarb	Nematicide/Insecticide/Acaricide.	2011
31.	Endosulfan	Insecticide.	2011
32.	Lindane	Insecticide.	2011
33.	Phorate	Insecticide.	2020
34.	Carbofuran	Insecticide.	2019
35.	Trichlorfon	Insecticide.	2019

36	Dicofol	Miticide	2021
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Source: PCPB Kenya

Table 3.4-10: 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 below 1000g active ingredient/L.

Source: PCPB Kenya

Table 3.4-11: Annex A, B and C of POPs under The Stockholm Convention that will be avoided in the Sub Projects

Annex A products	Annex B products	Annex C Products
Aldrin	DDT	Hexachlorobenzene (HCB)
Chlordane	Perfluorooctane sulfonic acid (PFOS), its salts and perfluorooctane sulfonyl fluoride (PFOSF)	Hexachlorobutadiene (HCBD)
Decabromodiphenyl ether		Pentachlorobenzene
Dicofol		Polychlorinated biphenyls (PCB)
Endrin		Polychlorinated dibenzo-p-dioxins (PCDD)
Heptachlor		Polychlorinated dibenzofurans (PCDF)
Hexabromobiphenyl		Polychlorinated naphthalenes
Hexabromocyclododecane (HBCDD)		
Hexachlorobenzene (HCB)		
Hexachlorobutadiene		
Beta hexachlorocyclohexane		
Lindane		
Pentachlorobenzene		
Pentachlorophenol and its salts and esters		
Polychlorinated naphthalenes		
Perfluorooctanoic acid (PFOA), its salts and PFOA-related compounds		
Short-chain chlorinated paraffins (SCCPs)		

Technical endosulfan and its related isomers		
Toxaphene		
Chlordecone		
Dieldrin		
Hexabromodiphenyl ether and heptabromodiphenyl ether		
Alpha hexachlorocyclohexane		
Mirex		
Polychlorinated biphenyls (PCB)		
Perfluorohexane sulfonic acid (PFHxS), its salts and PFHxS-related compounds		
Tetrabromodiphenyl ether and pentabromodiphenyl ether		

Source: [The Stockholm Convention](#)

3.5 Environmental and Social Risks Associated with Pesticide Use in FSRP

77. 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 in line with the ESS 1 and ESS 3 requirements as well as the EHS guidelines.

78. Pesticides are classified as hazardous materials as per the Environment, Health and Safety guidelines of the World Bank and their handling shall be guided by EHS guidelines among other safety Procedures described in the IPMP. Essential elements of occupational health and safety management in the EHSG have been summarized below:

- Hazard communication and training programs to prepare workers to recognize and respond to workplace chemical hazards. Programs should include aspects of hazard identification, safe operating and materials handling procedures, safe work practices, basic emergency procedures.
- Provision of suitable personal protection equipment (PPE) (footwear, masks, protective clothing and goggles in appropriate areas), emergency eyewash and shower stations, ventilation systems, and sanitary facilities
- Where there is risk of a spill of uncontrolled hazardous materials, facilities should prepare a spill control, prevention, and countermeasure plan

3.5.1 Impacts Occupational Health and Safety

79. 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

80. 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 5-1** below shows the possible modes of exposure during preparation of pesticides.

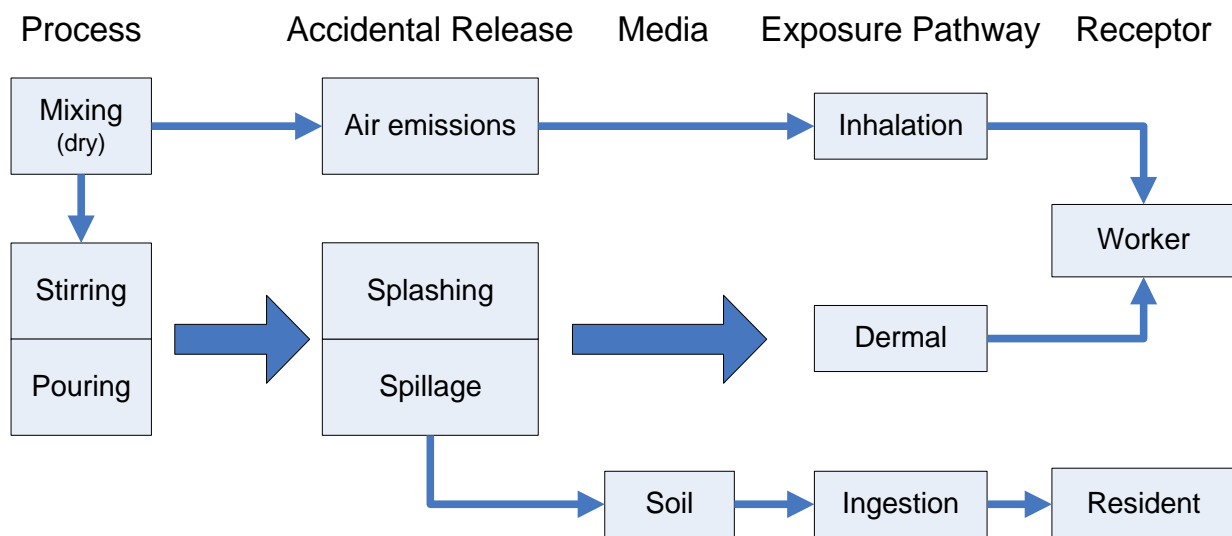


Figure 3.5-1: Conceptual Model for Possible Exposure Pathways from Preparation of Pesticide

Application Exposure Pathway

81. 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

82. 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.

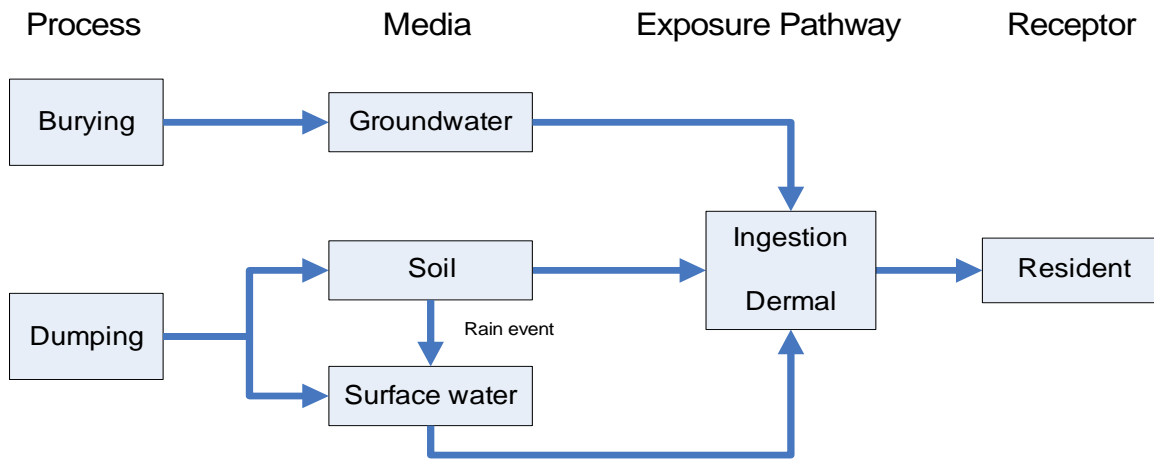


Figure 3.5-2: Conceptual Model for Possible Exposure Pathways from Disposal of Pesticide Formulations

Mitigation Measures

- Develop and implement Occupational Health and Safety Plan for each sub project/spray operation as part of the sub project IPMP. The occupational health and safety plan will follow the applicable legislations including OSHA-Hazardous substances rules, EMCA 1999 waste management regulations, the FAO guidelines and the WB EHS guidelines. 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.

- 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

83. The following drugs shown in table 12 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.

Table 3.5-12: Drugs Recommended for Treatment of exposure

Name of drug	Active ingredients
Promethazine	Promethazine Hydrochloride
Panadol	Paracetamol
Diazepam	Benzodiazapine/Diazepam
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

84. 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 FSRP 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 FSRP/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.

3.5.2 Impacts on Non Target Organism

85. 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.

86. 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.
87. The potential FSRP 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.

88. Table 13 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.

Table 3.5-13: Pesticide Toxicity

Pesticide	Mammal	Bird	Fish	Other Aquatic	Bee	Persistence	Bioaccumulation
Pyrethroids	High Toxicity	High Toxicity	Medium to High Toxicity	High Toxicity	High Toxicity	Medium to High Toxicity	High Toxicity
Carbamates	Medium to High Toxicity	Medium to High Toxicity	Medium to High Toxicity	Medium to High Toxicity	High Toxicity	Medium to High Toxicity	Medium to High Toxicity
Organophosphates	Medium to High Toxicity	Medium to High Toxicity	High Toxicity	High Toxicity	High Toxicity	High Toxicity	High Toxicity

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	High Toxicity
Medium to High Toxicity	Medium to High Toxicity
Medium Toxicity	Medium Toxicity
Low to 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 timing of spraying to avoid pesticides moving to undesired destinations.

3.5.3 Impacts on Ecologically Sensitive Environments

89. 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

90. The management measures will strictly adhere to FAO guidelines, WBG EHS general guidelines and Kenya's regulations as illustrated in table 14 below.

Table 3.5-14: Ecologically and Agronomically Sensitive Areas and their Management Measures

Ecologically and agronomically sensitive areas	Management Measures
National parks; nature reserves; internationally protected areas	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

3.5.4 Storage and Store Siting Impacts

91. 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.
92. 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.
93. 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.

3.5.5 Solid Waste Impacts

94. 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.
95. 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.
96. 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.

97. 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 obsolescence.
- Put in place a tracking mechanism to ensure safe final disposal of the pesticide's containers.

3.5.6 Effluent Waste Impacts

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

99. 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 spray 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

3.5.7 Community Health and Safety

100. 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 MoA&LD 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.
- 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.
- Incase of the occurrence of communicable diseases in the project county/ies adhere to the Ministry of health developed procedures and guidelines to reduce spread of outbreak. The Technical Note: Public Consultations and Stakeholder Engagement in VWB-supported operations when there are constraints on conducting public meetings will be employed in this project.

3.5.8 Accidental Release of Pesticides

101. 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 Plan 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 ESMF 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

3.6 Integrated Pest Management Plan

102. An effective IPM regime that is in line with the EHS guidelines for annual and perennial crop production and comprising of the following components shall be developed at the subproject level to capture the site-specific nature of the risks and impacts associated with the activity:

- Identifies and assess pests, threshold levels, and control options (including those listed below), as well as risks associated with these control options.
- Rotates crops to reduce the presence of insects, disease, or weeds in the soil or crop ecosystems.
- Supports beneficial bio-control organisms, such as insects, birds, mites, and microbial agents, to perform biological control of pests (e.g., by providing a favorable habitat, such as bushes for nesting sites and other original vegetation that can house pest predators and parasites).
- Favors manual, mechanical weed control and/or selective weeding.
- Considers using mechanical controls, such as traps, barriers, light, and sound, to kill, relocate, or repel pests.
- Uses pesticides to complement these approaches, not replace them. Prior to procuring any pesticide, assess the nature and degree of associated risks and effectiveness, taking into account the proposed use and the intended users as well as compatibility with the proposed biological control options

3.6.1 Pre-Spray Phase

The project will identify potential risk and possible mitigations measure to be taken as summarized in table 16, 17 and 18 below.

Table 3.6-15: 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.	<ul style="list-style-type: none"> ■ 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. 	<ul style="list-style-type: none"> ■ MoA&LD/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.	<ul style="list-style-type: none"> ■ Ensure the selected warehouse is sited away from a flood plain area, water course, wells, schools, markets. 	<ul style="list-style-type: none"> ■ MoA&LD/NPCU ■ CPCU
	<ul style="list-style-type: none"> ■ Secure the selected warehouse and apply all the guidelines for Storage and Stock Control manual by FAO. 	<ul style="list-style-type: none"> ■ MoA&LD/NPCU ■ CPCU
Accidental fires and injuries in the warehouses	<ul style="list-style-type: none"> ■ 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. 	<ul style="list-style-type: none"> ■ MoA&LD/NPCU ■ CPCU
	<ul style="list-style-type: none"> ■ 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. 	<ul style="list-style-type: none"> ■ MoA&LD/NPCU ■ CPCU
	<ul style="list-style-type: none"> ■ 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. 	<ul style="list-style-type: none"> ■ MoA&LD/NPCU ■ CPCU
	<ul style="list-style-type: none"> ■ Develop Emergency Preparedness and Response Plan 	

Table 3.6-16: Spray 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 unintentional exposure caused by accidents or limited pesticide knowledge.	<ul style="list-style-type: none"> ■ 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 	<ul style="list-style-type: none"> ■ MoA&LD/NPCU ■ CPCU
Surface Contamination	Water Contamination of surface water bodies directly or indirectly through runoff from soil.	<ul style="list-style-type: none"> ■ Avoidance of areas or regions with surface water bodies that are critical to habitats and livelihoods through mapping 	<ul style="list-style-type: none"> ■ MoA&LD/NPCU ■ CPCU

SPRAY PHASE POTENTIAL IMPACTS AND MITIGATION			
IMPACT TYPE	IMPACT/ISSUES	MITIGATION MEASURES	RESPONSIBLE PARTY
	<p>Impact on the aquatic life as well as community livelihoods.</p> <p>Possible release of the pesticides into the water bodies from accidental spills during the transportation, application of the pesticides.</p>	<p>of spray areas prior to spraying (screening).</p> <ul style="list-style-type: none"> ■ Optimum calibration of spraying equipment to reduce excess application of pesticide. ■ 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	<p>Pesticides can cause beneficial soil microorganisms to decline thereby affecting soil quality.</p> <p>Contamination of soil during the disposal of containers.</p> <p>Contamination of soil is detrimental to food security as it impacts directly on agriculture.</p>	<ul style="list-style-type: none"> ■ 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 	<ul style="list-style-type: none"> ■ MoA&LD/NPCU ■ CPCU

SPRAY PHASE POTENTIAL IMPACTS AND MITIGATION			
IMPACT TYPE	IMPACT/ISSUES	MITIGATION MEASURES	RESPONSIBLE PARTY
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.	<ul style="list-style-type: none"> ■ 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 	<ul style="list-style-type: none"> ■ MoA&LD/NPCU ■ CPCU
Solid Waste Impacts	Empty pesticide containers and used PPEs are considered toxic under the Basel Convention and therefore require disposal to conform to toxic waste disposal regimes.	<ul style="list-style-type: none"> ■ Develop Waste Management Plans ■ Provide training on waste management including container disposal methods to all spray teams ■ 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 obsolescence. 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 	<ul style="list-style-type: none"> ■ MoA&LD/NPCU ■ CPCU

SPRAY PHASE POTENTIAL IMPACTS AND MITIGATION			
IMPACT TYPE	IMPACT/ISSUES	MITIGATION MEASURES	RESPONSIBLE PARTY
		<p>containers must be returned to the store and accounted for.</p> <ul style="list-style-type: none"> ■ 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	<p>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.</p>	<ul style="list-style-type: none"> ■ 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) 	<ul style="list-style-type: none"> ■ MoA&LD/NPCU ■ CPCU ■ Spray Applicators
Community Health and Safety	<p>Communities exposed to pesticides may suffer short-term acute health effects such as nausea, headaches, sore eyes, skin rashes and dizziness.</p>	<ul style="list-style-type: none"> ■ Use biopesticides in areas where apiaries are located instead of synthetic pesticides ■ 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: 	<ul style="list-style-type: none"> ■ MoA&LD/NPCU ■ CPCU

SPRAY PHASE POTENTIAL IMPACTS AND MITIGATION			
IMPACT TYPE	IMPACT/ISSUES	MITIGATION MEASURES	RESPONSIBLE PARTY
		<ul style="list-style-type: none"> • 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 dairy 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 (exposure), contamination of (receptors like water, flora, soils) and risks to fauna (exposure).	<ul style="list-style-type: none"> ■ 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 	<ul style="list-style-type: none"> ■ MoA&LD/NPCU ■ CPCU

SPRAY PHASE POTENTIAL IMPACTS AND MITIGATION			
IMPACT TYPE	IMPACT/ISSUES	MITIGATION MEASURES	RESPONSIBLE PARTY
		<p>product Material Safety Data Sheet and procedures to be followed.</p> <ul style="list-style-type: none"> ■ 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	<ul style="list-style-type: none"> ■ 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. 	<ul style="list-style-type: none"> ■ MoA&LD/NPCU ■ CPCU

SPRAY PHASE POTENTIAL IMPACTS AND MITIGATION			
IMPACT TYPE	IMPACT/ISSUES	MITIGATION MEASURES	RESPONSIBLE PARTY
	<p>on off target organisms, bioaccumulation also builds the contamination in the animals through their feeding pathways and water intake.</p>	<ul style="list-style-type: none"> ■ 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 ■ 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: <ul style="list-style-type: none"> ○ 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 	

SPRAY PHASE POTENTIAL IMPACTS AND MITIGATION			
IMPACT TYPE	IMPACT/ISSUES	MITIGATION MEASURES	RESPONSIBLE PARTY
		<ul style="list-style-type: none"> ○ Follow timelines for milking dairy 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.	<ul style="list-style-type: none"> ■ 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. ■ 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, 	<ul style="list-style-type: none"> ■ MoA&LD/NPCU ■ CPCU

SPRAY PHASE POTENTIAL IMPACTS AND MITIGATION			
IMPACT TYPE	IMPACT/ISSUES	MITIGATION MEASURES	RESPONSIBLE PARTY
		livestock owners and those responsible for nearby environmentally sensitive sites.	
Storage and Store Siting	<p>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.</p> <p>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.</p> <p>The store facilities should be located away from water sources to avoid contamination by accidental spills.</p> <p>Storage building construction should comply with local codes.</p> <p>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.</p> <p>The store should be adequately ventilated either mechanically or</p>	<ul style="list-style-type: none"> ■ 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 	<ul style="list-style-type: none"> ■ MoA&LD/NPCU ■ CPCU

SPRAY PHASE POTENTIAL IMPACTS AND MITIGATION			
IMPACT TYPE	IMPACT/ISSUES	MITIGATION MEASURES	RESPONSIBLE PARTY
	naturally to ensure there are no dead-air spaces in the store.	<ul style="list-style-type: none"> ■ 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.	<ul style="list-style-type: none"> ■ 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. 	<ul style="list-style-type: none"> ■ MoA&LD/NPCU ■ CPCU ■ Store Managers ■ Pesticide Applicators

SPRAY PHASE POTENTIAL IMPACTS AND MITIGATION			
IMPACT TYPE	IMPACT/ISSUES	MITIGATION MEASURES	RESPONSIBLE PARTY
		<ul style="list-style-type: none"> ■ 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 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 	

Table 3.6-17: Post Spray 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	<ul style="list-style-type: none"> ■ 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 	<ul style="list-style-type: none"> ■ MoA&LD/NPCU ■ CPCU
Community Exposure from vehicles and secondary warehouses	<ul style="list-style-type: none"> ■ End-of-program cleaning/decontamination of interior and exterior of vehicles ■ End-of-program cleaning/decontamination of the interior of all warehouses. ■ 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 	<ul style="list-style-type: none"> ■ MoA&LD/NPCU ■ CPCU ■ Pesticide Applicators
Environmental Contamination and Resident Exposure from spray disposal activities	<ul style="list-style-type: none"> ■ 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 	<ul style="list-style-type: none"> ■ MoA&LD/NPCU ■ CPCU ■ Pesticide Applicators

POST SPRAYING PHASE POTENTIAL IMPACTS AND MITIGATION		
IMPACT/ISSUES	MITIGATION MEASURES	RESPONSIBLE PARTY
Residential exposure from contact with secondary warehouses	<ul style="list-style-type: none"> ■ 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 	<ul style="list-style-type: none"> ■ MoA&LD/NPCU ■ CPCU ■ Pesticide Applicators

3.7 Monitoring Indicators

Table 3.7-18: 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)	<ul style="list-style-type: none"> ■ 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 	<ul style="list-style-type: none"> ■ Once before the selection of vehicles and drivers preferably before the training. 	<ul style="list-style-type: none"> ■ MoA&LD/NPCU ■ CPCU ■ Pesticide Applicators
Possible environmental contamination caused by	Storage facility located outside of floodplain, away from nearby	<ul style="list-style-type: none"> ■ Once before the spray operations begin 	<ul style="list-style-type: none"> ■ MoA&LD/NPCU ■ CPCU

PRE- SPRAY PHASE MONITORING INDICATORS			
IMPACT/ISSUES	MONITORING INDICATORS	MONITORING FREQUENCY	RESPONSIBLE PARTY
warehouse exposure due to poor siting of warehouses, pilferage and vermin attack of the stored pesticides before spraying	schools, hospitals, water courses	<ul style="list-style-type: none"> ■ Quarterly monitoring of warehouse condition to identify any structure defects for repair 	
	Storage facilities fulfils the FAO Storage and Stock Control Manual	<ul style="list-style-type: none"> ■ Once before the spray operations begin ■ Quarterly monitoring on warehouse condition to identify any structure defects for repair 	<ul style="list-style-type: none"> ■ MoA&LD/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	<ul style="list-style-type: none"> ■ Once before the spray operations begin ■ Annual monitoring of extinguisher to ensure it is in good condition 	<ul style="list-style-type: none"> ■ MoA&LD/NPCU ■ CPCU
	Availability of PPE to all the workers/farmers .	<ul style="list-style-type: none"> ■ Daily monitoring and supervision of all operators accessing the warehouse 	<ul style="list-style-type: none"> ■ CPCU
	Training in fire prevention and fighting Existence of an Emergency Response Plan	<ul style="list-style-type: none"> ■ Once before the spray operations begin 	<ul style="list-style-type: none"> ■ MoA&LD/NPCU ■ CPCU

Table 3.7-19: Monitoring 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 unintentional exposure caused by accidents	<ul style="list-style-type: none"> ■ Record indicating training has been conducted on, Emergency procedures, PPE use ■ Ability to respond as required when exposure incidents are encountered. ■ Availability and level of utilization of PPE for all spray teams including storekeepers, drivers ■ All non-compliance documented for corrective action 	<ul style="list-style-type: none"> ■ Training to be undertaken once during the overall spraying period 	<ul style="list-style-type: none"> ■ MoA&LD/NPCU ■ CPCU

SPRAY PHASE MONITORING INDICATORS				
IMPACT TYPE	IMPACT/ISSUES	MONITORING INDICATORS	MONITORING FREQUENCY	RESPONSIBLE PARTY
Occupational Health and Safety Impacts	Additional Transporter Training	<ul style="list-style-type: none"> ■ Records to indicate training has been conducted ■ Occupational Health and Safety Policy—including on use of PPE, Training ■ Labour Management Procedures ■ Training Records 	<ul style="list-style-type: none"> ■ Training undertaken before commencement of duty 	<ul style="list-style-type: none"> ■ MoA&LD/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.	<ul style="list-style-type: none"> ■ Maps showing sensitive areas and choice of pesticide used 	<ul style="list-style-type: none"> ■ Mapping done before, field control activities 	<ul style="list-style-type: none"> ■ MoA&LD/NPCU ■ CPCU
Solid Waste Impacts	Empty pesticide containers are considered toxic under the Basel Convention and therefore require disposal to conform to toxic waste disposal regimes.	<ul style="list-style-type: none"> ■ Training records on waste handling ■ Empty containers decontaminated (triple rinse) and punctured 	<ul style="list-style-type: none"> ■ Check on training records before activities ■ Reconciliation of inventory for remaining stock of 	<ul style="list-style-type: none"> ■ MoA&LD/NPCU ■ CPCU

SPRAY PHASE MONITORING INDICATORS				
IMPACT TYPE	IMPACT/ISSUES	MONITORING INDICATORS	MONITORING FREQUENCY	RESPONSIBLE PARTY
		<ul style="list-style-type: none"> Waste collected by a licensed waste handler 	pesticides and empty containers after field monitoring activities	
Effluent Waste Impacts	<p>The pesticide effluent waste includes surplus diluted spray solution, rinsate among others.</p> <p>These are hazardous to both mankind and the environment. Contaminated effluent wastes could have adverse impacts on the communities and bio-physical environment.</p>	<ul style="list-style-type: none"> Soak-pits with charcoal available to take store rinse water and at end-of-day clean up points for effluent waste collection. 	<ul style="list-style-type: none"> Once before commencement and periodically to check if charcoal is used up. 	<ul style="list-style-type: none"> MoA&LD/NPCU CPCU
Community Health and Safety	<p>People exposed to pesticides may suffer short-term acute health effects such as nausea, headaches, sore eyes, skin rashes and dizziness.</p>	<ul style="list-style-type: none"> Routine weekly checks of waste management arrangements should be undertaken. Availability of exposure treatment medicine in the hospitals 	<ul style="list-style-type: none"> Periodically monitor availability and expiry dates of the medicines 	<ul style="list-style-type: none"> MoA&LD/NPCU CPCU

SPRAY PHASE MONITORING INDICATORS				
IMPACT TYPE	IMPACT/ISSUES	MONITORING INDICATORS	MONITORING FREQUENCY	RESPONSIBLE PARTY
		<ul style="list-style-type: none"> ■ Percentage of treatment medicines 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).	<ul style="list-style-type: none"> ■ 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 	<ul style="list-style-type: none"> ■ Check list of first responders contacts before commencement of activities ■ Reconcile quantities (stock) of pesticide leaving and returning to warehouse for every spraying activity 	<ul style="list-style-type: none"> ■ MoA&LD/NPCU ■ CPCU

SPRAY PHASE MONITORING INDICATORS				
IMPACT TYPE	IMPACT/ISSUES	MONITORING INDICATORS	MONITORING FREQUENCY	RESPONSIBLE PARTY
		<ul style="list-style-type: none"> ■ 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 	<ul style="list-style-type: none"> ■ Ensure store is manned at all times 	
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.	<ul style="list-style-type: none"> ■ Agro-ecological zones mapped out and biopesticides selected for those areas ■ Socio-economic status of community before and after field control activities 	<ul style="list-style-type: none"> ■ Before and after commencement field control activities 	<ul style="list-style-type: none"> ■ MoA&LD/NPCU ■ CPCU

SPRAY PHASE MONITORING INDICATORS				
IMPACT TYPE	IMPACT/ISSUES	MONITORING INDICATORS	MONITORING FREQUENCY	RESPONSIBLE PARTY
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.	<ul style="list-style-type: none"> ■ Sensitive habitats mapped out before spraying 	<ul style="list-style-type: none"> ■ Before and after commencement of field control activities 	<ul style="list-style-type: none"> ■ MoA&LD/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 away from stores of flammable liquids and any ignition source.	<ul style="list-style-type: none"> ■ Storage facility located outside of floodplain, away from nearby schools, hospitals, water courses ■ Storage facilities fulfill the FAO Storage and Stock Control Manual ■ Presence of firefighting equipment, thermometers, warning signs and at least two exits access in the warehouse 	<ul style="list-style-type: none"> ■ 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 	<ul style="list-style-type: none"> ■ MoA&LD/NPCU ■ CPCU

SPRAY PHASE MONITORING INDICATORS				
IMPACT TYPE	IMPACT/ISSUES	MONITORING INDICATORS	MONITORING FREQUENCY	RESPONSIBLE PARTY
		<ul style="list-style-type: none"> ■ 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.	<ul style="list-style-type: none"> ■ Store Inventory Records ■ Signed Stock cards showing pesticide movements ■ Training records ■ Record and location of obsolete pesticides ■ Guards and other security controls 	<ul style="list-style-type: none"> ■ Daily accounting of pesticide and tally of used sachet ■ Periodic monitoring of the inventory/stock taking 	<ul style="list-style-type: none"> ■ MoA&LD/NPCU ■ CPCU ■ National Police Service

Table 3.7-20: Monitoring 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	<ul style="list-style-type: none"> ■ 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 	<ul style="list-style-type: none"> ■ Daily stock reconciliation ■ Periodic monitoring of the warehouse to ensure that it does not have structural problems. 	<ul style="list-style-type: none"> ■ MoA&LD/NPCU ■ CPCU
Community exposure from vehicles and secondary warehouses	<ul style="list-style-type: none"> ■ Evidence of interiors and exteriors of vehicles cleaned ■ Evidence of cleaning of all the secondary warehouses ■ Cases of passenger exposure 	<ul style="list-style-type: none"> ■ Daily ■ Secondary warehouses will be cleaned at the end of spray operations however daily cleaning of the warehouses will be done for hygiene reasons 	<ul style="list-style-type: none"> ■ MoA&LD/NPCU ■ CPCU
Environmental contamination and resident exposure from spray disposal activities	<ul style="list-style-type: none"> ■ 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 awaiting recapture by manufacture 	<ul style="list-style-type: none"> ■ Daily 	<ul style="list-style-type: none"> ■ MoA&LD/NPCU ■ CPCU

POST SPRAY PHASE MONITORING INDICATORS			
IMPACT/ISSUES	MONITORING INDICATORS	MONITORING FREQUENCY	RESPONSIBLE PARTY
Environmental contamination and resident exposure from spray disposal activities	<ul style="list-style-type: none"> ■ 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 	<ul style="list-style-type: none"> ■ Daily 	<ul style="list-style-type: none"> ■ MoA&LD/NPCU ■ CPCU
Residential Exposure from contact with secondary warehouses	<ul style="list-style-type: none"> ■ Level of decontamination of warehouses after spray operations end 	<ul style="list-style-type: none"> ■ Decontamination to occur at the end of the spray operations. ■ Daily cleaning and collection of waste to be undertaken. 	<ul style="list-style-type: none"> ■ MoA&LD/NPCU ■ CPCU

4 IPMP IMPLEMENTATION ARRANGEMENT

103. The Component 1, 2 and 3 of the projects will be implemented by the MoA&LD 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 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.

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

Table 3.7-21: Institutional arrangement for Implementing the PMP

Institution	Roles/Responsibilities
MoA&LD	Lead agency responsible for coordination, capacity building and resource mobilization Also leads on implementing this IPMP
KALRO	Provide technical back stopping, capacity building and research intervention
County Governments	Provide coordination at the County Level Implement the IPMP
World Bank	Financial support
AAK	Capacity building on safe use of pesticides

105. Various contractors or Technical advisors will be involved in the project implementation at both the National and County levels. For this IPMP these could be service providers for capacity building trainings on safe use of pesticides, technical Extension staff, and spray professionals hired for pesticide applications etc. The Ministry (MoA&LD) through the project NPCU will provide coordination and oversight to ensure that all mitigation measures described in this IPMP are indeed implemented.

106. 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 13 Counties. These sub project level IPMPs will incorporate mitigation measures in this level IPMP as applicable to each of the sub-project.

107. The sub project IPMPs which are part of SPR or CPR will be reviewed by the FSRP/NPCU and disclosed in the MoA&LD website. The reports will also be disclosed in the project areas and made accessible to the beneficiaries. The Bank shall review all documents for subprojects classified as substantial risk, while sampling will be applied by typology of subproject for review of moderate and low risk subprojects. 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 FSRP. The reports will be submitted to NEMA for review and approval. The chart below illustrates the approval process of investment specific IPMPs

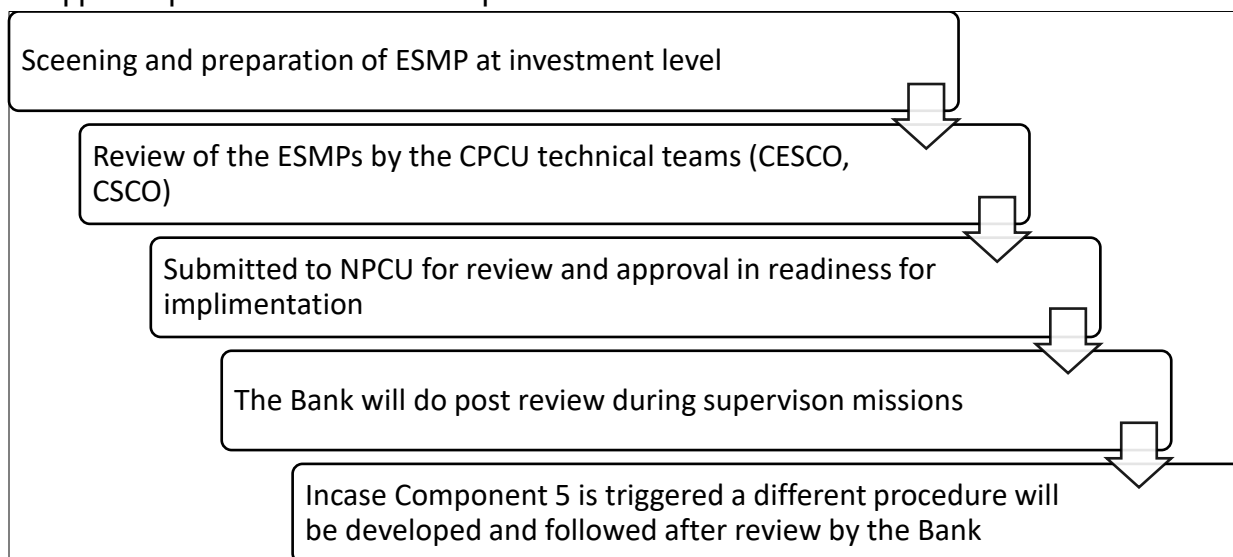


Figure 3.7-1: Investment Specific IPMP screening

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, and capacity building needs/when to train? Who to be train, ToTs involved, etc.)
- Institutional Arrangements and Coordination Mechanism, and M&E
- GM operationalization

- Annex (OHS Plan, Waste Management Plan, Emergency Preparedness)

4.1 Capacity Building

108. 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.

109. In this regard, training of pesticide users and applicators will be a vital component of capacity building in this project. 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.

110. Since this IPMP is anchored on various EHS guidelines of the Bank, investors and implimentors shall be trained on relevant EHS guidelines.

111. The FSRP 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 MoA&LD, 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.

4.2 IPMP Implementation Budget

112. The estimated total cost for IPMP implementation is indicated in table 17 below. The programme management team of FSRP 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. The core activities will be as follows:

Coordination

- a) Development of IPM packages for the FSRP 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

Table 4.2-22: 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

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ANNEXES

Annex I. Pesticide Waste Management Plan for FSRP

Background

This Pesticide Waste Management Plan has been prepared for the Food Systems Resilience Project (FSRP) which will use pesticides to improve crop and livestock productivity. The FSRP is a World Bank financed project to Government of Kenya's (GoK), Ministry of Agriculture and Livestock Development (MoA&LD). This document is an annex to the Integrated Pest Management Plan (IPMP) that has been prepared for the project and should be read alongside the Integrated Pesticide Management Framework.

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 FSRP 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 FSRP 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 FSRP 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.

I. 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, MoA&LD 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 use 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	<ul style="list-style-type: none"> ▪ Improper disposal of pesticide waste can create serious harm to applicators and other workers involved through exposure. 	<ul style="list-style-type: none"> ▪ 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 	<ul style="list-style-type: none"> ▪ 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. 	<ul style="list-style-type: none"> ▪ MoA&LD/N PCU ▪ CPCU

IMPACT TYPE	IMPACT/ISSUES	MITIGATION MEASURES	MONITORING	RESPONSIBILITY
		with pesticide waste.		
Community Health and Safety Impacts	<ul style="list-style-type: none"> ▪ 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. 	<ul style="list-style-type: none"> ▪ 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. ▪ Ensure proper storage of pesticide waste containers, put warning signs on pesticide storage areas. ▪ Label pesticide empty 	<ul style="list-style-type: none"> ▪ 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 storage area provided. ▪ Pesticide containers labelled as dangerous, including empty containers. 	<ul style="list-style-type: none"> ▪ MoA&LD/N PCU ▪ CPCU ▪ County Health Department

IMPACT TYPE	IMPACT/ISSUES	MITIGATION MEASURES	MONITORING	RESPONSIBILITY
		<p>pesticide containers as dangerous and containing waste.</p> <ul style="list-style-type: none"> ▪ 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. 	<ul style="list-style-type: none"> ▪ PPE disposal system situated. ▪ Community based grievance redressal mechanism set up. 	
<p>Surface Water Contamination Surface water contamination can result from empty contaminated pesticide containers, used and</p>	<ul style="list-style-type: none"> ▪ Contamination of surface water bodies directly or indirectly through runoff from soil. ▪ Impact on the aquatic life as well 	<ul style="list-style-type: none"> ▪ Provide training on waste management including container disposal methods to all spray teams ▪ Implement the Triple Rinse approach to decontaminate the containers. 	<ul style="list-style-type: none"> ▪ Training manual prepared ▪ Training on proper pesticide disposal done. ▪ Triple rinse cleaning method consistently 	<ul style="list-style-type: none"> ▪ MoA&LD/N PCU ▪ CPCU

IMPACT TYPE	IMPACT/ISSUES	MITIGATION MEASURES	MONITORING	RESPONSIBILITY
<p>contaminated PPEs, obsolete pesticide waste, excess and unused pesticide mixture, spill response material, and pesticide rinsate.</p>	<p>as community livelihoods.</p> <ul style="list-style-type: none"> ▪ Possible release of the pesticides into the water bodies from accidental spills during the transportation, cleaning, storage and disposal of pesticide containers. 	<ul style="list-style-type: none"> ▪ 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) ▪ Pesticide applicators will never wash themselves, their overalls, or their PPE in any water bodies, or where wash water will drain to water bodies. 	<p>applied.</p> <ul style="list-style-type: none"> ▪ Empty containers properly disposed of. ▪ Comprehensive stock and inventory done. ▪ Tracking system for containers established. ▪ Proper storage structure of pesticides constructed and locked. 	

IMPACT TYPE	IMPACT/ISSUES	MITIGATION MEASURES	MONITORING	RESPONSIBILITY
<p>Impacts on Ecological Sensitive Habitats</p>	<p>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.</p>	<ul style="list-style-type: none"> • 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. 	<ul style="list-style-type: none"> ▪ 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. 	<ul style="list-style-type: none"> ▪ MoA&LD/N PCU ▪ CPCU

IMPACT TYPE	IMPACT/ISSUES	MITIGATION MEASURES	MONITORING	RESPONSIBILITY
		<ul style="list-style-type: none"> • Establish soak pits (with charcoal to filter, adsorb and retain the pesticides). 		
<p>Accidental Release of Pesticides Waste e.g. obsolete/unused/excess pesticide mixture</p>	<p>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).</p>	<ul style="list-style-type: none"> ▪ 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 that must be notified (Environment, Water, Police, Fire Department etc.) ▪ Records must be kept of all incidents and remedial action taken. 	<ul style="list-style-type: none"> ▪ 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. ▪ Material to contain chemical spills provided. ▪ Record keeping mechanism in place. 	<ul style="list-style-type: none"> ▪ MoA&LD/N ▪ PCU ▪ CPCU

IMPACT TYPE	IMPACT/ISSUES	MITIGATION MEASURES	MONITORING	RESPONSIBILITY
		<ul style="list-style-type: none"> ▪ 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 		
Livelihood and Food Security Impacts	▪ Pesticide can poison aquatic	▪ Provide training on waste management including	▪ Training manual prepared	▪ MoA&LD/N PCU

IMPACT TYPE	IMPACT/ISSUES	MITIGATION MEASURES	MONITORING	RESPONSIBILITY
	<p>resources if they find their way into ecosystems.</p> <ul style="list-style-type: none"> ▪ The contamination pathways are through surface runoff, deposit on off target organisms, bioaccumulation also builds the contamination in the animals through their feeding pathways and water intake. 	<p>container disposal methods to all spray teams</p> <ul style="list-style-type: none"> ▪ 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. ▪ Rinse 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). 	<ul style="list-style-type: none"> ▪ 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. 	<ul style="list-style-type: none"> ▪ CPCU
Storage and Store Siting	<ul style="list-style-type: none"> ▪ Poor siting and design of pesticide storage facilities 	<ul style="list-style-type: none"> ▪ The store facilities should be located away from water sources to avoid 	<ul style="list-style-type: none"> ▪ Storage units constructed 	<ul style="list-style-type: none"> ▪ MoA&LD/N ▪ PCU ▪ CPCU

IMPACT TYPE	IMPACT/ISSUES	MITIGATION MEASURES	MONITORING	RESPONSIBILITY
	<p>including pesticide waste storage could lead to exposure and contamination of the bio-physical environment as well as human health risks due to contact.</p> <ul style="list-style-type: none"> ▪ 	<p>contamination by accidental spills.</p> <ul style="list-style-type: none"> ▪ 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. 	<ul style="list-style-type: none"> ▪ Security manuals of storage units. ▪ Inventory sheet of available cleaning agents. ▪ Storage and warehouse plans. 	

IMPACT TYPE	IMPACT/ISSUES	MITIGATION MEASURES	MONITORING	RESPONSIBILITY
		<ul style="list-style-type: none"> ▪ 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 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	<ul style="list-style-type: none"> ▪ 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 	<ul style="list-style-type: none"> ▪ Inventory records maintained. ▪ Training manuals. ▪ Training videos ▪ Storage manuals. 	<ul style="list-style-type: none"> ▪ MoA&LD/N PCU ▪ CPCU

IMPACT TYPE	IMPACT/ISSUES	MITIGATION MEASURES	MONITORING	RESPONSIBILITY
	<p>especially if they still contain waste residue.</p>	<p>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.</p> <ul style="list-style-type: none"> ▪ 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 		

IMPACT TYPE	IMPACT/ISSUES	MITIGATION MEASURES	MONITORING	RESPONSIBILITY
		<p>accordance to international disposal requirements for obsolete pesticides.</p> <ul style="list-style-type: none"> ▪ 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 listed in Pesticide Procedures in case of spills of excess pesticides; obsolete pesticides etc. 		

Annex 2. Pesticide Emergency Preparedness and Response Plan (EPRP) for FSRP

Background

This document is an annex to the Integrated Pest Management Plan (IPMP) that has been prepared for the project and should be read alongside the Integrated Pesticide Management Plan. 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 CPCU 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

- Vehicles to be used for transportation of expired pesticides should be NEMA licenced to transport hazardous materials and wastes in line with EMCA 1999 Waste Management regulations,2006.
- 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.
- 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.

I. CONTROLLING THE SPILL

- 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 shall 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 litter, 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 arise 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 well 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 litter, 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
<p>Precautions to void harmful impacts of pesticide spills on Occupational Health and Safety Impacts</p> <p>Pesticide spills can cause serious sometimes deadly to workers involved in transport, storage, mixing and applying pesticides.</p>	<p>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.</p>	<ul style="list-style-type: none"> ▪ 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. 	<ul style="list-style-type: none"> ▪ 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 	<ul style="list-style-type: none"> ▪ MoA&LD/N PCU ▪ CPCU

Emergency Preparedness Response Plan				
IMPACT TYPE	IMPACT/ISSUES	MITIGATION MEASURES	MONITORING	RESPONSIBILITY
		<ul style="list-style-type: none"> Provide washing facilities in the storage and mixing site for those exposed to pesticides during cleanup. 	location.	
<p>Precautions to avoid harmful impacts of pesticide spills on Community Health and Safety Impacts</p> <p>Pesticide spills can cause serious sometimes deadly harm to community members who get exposed to the pesticide during transport, storage, mixing and applying pesticides.</p>	Exposure	<ul style="list-style-type: none"> 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. 	<ul style="list-style-type: none"> 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 	<ul style="list-style-type: none"> MoA&LD/N PCU CPCU

Emergency Preparedness Response Plan				
IMPACT TYPE	IMPACT/ISSUES	MITIGATION MEASURES	MONITORING	RESPONSIBILITY
		<ul style="list-style-type: none"> ▪ Ensure treatment medicines for pesticide exposure are available at the medical center. ▪ 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 	<ul style="list-style-type: none"> 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. 	

Emergency Preparedness Response Plan				
IMPACT TYPE	IMPACT/ISSUES	MITIGATION MEASURES	MONITORING	RESPONSIBILITY
		<p>goggles or boots; ensure that community members are unable to access the discarded material.</p> <ul style="list-style-type: none"> ▪ Ensure that the project executers and host community are able to address the grievances when a spill occurs. 		
<p>Precautions to avoid harmful impacts of pesticide spill on surface water contamination</p> <p>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.</p>	<p>Exposure from spill of the pesticides into the water bodies during transportation, storage or mixing and application.</p>	<ul style="list-style-type: none"> ▪ 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 	<ul style="list-style-type: none"> ▪ 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. 	<ul style="list-style-type: none"> ▪ MoA&LD/N PCU ▪ CPCU

Emergency Preparedness Response Plan				
IMPACT TYPE	IMPACT/ISSUES	MITIGATION MEASURES	MONITORING	RESPONSIBILITY
		<p>water will drain to water bodies.</p> <ul style="list-style-type: none"> ▪ Train workers to ensure that they avoid spill going to waterways. ▪ Build storage facility away from water ways. 		
<p>Precautions to avoid harmful impacts of spill on ecological sensitive habitats</p> <p>Pesticide spills can create a potential risk of polluting ecologically sensitive habitats such as wetlands, National parks reserves, forests, pasture grasslands, and water bodies.</p>	<p>Exposure from spill of the pesticides into ecological sensitive habitats during transportation, storage or mixing and application.</p>	<ul style="list-style-type: none"> • 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. 	<ul style="list-style-type: none"> ▪ 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. 	<ul style="list-style-type: none"> ▪ MoA&LD/N PCU ▪ CPCU

Emergency Preparedness Response Plan				
IMPACT TYPE	IMPACT/ISSUES	MITIGATION MEASURES	MONITORING	RESPONSIBILITY
<p>Precautions to avoid risk of spills during transportation</p> <p>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).</p>	Exposure	<ul style="list-style-type: none"> ▪ 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.) 	<ul style="list-style-type: none"> ▪ 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 	MoA&LD/NPC U CPCU

Emergency Preparedness Response Plan				
IMPACT TYPE	IMPACT/ISSUES	MITIGATION MEASURES	MONITORING	RESPONSIBILITY
		<ul style="list-style-type: none"> ▪ 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. ▪ 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. 	<ul style="list-style-type: none"> ▪ Cell phone for emergency in vehicle. 	
Precautions to avoid risk of spill during storage	Exposure / spills	<ul style="list-style-type: none"> ▪ All primary pesticide storage facilities will be double-padlocked and guarded 	<ul style="list-style-type: none"> ▪ Storage units constructed away from water sources 	<ul style="list-style-type: none"> ▪ MoA&LD/N ▪ PCU ▪ CPCU

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<p>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).</p> <p>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</p>		<ul style="list-style-type: none"> ▪ 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 	<ul style="list-style-type: none"> ▪ 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 	

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		<p>facilities and all workers will be trained on how to use the available firefighting facilities.</p> <ul style="list-style-type: none"> ▪ 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 		

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IMPACT TYPE	IMPACT/ISSUES	MITIGATION MEASURES	MONITORING	RESPONSIBILITY
		<ul style="list-style-type: none"> ▪ 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. 		
<p>Precautions to avoid risk of spill during Mixing and Application of pesticides</p> <p>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</p>	Exposure / spills	<ul style="list-style-type: none"> ▪ 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. 	<ul style="list-style-type: none"> ▪ PPE provided ▪ Training manuals on proper pesticide application and mixing. ▪ Spill kit provided. 	<ul style="list-style-type: none"> ▪ MoA&LD/N ▪ PCU ▪ CPCU

Emergency Preparedness Response Plan				
IMPACT TYPE	IMPACT/ISSUES	MITIGATION MEASURES	MONITORING	RESPONSIBILITY
applicator, as well as the possibility of inhalation.		<ul style="list-style-type: none"> ▪ Do not spray during inclement weather. ▪ Read label before mixing. ▪ Do not mix more than needed. 		
Precautions to reduce risks during pesticide spill clean-up risks	Contamination /exposure	<ul style="list-style-type: none"> ▪ 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” ▪ Provide first aid kit ▪ Provide emergency to hospitals ▪ Provide medicine to hospitals 		<ul style="list-style-type: none"> ▪ MoA&LD/N PCU ▪ CPCU

Emergency Preparedness Response Plan				
IMPACT TYPE	IMPACT/ISSUES	MITIGATION MEASURES	MONITORING	RESPONSIBILITY
		for treatment of pesticide exposure		
Precautions to reduce pesticide fire hazards	Exposure/spills	<ul style="list-style-type: none"> ▪ 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 	<ul style="list-style-type: none"> ▪ 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 	<ul style="list-style-type: none"> ▪ MoA&LD/N PCU ▪ CPCU

Emergency Preparedness Response Plan				
IMPACT TYPE	IMPACT/ISSUES	MITIGATION MEASURES	MONITORING	RESPONSIBILITY
		onsite by building berms. <ul style="list-style-type: none"> ▪ Consult with emergency responders to decide whether to allow the fire to burn out. 		