SPECIAL AGRO-INDUSTRIAL PROCESSING ZONES

AFRICAN DEVELOPMENT BANK GROUP
GROUPE DE LA BANQUE AFRICAINE DE DÉVELOPPEMENT


# PEST MANAGEMENT PLAN (PMP) ASSESSMENT

# ON

# ERUWA AGRICULTURAL TRANSFORMATION CENTRE (ATC)

## OCTOBER 2025

## PEST MANAGEMENT PLAN (PMP) ASSESSMENT ON ERUWA AGRICULTURAL TRANSFORMATION CENTRE (ATC)

**Developed by: AGRO4U Limited for the SAPZ Project Implementation Unit, Oyo State Agribusiness Development Agency (OYSADA)**
**Agency Headquarters: Oje – Owode Road, Ajegunle, PO Box 278, Saki, Oyo State, Nigeria**
**Ibadan Administrative Office: Qrt 804 Agodi Reservation Area, Opposite Bank of Agriculture, Secretariat Road, off Total Garden. PO Box7300 Secretariat**
**Post-Office Ibadan, Oyo State, Nigeria**

**Correct citation: Azeez Luqman Adeyemi, Adeagbo Ademola Luqman, Adebowale Akande**
**Editor: Oluwadamilola Sanmi-Abiodun, Gift Peter**
**Email: a.akande@cgiar.org**

## TABLE OF CONTENT

## LIST OF TABLES

## LIST OF FIGURES

## LIST OF PLATES

## LIST OF ABBREVIATIONS AND ACRONYMS

| | |
|---|---|
| AfDB | African Development Bank |
| ATC | Agricultural Transformation Centre |
| EIA | Environmental Impact Assessment |
| ESF | Environmental and Social Framework (World Bank) |
| ESIA | Environmental and Social Impact Assessment |
| ESMP | Environmental and Social Management Plan |
| ESS | Environmental and Social Standard |
| ESS3 | Environmental and Social Standard 3: Resource Efficiency and Pollution Prevention and Management |
| ESS4 | Environmental and Social Standard 4: Community Health and Safety |
| ETL | Economic Threshold Levels |
| FAO | Food and Agriculture Organization (of the United Nations) |
| FFS | Farmer Field Schools |
| FGDs | Focus Group Discussions |
| FMAFS | Federal Ministry of Agriculture and Food Security |
| FMEnv | Federal Ministry of Environment |
| FMARD | Federal Ministry of Agriculture and Rural Development |
| GRM | Grievance Redress Mechanism |
| Ha | Hectare |
| HHPs | Highly Hazardous Pesticides |
| IFAD | International Fund for Agricultural Development |
| IFIs | International Financial Institutions |
| ILO | International Labour Organization |
| IPM | Integrated Pest Management |
| IPPC | International Plant Protection Convention |
| ISS | Integrated Safeguards System (AfDB) |
| LFN | Laws of the Federation of Nigeria |
| LGA | Local Government Area |
| NAFDAC | National Agency for Food and Drug Administration and Control |

| | |
|---|---|
| NESREA | National Environmental Standards and Regulations Enforcement Agency |
| NGOs | Non-Governmental Organizations |
| NPQS | Nigerian Plant Quarantine Service |
| OP 4.09 | World Bank Operational Policy on Pest Management |
| OS | Operational Safeguard (AfDB) |
| OSH | Occupational Safety and Health |
| OYMARAD | Oyo State Ministry of Agriculture and Rural Development |
| OYSADA | Oyo State Agribusiness Development Agency |
| PHI | Pre-Harvest Interval |
| PMP | Pest Management Plan |
| PMU | Project Management Unit |
| PMPCU | Pest Management Plan Coordination Unit |
| POPs | Persistent Organic Pollutants |
| PPE | Personal Protective Equipment |
| S.I. | Statutory Instrument |
| SAPZ | Special Agro-Industrial Processing Zone |
| SECAP | Social, Environmental and Climate Assessment Procedures (IFAD) |
| WHO | World Health Organization |

## EXECUTIVE SUMMARY

### ES.1 Background of the Project

The Eruwa Agricultural Transformation Centre (ATC) is one of the priority investment locations under the Oyo State Special Agro-Industrial Processing Zone (SAPZ) Programme supported by the African Development Bank (AfDB). The ATC is located in Ibarapa East Local Government Area of Oyo State and covers approximately 3,067 hectares. The site is strategically located along the Abeokuta–Igboora–Iseyin corridor at approximately 7°31′N and 3°22′E and hosts critical water infrastructure, including the Eruwa Dam and associated water treatment facilities that supply potable water to surrounding communities.

The SAPZ intervention is designed to transform agricultural production systems by improving agricultural productivity, aggregation, storage, processing, value addition, and market access. While these investments are expected to generate significant socio-economic benefits, they may also increase pest management challenges and pesticide usage. Without adequate controls, improper pesticide procurement, storage, handling, application, and disposal could result in adverse impacts on human health, biodiversity, soil resources, surface water, groundwater, and community well-being.

To address these risks, a Pest Management Plan (PMP) has been prepared in accordance with the AfDB Integrated Safeguards System (ISS), national environmental regulations, FAO International Code of Conduct on Pesticide Management, WHO Recommended Classification of Pesticides by Hazard, and relevant environmental and agricultural legislation in Nigeria. The PMP provides a comprehensive framework for promoting Integrated Pest Management (IPM), minimizing reliance on chemical pesticides, strengthening institutional capacity, and ensuring environmentally sound pest management practices throughout the project lifecycle.

### ES.2 Scope and Objectives of the PMP

The PMP covers all project-supported farming communities, aggregation centres, storage facilities, processing facilities, and associated infrastructure within the Eruwa ATC area.

The PMP addresses:

- Crop pests, including insects, weeds, and plant diseases;
- Storage pests, including weevils, termites, rodents, moths, and moulds;
- Public health pests, including mosquitoes, flies, rats, and other disease vectors;
- Environmental and occupational health risks associated with pesticide use;
- Pest management practices across the entire agricultural value chain.

The objectives of the PMP are to:

- Identify major pest species and associated risks within the project area;
- Promote adoption of Integrated Pest Management (IPM);
- Minimize environmental and health impacts associated with pesticide use;
- Strengthen institutional capacity for sustainable pest management;
- Improve farmer awareness and technical capacity;
- Establish monitoring, reporting, emergency response, and compliance systems;
- Ensure compliance with AfDB safeguard requirements and national regulations.

**ES.3 Methodology**

Preparation of the PMP involved a combination of field investigations, stakeholder consultations, and desk-based review of relevant regulatory and technical documentation.

Primary data were collected through structured questionnaires administered to 56 respondents, including farmers, storage operators, traders, extension officers, community representatives, and other stakeholders. The assessment also involved focus group discussions, field observations, consultations with relevant institutions, and review of agricultural extension reports, scientific literature, and applicable national and international regulations.

The methodology enabled identification of pest management practices, pesticide usage patterns, environmental and health risks, institutional gaps, and opportunities for promoting sustainable pest management.

## ES.4 Key Findings

### Pest Profile and Severity

The assessment confirmed that pest infestation remains a major production constraint within the Eruwa ATC.

Key findings include:

- 35.7% of respondents considered pest infestations to be very serious, while 46.4% considered them moderately serious.
- 35.7% reported that pest problems are increasing over time.
- The vegetative growth stage was identified as the most vulnerable period for pest attacks.
- Insects (36.2%), vertebrate pests (20.3%), diseases (14.5%), and weeds (13.0%) were identified as the major pest groups affecting agricultural production.
- Storage losses are primarily caused by termites (36.4%) and weevils (31.8%).

These findings indicate significant pest pressure that threatens agricultural productivity and post-harvest management systems.

### Pesticide Use and Associated Risks

The assessment also revealed substantial dependence on chemical pesticides:

- 58.3% of respondents rely primarily on chemical pest control methods.
- Grammazone was identified as the most frequently used pesticide.
- 89.3% of pesticides are sourced from local agrochemical markets.
- 35.7% of users do not consistently utilize Personal Protective Equipment (PPE).
- 28.6% engage in unsafe disposal practices, including burning, burial, and reuse of pesticide containers.
- 25.8% of respondents have never received formal training on safe pesticide use or IPM.

These practices present significant occupational health, environmental, and community safety risks.

## ES.5 Key Risks Identified

The assessment identified several priority risks requiring mitigation:

- Occupational exposure of farmers and applicators to pesticides;
- Contamination of soil, surface water, and groundwater resources;
- Pollution risks to the Eruwa Dam and associated water supply infrastructure;
- Improper disposal and reuse of pesticide containers;
- Development of pesticide resistance;
- Storage losses resulting from poor pest management practices;
- Exposure of nearby communities to pesticide drift and contamination;
- Potential use of unregistered or inappropriate pesticide products.

## ES.6 Proposed Pest Management Measures

To address identified risks, the PMP establishes a comprehensive Integrated Pest Management (IPM) framework based on prevention, monitoring, biological control, cultural control, mechanical control, and responsible pesticide use.

Major measures include:

### Pest-Specific Integrated Pest Management Programme

The PMP provides pest-specific management measures for:

- Fall Armyworm;
- Stem borers;
- Aphids;
- Termites;
- Weevils;
- Rodents;
- Fungal and bacterial diseases;
- Public health pests such as mosquitoes and flies.

The programme establishes pest thresholds, monitoring frequencies, control measures, and implementation responsibilities.

**Approved and Prohibited Pesticides**

The PMP includes an approved pesticide list based on WHO hazard classifications and NAFDAC registration requirements. It also prohibits Highly Hazardous Pesticides (HHPs), Persistent Organic Pollutants (POPs), and pesticides banned under Nigerian law and international conventions.

**Pesticide Procurement and Quality Assurance**

Only NAFDAC-approved suppliers and registered products shall be utilized. Product verification, inventory management, batch tracking, and shelf-life controls shall be implemented to ensure product quality and traceability.

**Pesticide Waste and Obsolete Pesticide Management**

The PMP establishes procedures for:

- Triple-rinsing of pesticide containers;
- Container collection and storage;
- Hazardous waste disposal;
- Waste manifest tracking;
- Identification and management of obsolete pesticides;
- Chance discovery procedures for unknown or banned chemicals.

**Emergency Preparedness and Response**

An Emergency Preparedness and Response Plan (EPRP) has been developed to address:

- Chemical spills;
- Pesticide poisoning;
- Fire incidents;

- Environmental contamination events.

The EPRP establishes reporting procedures, emergency response actions, and institutional responsibilities.

**Occupational Health and Medical Surveillance**

A medical surveillance programme has been developed for farmers, pesticide applicators, storage operators, and project workers. The programme includes routine health screening, annual medical examinations, exposure investigations, and incident reporting.

**Pest Resistance Management**

The PMP includes measures to prevent pesticide resistance through rotation of active ingredients, rotation of pesticide classes, biological control, resistance monitoring, and proper record keeping.

**Water Quality Monitoring Programme**

Given the proximity of the project to the Eruwa Dam, a dedicated water quality monitoring programme has been established. Quarterly monitoring will be undertaken for pH, nitrate, phosphate, pesticide residues, heavy metals, dissolved oxygen, turbidity, and related parameters.

**ES.7 Institutional Arrangements**

Implementation of the PMP shall involve coordinated participation of OYSADA, the SAPZ Project Management Unit, farmers, extension officers, storage operators, environmental officers, health personnel, regulatory agencies, and community representatives.

The PMP includes a detailed roles and responsibilities matrix specifying implementation, monitoring, reporting, compliance, and emergency response functions.

**ES.8 Monitoring and Reporting**

The PMP establishes a comprehensive monitoring framework based on measurable performance indicators including:

- Adoption of IPM practices;
- PPE compliance rates;
- Reduction in unsafe disposal practices;
- Water quality compliance;
- Number of farmers trained;
- Medical surveillance coverage;
- Emergency response performance;
- Environmental compliance status.

Monitoring results shall be reported through quarterly and annual environmental and social performance reports.

**ES.9 Capacity Building Requirements**

Capacity building forms a critical component of the PMP.

Training programmes will cover:

- Integrated Pest Management;
- Safe pesticide handling and application;
- Use of PPE;
- Storage management;
- Waste management;
- Emergency response procedures;
- Environmental monitoring and reporting.

The programme targets farmers, extension officers, agro-processors, contractors, and project personnel.

**ES.10 PMP Implementation Budget**

Implementation of the PMP will require an estimated annual budget of ₦50,050,000 (approximately US$31,285) based on an exchange rate of ₦1,600/US$.

The budget covers:

- Pest surveillance and monitoring;
- Farmer training and awareness;
- Demonstration farms and field schools;
- PPE procurement;
- Water quality monitoring;
- Occupational health surveillance;
- Emergency preparedness and response;
- Waste management;
- Obsolete pesticide management;
- Environmental audits;
- Monitoring and reporting activities.

The budget shall be reviewed annually and adjusted as necessary throughout project implementation.

**ES.11 Conclusion**

The PMP provides a comprehensive framework for managing pest-related risks associated with the development and operation of the Eruwa Agricultural Transformation Centre. The Plan promotes sustainable agricultural production through Integrated Pest Management, protects human health and environmental resources, safeguards the Eruwa Dam and surrounding communities, and ensures compliance with AfDB safeguard requirements, national regulations, and international best practices.

Successful implementation of the PMP will contribute to increased agricultural productivity, reduced dependence on chemical pesticides, improved occupational and community health, enhanced environmental protection, and long-term sustainability of the Eruwa Agricultural Transformation Centre under the SAPZ Programme.

# CHAPTER ONE: INTRODUCTION

## 1.1 Background

Agricultural production within the Eruwa Agricultural Transformation Center (ATC), located in Ibarapa-East Local Government Area, Oyo State, represents a cornerstone of local livelihoods, regional food security, and rural economic growth. A defining environmental feature of the area is the presence of an Oyo State Water Corporation facility, incorporating a dam and water treatment system that supplies potable water to the surrounding communities. This proximity to a public water source underscores the critical importance of maintaining environmental integrity, particularly in preventing agrochemical runoff and preserving surface water quality within the catchment area.

In recognition of Eruwa's agricultural significance, the Oyo State Government has initiated the establishment of the Eruwa Agricultural Transformation Centre (ATC) flagship intervention designed to function as an integrated agricultural value-chain hub. The ATC will facilitate production, aggregation, processing, storage, and market access, thereby transitioning the community from traditional cultivation practices to a commercially oriented agribusiness model. However, despite this strategic investment, the agricultural system remains vulnerable to multiple pest pressures, including insect infestations, phytopathogens, invasive weeds, post-harvest pests, and disease vectors. These pest challenges significantly undermine crop productivity, post-harvest quality, and ecosystem resilience, while the indiscriminate use of agrochemicals heightens risks to human health and environmental sustainability. To mitigate these challenges, the Pest Management Plan (PMP) has been formulated as a complementary safeguard instrument under the Environmental and Social Impact Assessment (ESIA) framework for the ATC project. PMP is prepared in compliance with AfDB Integrated Safeguards System (ISS) requirements and SAPZ ESMS; this will lead to increased agricultural productivity, input use, and aggregation activities at Eruwa ATC to the need for proactive pest and vector management, by this, PMP will be supporting sustainable agribusiness development and environmental protection objectives under SAPZ.

In general, PMP provides a structured approach to ensure safe, effective, and environmentally sound pest control practices, aligned with national legislation and international environmental and social safeguard standards, including those of development partners and multilateral donors. The

PMP will guide all stakeholders' farmers, extension agents, and ATC management in adopting Integrated Pest Management (IPM) principles, promoting biological and cultural control methods, rational pesticide use, and capacity-building for safer handling, storage, and disposal of agrochemicals. Given the project's proximity to a sensitive hydrological system, pest management transcends operational necessity to become a core environmental protection measure. Effective implementation of the PMP will ensure the protection of public health, safeguard water resources, and sustain the long-term productivity and ecological balance of the Eruwa community and its environs.

## 1.2 Purpose and Rationale for Pest Management at ATC

Considering pest management practices is essential for several reasons:

i. Environmental Contamination: Misuse, improper disposal, and spillage of pesticides can contaminate soil and water resources, affecting ecosystems and human health.
ii. Human Health Risks: Improper handling, storage, and application of pesticides pose serious health risks to farmers, applicators, and surrounding communities.
iii. Regulatory and Legal Compliance: Certain pesticides are banned or restricted under national legislation and international conventions, necessitating a review of current practices.
iv. Sustainability and Resilience: Overreliance on chemicals leads to pest resistance, accelerates environmental degradation, and results in loss of biodiversity and beneficial insects.
v. Food Security: Poor storage and ineffective post-harvest pest control measures contribute to significant post-harvest losses and threaten food security.
vi. Public Health: Uncontrolled public health pests (e.g., mosquitoes, rodents, flies) are vectors that contribute to the transmission of diseases.

Therefore, an effective PMP is essential to ensure all pest control measures are safe, sustainable, environmentally sound, and socially acceptable, in full alignment with the principles of Integrated Pest Management (IPM).

## 1.3 Objectives of the Pest Management Assessment

The assessment phase of the PMP seeks to:

i. Identify major agricultural and public health pest species and document their seasonal patterns.

ii. Document current chemical and non-chemical pest management practices used by stakeholders.
iii. Analyse the types of pesticides used, their frequency of application, and application methods.
iv. Assess access to pest control inputs and the effectiveness of current regulatory oversight.
v. Evaluate farmer awareness and adherence to the proper use of protective measures and safety protocols.
vi. Investigate the extent of post-harvest losses caused by storage pests.
vii. Examine community exposure to vector-borne diseases related to public health pests.
viii. Assess the environmental and health risks associated with pesticide procurement, handling, storage, and disposal.
ix. Identify institutional, technical, and training gaps that hinder the adoption of IPM.
x. Propose integrated, sustainable, and regulatory-compliant pest management strategies based on the findings.

### 1.3.1 Objectives of the Field Survey

The data collection exercise was specifically designed to achieve the following objectives:

- Pest Identification: Identify the most prevalent crop pests (insects, weeds, diseases), storage pests (weevils, rodents, moulds), and public health pests (mosquitoes, rats) in the project area.
- Practice Assessment: Assess current pest management practices utilized by farmers, including the types of pesticides used, application frequency, handling, and disposal patterns.
- Knowledge and Capacity Evaluation: Evaluate stakeholder knowledge, attitudes, and perceptions regarding pest control, and determine the current levels of training, access to extension services, and capacity gaps for adopting safer alternatives.
- Risk Identification: Identify the specific environmental, health, and social risks associated with current pesticide procurement and use within the value chain.
- PMP Design: Generate the necessary field-based evidence to inform and guide the design of the Integrated Pest Management Plan (IPM/PMP).

## 1.4 Scope of the Pest Management Plan (PMP)

The PMP is designed to provide comprehensive pest management coverage, extending beyond the physical boundaries of the hub to include all areas impacted by the project's value chain. The plan addresses three major categories of pests, integrating both the agricultural and public health dimensions required by the ESIA framework (Table 1.1).

**Table 1.1: Scope of the Pest Management Plan (PMP) by Pest Category**

| Pest Category | Examples | Relevance to the Project |
|---|---|---|
| Crop Pests | Insects (e.g., stem borers, aphids), Weeds, Plant Diseases (e.g., fungal, viral) | Targets pests that affect primary production within the IGH and linked farming communities, directly impacting the yield and quality of crops grown for processing. |
| Storage Pests | Weevils, Moths, Rodents, Mites, Moulds | Targets pests causing post-harvest losses at on-site storage facilities, aggregation points, and processing centres within the hub, directly affecting food security and economic viability. |
| Public Health Pests | Mosquitoes, Flies, Rats, other Vectors | Targets pests that transmit diseases or cause nuisance in the rural settlements and communities linked to the value chain, focusing on community health and safety (in alignment with World Bank ESS4). |

The broad scope ensures the PMP is a holistic instrument that covers the entire project ecosystem from production (farm) to processing (hub) to community all associated environmental and social risks as required by national regulations and AfDB/World Bank safeguards.

## 1.5 Integration of PMP with the ESIA

The Pest Management Plan (PMP) is an integral and compulsory component of the overall Environmental and Social Impact Assessment (ESIA) for projects involving agricultural activities or vector control. It acts as a specialized technical study whose findings and recommendations are directly woven into the main ESIA and subsequent management plans.

### 1.5.1 **Function of PMP Findings within the ESIA Framework**

The core findings of the Pest Management Assessment serve multiple critical functions within the broader ESIA framework:

a. Informing the ESIA and Impact Analysis: The assessment provides the ESIA team with crucial data on baseline pest conditions, current pesticide usage patterns, and the associated risks. This information is used to accurately categorize the project's environmental and social risk profile (e.g., classifying potential pollution and health impacts).
b. Forming the Foundation of the PMP: The assessment's data on pest incidence, stakeholder capacity, and current practices directly dictates the content and structure of the standalone PMP document, establishing the Integrated Pest Management (IPM) strategy as the project's mandatory approach.
c. Feeding into the Environmental and Social Management Plan (ESMP): The PMP's proposed actions are directly integrated into the project's overarching ESMP. This ensures that specific pest-related mitigation, monitoring, and institutional arrangements are formalized alongside other environmental and social safeguard measures.
d. Guiding Mitigation Measures: The assessment guides the design of site-specific mitigation measures. These measures move beyond simple restrictions to include non-chemical control methods, safe handling and disposal protocols, and the management of obsolete pesticide stocks to reduce environmental and health risks.
e. Guiding Capacity-Building and Training: The identified knowledge and capacity gaps (e.g., lack of PPE use, incorrect storage) are used to design targeted and effective training programs for farmers and extension workers, promoting the sustainable adoption of IPM principles.
f. Ensuring Policy Compliance: The PMP provides documented assurance that the project meets the stringent safeguard requirements of financing institutions and regulatory bodies, including:
    - World Bank ESS3/OP 4.09 (reliance on IPM).
    - FAO IPM Principles (sustainable and ecosystem-based control).
    - WHO Classification (safe procurement and exclusion of Highly Hazardous Pesticides).

        National Nigerian Pesticide Laws (regulatory alignment).

## CHAPTER TWO: LEGAL AND INSTITUTIONAL FRAMEWORK

In accordance with the provisions of the Environmental Impact Assessment (EIA) Act No. 86 of 1992 (as amended by the EIA Act CAP E12, Laws of the Federation of Nigeria, 2004) and relevant international standards, the Pest Management Plan (PMP) for this Project has been developed to ensure that pesticide use is safe, environmentally sound, and socially responsible. The PMP aligns with national regulations and World Bank safeguard requirements to identify risks associated with pesticide procurement, storage, application, and disposal, and to prescribe appropriate Integrated Pest Management (IPM) strategies and mitigation measures.

The Pest Management Plan (PMP) is grounded in a rigorous legal and institutional framework, ensuring that all project activities related to pest control are safe, environmentally sound, and compliant with both Nigerian national law and international donor safeguard requirements. The PMP is designed to cover the entire project lifecycle, from planning through implementation and monitoring. Its development and execution involve a structured, stepwise process:

- Policy Review: Comprehensive review of all applicable national laws, regulations, and international standards.
- Assessment: Field assessment of current pest challenges, existing control practices, and identification of pesticide-related environmental and social risks.
- Strategy Development: Development of Integrated Pest Management (IPM) options tailored to the project area.
- Management Planning: Definition of mitigation, monitoring, institutional roles, and capacity building strategies.
- Implementation: Execution of the IPM strategies and implementation/supervision plans.

### 2.1 Nigerian Regulations (FMEnv, NAFDAC, NESREA)

The following primary acts and regulations provide the legal mandate for safe pesticide management in Nigeria (Table 2.1).

**Table 2.1: National Institutional Roles and Responsibilities in Pest Management and PMP Implementation**

| Legislation/Policy | Administering Body | Key Requirements for Pest Management |
|---|---|---|
| Environmental Impact Assessment (EIA) Act, 1992 | Federal Ministry of Environment (FMEnv) | Mandates that all agricultural and land development projects undergo an ESIA, requiring the inclusion of pest and pesticide management considerations. Provides the legal basis for environmental monitoring. |
| NAFDAC Act & Pesticide Registration Regulations (2019) | National Agency for Food and Drug Administration and Control (NAFDAC) | Vests regulatory authority for all agricultural and public health pesticides. Mandates product registration, quality verification, proper labelling, and adherence to FAO/WHO standards for import, manufacture, sale, and use. |
| National Environmental (Agricultural Sector) Regulations, 2009 (S.I. No. 26) | National Environmental Standards and Regulations Enforcement Agency (NESREA) | Defines environmental requirements for agricultural operations. Emphasizes adoption of IPM and prohibits the use of unregistered or highly toxic pesticides. Requires record-keeping of agrochemical procurement and usage. |
| NESREA Act, 2007 | NESREA | Establishes NESREA as the chief enforcement arm of FMEnv. Mandates pollution prevention and control from agricultural activities, specifically including the enforcement of regulations related to pesticide waste and residue management. |
| Harmful Wastes (Special Criminal Provisions) Act, 1988 | FMEnv / Federal Attorney General | Criminalizes the improper storage, transportation, or disposal of hazardous substances, including obsolete and expired pesticides, empowering prosecution of violators. |
| Factories Act, 2004 | Federal Ministry of Labour | Ensures occupational safety for workers handling hazardous materials. Requires provision of Personal Protective Equipment (PPE), training, emergency response, and health surveillance for pesticide applicators. |

## 2.2 International standards (FAO, WHO, World Bank ESS3/OP4.09, AfDB)

The PMP ensures the project is aligned with the rigorous standards of international financiers and global chemical control treaties:

### 2.2.1 Donor Safeguards (World Bank and AfDB)

The PMP is designed to achieve mandatory compliance with:

- World Bank Environmental and Social Standard (ESS) 3: Resource Efficiency and Pollution Prevention and Management. These standards demand that pest management relies primarily on IPM and requires the exclusion of pesticides classified as WHO Class IA (extremely hazardous) and IA (highly hazardous). It mandates comprehensive risk assessment, monitoring, and emergency response.
- World Bank ESS4: Community Health and Safety. Ensures the protection of farmers, workers, and communities from the risks associated with pesticide exposure.
- African Development Bank (AfDB) Operational Safeguard (OS) 3: Biodiversity and Ecosystem Services. Regulates pesticide use to prevent ecological harm, explicitly prohibiting highly hazardous pesticides and mandating alignment with the FAO/WHO Code of Conduct.

### 2.2.2 Global Conventions and Codes

Nigeria is a signatory to several international agreements that inform the PMP's operational guidelines:

- FAO International Code of Conduct on Pesticide Management (2014) – Provides global standards for responsible pesticide lifecycle management. The FAO International Code of Conduct on Pesticide Management: Provides the fundamental global best practices for the responsible lifecycle management of pesticides (from manufacture to disposal).
- WHO Classification of Pesticides by Hazard (2020) – Guides classification, labelling, and restriction of toxic substances
- Stockholm Convention (2001) – Controls Persistent Organic Pollutants (POPs) such as banned pesticides (e.g. DDT). Stockholm Convention on Persistent Organic Pollutants (POPs): Mandates the elimination or severe restriction of persistent, bio-accumulative chemicals (e.g., DDT, Aldrin), many of which are older, highly toxic pesticides.

- Rotterdam Convention (1998) – Requires prior informed consent for trade in hazardous chemicals and pesticides. Rotterdam Convention on Prior Informed Consent (PIC): Requires informed consent for the international trade of certain hazardous chemicals and pesticides, ensuring that importing countries are aware of the potential risks.
- Basel Convention (1989) – Regulates transboundary movement and disposal of hazardous waste, including obsolete pesticides. The Basel Convention on Hazardous Wastes: Regulates the transboundary movement and disposal of hazardous wastes, including obsolete and banned pesticides.
- ILO Convention 184 (Safety and Health in Agriculture) – Protects agricultural workers from occupational risks associated with pesticide exposure.

## 2.3 Institutional Roles and Coordination

Effective pest management requires the coordinated effort of multiple government agencies, extending from the federal policy level to state extension services. The PMP defines these roles to ensure seamless implementation (Table 2.2).

**Table 2.2: Roles of National and International Organizations in Pest Management**

| Agency / Institution | Level | Key Roles in Pest Management for the Project |
|---|---|---|
| Federal Ministry of Environment (FMEnv) | National | Sets environmental regulations, approves ESIA/PMP, monitors pesticide environmental impact, and waste management oversight. |
| Federal Ministry of Agriculture & Food Security (FMAFS) | National | Promotes IPM adoption, farmer extension services, agricultural policy guidance, pest surveillance, and control programs. |
| NAFDAC | National | Registers and licenses pesticides, regulates importation, formulation, distribution, labelling and quality control. |
| NESREA | National | Enforces environmental compliance, monitors pollution from pesticide use/disposal, issues penalties and compliance directives. |
| Nigerian Plant Quarantine Service (NPQS) | National | Controls transboundary movement of plant materials and pesticides, and prevents entry of invasive pests. |
| State Ministries of Agriculture / Environment | State | Local implementation of IPM programs, field-level monitoring, farmer training, data collection, and reporting. |
| LGA / Extension Services | Local | Grassroots farmer engagement, awareness creation, IPM advisory services, and community-level monitoring. |

| Agency / Institution | Level | Key Roles in Pest Management for the Project |
|---|---|---|
| World Bank (ESF, ESS3, ESS4) | International | Sets safeguard requirements, prohibits highly hazardous pesticides, ensures IPM adoption, monitors compliance, capacity building. |
| African Development Bank (ISS, OS1, OS3) | International | Requires environmental and social assessment, biodiversity protection, safe pesticide management, and gender and inclusion in PMP. |
| FAO / WHO (Code of Conduct on Pesticide Management) | International | Provides global best practices on pesticide lifecycle management, risk reduction, training, and policy support. |
| Rotterdam, Stockholm, Basel Conventions | International | Regulate hazardous chemicals, eliminate POPs, control transboundary movement of hazardous wastes, and enforce safe disposal. |
| IPPC (International Plant Protection Convention) | International | Global framework for plant health, pest surveillance, quarantine measures, and phytosanitary standards. |
| Research Institutes / Universities | National/ International | Develop IPM technologies, provide data on pest ecology and resistance, and support training and innovation. |
| Private Sector / Agrochemical Companies | National | Supply registered pesticides, promote stewardship, and support farmer training on safe use and disposal. |
| NGOs / Farmer Associations | National/Local | Community mobilization, advocacy for safe practices, monitoring misuse, and promoting ecological alternatives. |

## 2.4 Gaps in Enforcement of Pest Management Regulations

Despite the existence of comprehensive national legislation and international standards (as outlined in Sections 2.1 and 2.2), effective pest management and safe pesticide use in the project area are undermined by systemic weaknesses in enforcement and institutional capacity. Addressing these gaps is paramount to the success of the PMP.

### 2.4.1 Regulatory and Oversight Deficiencies

Systemic weaknesses in governance create a permissive environment for unsafe practices:

- Weak Regulatory Oversight and Monitoring: There is limited active inspection of farms, markets, and storage facilities, resulting in a low probability of detection for illegal practices. This is compounded by inadequate field-level surveillance of pesticide distribution and use, and poor routine monitoring of environmental contamination (soil, water, air).

- Inadequate Control of Illegal and Counterfeit Pesticides: The proliferation of unregistered, substandard, or counterfeit products in local agro markets poses direct health and environmental risks. This is enabled by weak border control and limited cooperation among key regulatory agencies like NAFDAC, Customs, and the National Plant Quarantine Service (NPQS). Furthermore, a fundamental lack of traceability systems for pesticide supply chains makes accountability nearly impossible.
- Limited Institutional Capacity: Regulatory agencies suffer from insufficient manpower for effective field supervision and lack the necessary funding and logistics (vehicles, testing equipment, data systems). Compounding this, overlapping mandates between various agencies (e.g., FMEnv, NAFDAC, FMAFS) create confusion and delays in enforcement.

### 2.4.2 Farmer Practices and Compliance Gaps

Enforcement failure often stems from a lack of technical knowledge and adherence among end-users:

- Low Farmer Awareness and Poor Compliance: Many farmers are unaware of banned or restricted pesticides (such as WHO Class Ia/Ib or POPs). There is a limited understanding of crucial safety practices, including reading label instructions, adhering to Personal Protective Equipment (PPE) requirements, and observing pre-harvest intervals (PHIs). This leads to widespread, often indiscriminate, reliance on chemical control instead of the adoption of Integrated Pest Management (IPM).
- Weak Enforcement of Safe Handling and Disposal: There is no formal national collection or disposal system for hazardous waste. Consequently, used pesticide containers are frequently and illegally burned, buried, or discarded in fields and waterways. The lack of penalties or consistent follow-up on these unsafe practices perpetuates environmental pollution.

### 2.4.3 Policy Integration and Data Deficits

The inability to link policy to action and measure outcomes hinders effective planning:

- Poor Integration of Public Health Pest Control: Effective vector control (mosquitoes, rodents) is often reactive rather than preventive, and there is limited coordination between the agricultural sector (pesticide use) and the health sector (disease prevention). Critically,

the potential overlap between agricultural and domestic pesticide uses and their cumulative risk is not adequately regulated or monitored.

- Limited Data and Reporting Systems: The absence of a centralized database tracking pesticide importation, sales, usage, and poisoning cases creates an information blackout. This results in the underreporting of pesticide-related health incidents and prevents evidence-based planning and decision-making for national IPM strategies.
- Inconsistent Compliance with International Standards: Donor safeguard policies (AfDB, World Bank ESSs) and international conventions (Rotterdam, Stockholm) are often not fully embedded as routine national enforcement practices. Alignment frequently relies on project-specific funding and supervision, rather than institutionalized regulatory rigour.

## 2.5 Alignment Strategy for the Project

To successfully address the enforcement gaps and institutional challenges identified, the Pest Management Plan (PMP) will implement a robust alignment strategy. This strategy ensures that project activities not only meet the highest standards of environmental and social responsibility but also achieve full compliance with national law and international donor safeguards.

### 2.5.1 Core Principles and Policy Compliance

The PMP establishes its foundation on internationally accepted best practices and mandatory safeguard requirements:

- Integrated Pest Management (IPM) as the Guiding Principle: The project will formally adopt and promote FAO IPM standards as the central philosophy for all pest control decisions. This means prioritizing biological, cultural, and mechanical controls, with synthetic chemicals only used as a last resort and within a defined management program.
- Mandatory Donor Safeguard Compliance: The PMP serves as the instrument for full compliance with the World Bank Environmental and Social Standard 3 (ESS3)/Operational Policy 4.09 and the similar requirements of the African Development Bank (AfDB). This mandates the exclusion of highly hazardous pesticides (WHO Class Ia and Ib) and requires thorough risk assessment and mitigation for all necessary chemical usage.
- Enforcement of National Regulations: The PMP will rigorously enforce existing national mandates, including NAFDAC registration rules (ensuring only approved products are

used) and FMEnv/NESREA disposal rules (mandating the safe handling and management of pesticide waste and containers).

- Product Selection through WHO Hazard Classification: All pesticides considered for project use will be screened against the WHO Recommended Classification of Pesticides by Hazard. The PMP will maintain a strict whitelist of acceptable, low-toxicity products, effectively integrating safety standards into the procurement process.

### 2.5.2 Institutional Strengthening and Implementation

To overcome the challenges of weak enforcement, the strategy focuses on defining roles, building capacity, and establishing accountability:

- Defined Institutional Responsibilities and Reporting Mechanisms: The PMP will clearly define the roles, responsibilities, and coordination protocols for all relevant agencies (FMAFS, NAFDAC, NESREA, State MoA) at every stage of the project lifecycle. This includes establishing a transparent monitoring and reporting mechanism to track pesticide use, training effectiveness, and compliance.
- Strengthened Enforcement and Capacity within Local Institutions: The project will invest directly in the capacity building of key local institutions. This includes providing specialized training for extension officers and regulatory personnel in IPM assessment and compliance monitoring, as well as supporting the necessary logistics (e.g., field equipment) to enable effective surveillance and enforcement.
- Support for Farmers with Training and Safer Alternatives: Recognizing that compliance starts with the user, the PMP will finance targeted farmer training programs focused on IPM techniques, safe handling, and the correct use of Personal Protective Equipment (PPE). Furthermore, the project will actively support the supply chain for safer alternatives (e.g., biopesticides, pest-resistant seeds, advanced storage technologies) to reduce the reliance on chemical options.

## 2.6 Importance of Pest Management for Environmental and Social Safeguards

Effective Pest Management, particularly through the adoption of Integrated Pest Management (IPM) strategies, is critical for achieving both environmental sustainability and robust social

safeguards within a project. It moves beyond mere pest control to ensure that all measures are safe, ethical, and ecologically sound.

### 2.6.1 Environmental Safeguards

Pest management underpins environmental sustainability by directly mitigating key ecological threats:

i. Preventing Water and Soil Pollution: Proper pest management minimizes the use of synthetic chemicals, thereby preventing toxic residues from leaching into groundwater and surface water bodies, and accumulating in the soil. This protects aquatic life, soil microflora, and ensures the safety of water resources for human and animal consumption.
ii. Protecting Biodiversity and Beneficial Species: IPM prioritizes non-chemical methods, which preserve natural predator-prey relationships and safeguard non-target organisms, including pollinators (like bees), beneficial insects, and wildlife. This maintains ecological balance and supports sustainable crop production.
iii. Minimizing Chemical Footprint and Resistance: By reducing over-reliance on broad-spectrum pesticides, IPM slows the development of pesticide resistance in target pests. This prolongs the useful life of necessary chemicals and reduces the overall chemical load in the environment.

### 2.6.2 Social and Economic Safeguards

Implementing safe and sustainable pest management directly enhances human health, community well-being, and economic stability:

i. Reducing Public Health Risks and Occupational Hazards: Controlling chemical use significantly lowers the risk of acute and chronic health issues (e.g., neurological damage, cancers) among farmers, applicators, and local communities from accidental exposure, drift, or contact with treated produce.
ii. Enhancing Social Equity and Protection: IPM safeguards are particularly important for vulnerable groups, such as women and hired labourers, who often handle or apply chemicals with inadequate personal protective equipment (PPE). By substituting hazardous chemicals with safer alternatives and providing comprehensive training, the project enhances their workplace safety and social protection.

iii. Avoiding Economic Losses and Boosting Food Security: Effective, targeted pest management, especially concerning post-harvest storage pests, significantly reduces crop and stored product losses. This directly contributes to increased farmer income, improved food availability, and enhanced regional food security

iv. Ensuring Regulatory Compliance: Adherence to best practices, such as the World Bank's safeguard policies and relevant national laws, ensures the project maintains social license to operate and qualifies for donor financing

## 2.7 Link to Donor-Funded Requirements

The Pest Management Plan (PMP) is an essential safeguard instrument that ensures a project aligns with the environmental and social standards (ESS) set by major International Financial Institutions (IFIs) and global bodies. Compliance with these frameworks is mandatory for securing and maintaining donor financing.

### 2.7.1 World Bank Group Requirements

The PMP primarily satisfies the requirements of the World Bank's Environmental and Social Framework (ESF), specifically

World Bank Environmental and Social Standard 3 (ESS3): Resource Efficiency and Pollution Prevention and Management. ESS3 explicitly requires the borrower to minimize and manage the risks and impacts associated with pesticide use. It promotes the adoption of Integrated Pest Management (IPM) approaches, emphasizing biological and non-chemical controls to reduce reliance on synthetic pesticides.

The PMP ensures that any use of pesticides is justified under an IPM approach, is based on the World Health Organization's (WHO) hazard classification (excluding WHO Class IA and IB products), and has minimal adverse effects on human health, non-target species, and the environment.

World Bank Operational Policy (OP) 4.09 (Pest Management): (Pre-ESF, but principles remain)

This policy establishes the requirement for a PMP where a project finances pesticide procurement or significantly affects pest management practices.It supports a strategy that favours biological and environmental control methods and mandates that the PMP assess the country's institutional capacity to regulate and implement safe pest management.

### 2.7.3 Alignment with Other Development Bank Frameworks

The principles established in the PMP are universally accepted standards for agricultural sustainability, directly aligning with the frameworks of other major IFIs. African Development Bank (AfDB) Integrated Safeguards System (ISS): The AfDB's system requires projects to promote sustainable management of natural resources and prevent pollution, which is achieved by substituting chemical controls with IPM techniques outlined in the PMP.International Fund for Agricultural Development (IFAD) Social, Environmental and Climate Assessment Procedures (SECAP): IFAD's procedures focus on building the environmental sustainability and climate resilience of poor rural people's economic activities. A PMP directly contributes by reducing environmental health risks, protecting soil and water, and promoting sustainable farming practices. In essence, the PMP translates abstract donor policies into concrete, implementable actions on the ground, making the project eligible for financing and ensuring its long-term social and environmental integrity.

## 2.8 Expected Outcomes of Integrating Pest Management into the ESIA

By successfully integrating the Pest Management Plan (PMP) into the Environmental and Social Impact Assessment (ESIA), the project is expected to deliver multiple benefits across environmental, social, and economic domains, ensuring long-term sustainability and compliance.

### 2.8.1 Environmental and Ecological Outcomes

The focus on Integrated Pest Management (IPM) will yield significant ecological benefits:

- Reduced Environmental Contamination: The rigorous screening and minimal use of chemical pesticides will lead to a demonstrable reduction in residues contaminating soil, groundwater, and surface water sources, thereby protecting sensitive ecosystems.
- Prevented Pest Resistance and Preserved Biodiversity: By prioritizing biological and non-chemical controls, the project will effectively slow the development of pest resistance to

common chemicals. This approach safeguards beneficial insect populations (e.g., pollinators and natural predators) and preserves agro biodiversity within the project area.

- Promoted Sustainable, Ecosystem-Based Practices: The project will foster a shift toward IPM, which is an ecologically rational approach that manages pests below economic injury levels rather than seeking eradication, leading to healthier and more resilient agro-ecosystems.

### 2.8.2 Social, Health, and Economic Outcomes

The PMP directly addresses social safeguards and economic viability:

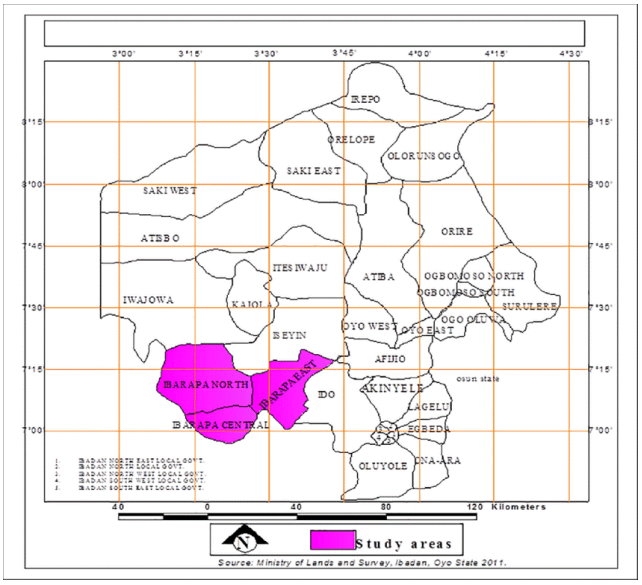
- Protect Farmer and Community Health: By enforcing strict safety protocols, reducing the handling of Highly Hazardous Pesticides (HHPs), and providing appropriate training and Personal Protective Equipment (PPE), the project will minimize occupational exposure and reduce public health risks related to pesticide poisoning.
- Minimized Post-Harvest Losses and Improved Food Security: Effective and sustainable pest control in the storage phase, achieved through tailored IPM methods, will lead to a substantial reduction in post-harvest losses. This directly translates into increased food availability and enhanced food security for communities and markets.
- Strengthened Regulatory Compliance and Donor Confidence: Achieving full adherence to international standards, such as the World Bank ESS3/OP 4.09 and the FAO/WHO Code of Conduct, ensures the project is robustly compliant. This outcome strengthens institutional capacity and maintains the confidence of financiers and regulatory bodies.

## CHAPTER THREE: METHODOLOGY

### 3.1 Study Area

**Project Location and Context**

The project is the development of an agricultural transformation centre, which is part of the African Development Bank (AfDB)–assisted Oyo State ATC Program. The ATC hub is situated at the Eruwa Community along Igboora/Abeokuta Iseyin Road, in Ibarapa-East Local Government Area, Oyo State. a cornerstone of local livelihoods, regional food security, and rural economic growth. The area spans approximately 3,067 hectares (Oyo State Ministry of Agriculture, Natural Resources and Rural Development) at geographic coordinates 7°31'N and 3°22'E, strategically situated along the Abeokuta–Igboora–Iseyin corridor. The establishment of this hub is expected to catalyse increased agricultural production, processing, and storage activities in the surrounding areas, thereby increasing the potential for both pest problems and the use of chemical controls.



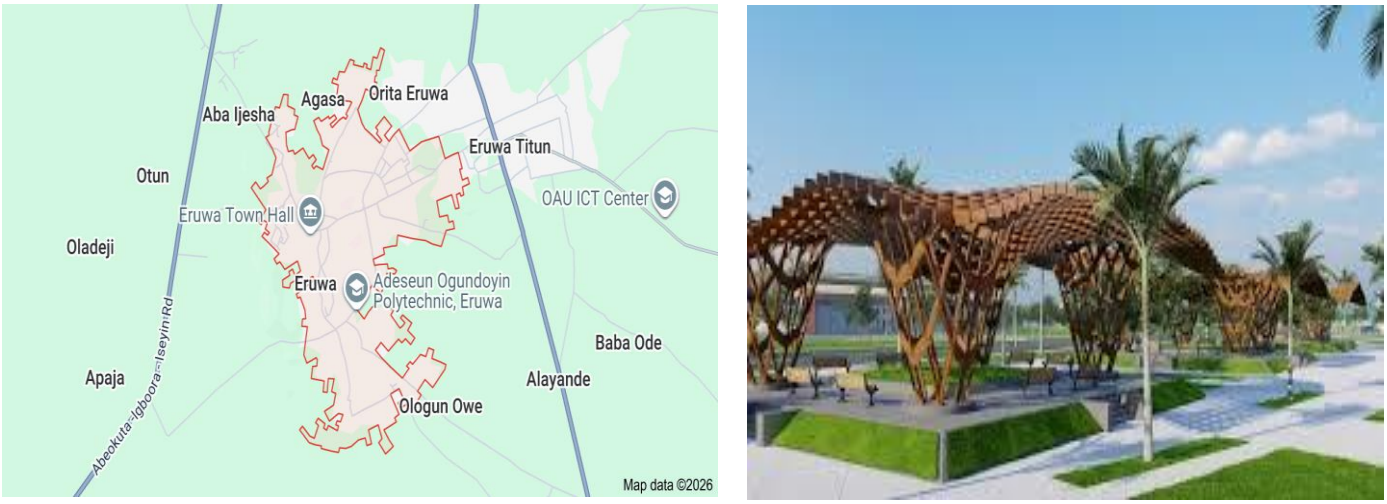



**Figure 3.1. Eruwa Agribusiness Industrial Hub**

## 3.2 Data Types and Sources

To ensure the Pest Management Plan (PMP) is robust, evidence-based, and highly context-specific, the assessment utilized a rigorous, mixed-methods approach combining primary data collection with the review of relevant secondary sources. This comprehensive approach ensured that both the technical (pest science) and social (user practices, risks) dimensions of pest management were thoroughly captured. A detailed field-based pest management survey served as the core source of primary data. This activity involved: Structured Questionnaire Administration: A standardized questionnaire was administered to a wide range of project stakeholders, including: Farmers and Producers: To capture site-specific pest challenges, existing control methods (chemical and non-chemical), pesticide types used, and perceived effectiveness. Traders and Storage Handlers: To document post-harvest pest issues, storage practices, and the application of post-harvest protectants. Extension Officers and Agricultural Agents: To assess knowledge dissemination, training gaps, and institutional capacity for promoting Integrated Pest Management (IPM). Data Capture: The survey was designed to capture both quantitative data (e.g., frequency of spraying, quantity of pesticide applied, estimated post-harvest losses) and qualitative data (e.g., reasons for choosing a specific pesticide, challenges in accessing protective gear, traditional pest control knowledge).

To validate survey findings and add depth to the analysis, the assessment incorporated the following complementary methods: Stakeholder Consultations: One-on-one meetings with key

officials from government regulatory bodies (e.g., agriculture and environmental ministries), non-governmental organizations, and private sector chemical suppliers to understand the regulatory landscape and supply chain. Focus Group Discussions (FGDs): Group discussions were conducted with segments of the farming community (e.g., women's groups, youth cooperatives) to facilitate a deeper, participatory understanding of shared challenges, risk perception, and community-level pest management practices. Observational Field Visits and Transect Walks: Direct inspection of farms, storage facilities, and pesticide selling points to visually verify reported practices, confirm pest incidence, assess pesticide storage conditions, and observe safety measures in use.

The primary data was contextualized and cross-referenced with secondary sources to ensure technical accuracy and policy compliance: Scientific Literature and Pest Databases: Review of relevant peer-reviewed studies, government bulletins, and national/regional pest databases to accurately identify major pest species, their biology, seasonal patterns, and existing IPM solutions. National and International Regulatory Documents: Detailed analysis of legal and policy documents, including: National laws on pesticide registration, handling, and disposal. Donor policies (AfDB ISS). Global standards (FAO/WHO International Code of Conduct on Pesticide Management). These multi-sourced data streams ensure the PMP is evidence-based, technically sound, and fully aligned with national regulations and donor safeguard requirements. The survey focused on the Eruwa ATC located at Eruwa to ensure representation across the entire project catchment area

### 3.3 Sampling Procedure

Following the community consultation session, the primary quantitative data for the Pest Management Plan (PMP) were collected through the administration of a structured questionnaire to key stakeholders. The data collection instrument was a structured questionnaire designed in both English Language and explained to the settlers, farmer and residents in Yoruba to maximize comprehension and facilitate participation among non-literate farmers. PMP personnel and SAPZ staff served as the enumerators and 56 respondents were interviewed.

The questionnaire was administered through face-to-face interviews, ensuring the research team could provide clarification, translate complex concepts (the questionnaire was available in both English and Yoruba), and maintain data quality.

The key stakeholders targeted for the questionnaire administration included:

- Chairman and other executive members of the settlers' association of Eruwa Community: These individuals provided high-level information on the community's general perception of pest issues, past efforts in vector control, and insights into local institutional structures for managing agricultural and public health concerns.
- Smallholder and Medium-Scale Farmers: Representing the largest group of respondents, farmers provided detailed data on their specific cropping systems, the types and incidence of crop pests (insects, weeds, diseases), frequency of pesticide application, brand names used, and estimated post-harvest losses due to storage pests.
- Hired Farm Workers/Applicators: This group offered critical input on occupational health practices, including the use (or lack thereof) of Personal Protective Equipment (PPE), methods of mixing chemicals, and disposal routines, highlighting the direct safety risks involved.
- Extension Officers and Agricultural Advisors: Their responses provided expert context on the availability of training and support services, current technical advice being disseminated, and identified gaps in the adoption of Integrated Pest Management (IPM).

**Plate 3.1: PMP personnel, SAPZ staff and members of settlers' association**

**Plate 3.2: A cross-section of respondents at Eruwa ATC being attended to by enumerator**

## 3.4 Data Analysis

Quantitative data was entered into a spreadsheet/database and analyzed using descriptive statistics (frequencies, percentages, cross-tabulations) to identify correlations (e.g., PPE use by gender, pesticide type by crop). Qualitative responses were coded thematically and integrated to provide contextual understanding of the statistical findings. The completed questionnaires were analyzed using the Statistical Package for the Social Sciences (SPSS), and the results were visually represented using pie charts.

## 3.5 Global Regulatory and Ethical Frameworks

The PMP serves as the practical tool for adhering to key international codes of conduct. FAO/WHO International Code of Conduct on Pesticide Management: This Code provides voluntary standards of conduct for all public and private entities (governments, industry, farmers) involved in the lifecycle of pesticides, from production to disposal. The PMP ensures project activities are in line with the Code's main objective: to maximize the benefits of pest control while protecting human and animal health and the environment from harmful effects. It requires strict adherence to international best practices for pesticide labelling, storage, handling, disposal, and risk reduction, especially regarding Highly Hazardous Pesticides (HHPs).

## 3.6 Ethical Considerations and Limitations

### 3.6.1 Ethical Protocol

The survey adhered to strict ethical standards: participation was voluntary, all respondents provided informed consent, identities were kept confidential and anonymous, and culturally appropriate communication was maintained throughout the process.

# CHAPTER FOUR: RESULTS AND DISCUSSIONS

## 4.1 Socio-Economic and Farming Profile

This chapter provides a detailed analysis of the socio-economic and demographic characteristics of the farming population surrounding the Eruwa ATC, establishing the baseline context for the Pest Management Plan (PMP). It covers the demographic and agricultural context, the specific pest challenges faced, and the current, often risky, practices employed by local farmers.

### 4.1.1 Demographic Breakdown

The farming population in the Eruwa ATC catchment area is characterized by major demographic trends:

- Gender: The demographic profile of the Eruwa farming community is marked by a significant gender imbalance and age dominance. The community is overwhelmingly male-centric (90%), with a notably smaller female representation (10%). This pronounced disparity may impact extension service delivery, access to resources, and farm management practices, which traditionally fall along gender lines (Figure 4.1)

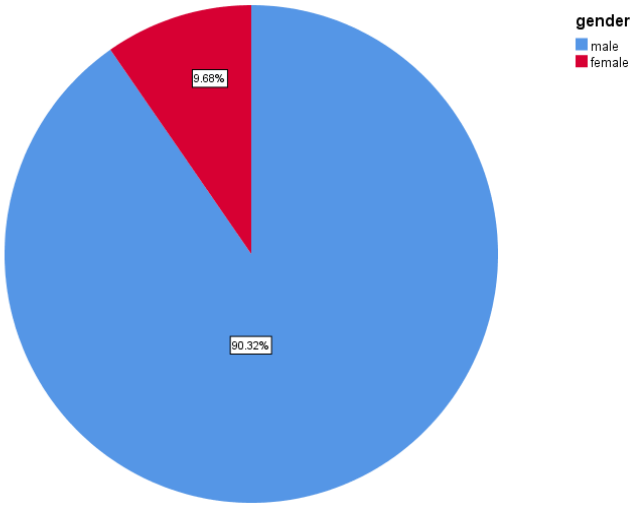



**Figure 4.1: Gender distribution of the respondents**

- Age: the data clearly indicate a community of experienced, older farmers. Many respondents were aged 46–60 years (45%) or above 60 years (26%), with these older demographics collectively accounting for nearly three-quarters of the sample. This

composition confirms the dominance of older farmers in the Eruwa agricultural sector, highlighting potential challenges related to technology adoption, succession planning, and the physical demands of farming (Figure 4.2).

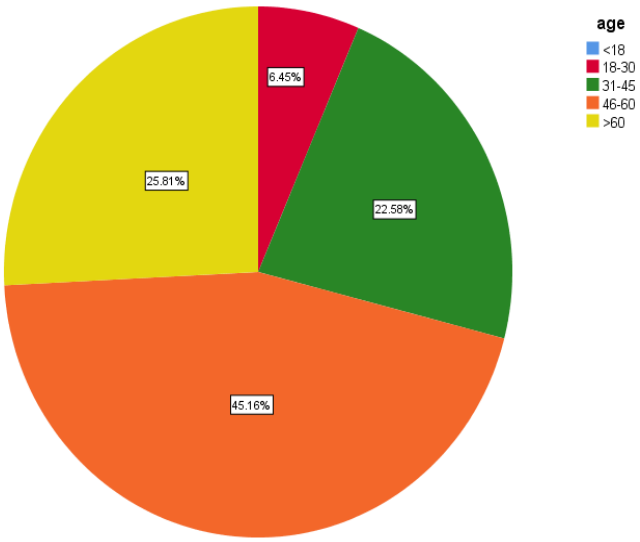



**Figure 4.2: Age distribution of the respondents**

### 4.1.2 Types of Farmers and Labour Dynamics

The Eruwa community is predominantly comprised of medium-scale producers. Crucially, these farmers display a strong commercial orientation. Their production strategy is focused on both staple crops (e.g., cassava) and major cash crops (e.g., cocoa). This commercial drive is evident in their operational practices, which frequently include the hiring of external labour and active engagement in produce marketing. This suggests a well-integrated local economy where farming extends beyond subsistence to generate significant market income.

Occupation: Given that the sample was entirely composed of full-time farmers (100%), the data strongly reflect a homogeneous and dedicated agricultural livelihood (Figure 4.3).

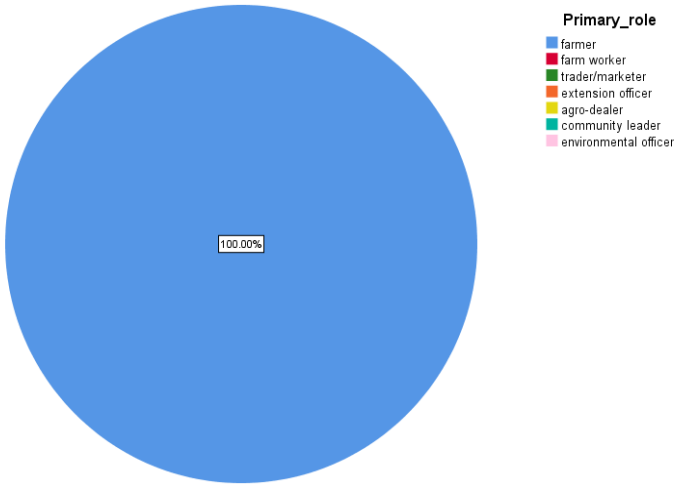



**Figure 4.3: Major occupations of the respondents**

- Pesticide Pesticide application in Eruwa is overwhelmingly managed through outsourced labor, a finding that significantly contrasts with the community's general self-reliance in other farm management tasks. Most pesticide application is performed by hired laborers (90%), with only 10% being applied directly by the farmers themselves. This high dependence on hired labour for chemical applications suggests that Eruwa farmers treat this task as a specialized or physically demanding chore to be outsourced, likely to maintain their focus on managerial and commercial responsibilities. This model shifts the immediate technical and health burden away from the farm owner, placing it instead on temporary or contract workers (Figure 4.4).

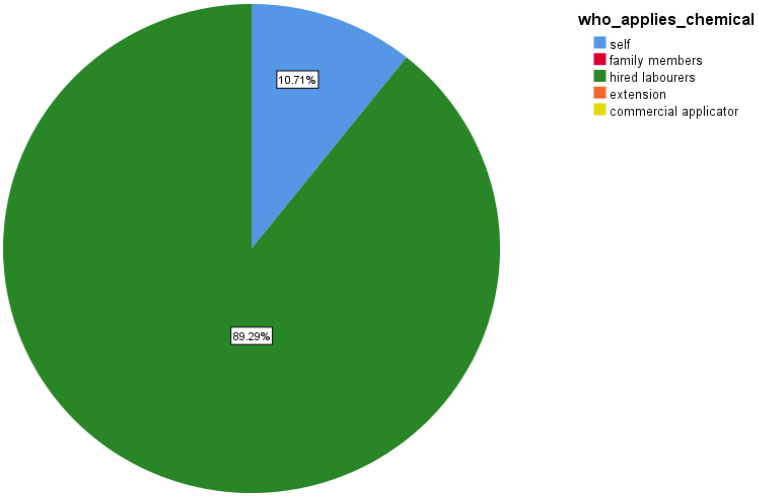



**Figure 4.4: Distribution of Farm Labor Responsible for Pesticide Application**

### 4.1.3 Cropping System and Diversity

The Eruwa cropping system is highly diverse and integrated, successfully balancing food security with cash generation. The leading crops are Cassava (26%) and Cocoa (26%), demonstrating an equal focus on both arable and perennial crops. This is supplemented by significant production of Maize (23%), Yam (10%), and Vegetables (8%). While this crop mix underscores the community's, dual objective securing immediate food needs while ensuring a stable cash income it carries an inherent risk. The integration of diverse crops and year-round cultivation creates a complex agro-ecosystem that inherently exposes the farms to a wider, more persistent array of pest and disease pressures. This complexity necessitates sophisticated, integrated pest management strategies to maintain yield stability across the various crops.

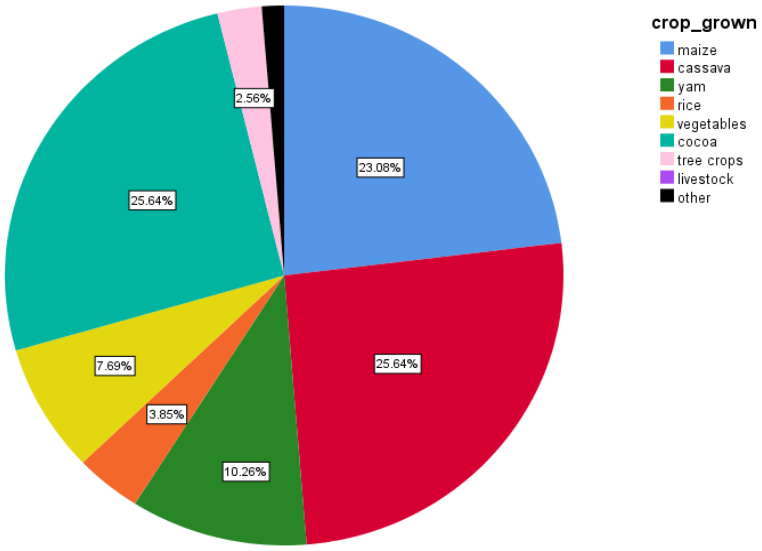



**Figure 4.5: Major corps grown by the respondents**

### 4.1.4 Farm Sizes

Eruwa farmers operate relatively larger farm holdings, a clear indicator of their moderate commercial focus. A substantial 46% cultivate above 10 acres, while 36% farm between 6–10 acres. Only a small minority (18%) operate farms of less than one acre. The large proportion of medium-to-large-scale farms suggests greater access to or control over agricultural land in Eruwa, possibly facilitated by cooperative land agreements or customary tenure systems. This land availability is a key factor enabling their commercial orientation and capacity to hire labour, contrasting with smaller-scale, subsistence farming models (Figure 4.6):

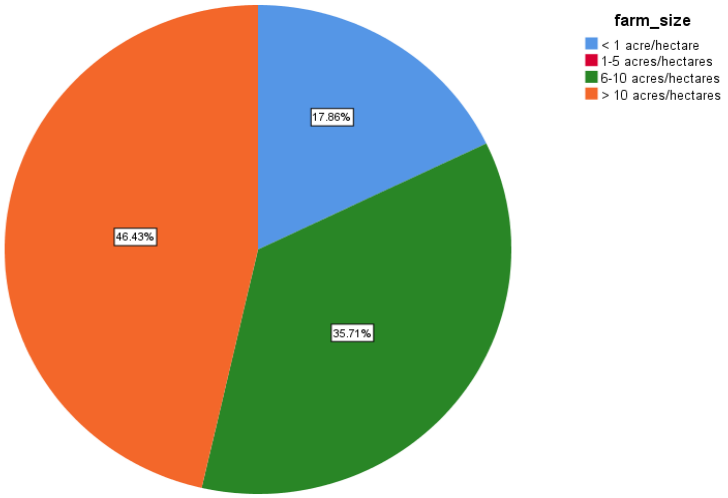



**Figure 4.6: Distribution of Cultivated Land Area among Respondents**

### 4.1.5 Storage Practices

The Eruwa farming community exhibits a remarkably high adherence to chemical safety protocols concerning storage. Critically, all surveyed farmers (100%) reported storing pesticides in locked areas. This unanimous compliance is a powerful indicator of strong, effective training and awareness campaigns within the area. This finding strongly suggests the successful influence of agricultural extension or targeted training programs that emphasize basic chemical safety. The farmers recognize the necessity of securing these compounds to prevent accidental exposure to family members (especially children) and livestock. This foundation of high compliance in storage serves as a crucial positive factor in their overall chemical management profile (Figure 4.7).

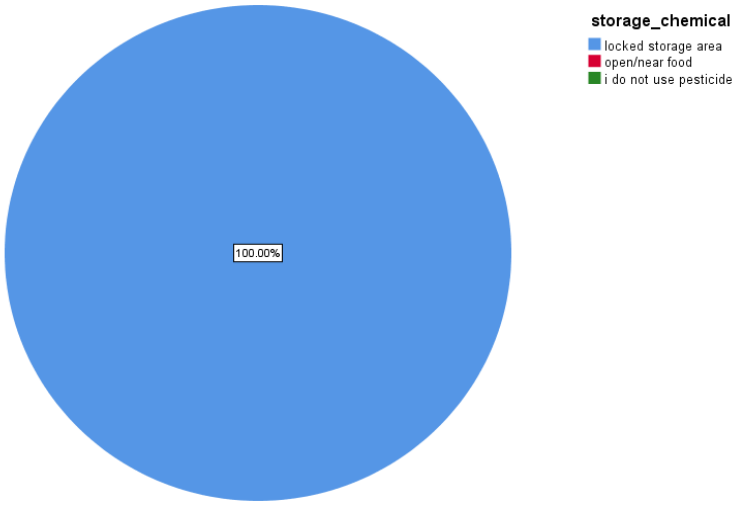



**Figure 4.7: Storage Practices for Agricultural Chemicals/Pesticides among Respondents**

### 4.1.6 Public Health/Environmental Context

The farmers' responses reveal a high personal awareness of the public health risks associated with pesticide use, though their perception of the environmental impact is comparatively lower.

- Health Risk Perception: The perception of health risk is high within the community, suggesting that the dangers of acute and chronic exposure are well-recognized. A significant majority of farmers categorized pesticide-related health effects as either very serious (41%) or serious (14%), collectively indicating that more than half (55%) view the health hazard critically (Figure 4.8). Furthermore, a concerning 25% of respondents reported known poisoning or misuse cases within the community. This quarter of the sample provides direct evidence of incidents, reinforcing the reality behind the high-risk perception. It highlights the urgent need to close the gap between the recognized severity of the risk and the application practices observed in the field (e.g., low safety compliance during application).
- Environmental Awareness risks: In contrast to the strong health awareness, environmental side-effects were less frequently observed or acknowledged. Only 21% reported noticing adverse effects after pesticide application (Figure 4.9). The effects that were reported tended to be acute and visible, such as soil burn (likely due to misapplication or high concentrations) or fish mortality near runoff areas. The low reporting rate for other, more chronic environmental issues (like changes in beneficial insect populations or long-term soil health) suggests a potential gap in knowledge or observation regarding the broader, less immediate ecological consequences of chemical use.

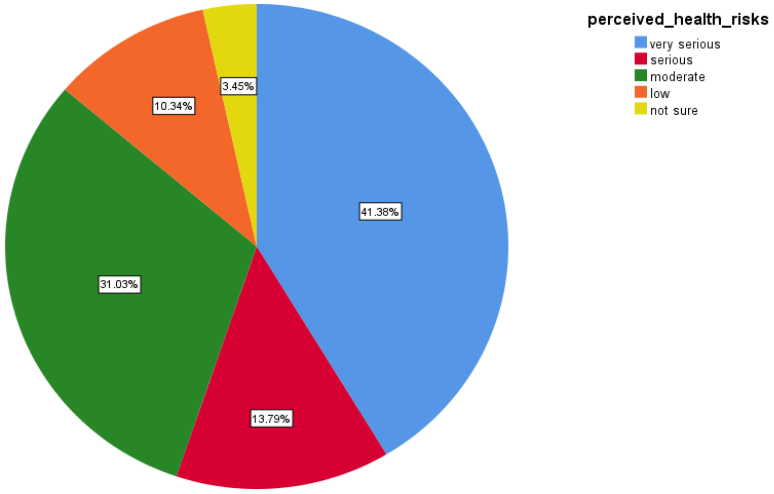



**Figure 4.8: Respondents' Perceived Health Risks Associated with On-Farm Pesticide Exposure**

- In summary, Eruwa farmers are commendably compliant with basic safety protocols (storage) and acutely aware of the human health dangers, but there is a clear opportunity for education to enhance environmental awareness and translate their high-risk perception into safer application practices.

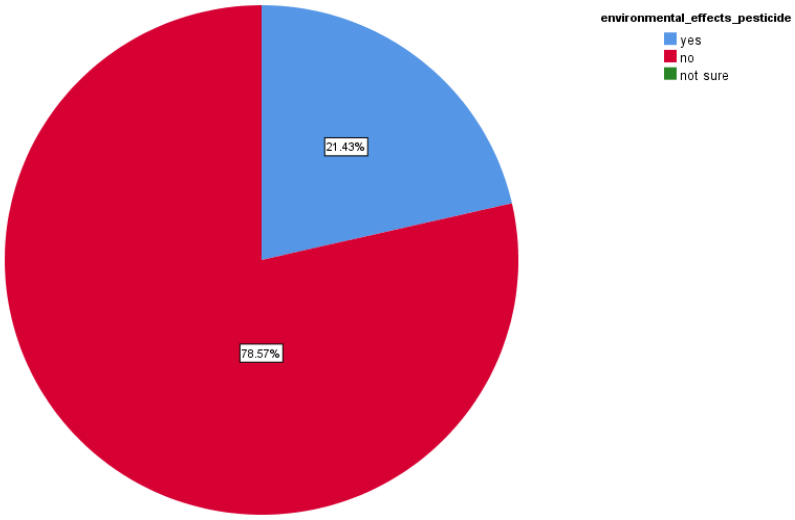



**Figure 4.9: Level of Respondent Awareness Concerning the Environmental Impacts of Pesticide Use**

### 4.1.7 Field pests (insects, weeds, diseases)

- Eruwa farmers face a complex and varied spectrum of pests, reflecting the integrated nature of their mixed-crop and livestock system. The most frequently cited pest category was

Insects (36%), which typically pose the greatest threat to crop yields during the growing season. This is closely followed by Vertebrates (20%), and then by Diseases (15%) and Weeds (13%). The notable inclusion of Livestock Pests (6%) explicitly highlights the coexistence of crops and livestock-related pest pressures within the Eruwa agro-ecosystem, necessitating integrated management strategies that address both animal and plant health (Figure 4.10).

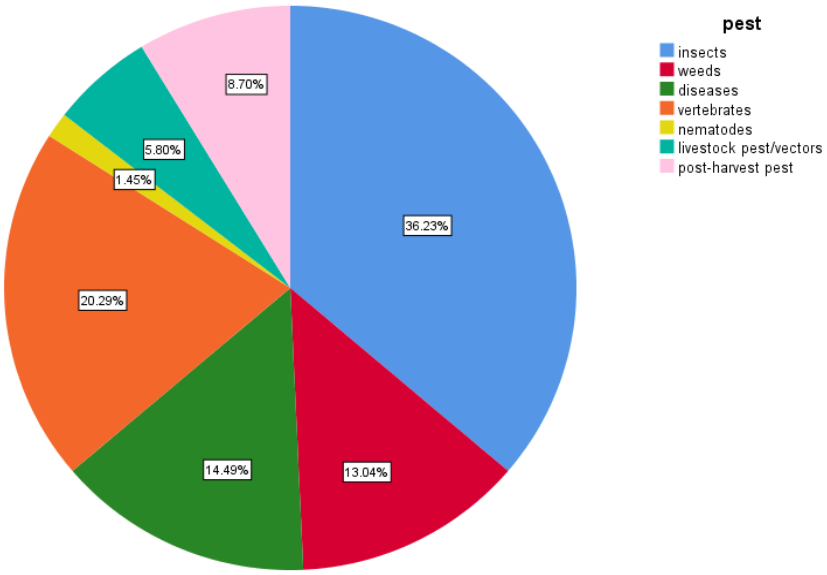



**Figure 4.10: Categorization of Pests Adversely Affecting Respondent Farms**

### 4.1.8 Pests causing post-harvest losses

Post-harvest challenges are highly significant, with destructive pests threatening stored harvests and commodity value. Termites (36%) and Weevils (32%) were identified as the most destructive storage pests, collectively accounting for over two-thirds of the reported issues. Rodents (16%) and Beetles (11%) also contribute to these losses (Figure 4.11). These findings suggest that the existing storage infrastructure is highly vulnerable. The problems are exacerbated by factors such as moisture, poor aeration, and the limited adoption of modern hermetic storage solutions, leading to substantial food losses and quality degradation.

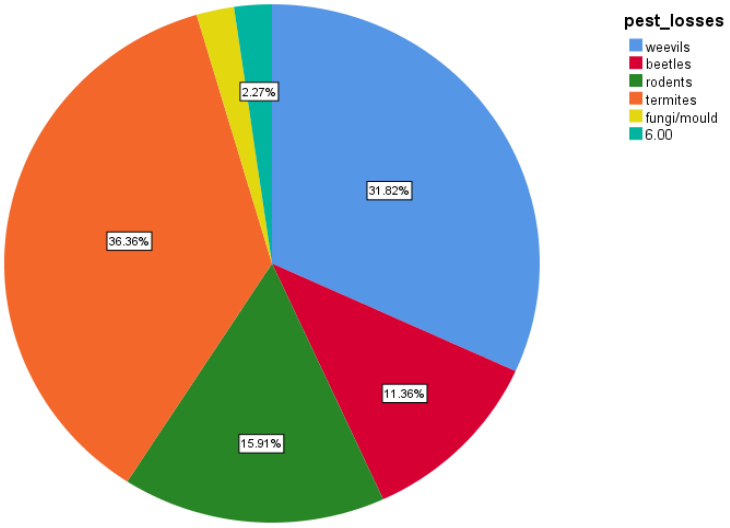



**Figure 4.11: Frequency distribution of major pests responsible for post-harvest losses**

### 4.1.9 Seasonal Trends, Severity, and Changes in Pest Situation Over Time

Pest pressure is intense and worsening:

Seasonal trends: the pest burden in Eruwa is not uniform throughout the year but exhibits distinct seasonal peaks that align with the crop cycle and environmental conditions. The highest pressure occurs during the vegetative stage (38%) and the planting phase (24%) (Figure 4.12). This concentration of pest activity (totalling 62%) occurs at the stages when crops are most vulnerable to damage that can irreversibly impact final yield. This trend aligns logically with the humid growing season, which creates optimal conditions for high pest reproduction and population growth, demanding intensive management efforts early in the cropping calendar. The decreasing pressure towards harvest and post-harvest implies that the focus of pest control must be weighted toward the beginning and middle of the season.

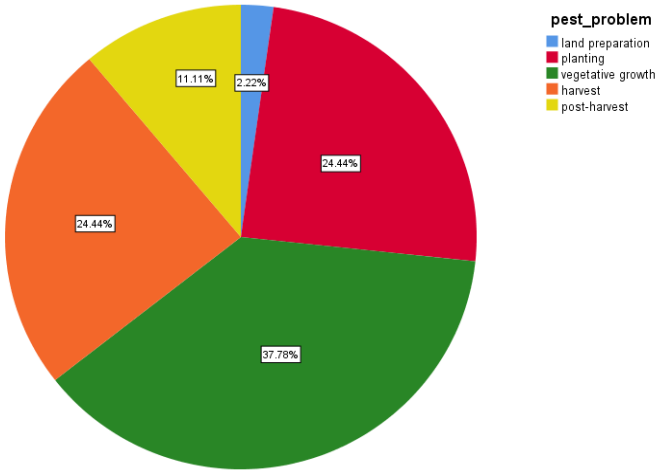



**Figure 4.12: Agricultural stages during which pests most frequently invade respondent farms**

- Perceived Severity: Eruwa farmers perceive the infestation levels to be substantial, a perception that drives the economics of pest management in the community. Half of the respondents (50%) rated infestation levels as serious (14%) or very serious (36%), with nearly all others rating them as moderate (46%). Critically, over one-third of farmers (36%) also indicated that pest problems are getting worse over time (Figure 4.13). This increasing trend suggests that current control measures may be insufficient or that pest resistance is emerging. These strong negative perceptions correlate directly with reported yield losses and the increasing financial cost associated with purchasing and applying pest control inputs, placing a growing strain on farm profitability.

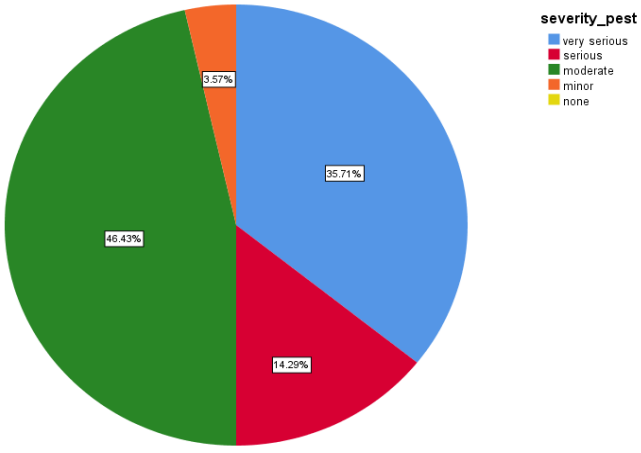



**Figure 4.13: Respondents' Perception of the Seriousness of Pest Infestation on Their Farms**

- Changes in Pest Situation Over Time: The perception of long-term pest trends in Eruwa presents a predominantly optimistic outlook, diverging from the experience of communities like Eruwa. A significant majority of farmers (64%) reported that pest problems are getting better, or the situation has improved, while only 36% believed the trend is worsening (Figure 4.14).

The optimism held by the majority (64%) suggests a belief that current control strategies are effective. Farmers likely attribute this improving trend to:

- Proactive Management: The high commercial orientation of Eruwa farmers (as previously established) means they are likely to invest more readily in control measures, leading to short-term success.
- Effective Chemical Intervention: Similar to the Eruwa scenario, the adoption of newer, more potent chemical brands may offer temporary relief and drive the perception of improvement.
- Targeted Extension Success: Occasional advice or training, particularly related to the major crops (cassava and cocoa), may be improving application timing or product selection, resulting in better outcomes.
- Storage Compliance: The 100% compliance in safe storage likely reduces post-harvest losses, which could contribute to a broader sense of pest control success.

Despite the overall positive sentiment, the substantial minority (36%) who report a worsening trend highlights persistent and serious underlying issues. These farmers likely face challenges similar to those in other regions:

- Pesticide Resistance: The reduced efficacy of familiar pesticides, particularly against key pests of their dominant crops (cassava, cocoa, maize), requires them to use more chemicals or switch brands frequently, driving up costs and environmental risks.
- Climate Variability: Unpredictable rainfall and rising temperatures can extend the pest season or favour the multiplication of certain insect populations, making control efforts less predictable.
- Labor Risks: The heavy reliance on hired labour for application may lead to inconsistent or improper dosage/techniques, contributing to control failures and resistance development over time.

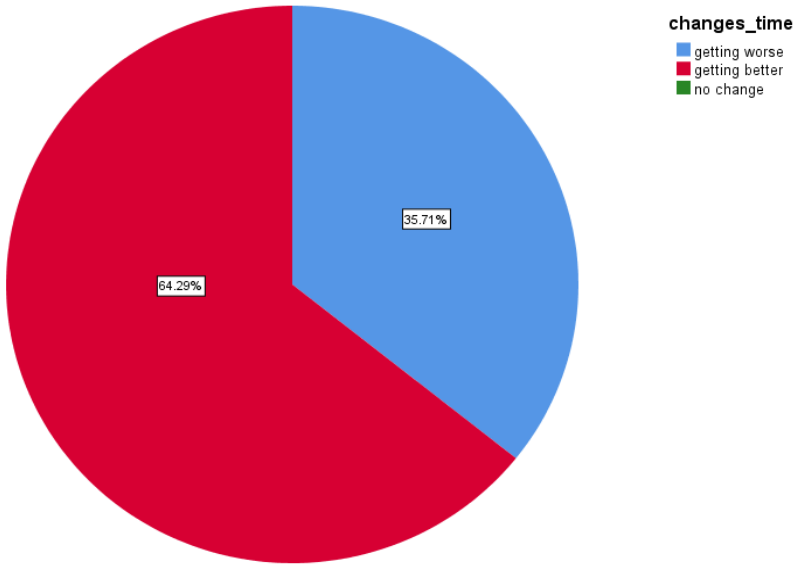



**Figure 4.14: Observed temporal changes in pest behavior related to pesticide application**

## 4.2 Current Pest Management Practices and Emerging Alternatives

### 4.2.1 Chemical/Pesticide Use

Pest management in Eruwa is overwhelmingly dominated by a single chemical product, indicating a near-monopoly in the market and a highly standardized, albeit risky, approach to pest control. The chart reveals an extreme concentration of chemical preference. The product Grammazone is the undisputed leading pesticide, accounting for a massive 72.73% of all reported chemical use. This level of market dominance is highly unusual and suggests that the local agricultural system relies almost entirely on this single formulation, which is a trade name for Paraquat. The remaining 27.27% is distributed across several other products:

- Snipper (likely Dichlorvos or a similar hazardous pesticide) accounts for 6.06%.
- force-up (a possible glyphosate formulation) accounts for 6.06%.
- DDVP (Dichlorvos) and parafox each account for 3.03%.
- The remaining chemicals (wuwawuwa pest and Harrow) make up the final small percentages (Figure 4.15).

This extreme reliance on a single, highly potent chemical raises significant human health and environmental concerns.

- Paraquat (Grammazone): This chemical, an herbicide often used for weed control, is classified as a Highly Hazardous Pesticide (HHP) and is a WHO Class II (Moderately Hazardous) or even WHO Class I (Highly Hazardous) chemical, depending on concentration. It is either banned or severely restricted in many countries due to its high toxicity and risk of fatal poisoning.
- Risk Amplification: Given that the majority of applications are carried out by hired labour with low safety compliance (as previously discussed), the high usage rate of such a dangerous chemical drastically amplifies the occupational health risks for applicators.
- Resistance and Sustainability: This near-total reliance on one herbicide creates an enormous selection pressure, virtually guaranteeing the rapid development of weed resistance to Paraquat, which will ultimately undermine the community's primary pest management strategy and lead to higher chemical costs in the near future.

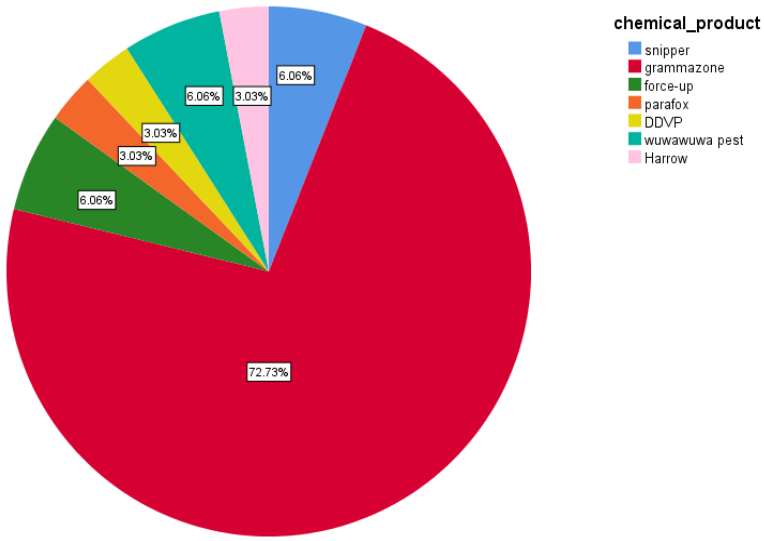



**Figure 4.15: Distribution of Major Pesticide Types Applied by Respondents on Their Farms**

### 4.2.2 Biggest Challenge Faced in Controlling Pests

The survey results from Eruwa reveal that challenges to effective pest management are primarily driven by economic constraints and technical limitations (effectiveness and knowledge). Unlike the Eruwa findings, where cost was overwhelmingly dominant, Eruwa shows a more balanced distribution of constraints across cost, effectiveness, and availability.

The two leading challenges cited by Eruwa farmers are the cost of chemicals and the declining effectiveness of the products.

- Cost-Chemical Expensiveness (33.33%): One-third of Eruwa farmers identify the high cost of pesticides as their foremost obstacle (Figure 4.16). Given the community's strong commercial orientation and heavy reliance on the single, potent chemical Grammazone (Paraquat) (as seen in the previous figure), the high input cost places a significant strain on profitability. This expense likely forces farmers to underdose or skip applications, leading to control failures.
- Effectiveness (23.81%): Nearly a quarter of respondents cite the lack of effectiveness as the biggest challenge. This is a critical finding, especially considering the community's near-total reliance on a single chemical. The decreasing efficacy strongly suggests the rapid development of pest or weed resistance to Paraquat and other commonly used synthetics. This growing ineffectiveness validates the fears of a fragile control system built around a single, dominant chemical.

The remaining major challenges highlight issues related to supply chain reliability and access to safe application resources.

- Availability (21.43%): Over one-fifth of farmers struggle with the availability of chemicals (Figure 4.16). This scarcity, particularly during peak season, pushes farmers toward unreliable, local sources where counterfeit or substandard products a major risk noted in the Eruwa context are common. This supply instability contributes directly to the perceived problem of ineffectiveness.
- Labour (11.90%): A minor, yet significant, constraint is labour. While Eruwa farmers largely outsource pesticide application (90% hired labour), this challenge suggests that either the cost of hiring is prohibitive or that skilled labour is scarce during crucial times, hindering timely control operations.

Interestingly, knowledge (9.52%) and health/safety (less than 1%) are the least cited challenges.

- Knowledge (9.52%) (Figure 4.16): A relatively low percentage of farmers identify a knowledge gap as the biggest issue. This contrasts with the clear need for better knowledge

regarding resistance management and non-chemical methods, suggesting farmers may not fully recognize the complexity of the current pest problem as a technical/knowledge deficit.

- Health/Safety (less than 1%): The near absence of this concern in the biggest challenge category is alarming. While the Eruwa community previously reported high compliance in storage (100%) and high awareness of health risks (55% serious), they do not view health and safety as a primary constraint to pest control. This implies a concerning trade-off where commercial profitability and effective control are prioritized over occupational safety, despite the known risks of using Highly Hazardous Pesticides like Grammazone.

In summary, the Eruwa community is trapped between high-cost inputs and the declining performance of those inputs due to resistance. While they show strong awareness in basic safety (storage), their low prioritization of health and knowledge in this challenge profile suggests a chemical-intensive, short-term management strategy is currently dominating the long-term sustainability and safety agenda.

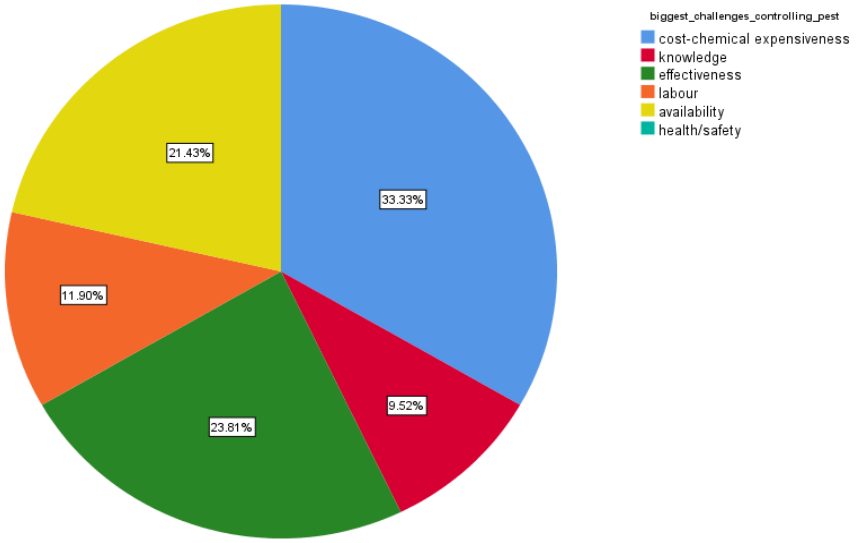



**Figure 4.16: Major Challenges and Cost Factors Associated with On-Farm Pesticide Application**

### 4.2.3 Traditional Methods, Biological Options, and Cultural Practices

#### 4.2.3.1 Dominance of Chemical Control

Chemical sprays are the primary and overwhelming method, cited by 58.33% of respondents (Figure 4.17). This figure is significantly higher than the 33% reported for Eruwa in your template, highlighting Eruwa's greater dependence on synthetic inputs. This near 60% reliance on chemical intervention confirms that, despite awareness of health risks and the rising cost of chemicals, the immediate, perceived effectiveness of spraying (primarily with Grammazone, as seen in the previous analysis) drives their decision-making.

#### 4.2.3.1 Non-Chemical Methods: A Foundation for IPM

While chemicals dominate, a noticeable portion of farmers engage in non-chemical methods, providing a necessary foundation for future Integrated Pest Management (IPM) programs.

- Manual/Mechanical Control (12.50%) (Figure 4.17): This involves the physical removal of pests or manual destruction of affected parts. This sizable proportion demonstrates a persistence of labour-intensive, hands-on farming techniques alongside modern chemical use.
- Cultural Practices (12.50%): This category includes preventative measures like crop rotation, sanitation, intercropping, and variety selection. The fact that an equal percentage of farmers cite this as a primary method as those using manual methods shows an existing level of indigenous knowledge and preventative management that can be formalized and optimized.
- Traditional/Local Remedies (2.08%): The use of ash or plant extracts is minimal. While simple and low-cost, the low uptake suggests these methods are likely viewed as ineffective against the major infestations faced by these commercial farmers.
- Biological Control (2.08%): Similar to traditional remedies, the use of biological options is currently very limited. This low percentage indicates that access to or knowledge of safe, environmentally friendly solutions is severely lacking, despite the potential benefits.

#### 4.2.3.3 Implications for Sustainability

The data clearly show a heavy economic and environmental reliance on chemical solutions. While the co-existence of manual and cultural practices provides an opportunity, the current, unstructured

application of these methods limits their collective effectiveness. The strong preference for chemical solutions suggests that cultural, biological, and traditional methods are often relegated to secondary or supplementary roles. For sustainable pest management to take hold in Eruwa, there must be technical guidance and institutional support to standardize and integrate these non-chemical methods, shifting the paradigm away from the current, risky chemical dependency.

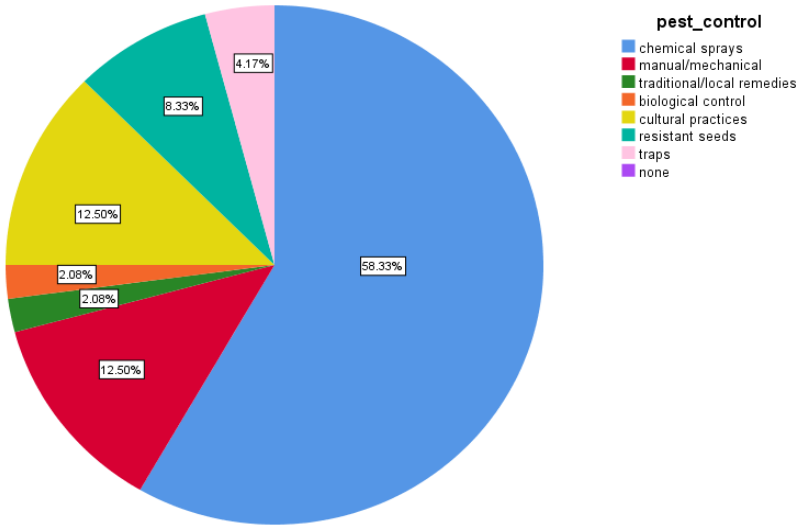



**Figure 4.17: The Predominance of Different Pest Control Strategies Employed by Farmers**

### 4.2.4 Role of Extension Services and Farmer Training in Safe Pesticide Use

#### 4.2.4.1 Role of Extension Services

Agricultural extension services are pivotal for ensuring farmer success and safety, specifically in disseminating critical information on pest identification, safe pesticide use, and the implementation of Integrated Pest Management (IPM) practices. However, data from the field survey (Figure 4.18) reveal that extension contact is irregular and inconsistent across the project communities, severely undermining their potential impact.

#### 4.2.4.2 Inconsistent Contact Frequency

The frequency of extension visits indicates a significant institutional limitation and outreach gap:

- Occasional Contact Dominates: The majority of farmers receive visits only occasionally (65%) (Figure 4.18). This sporadic contact is insufficient for fostering the sustained learning and behaviour change required for complex pest management.
- Limited Regular Support: Only a smaller fraction of farmers enjoys regular visits (23%). This minority likely forms the segment most receptive to new technology and safer practices.
- Unreached Farmers: A minor, yet concerning, proportion indicated that extension workers rarely or never visit their farms (13%).
- This pattern points to the limited institutional reach of extension services and a critical need for capacity reinforcement.

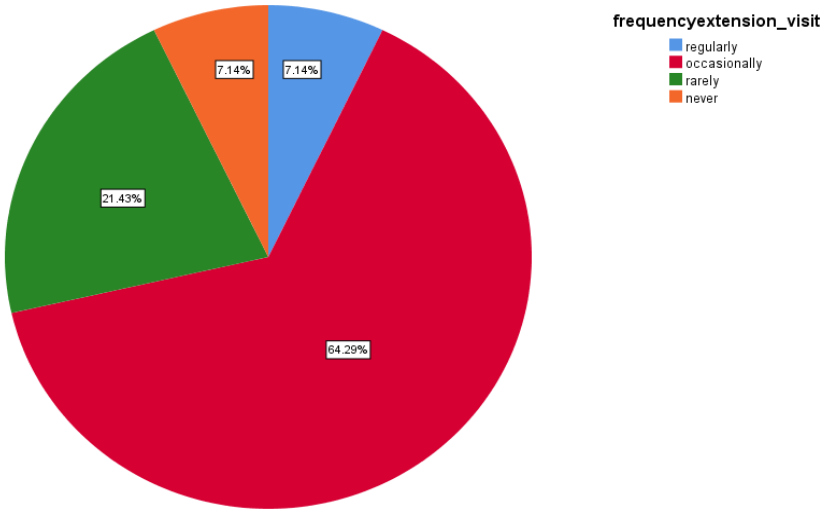



**Figure 4.18: Reported Frequency of Agricultural Extension Visits to Farmers and Their Farms**

#### 4.2.4.3 Implications for Risk and Sustainability in Eruwa

This irregularity in extension contact has direct and negative consequences, particularly for the commercially oriented Eruwa community, which is highly reliant on hazardous chemicals like Grammazone:

- Risk Amplification: Irregular contact directly hinders farmers' ability to access timely advice on pest outbreaks and, most critically, safe pesticide use. This absence of guidance

exacerbates the already-high health risks associated with their reliance on dangerous chemicals.

- IPM Adoption Barrier: The lack of hands-on training on Integrated Pest Management (IPM) methods means farmers are left without viable alternatives to their chemical-heavy approach. This prevents them from adopting and sustaining the environmentally sound pest control practices necessary for long-term farm health and profitability.
- Safety Compliance Gap: Without consistent extension follow-up, farmers struggle to properly handle, store, and dispose of pesticides in line with Environmental and Social Management Plan (ESMP) safeguards. This institutional gap creates the crucial disconnect between the farmers' high awareness of storage (100% compliance) and their poor compliance during application (high reliance on untrained hired labour).

In summary, the current, infrequent extension model fails to provide the continuous, specialized support required to shift Eruwa farmers away from their high-risk, single-chemical dependency toward sustainable and safe pest management.

#### 4.2.4.4 Training Providers

The data for Eruwa reveals that training is not solely dominated by the public sector but also features significant input from "other" sources, likely indicating a role for the private sector, community, or informal training channels. The government remains the principal provider of formal training, accounting for 60.71% of all reported training sources (Figure 4.19).

- Public Sector Reliance: This figure confirms that the government extension services, despite their earlier noted inconsistency in field visits, are still the most recognized and accessible formal entity for farmer training. This sustained reliance underscores the need to prioritize the capacity building of public extension staff.
- Capacity Gap: While dominant, the 60.71% figure means nearly 40% of training (Figure 4.19) comes from other sources, reflecting the limited reach and capacity constraints of the public sector to cover all training needs.

#### 4.2.4.5 Significant Role of Non-Traditional Sources

A considerable portion of training in Eruwa is provided by sources outside of the usual formal channels. Other Sources (25.00%): A quarter of all reported training comes from the other

category. This substantial percentage likely includes community-based organizations, larger commercial farms, or informal farmer-to-farmer exchanges. This signals a degree of self-reliance and localized knowledge dissemination in the community.

- Agro-Dealers (10.71%): Agro dealers play a distinct, albeit minor, role in training. This is a critical finding, as agro dealers are often the first point of contact when farmers purchase chemicals (especially a single, dominant one like Grammazone). Integrating them into formal training programs can significantly improve point-of-sale safety instruction and product stewardship.
- NGOs and Cooperatives: NGOs (3.57%) (Figure 4.20) and cooperatives/farmer groups (0%) show minimal or non-existent involvement. This highlights a missed opportunity for leveraging civil society organizations and farmer collectives to deliver sustainable pest management training.

The Eruwa community's training landscape demonstrates a reliance on the public sector and a diverse mix of non-traditional providers. The challenge is to capitalize on these existing channels while addressing the gaps:

1. Strengthen Government-Dealer Partnership: Given the high reliance on government training and the significant usage of Grammazone, integrating agro-dealers into government-led training programs is essential to standardize information on safe handling, personal protective equipment (PPE) use, and resistance management right at the retail level.
2. Formalize other Training: The large other category needs to be investigated and, where possible, formalized to ensure the quality and consistency of the knowledge being shared, particularly concerning IPM.
3. Boost NGO/Cooperative Involvement: Targeted initiatives should be designed to increase the capacity and participation of NGOs and farmer cooperatives in training delivery, as they are crucial for achieving the necessary multi-stakeholder reach and continuity for long-term behavioural change.

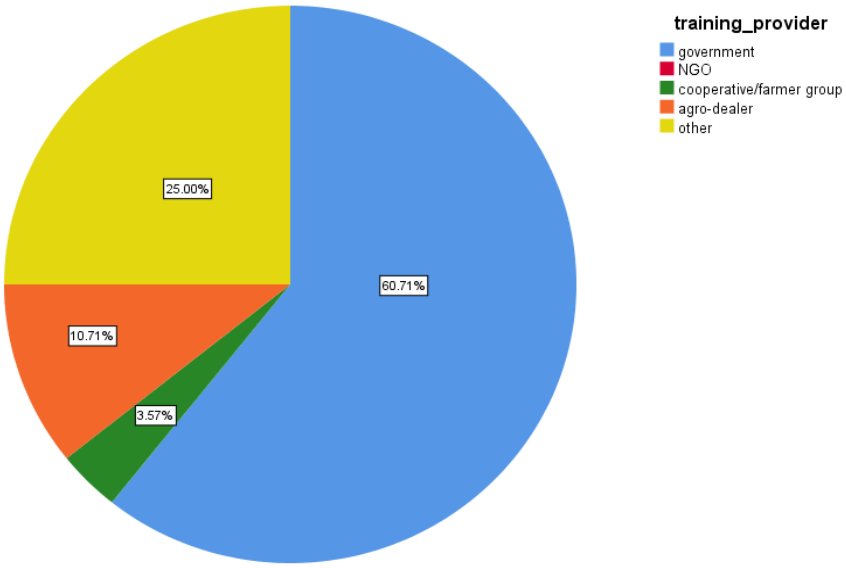



**Figure 4.20: Key Sources of Agricultural Training and Extension for Survey Respondents**

### 4.2.5 Farmers' Interest in IPM and Safe Pesticide Use

The Eruwa farming community demonstrates an unprecedented demand for advanced training in pest management. The survey results show a consensus that reflects a critical need for knowledge adoption to overcome the current challenges of high-cost, high-risk chemical use.

Unanimous Demand for Training. 100.00% of Eruwa farmers are very interested in receiving training on Integrated Pest Management (IPM) (Figure 4.21).

This complete consensus suggests that the farmers are acutely aware of the limitations and unsustainability of their current, single-chemical-dominant control strategy (Grammazone). Their unanimous interest directly correlates with the previously cited challenges of declining chemical effectiveness and high costs, driving a clear readiness for a change in practice.

#### 4.2.5.1 Key Training Priorities

This high level of interest must be channelled into targeted training programs that address the community's specific vulnerabilities. The curriculum should focus on translating the farmers' desire for knowledge into safer, more sustainable practices:

1. Pest Identification and Ecology: Training must enable farmers to correctly identify pest species and understand their life cycles to facilitate early and targeted interventions, moving beyond blanket chemical application.
2. Chemical Safety and Stewardship: Given the heavy reliance on Highly Hazardous Pesticides (like Grammazone) and the low safety compliance among hired labour, training on safe chemical mixing, proper application techniques, and the consistent use of Personal Protective Equipment (PPE) is an immediate priority for mitigating health risks.
3. Non-Chemical Alternatives: Training should introduce and demonstrate the efficacy of biological options and optimized cultural practices to provide viable alternatives to chemical dependence, thereby building a more resilient pest management system.
4. Environmental Safeguards: A strong focus on the responsible disposal of empty chemical containers is essential to prevent environmental contamination (like the previously noted fish mortality) and protect community health.

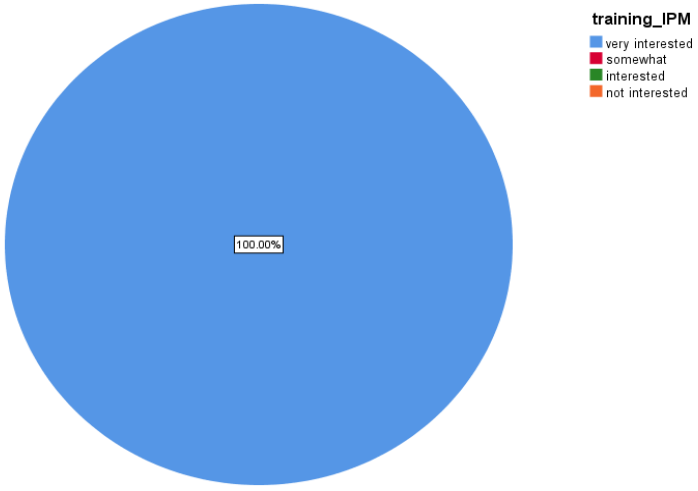



**Figure 4.21: Distribution of Respondent Interest Level in Agricultural Training Programs**

### 4.2.6 Priority Services Expected from the Agro hub

Eruwa farmers prioritize a balanced mix of knowledge acquisition, economic relief, and access to alternatives for the proposed ATC. This reflects their commercial focus and awareness of the limitations inherent in their current chemical-heavy approach.

#### 4.2.6.1 Top Priorities: Knowledge and Affordability

The highest priority for Eruwa farmers is training on Integrated Pest Management (IPM), followed closely by the need for subsidized chemical access.

- Training on IPM (30.43%): This is the single highest priority, reinforcing the unanimous interest in training reported earlier (Figure 4.22). Given the reliance on one chemical (Grammazone) and its declining effectiveness, farmers clearly recognize that a lack of technical knowledge is the biggest barrier to sustainable pest control.
- Subsidized or Group Purchase of Chemical Pesticides (26.09%): This represents the economic necessity of the commercial farming system. Since *cost* was previously cited as the biggest challenge (33.33%), securing more affordable access to inputs is a core need to maintain profitability (Figure 4.22). This demand for cheaper chemicals must be balanced against the imperative to promote safety.

#### 4.2.6.2 Significant Demand for Alternatives and Access

The remaining priorities highlight the farmers' desire to move beyond simple chemical usage to safer, more sustainable options.

- Access to Biopesticides (21.74%): This is a remarkably high priority, significantly higher than mostly reported for other communities (Figure 4.22). This finding signals a strong, active interest in non-chemical pest control alternatives within the Eruwa community. This willingness to adopt biopesticides should be leveraged by the ATC to diversify its pest management strategy and reduce reliance on hazardous synthetics.
- Access to Improved/Safer Facilities (10.87%): This priority relates to infrastructure facilities for storage, application, or handling. This demand aims to bridge the gap between their high storage compliance and their low safety compliance during the application process.

#### 4.2.6.3 Secondary Priorities

Better and More Regular Extension (5.43%) and Safe Disposal of Empty Pesticides (5.43%) are the least cited priorities. While their low ranking might suggest farmers don't see them as the biggest challenge, they are still important:

- Extension Services: The low ranking for extension services is surprising given the high demand for training, suggesting farmers may see the ATC training itself as the primary solution, rather than relying on the current, inconsistent government extension model.
- Safe Disposal: Although ranked last, the need for a formal safe disposal system is crucial for environmental and health protection, especially given the continuous use of hazardous chemicals.

In summary, the Eruwa priorities emphasize a desire to invest in long-term knowledge (IPM) and sustainable inputs (Biopesticides), while simultaneously seeking short-term economic relief via subsidized chemical access. The ATC should prioritize the IPM and Biopesticide components to fulfill the farmers' demand for a safer, more diversified, and sustainable future.

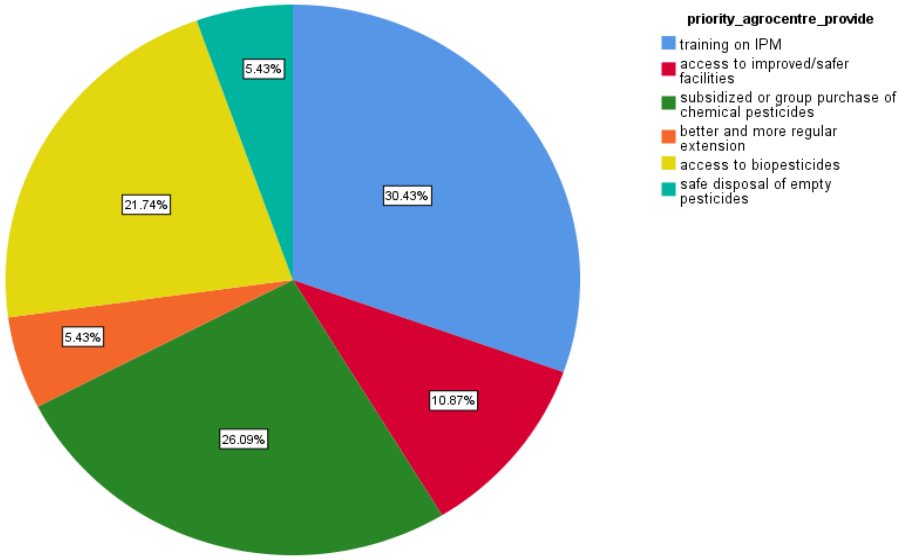



**Figure 4.22: Ranking of Priority Needs and Services Expected from the Agro Hub by Respondents**

### 4.2.7 Safety/PPE usage

The data for Eruwa shows that while many farmers report consistent PPE use, a significant portion still engages in high-risk practices by only using PPE sometimes. This indicates a critical, persistent occupational health risk that contradicts the community's high awareness of health hazards.

#### 4.2.7.1 PPE Usage Pattern

- Always Using PPE (64.29%): Nearly two-thirds of Eruwa farmers report always using protective clothing during pesticide application (Figure 4.23). This figure is commendably high and suggests that safety messages, possibly through government extension or the 100% compliance with safe storage practices, are influencing behaviour.
- Sometimes Using PPE (35.71%): Over one-third of farmers admit to using PPE only sometimes (Figure 4.23). However, this large sometimes group represents a serious and immediate health risk, as exposure to highly toxic chemicals is dangerous even when sporadic.

#### 4.2.7.2 Critical Safety Implications

The high percentage of sometimes users is particularly concerning, given the context of the Eruwa farming system:

- Hazardous Chemical Exposure: As previously established, Eruwa's chemical use is dominated by Grammazone (Paraquat), a Highly Hazardous Pesticide. Applying this chemical without consistent PPE leads to high levels of acute and chronic exposure, particularly through skin contact and inhalation.
- Hired Labor Risk: While the chart reflects the farmer's reporting, the actual application is largely done by hired labourers (90%). It is highly likely that the sometimes category disproportionately represents these contract workers, who may be less trained, less monitored, and less prioritized for PPE provision, effectively transferring the majority of the occupational risk to them.
- Gap Between Awareness and Practice: The community has shown high awareness of health risks, and high compliance in storage, yet over a third fail to use PPE consistently. This highlights a critical disconnect where safety is compromised in the field, likely due to factors like PPE unaffordability, discomfort, or urgency to complete the task.

This evidence underscores a critical need for immediate intervention. Strategies must focus on subsidized PPE provision, mandating and enforcing safety standards for hired laborers, and continuous, practical training to ensure that "sometimes" is eliminated in favor of always for all applicators.

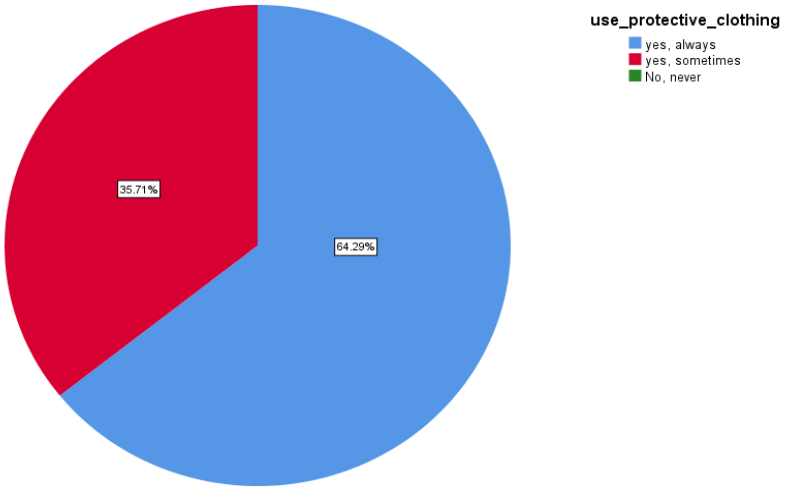



**Figure 4.23: Respondent Compliance Level Regarding the Use of Protective Clothing (PPE) During Pesticide Application**

### 4.2.8 Chemical Sources and Container Disposal Patterns

#### 4.2.8.1 Sources of Chemicals

The procurement of agricultural chemicals in Eruwa is almost entirely dependent on the local open market, significantly increasing the risks of using substandard products and receiving inadequate safety information.

Extreme Reliance on Informal Sources

- Local Market Dominance (89.29%): A massive 89.29% of Eruwa farmers obtain their chemicals from local open markets (Figure 6.9).
- Minimal Formal Sourcing (10.71%): Only 10.71% of farmers source their chemicals from registered agro dealers. The complete absence of sourcing from cooperatives, extension officers, or others underscores the lack of institutional and formal supply chains.

#### 4.2.8.2 Implications for Safety and Efficacy

This extreme reliance on the local market poses severe problems, particularly given Eruwa's established practices:

1. Risk of Adulteration: Informal markets are the primary outlet for unregulated and potentially adulterated or counterfeit products. Since the community relies heavily on a

single chemical (Grammazone/Paraquat), using a substandard version directly contributes to the farmers' reported problem of declining effectiveness and necessitates higher dosages, which drives up costs and risks.

2. Health and Safety Exposure: Purchases from local markets typically lack proper technical advice on safe handling, correct dosage, and environmental risks. This reinforces the community's low safety compliance during application and transfers the burden of risk onto applicators (hired labour).
3. Lack of Certification: Products in open markets often lack proper labelling or approval by regulatory authorities. This reliance is fundamentally incompatible with the principles of safe and sustainable pest management.

The finding underscores an urgent need for stronger input quality control and supply chain reform. The proposed ATC is essential to serve as a certified, reliable pesticide and biopesticide distribution point to bypass the dangerous dependency on the local open market.

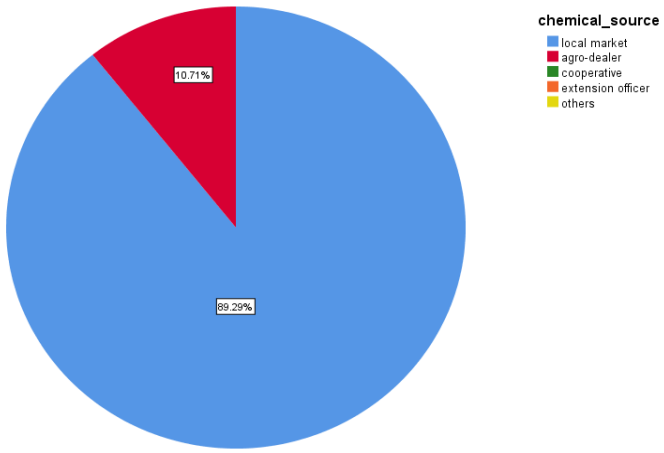



**Figure 4.24: Key Suppliers and Outlets for Chemical and Pesticide Purchases Reported by Respondents**

### 4.2.8.3 Pesticide Container Disposal Patterns

The self-reported data suggests a high level of compliance with safe disposal practices; however, the actual implementation likely falls short of meeting regulatory and environmental standards, posing a significant ongoing risk.

- Safe Disposal Claim (71.43%): A strong majority of Eruwa farmers (71.43%) claim to practice safe disposal of empty pesticide containers (Figure 4.25). This figure indicates a high level of awareness that containers pose a risk and should not be simply discarded.
- Unsafe Disposal Admission (28.57%): A significant minority (28.57%) admits to unsafe disposal. This is concerning, as it likely involves high-risk practices such as discarding containers in water channels, open fields, or reusing them for storing food or water, which is a leading cause of accidental poisoning.

Safe Does Not Mean Compliant: Based on the template's context, the farmers' definition of safe disposal (71.43%) likely includes practices like burying, burning, or leaving containers in the field, none of which meet formal regulatory standards for decontaminating hazardous waste. Burying leads to soil and groundwater contamination, and burning can release toxic fumes.

In summary, despite the high self-reported safe disposal rate, the substantial proportion admitting to unsafe practices and the lack of formal infrastructure confirm that container disposal remains a major environmental and public health challenge in Eruwa.

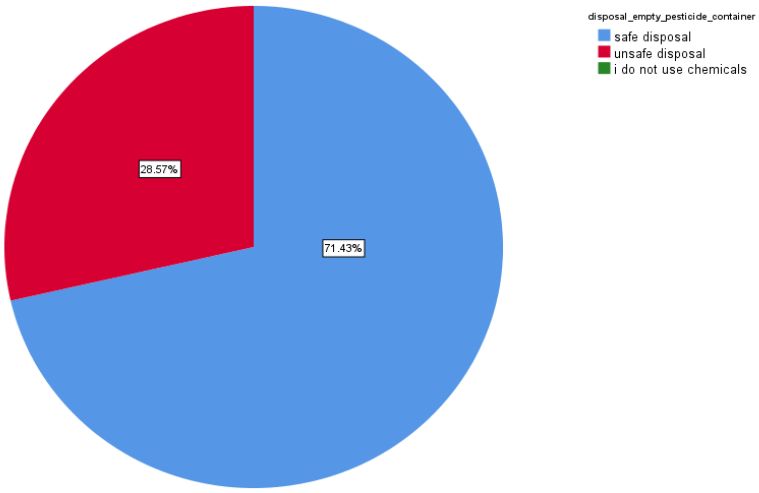



**Figure 4.25: Respondent Practices for the Disposal of Empty Pesticide Containers**

## 4.3 Environmental and Social Risk Assessment of Pest Management

### 4.3.1 Environmental and Social Impacts

Eruwa employs a pest control system that is characterized by extreme chemical dependency (58.33% relying on chemical sprays) and a heavy reliance on a single Highly Hazardous Pesticide (HHP)-Grammazone (Paraquat). This system generates severe risks. The practice is compounded by an overwhelming reliance on the local, informal market (89.29%) for procurement. Eruwa exhibits a low overall PPE usage rate among applicators (35.71% use it only sometimes) and critical, unsafe chemical sourcing and disposal practices that pose major environmental and health threats.

### 4.3.2 Analysis of Impacts

#### 4.3.2.1 Environmental Impacts

The environmental challenges in Eruwa are intensified by the concentration of chemical use and poor supply chain control:

- Chemical Contamination: The overwhelming 72.73% reliance on Grammazone (Paraquat) and the sourcing of chemicals from unregulated local markets (89.29%) heighten the risk of severe soil and water contamination. The pervasive use of this potent herbicide can rapidly reduce soil biodiversity and accelerate long-term degradation of soil structure.
- Improper Disposal: A significant minority (28.57%) of farmers admit to engaging in unsafe disposal methods, such as discarding, burying, or burning containers, risking chemical leaching into water sources and releasing toxic fumes.
- Storage near Food: While not explicitly measured, the strong reliance on the informal market and the lack of external facilities suggest a high, unmitigated risk of storing HHPs close to food, increasing the potential for accidental contamination and ingestion.
- Regulatory Gaps: The 89.29% reliance on the local market indicates a complete breakdown of regulatory enforcement and supply chain oversight, allowing dangerous and potentially adulterated products to enter the farming ecosystem.

#### 4.3.2.2 Social and Human Health Impacts

Human health risks are amplified by the transfer of application responsibility to hired labour, coupled with low safety compliance:

- Risk to Hired Labor: The application task is heavily delegated to hired labour (90% for the application). Without proper training and supervision, this group faces the direct and continuous risk of acute and chronic health issues from highly toxic chemicals.
- Low PPE Usage: Safety compliance is inadequate: 35.71% of farmers/applicators report only sometimes using PPE. This inconsistent protection is insufficient against HHPs like Grammazone, leading to high levels of acute exposure for applicators.
- Symptoms of Poisoning: The absence of health surveillance, coupled with high exposure, suggests a high likelihood of underreporting and low awareness regarding chemical exposure symptoms among the farming population and, critically, their hired workforce.
- Public Health Risk: The 89.29% informal sourcing and the high use of HHPs create a high risk of misapplication, including the improper use of agricultural chemicals inside homes to control public health pests, thereby increasing indoor exposure risk for the entire household.

#### 4.3.2.3 Social-Economic Impacts

The current situation burdens the farming community financially and logistically:

- Cost Burden and Resistance: Cost (33.33%) and declining effectiveness (23.81%) are major challenges. Repeated spraying of a single chemical, driven by emerging pest resistance, depletes farm income, while the high cost of inputs reduces profit margins.
- Labour-Intensive Alternatives: Although cultural practices are used, they are generally perceived as secondary and remain labour-intensive, often increasing the burden on women and children who manage these tasks.
- Supply Chain Insecurity: The reliance on the informal market leads to issues with product availability (21.43%) and quality, destabilizing the ability to manage pests effectively.
- Limited Extension Support: The lack of consistent advisory services leaves farmers without guidance on safer alternatives, risk mitigation, and the required shift from chemicals, hindering sustainable management.

### 4.3.3 Vulnerable Groups (Women, Children, Labourers) and Associated Impacts

The chemical-intensive system in Eruwa creates specific, heightened risks for vulnerable groups:

- Hired Labour: 90% reliance on hired labor for application, combined with 35.71% inconsistent PPE usage. High occupational exposure to HHPs; risk transferred from farm owner to unprotected contract workers.
- Women/Children: 89.29% informal chemical sourcing (unlabeled/unregulated) and unsafe disposal (28.57%). Increased risk of household exposure and accidental poisoning from improperly stored or reused containers; heavy labour burden from manual weeding.

### 4.3.4 Strategic Interventions and Justification for PMP

This section translates the critical environmental and social risks identified in Eruwa including extreme reliance on a single HHP, high risk among hired labor, and poor chemical waste management into a structured mitigation strategy. It provides the rationale for the proposed actions within the Pest Management Plan (PMP), ensuring interventions are directly targeted at the primary drivers of unsustainable practices (Table 4.1).

**Table 4.1: Critical PMP Actions Derived from Risk Assessment: Mitigation Strategy for Eruwa**

| Critical PMP Action | Justification |
|---|---|
| Phase-Out of HHPs | Grammazone is used by 72.73% of farmers. Substitution with safer alternatives is mandatory to meet ESMP standards and combat resistance. |
| Mandatory Training & PPE Enforcement | 35.71% inconsistent PPE use and 90% reliance on hired labour require targeted safety training and subsidized PPE access for all applicators. |
| Infrastructure for Safe Disposal | The 28.57% unsafe disposal rate necessitates the establishment of Eruwa ATC-based container collection and disposal systems. |
| Establish Certified Supply Chain | The 89.29% reliance on the informal market requires the Eruwa ATC to serve as a certified hub for chemical procurement and safety information. |

| Critical PMP Action | Justification |
|---|---|
| Strengthen Health Surveillance | Counter the likely underreporting of poisoning by implementing health monitoring and awareness protocols focused on the hired labour force. |
| IPM Promotion & Biological Control | Leverage the 100% interest in training and the 21.74% demand for biopesticides to fully integrate non-chemical methods, reducing chemical dependency. |
| Gender and Youth Integration | Target women and youth for IPM training to reduce the manual labour burden and increase safe handling awareness among those most exposed in the home and field. |
| Community Health Linkage | Address the misuse of agricultural chemicals in homes by linking the PMP with community public health programs. |

In conclusion, current pest management practices in Eruwa create substantial and immediate environmental and social risks due to extreme chemical dependency, an unregulated supply chain, and inconsistent PPE use among applicators. The community's unanimous interest in training (100%) and high demand for biopesticides present a major opportunity for transformation. Embedding a targeted PMP within the Eruwa ATC's ESMP framework is critical to mitigate these risks, enforce safety standards for the hired labor pool, and effectively transition the community toward a sustainable, knowledge-driven model.

## 4.4 Pest Management Risk Assessment Matrix

### 4.4.1 Identification of Key Risks

Field survey findings reveal multiple environmental, health, social, and institutional risks associated with current pest management practices at Eruwa. The core issue is the majority's reliance on chemical control sourced from local markets, combined with limited training on pesticide handling, storage, and disposal.

#### 4.4.1.1 Environmental Risks

- Soil Contamination: Due to the repeated use of paraquat, Grammazone, and similar persistent herbicides.

- Water Pollution: From pesticide runoff and the washing of spraying equipment near streams and open wells.
- Biodiversity Loss: A decline in pollinators and beneficial soil organisms is noted as a result of broad-spectrum insecticide use.
- Pest Resistance: Increasing prevalence of resistance stemming from the repeated use of the same active ingredients without rotation.

#### 4.4.1.2 Human Health Risks

- Acute Exposure: The risk is primarily driven using Grammazone (Paraquat) (72.73% of chemical use) coupled with inadequate Personal Protective Equipment (PPE) usage. Approximately 35.71% of applicators reported using PPE "sometimes," creating high-risk exposure windows.
- Chronic Exposure: Frequent, low-level contact through direct skin contact, inhalation, and poor hygiene (lack of hand-washing facilities).
- Food Contamination: High risk of pesticide residues in food due to poor farmer understanding of Pre-Harvest Intervals (PHI).
- Unsafe Storage: About 10% of respondents store pesticides in kitchens or near foodstuffs, increasing the risk of accidental ingestion.

#### 4.4.1.3 Social and Economic Risks

- Economic Burden: Rising production costs due to high pesticide prices, cited as the most significant challenge by 45% of respondents.
- Reduced Productivity: Health-related absenteeism and reduced labour productivity among applicators.
- Post-Harvest Losses: Significant losses from storage pests, estimated at 30–40%, directly reduce farmer income and food security.
- Gender Vulnerability: Women and children often assist in mixing chemicals and washing containers without protective equipment, heightening their exposure risk.

#### 4.4.1.4 Regulatory and Institutional Risks

- Regulatory Failure: Use of restricted pesticides (notably Sniper) available through informal vendors.
- Weak Oversight: Absence of applicator certification or formal pesticide record-keeping.

- Infrastructure Gaps: Weak extension presence and the complete absence of a formal container disposal system; open burning and reuse are common practices.

### 4.4.2 Risk Rating Methodology

Risk was rated based on Likelihood (L) and Severity (S), both scaled from 1 (Rare/Low) to 4 (Almost Certain/Critical). The Risk Rating is calculated as the product of *L* and *S* (Table 4.2)

**Table 4.2: Risk score and classification**

| Score | Classification |
|---|---|
| 1–3 | Low |
| 4–6 | Medium |
| 7–9 | High |
| 10–16 | Extreme |

Canadian Policy on hazards and risks

### 4.4.3 Pest Management Risk Matrix

This matrix identifies, scores, and categorizes the key risks to establish immediate mitigation priorities (Table 4.3).

**Table 4.3: Environmental and Social Risk Quantification Matrix for Pest Management**

| Risk | L | S | Rating (L × S) | Category | Justification |
|---|---|---|---|---|---|
| Chronic Pesticide Exposure | 4 | 4 | 16 | Extreme | 72.73% use of Grammazone combined with 35.71% inconsistent PPE usage, primarily by hired labour. |
| Soil Contamination by Paraquat | 4 | 3 | 12 | Extreme | Overwhelming reliance (72.73%) on persistent, single-mode-of-action herbicide. |
| Unsafe Disposal (Burning/Dumping) | 4 | 3 | 12 | Extreme | 28.57% unsafe disposal admission, compounded by HHP residues and lack of collection system. |

| Risk | L | S | Rating (L × S) | Category | Justification |
|---|---|---|---|---|---|
| Pest Resistance | 4 | 2 | 8 | High | Extreme reliance on one chemical product (72.73%) virtually guarantees rapid resistance development (Likelihood is high, Severity is medium). |
| Water Pollution (Runoff/Washing) | 3 | 3 | 9 | High | Absence of buffer zones or controlled washing areas; risk intensified by high HHP use. |
| Weak Regulatory Enforcement | 4 | 2 | 8 | High | 89.29% sourcing from unregulated local markets allows HHPs to enter the supply chain (Likelihood is high, Severity is medium). |
| Food Contamination (Residues) | 3 | 3 | 9 | High | Lack of Pre-Harvest Interval (PHI) awareness, combined with the use of highly potent chemicals. |
| Acute Poisoning (Labor/Family) | 3 | 4 | 12 | Extreme | Severity is critical due to Grammazone use and high-risk exposure to hired labour (90% application rate). |
| Economic Burden of Chemicals | 4 | 2 | 8 | High | 33.33% cite cost as the biggest challenge; this high likelihood creates financial fragility. |
| Lack of Training Coverage | 3 | 3 | 9 | High | High demand for IPM training (100% interest) suggests the current irregular extension is insufficient. |
| Storage near Food | 2 | 4 | 8 | High | Risk of storing informally sourced chemicals indoors, creating critical health severity if ingested. |

| Risk | L | S | Rating (L × S) | Category | Justification |
|---|---|---|---|---|---|
| Biodiversity Loss | 2 | 3 | 6 | Medium | Reduced pollinator activity and beneficial organisms observed due to broad-spectrum chemical use. |

Shekhar et al., 2024. Canadian Policy on hazards and risks

### 4.4.4 Narrative Interpretation: Critical Risk Profile

Eruwa's pest management system faces an alarmingly high concentration of Extreme-level risks, underscoring a profile of acute chemical dependency, supply chain failure, and institutional neglect.

The most critical threats, scored Extreme (12-16), are Chronic Pesticide Exposure (16), Soil Contamination by Paraquat (12), and Unsafe Disposal (12), along with Acute Poisoning (12). These risks are not theoretical; they are driven by the overwhelming 72.73% reliance on Grammazone, the 89.29% unregulated sourcing, and the resulting 35.71% inconsistent PPE use by applicators. The system is undermined by the high likelihood of Pest Resistance and Weak Regulatory Enforcement (both scoring High), which perpetuate contamination hazards and undermine the sustainability of the farming enterprise. The situation demands immediate, integrated, and comprehensive PMP and ESMP interventions.

### 4.4.5 Critical Risks and Recommended PMP Actions

The following Table 4.4 outlines the required PMP actions, prioritizing mitigation of the **Extreme** and **High** risks identified in Eruwa.

**Table 4.4: Summary of Critical Risks and Corresponding PMP Mitigation Actions**

| Critical Risk | Recommended PMP/ESMP Response | Responsible Agency |
|---|---|---|
| Acute/Chronic Poisoning | Distribute subsidized PPE and institutionalize farmer health monitoring and awareness training, targeting hired labour safety. | ESMP Health Desk, Extension Unit |
| Paraquat and HHP Use | Ban/Phase-out Grammazone and replace with safer, low-toxicity alternatives; enforce Eruwa ATC input certification. | Eruwa ATC, NAFDAC |
| Unsafe Disposal | Create a container return scheme and community drop-off points at the Eruwa ATC to manage the 28.57% unsafe disposal rate. | Eruwa ATC / NESREA |
| Weak Regulation/Supply Chain | Strengthen monitoring and licensing of local agro dealers; restrict HHP sales to certified channels only to bypass the 89.29% informal market. | FMARD, NAFDAC |
| Pest Resistance | Promote IPM rotation strategies and leverage 21.74% demand to integrate biological and cultural controls. | Oyo ADP / IAR&T |
| Lack of Training Coverage | Institutionalize regular Farmer Field Schools (FFS) on IPM and chemical safety to leverage the 100% interest in training. | Eruwa ATC / NGOs / Extension Unit |
| Economic Burden of Chemicals | Provide subsidized/group purchase channels for certified, safer inputs to reduce the 33.33% cost challenge. | Eruwa ATC, Bank of Agriculture |

Eruwa faces an urgent and critical mix of environmental, health, and institutional risks, characterized by extreme chemical dependency and a breakdown in the supply chain. The most immediate threats require direct mitigation under the Pest Management Plan (PMP), supported by robust training, PPE provision, and Eruwa ATC-based infrastructure and monitoring.

The high likelihood of Chronic Pesticide Exposure (16), Acute Poisoning (12), and Soil Contamination (12), driven by the overwhelming reliance on Grammazone and the unregulated

local market (89.29%), demands a rapid intervention. The PMP must prioritize phasing out Highly Hazardous Pesticides (HHPs), establishing a certified supply chain, and enforcing mandatory safety compliance among all applicators to safeguard public and environmental health.

## 4.5 GAP Analysis

### 4.5.1 Overview

The Eruwa ATC presents a commercially-oriented agricultural system with extreme reliance on a single Highly Hazardous Pesticide (HHP) and minimal institutional oversight. Analysis of field data reveals critical gaps in regulation, knowledge, infrastructure, and safety that collectively undermine effective and sustainable pest management. Farmers demonstrate an overwhelming dependency on local open markets (89.29%) for pesticide procurement, while extension support and technical training are severely limited. These conditions place both environmental and public health systems at extreme risk and violate key provisions of the FAO/WHO Code of Conduct and World Bank ESS3 on pollution prevention and resource efficiency.

### 4.5.2 Key Gaps

#### 4.5.2.1 Policy and Regulatory Gaps

The continued 72.73% reliance on Gramoxone (Paraquat) is a major deviation from global and national safety standards. Despite NAFDAC's restrictions, this product remains easily accessible in local markets (89.29%). Farmers have no licensing for application, and there is no formal record of products used.

- **Missing Safeguard Compliance:** The availability and use of HHPs directly violate World Bank Operational Policy (OP) 4.09 (Pest Management), which requires the avoidance of HHPs when effective, less harmful alternatives are available.
- **Gaps: Extreme weak regulatory enforcement** and the absence of monitoring have resulted in widespread misuse and unsafe handling, violating both FMARD guidelines and World Bank OP 4.09.

#### 4.5.2.2 Knowledge and Training Gaps

While 60.71% of farmers reported receiving training, the 100.00% interest in IPM training confirms that existing knowledge is inadequate to address the challenge of declining chemical effectiveness (23.81%) and resistance. Understanding of IPM principles, pest thresholds, and

toxicological classifications is extremely limited, and decisions are experience-driven, heightening the risks of overapplication and contamination.

- **Gaps:** The inadequate extension capacity fails to meet the safety and training requirements mandated by the World Bank Environmental and Social Standards (ESS1 and ESS2).
- **Implication:** There is an urgent need for structured, ongoing, practical IPM training programs and field schools within the Eruwa ATC's extension framework.

#### 4.5.2.3 Technical and Operational Gaps

**Chemical control overwhelmingly dominates** pest management in Eruwa 58.33% of farmers rely on pesticide spraying. Non-chemical methods like biological control are minimal (2.08%). There are no formal pest monitoring or scouting systems, and application decisions are reactive. Farmers lack consistent access to safer alternatives, despite 21.74% citing a demand for biopesticides.

- **Missing IPM Requirement:** The lack of established pest monitoring and a strong bias toward chemical use represents a fundamental failure to comply with the core philosophy of IPM, as required by the FAO/WHO Code of Conduct.

#### 4.5.2.4 Health and Safety Gaps

Occupational health and safety practices are critically weak. While 64.29% report always using PPE, 35.71% use it sometimes. This risk is concentrated among hired labourers (90% applications) who are often unsupervised. There are no established first-aid or emergency response systems for pesticide poisoning.

- **Missing OHS Compliance:** The absence of consistent PPE, OHS training, and emergency protocols violates World Bank ESS2 and ESS4, specifically regarding contractor and worker safety from hazardous materials.

**Implication:** The absence of structured health protocols and consistent PPE provision exposes farmers and, critically, their outsourced labour, to acute and chronic chemical hazards.

#### 4.5.2.5 Storage and Disposal Gaps

No dedicated, secure chemical storage facilities exist, despite 100% self-reporting of storage compliance (which means storage is likely close to homes). Disposal practices are unsafe: 28.57% admit to unsafe disposal (burning, burying, or dumping).

- **Missing Pollution Prevention:** The lack of a formal container return system is in breach of NESREA environmental guidelines and World Bank ESS3 requirements for hazardous waste management.

#### 4.5.2.6. Environmental Protection Gaps

Environmental safeguards are virtually absent. The overwhelming use of Grammazone (72.73%) has already resulted in reduced soil fertility, and poor practices lead to contamination (e.g., reported fish mortality near runoff areas).

- Missing Biodiversity and Resource Protection**:** The absence of measures to protect local waterways and beneficial organisms constitutes a gap against World Bank ESS6 and ESS3 requirements.

#### 4.5.2.7 Post-Harvest and Storage Gaps

Post-harvest losses from storage pests are significant, yet hermetic or improved storage systems are rarely used. High losses lead to the misuse of chemicals in storage, increasing the risk of food residues.

- Gaps: The high post-harvest losses and resulting chemical misuse undermine the project's goals of food security and economic sustainability.

#### 4.5.2.8 Institutional and Extension Gaps

Extension services are infrequent and under-resourced. There are no dedicated IPM specialists, and the current institutional structure cannot support the sustainable implementation and monitoring of the PMP, jeopardizing long-term impact.

#### 4.5.2.9 Data, Monitoring, and Reporting Gaps

Eruwa lacks systematic tracking of pesticide use, poisoning incidents, or environmental monitoring (soil, water, or biodiversity impacts). This prevents effective impact assessment and corrective action, failing to meet the monitoring and reporting requirements of all World Bank ESSs.

#### 4.5.2.10 Implications of Gaps

The identified gaps in Eruwa translate into:

- Extreme risk of environmental contamination and chronic human poisoning, particularly among the hired labor force and vulnerable groups.
- Direct non-compliance with multiple national and international safeguard policies, especially concerning the use and sourcing of HHPs.
- Low resilience to pest resistance due to the single-chemical approach, threatening long-term farm viability.
- Unsustainable production systems due to soil degradation and input dependence, increasing the long-term economic burden on farmers (33.33% cite cost as the biggest challenge).

### 4.5.3 Rationale for PMP Intervention

- To address these critical compliance and sustainability issues, the PMP must be comprehensive and leverage 100% farmer interest in training:
- Phase-Out and Certification: Immediately replace Grammazone and other HHPs with IPM-based practices and certified biopesticides, enforcing procurement only through the Eruwa ATC.
- Mandatory Safety Training: Institutionalize Farmer Field Schools (FFS) and regular training on safe handling, focused on the hired labour force, dosage, and environmental protection.
- Infrastructure: Establish Eruwa ATC-based storage and disposal infrastructure (secure storage rooms and container collection points).
- Enforcement: Strengthen coordination with NAFDAC, FMARD, and NESREA to control HHP supply and enforce standards in the local market.
- Integration: Integrate health monitoring, PPE distribution, and environmental tracking within the ESMP framework, focusing on the highly exposed applicator group.
- Vulnerable Groups: Protect women and children from exposure through targeted awareness and household-level chemical management education.

## 4.6 Proposed Pest Management Plan (PMP) Framework

### 4.6.1 Purpose and Objectives of the PMP/ Guiding Principles of IPM/PMP

The Pest Management Plan (PMP) is developed as a mandatory safeguard instrument to ensure all pest and pesticide-related activities in the Eruwa ATC are environmentally sound, socially responsible, and fully compliant with national legislation and international best practices, including World Bank OP 4.09, ESS3, and the FAO/WHO International Code of Conduct. This plan is a direct response to survey findings revealing high chemical dependency, use of Highly Hazardous Pesticides (HHPs) (paraquat, DDVP/Sniper), inadequate training, unsafe storage/disposal, and documented poisoning cases, which pose critical risks to human health, food safety, and long-term agricultural sustainability.

The overarching purpose is to transition from non-sustainable, chemically intensive practices to a preventive, knowledge-based, and environmentally sustainable pest management system.

The PMP establishes a structured framework for:

1. Promoting and institutionalizing Integrated Pest Management (IPM) as the primary control approach.
2. Reducing reliance on HHPs and introducing safer alternatives.
3. Ensuring compliance with all national and international regulations.
4. Building technical capacity for farmers, applicators, and extension workers.
5. Improving occupational health and safety (PPE enforcement, first aid).
6. Protecting vulnerable groups (women, children, labourers).
7. Establishing safe infrastructure for storage and container disposal.
8. Preventing pest resistance and environmental contamination.
9. Integrating post-harvest pest management.
10. Strengthening institutional coordination and data monitoring.

The successful implementation of this PMP will lead to safer food systems, healthier communities, protected ecosystems, improved compliance, and enhanced agricultural productivity and resilience.

The PMP is anchored on globally accepted principles of IPM, emphasizing prevention, ecological balance, and judicious use of chemicals as a last resort (Table 4.5).

**Table 4.5: Guiding Principles and Core Actions of the Integrated Pest Management (IPM) Plan**

| Principle | Core Action |
|---|---|
| 1. Prevention First | Utilize crop rotation, resistant varieties, and sanitation over chemical reactions. |
| 2. Pest Identification & Monitoring | Base all control decisions on evidence, accurate identification, and established Economic Threshold Levels (ETL), not routine spraying. |
| 3. Combination of Control Strategies | Promote the hierarchy of Cultural, Mechanical, Biological, and Host Plant Resistance methods before chemical intervention. |
| 4. Chemical Control as Last Resort | Use only approved, low-risk pesticides, enforce HHP phase-out, and strictly adhere to label instructions and Pre-Harvest Intervals (PHI). |
| 5. Protection of Human Health | Mandate Occupational Safety Protocols (PPE, first aid, poisoning response) for all workers and protect vulnerable community members. |
| 6. Environmental Stewardship | Minimize negative impacts on soil health, water bodies, pollinators, and biodiversity. |
| 7. Resistance Management | Prevent resistance by rotating active ingredients and modes of action, avoiding blanket spraying. |
| 8. Regulatory Compliance | Ensure full adherence to NAFDAC, FMARD, NESREA, World Bank ESS3 & OP 4.09, and FAO/WHO Code. |
| 9. Capacity Building & Knowledge Transfer | Support continuous training, Farmer Field Schools (FFS), and certification of applicators. |
| 10. Participatory Approach | Actively involve farmers, cooperatives, and communities in surveillance, decision-making, and monitoring. |
| 11. Continuous Monitoring | Implement regular evaluation, data collection, and feedback loops to enable adaptive management. |

### 4.6.2 PMP Strategies and Components

#### 4.6.2.1 Regulatory Compliance and Enforcement

This component ensures full compliance by eliminating HHPs, regulating the input supply chain, and establishing a robust enforcement mechanism.

- HHPs Elimination: The PMP will develop a "Do-Not-Use List" and phase out identified HHPs (paraquat, DDVP) by replacing them with safer alternatives and strictly enforcing PHI adherence.
- Input Regulation: Pesticides must be sourced only from certified, licensed agro dealers, prohibiting purchases from informal vendors and mandating the provision of safety data sheets (SDS).
- Certification: All hired sprayers and self-applying farmers must be certified after training in IPM and safe handling.
- Enforcement: Routine inspections, penalties for non-compliance, and collaboration with NAFDAC/NESREA will be established via a Local Pesticide Compliance Task Force.

#### 4.6.2.2 Institutional Strengthening and Coordination

Effective implementation requires multi-sectoral collaboration coordinated by a dedicated unit.

- PMP Coordination Unit (PMPCU): A unit established at the Agro centre level to oversee implementation, coordinate training, maintain records, and liaise with government and health agencies.
- Extension Integration: Extension officers will be trained as IPM Specialists and Pesticide Safety Advisors to ensure regular field follow-up and the establishment of FFS and demonstration plots.
- Cross-Sectoral Collaboration: Formal linkages will be created with the Health Sector (poisoning recognition/treatment), Environmental Agencies (monitoring, waste management), and Research Institutions (resistance monitoring, IPM technology evaluation).
- Clear Roles: The PMP will clearly define roles and responsibilities for all stakeholders, from the Project Management Unit to community leaders.

#### 4.6.2.3 Capacity Building and Training Programs

Training is the cornerstone of the PMP, designed to transform practices from chemical dependence to knowledge-based IPM, targeting all stakeholders from farmers to local authorities (Table 4.6).

**Table 4.6: PMP Capacity Building Matrix: Target Groups and Customized Training Focus**

| Target Group | Training Focus |
|---|---|
| Farmers | IPM basics, pest scouting, safe pesticide use, PPE, PHI, record-keeping. |
| Hired Sprayers | Advanced calibration, mixing, drift control, PPE, first aid, and applicator certification. |
| Agro dealers | Legal responsibilities, safe product handling, farmer advising, and counterfeit prevention. |
| Extension Officers | IPM technical training, demonstration skills, and monitoring. |
| Health Workers | Identifying pesticide poisoning, treatment protocols, and reporting incidents. |
| Community Members | Public health pest control, household safety, and awareness of chemical risks. |
| Local Authorities | Enforcement, regulation, data collection, and coordination. |

Training will be practical, field-based, delivered in local languages through Farmer Field Schools (FFS) and supported by incentives like subsidized PPE and enhanced market access linked to compliance.

#### 4.6.2.4 Promotion of IPM and Non-Chemical Alternatives

This component institutionalizes IPM as the primary approach, shifting control from reactive chemical spraying to proactive, ecological methods, forming the HEART of the PMP (Table 4.7).

**Table 4.7: Core Strategies for IPM Promotion and Non-Chemical Alternatives**

| Strategy | Core Practices |
|---|---|
| Cultural (Agroecological) | Crop rotation, field sanitation, timely/synchronized planting, and intercropping. |
| Resistant Varieties | Promote and conduct trials of pest-resistant/tolerant varieties (IITA, NIHORT). |
| Mechanical/Physical | Traps (sticky, pheromone, light), hand-picking, and rodent guards. |
| Biological Control | Conservation and release of natural enemies (ladybirds, parasitoids), use of entomopathogenic agents. |
| Botanical/Bio-Pesticides | Encourage locally available, low-toxicity formulations (Neem, garlic extracts) and registered commercial bio-pesticides. |
| Surveillance & Monitoring | Establish a community-based scouting network using standard sheets; base all interventions on Economic Threshold Levels (ETL). |
| Habitat Management | Plant border crops for natural enemies, maintain refugia, and conserve soil organic matter. |
| Post-Harvest IPM | Integrate improved storage technologies (hermetic storage) to address 30-40% losses. |

#### 4.6.2.5 Safe and Rational Use of Pesticides (As Last Resort)

This section establishes strict controls to manage the residual risk associated with necessary chemical use, ensuring safety, compliance, and effectiveness.

- Pesticide Selection: Only NAFDAC-registered, non-HHP, low-toxicity, and environmentally degradable products will be approved via a Project-Approved Pesticide List (PAPL).
- Prohibited List: Paraquat (Gramoxone), Sniper (DDVP), and all WHO Class Ia/Ib pesticides will be phased out and banned from project activities.
- Authorization System: Farmers must receive a prescription and authorization from IPM specialists (based on scouting/threshold verification) before any chemical application.
- Safe Procedures: The PMP mandates sprayer calibration, use of clean water, proper PHI/REI observance, and strict adherence to buffer zones near sensitive areas.

- Mandatory PPE: Minimum PPE (gloves, coveralls, masks, boots) will be required, with initial kits provided, training enforced, and the rule No PPE = No Spraying implemented.
- Record Keeping: Every application must be logged with details on date, product, dose, PPE used, and PHI compliance for traceability and inspection.
- Emergency Preparedness: Establish emergency protocols, first aid kits, and mandatory incident reporting to the PMPCU and local health facilities.

### 4.6.3 Pest-Specific Integrated Pest Management (IPM) Programme

The Eruwa Agricultural Transformation Centre (ATC) will implement a Pest-Specific Integrated Pest Management (IPM) Programme to ensure that pest populations are maintained below economically damaging levels while minimizing risks to human health, biodiversity, water resources, and the environment. The programme prioritizes preventive, biological, cultural, and mechanical control measures, with chemical control applied only when pest populations exceed established economic threshold levels.

Table 4.8 presents the pest-specific IPM programme for major pests anticipated within the Eruwa ATC and associated value chains.

**Table 4.8: Pest-Specific Integrated Pest Management Programme for Eruwa ATC**

| Pest Category | Major Pest Species | Affected Crop/Facility | Economic Threshold/Action Level | IPM Control Measures | Responsible Parties | Monitoring Frequency |
|---|---|---|---|---|---|---|
| Insect Pest | Fall Armyworm (Spodoptera frugiperda) | Maize | ≥20% of plants infested | Early planting; field scouting; destruction of egg masses; biological control agents; selective pesticide application where necessary | Farmers, Extension Officers, ATC Management | Weekly |
| Insect Pest | Stem Borers (Busseola spp.) | Maize, Sorghum | ≥10% stem damage observed | Crop rotation; removal of crop residues; resistant varieties; biological control; targeted pesticide application | Farmers, Extension Officers | Bi-weekly |
| Insect Pest | Aphids (Aphid spp.) | Vegetables, Legumes | Colonization of young plants or economic threshold reached | Resistant varieties; biological predators (ladybird beetles); field sanitation; selective pesticides | Farmers, Extension Officers | Weekly |
| Insect Pest | Termites | Cassava, Stored Produce, Structures | Visible infestation or crop damage | Destruction of termite mounds; field sanitation; biological control; approved termiticides when necessary | Farmers, Facility Managers | Monthly |

| Pest Category | Major Pest Species | Affected Crop/Facility | Economic Threshold/Action Level | IPM Control Measures | Responsible Parties | Monitoring Frequency |
|---|---|---|---|---|---|---|
| Insect Pest | Grasshoppers | Vegetables and Field Crops | Visible economic damage | Early detection; mechanical collection; habitat management; approved pesticides when required | Farmers | Weekly |
| Weed Pest | Broadleaf Weeds | All Crops | Weed cover >20% of field area | Hand weeding; mulching; cover cropping; crop rotation; selective herbicides | Farmers | Bi-weekly |
| Weed Pest | Grasses and Sedges | All Crops | Weed competition affecting crop growth | Mechanical weeding; cover crops; proper spacing; selective herbicides where necessary | Farmers | Bi-weekly |
| Plant Disease | Cassava Mosaic Disease | Cassava | Presence of infected plants | Use of certified disease-free planting materials; removal of infected plants; resistant varieties | Farmers, Extension Officers | Monthly |
| Plant Disease | Maize Streak Virus | Maize | Disease incidence >10% | Resistant varieties; vector control; crop rotation; field sanitation | Farmers, Extension Officers | Monthly |
| Plant Disease | Fungal Leaf Spots and Blights | Vegetables and Cereals | Disease symptoms affecting >10% of plants | Improved spacing; sanitation; biological fungicides; approved fungicides where required | Farmers | Bi-weekly |
| Storage Pest | Weevils (Sitophilus spp.) | Stored Grains | Evidence of infestation in storage facilities | Hermetic storage; proper drying; warehouse sanitation; approved grain protectants | Storage Operators, Farmers | Monthly |
| Storage Pest | Moths | Stored Produce | Visible infestation | Improved storage structures; sanitation; monitoring traps; approved protectants | Storage Operators | Monthly |
| Storage Pest | Rodents (Rats and Mice) | Warehouses and Stores | Rodent signs observed | Trapping; sanitation; rodent-proof structures; bait stations | Facility Managers, Farmers | Monthly |
| Storage Pest | Moulds and Mycotoxins | Stored Grains | Moisture content exceeds recommended limits | Proper drying; ventilation; moisture monitoring; removal of contaminated produce | Storage Operators | Monthly |
| Public Health Pest | Mosquitoes | Communities, Water Bodies | Standing water or mosquito breeding sites identified | Drainage improvement; environmental sanitation; larval source management; approved vector control measures | Community Leaders, Health Authorities, ATC Management | Quarterly |
| Public Health Pest | Houseflies | Markets, Processing Areas | Increased fly nuisance or infestation | Proper waste management; sanitation; fly traps; environmental hygiene campaigns | Facility Managers, Community Associations | Monthly |

| Pest Category | Major Pest Species | Affected Crop/Facility | Economic Threshold/Action Level | IPM Control Measures | Responsible Parties | Monitoring Frequency |
|---|---|---|---|---|---|---|
| Public Health Pest | Rodents | Communities and Public Facilities | Evidence of infestation | Community sanitation; waste management; trapping; targeted rodent control programmes | Community Associations, Health Authorities | Quarterly |

**Implementation Requirements**

The following principles shall guide implementation of the Pest-Specific IPM Programme:

1. Pest surveillance and monitoring shall be undertaken before any pesticide application.
2. Chemical control shall only be used when economic threshold levels have been exceeded.
3. Preference shall be given to biological, cultural, and mechanical control measures.
4. Only pesticides registered by NAFDAC and approved under the project shall be utilized.
5. WHO Class IA and IB pesticides shall be prohibited.
6. Monitoring records shall be maintained by farmers, extension officers, warehouse operators, and ATC management.
7. Monitoring results shall be incorporated into quarterly environmental and social safeguard reports.

The Pest-Specific IPM Programme shall be reviewed annually to accommodate emerging pest threats, climate variability, changes in cropping systems, and lessons learned during implementation.

### 4.6.4 Approved and Prohibited Pesticides for Eruwa ATC

To ensure compliance with the Federal Government of Nigeria regulations, NAFDAC registration requirements, FAO International Code of Conduct on Pesticide Management, WHO Hazard Classification System, African Development Bank (AfDB) Integrated Safeguards System, and World Bank Environmental and Social Standard (ESS) 3, only approved pesticides shall be used under the Eruwa Agricultural Transformation Centre (ATC) Project.

The project shall prioritize Integrated Pest Management (IPM) approaches and promote biological, cultural, and mechanical control measures. Chemical pesticides shall only be used where pest populations exceed established economic threshold levels and where non-chemical control methods are insufficient.

**Table 4.9: Approved Pesticides for Use under Eruwa ATC**

| Active Ingredient | WHO Hazard Classification | Target Pest | Typical Application Rate* | Remarks |
|---|---|---|---|---|
| Lambda-cyhalothrin | Class II (Moderately Hazardous) | Armyworms, Aphids, Caterpillars | As per manufacturer label | Restricted to trained applicators |
| Cypermethrin | Class II | Insect pests | As per label recommendation | Use only under IPM programme |
| Emamectin Benzoate | Class III (Slightly Hazardous) | Fall Armyworm, Caterpillars | As per label recommendation | Preferred selective insecticide |
| Spinosad | Class III | Caterpillars, Thrips | As per label recommendation | Environmentally preferred option |
| Bacillus thuringiensis (Bt) | Unlikely to Present Acute Hazard | Caterpillars and Lepidopteran pests | As per manufacturer specification | Preferred biological pesticide |
| Neem-based Biopesticides (Azadirachtin) | Unlikely to Present Acute Hazard | Multiple insect pests | As recommended | Preferred biological option |
| Metalaxyl + Mancozeb | Class III | Fungal diseases | As recommended | Use only when disease threshold is exceeded |
| Copper-based Fungicides | Class III | Fungal and bacterial diseases | As recommended | Controlled application required |
| Glyphosate | Class III | Annual and perennial weeds | As recommended | Spot treatment preferred |
| Pendimethalin | Class III | Pre-emergence weed control | As recommended | Restricted to trained operators |
| Aluminium Phosphide** | Class II | Storage pests | As recommended by certified fumigator | Use only by licensed personnel |

*Actual application rates shall follow NAFDAC-approved product labels and manufacturers' recommendations.

**Use restricted to certified fumigation personnel under controlled conditions.

**Prohibited Pesticides**

The project shall prohibit procurement, storage, transportation, distribution, or use of pesticides classified as Highly Hazardous Pesticides (HHPs), Persistent Organic Pollutants (POPs), or substances prohibited under Nigerian law and international conventions.

**Table 4.10: Prohibited Pesticides under Eruwa ATC**

| Active Ingredient | Classification/Basis for Prohibition | Status |
|---|---|---|
| Aldrin | Stockholm Convention POP | Prohibited |
| Dieldrin | Stockholm Convention POP | Prohibited |
| Endrin | Stockholm Convention POP | Prohibited |
| Chlordane | Stockholm Convention POP | Prohibited |
| Heptachlor | Stockholm Convention POP | Prohibited |
| Toxaphene | Stockholm Convention POP | Prohibited |
| Mirex | Stockholm Convention POP | Prohibited |
| Lindane | POP/Hazardous Pesticide | Prohibited |
| DDT (except approved public health exemptions) | Stockholm Convention POP | Prohibited |
| Parathion | WHO Class IA | Prohibited |
| Ethyl Parathion | WHO Class IA | Prohibited |
| Methyl Parathion | WHO Class IA | Prohibited |
| Monocrotophos | WHO Class IB | Prohibited |
| Aldicarb | WHO Class IA | Prohibited |
| Phosphamidon | WHO Class IA | Prohibited |
| Methamidophos | WHO Class IB | Prohibited |
| Any unregistered pesticide | NAFDAC Regulation | Prohibited |
| Any counterfeit pesticide | NAFDAC Regulation | Prohibited |
| Any pesticide banned by FMEnv, NAFDAC, NESREA or international conventions ratified by Nigeria | Regulatory Requirement | Prohibited |

The list shall be reviewed annually to ensure alignment with evolving national and international regulatory requirements.

### 4.6.4 Pesticide Procurement and Quality Assurance Procedures

The Eruwa ATC shall establish and maintain a pesticide procurement and quality assurance system to ensure that all pesticides utilized under the project are genuine, effective, traceable, and compliant with regulatory requirements.

**Procurement Principles**

The following principles shall govern pesticide procurement under the project:

i. Preference shall be given to non-chemical pest management approaches in accordance with the project's Integrated Pest Management (IPM) strategy.
ii. Procurement of pesticides shall only occur where pest monitoring confirms that economic threshold levels have been exceeded.
iii. Only pesticides approved under the project's approved pesticide list shall be procured.
iv. Procurement shall be undertaken only through licensed and NAFDAC-approved suppliers, distributors, or agro-dealers.
v. Procurement of WHO Class IA and IB pesticides shall be strictly prohibited.

**Supplier Qualification Requirements**

All pesticide suppliers shall satisfy the following minimum requirements:

- Valid NAFDAC registration and licensing.
- Evidence of product registration certificates.
- Demonstrated compliance with pesticide handling regulations.
- Availability of Safety Data Sheets (SDS).
- Ability to provide traceability documentation for supplied products.

Suppliers failing to meet these requirements shall not be eligible to supply pesticides to the project.

**Product Verification Procedures**

Before acceptance of any pesticide consignment, the following verification procedures shall be undertaken:

**Table 4.11: Product verification and requirement**

| Verification Item | Requirement |
|---|---|
| Product Registration | Must possess valid NAFDAC registration |
| Product Label | Complete label in English language |
| Active Ingredient | Must correspond with approved pesticide list |
| Batch Number | Clearly indicated |
| Manufacturing Date | Clearly indicated |
| Expiry Date | Minimum remaining shelf-life of 12 months |
| Packaging Integrity | No damage, leakage, or tampering |
| Safety Data Sheet | Must accompany shipment |

Any pesticide failing verification shall be rejected and returned to the supplier.

**Inventory and Batch Tracking System**

A pesticide inventory management system shall be established to ensure full traceability of products from procurement to final use.

Records shall include:

- Product name.
- Active ingredient.
- Batch number.
- Supplier details.
- Date of procurement.
- Quantity received.
- Quantity issued.
- User or application location.
- Remaining stock balance.
- Expiry date.

Inventory records shall be maintained by designated ATC personnel and reviewed monthly.

**Shelf-Life Management**

To prevent accumulation of obsolete pesticides:

- Products with less than 12 months shelf-life shall not be procured.

- First-Expiry-First-Out (FEFO) inventory management shall be applied.
- Quarterly inventory audits shall be conducted.
- Expired products shall be removed immediately and managed as hazardous waste.

**Storage Requirements**

All procured pesticides shall be stored in dedicated pesticide storage facilities that meet the following requirements:

- Secure and lockable structures.
- Adequate ventilation.
- Impermeable flooring.
- Spill containment measures.
- Fire extinguishers and emergency response equipment.
- Restricted access to authorized personnel only.
- Separate storage from food, feed, seeds, fertilizers, and water sources.

**Quality Assurance Monitoring**

The Environmental and Social Safeguards Officer, Extension Services Unit, and ATC Management shall undertake quarterly inspections to verify compliance with procurement and quality assurance procedures.

Inspection findings shall be documented and incorporated into quarterly PMP monitoring reports.

### 4.6.3 Safe Use Protocols

#### 4.6.3.1 Implementation Strategy

The PMP will be executed in three phases:

1. Phase I (0–12 months): Capacity building, awareness, institutional setup, and initial monitoring tools.
2. Phase II (1–3 years): Demonstration of IPM practices, biological control introduction, and establishment of disposal systems.
3. Phase III (3–5 years): Consolidation, monitoring expansion, and policy integration into Agro-Hub operations.

#### 4.6.3.2 Implementation Matrix

**Table 4.12: Implementation agencies for the PMP strategy**

| Thematic Area | Action Steps | Lead Institution | Timeline | Expected Outcome |
|---|---|---|---|---|
| Farmer Training & Capacity Building | Conduct IPM training, safe pesticide handling, and field demonstrations | Oyo ADP / ATC / NGOs | Continuous | 80% of farmers trained in IPM within 3 years |
| Safe Chemical Management | Enforce approved pesticide lists; establish safe storage facilities; promote PPE | ATC / NAFDAC / NESREA | Short-term | Reduced exposure and poisoning incidents |
| Biological and Cultural Controls | Introduce neem-based biopesticides, crop rotation, and resistant varieties | IAR&T / NIHORT / ADP | Medium-term | Reduced dependence on hazardous chemicals |
| Waste Management | Develop pesticide container collection points; organize awareness on reuse risks | ATC / LGAs | Medium-term | 70% reduction in unsafe disposal |
| Monitoring and Reporting | Maintain pesticide usage logs; collect soil/water samples | ATC / FMARD / NESREA | Continuous | Reliable data for environmental oversight |
| Community Sensitization | Conduct radio programs, posters, and school outreach | LGAs / NGOs / Media | Continuous | Enhanced community awareness |

### 4.6.4 Emergency Preparedness and Response Plan (EPRP)

The Eruwa ATC shall establish and maintain an Emergency Preparedness and Response Plan (EPRP) to address pesticide-related incidents that may result in harm to workers, communities, property, water resources, or the environment.

**Table 4.12: Pesticide Emergency Response and Incident Management Framework**

| Emergency Scenario | Immediate Response Action | Responsible Person | Required Equipment | Reporting Timeline |
|---|---|---|---|---|
| Chemical Spill | Stop source, isolate area, prevent spread | Farm Supervisor | Spill kit, absorbent materials | Immediate |
| Pesticide Exposure (Skin) | Remove contaminated clothing, wash affected area | First Aider | Clean water, soap | Immediate |
| Pesticide Exposure (Eyes) | Flush eyes with clean water for 15 minutes | First Aider | Eye wash station | Immediate |
| Inhalation Exposure | Move victim to fresh air | First Aider | Respiratory PPE | Immediate |
| Ingestion/Poisoning | Refer victim immediately to health facility | Medical Personnel | First aid kit | Immediate |
| Fire in Chemical Store | Evacuate personnel and activate fire response | Store Manager | Fire extinguishers | Immediate |
| Water Contamination Incident | Stop pesticide operations and notify authorities | Environmental Officer | Spill containment equipment | Within 24 Hours |

**Emergency Contact Chain**

1. Site Supervisor
2. ATC Management
3. Environmental and Social Safeguards Officer
4. Local Health Facility
5. Oyo State Ministry of Environment

6. NAFDAC/NESREA where applicable

All incidents shall be documented using the project's Incident Reporting Form and investigated within 48 hours.

### 4.6.5 Occupational Health Surveillance and Medical Monitoring Programme

To protect farmers, pesticide applicators, storage personnel, and other workers from occupational exposure to pesticides, the project shall establish a medical surveillance programme.

**Table 4.13: Occupational Health Surveillance Programme**

| Activity | Target Group | Frequency | Responsibility |
|---|---|---|---|
| Pre-employment Medical Examination | Spray Operators | Before assignment | ATC Management |
| General Medical Examination | Workers handling pesticides | Annually | Designated Health Facility |
| Health Screening | Farmers and Applicators | Every 6 Months | Health Officer |
| Respiratory Assessment | Spray Operators | Annually | Medical Personnel |
| Incident Recording | All Personnel | Continuous | Supervisors |
| Exposure Investigation | Affected Personnel | As Required | Safeguards Officer |
| Medical Referral | Exposed Personnel | Immediate | Health Facility |

**Monitoring Indicators**

- Number of workers medically screened.
- Number of pesticide-related illnesses.
- Number of exposure incidents recorded.
- Percentage of workers receiving annual medical examinations.

### 4.6.6 Pest Resistance Management Programme

The project shall implement a Pest Resistance Management Programme to prevent the development of resistance among target pest populations.

**Table 4.14: Pest Resistance Management Matrix**

| Management Measure | Description | Frequency | Responsibility |
|---|---|---|---|
| Rotation of Active Ingredients | Alternate active ingredients with different modes of action | Every Season | Farmers/Extension Officers |
| Rotation of Pesticide Classes | Avoid repeated use of same chemical class | Continuous | Farmers |
| Biological Control | Promote natural enemies and biopesticides | Continuous | Extension Officers |
| Cultural Control | Crop rotation and sanitation | Every Season | Farmers |
| Resistance Monitoring | Monitor reduction in pesticide effectiveness | Quarterly | Extension Officers |
| Record Keeping | Maintain pesticide application records | Continuous | Farmers |

Indicators shall include:

- Reduction in repeated pesticide applications.
- Number of farms adopting resistance management.
- Evidence of pest susceptibility trends.

### 4.6.7 Water Quality Monitoring Programme

**Overview**

The Eruwa Agricultural Transformation Centre (ATC) is located within a sensitive hydrological environment that includes the Eruwa Dam and associated water treatment facilities supplying potable water to surrounding communities. Given the potential risk of contamination arising from pesticide handling, storage, transportation, application, and disposal, a dedicated Water Quality Monitoring Programme shall be implemented throughout the project lifecycle.

The programme is designed to detect and prevent deterioration of surface water and groundwater quality resulting from project-related pest management activities and to ensure compliance with national environmental regulations and AfDB safeguard requirements.

**Objectives**

The objectives of the Water Quality Monitoring Programme are to:

i. Protect the Eruwa Dam and associated water resources from pesticide contamination.

ii. Monitor trends in water quality throughout project implementation.

iii. Provide early warning of pollution incidents.

iv. Ensure compliance with FMEnv, NESREA, and AfDB environmental requirements.

v. Support adaptive management and corrective actions where necessary.

**Monitoring Locations**

Water quality monitoring shall be undertaken at:

- Upstream locations of the Eruwa Dam.
- Downstream locations of the Eruwa Dam.
- Water abstraction points.
- Drainage channels receiving agricultural runoff.
- Groundwater sources within the project area.
- Any additional environmentally sensitive locations identified during implementation.

**Table 4.15: Water Quality Monitoring Programme**

| Parameter | Purpose | Monitoring Frequency | Responsibility |
|---|---|---|---|
| pH | Assess acidity/alkalinity | Quarterly | Environmental Officer |
| Electrical Conductivity | Assess dissolved salts | Quarterly | Environmental Officer |
| Nitrate | Assess fertilizer and agrochemical pollution | Quarterly | Accredited Laboratory |
| Phosphate | Assess nutrient enrichment | Quarterly | Accredited Laboratory |
| Dissolved Oxygen | Assess ecological health | Quarterly | Environmental Officer |
| Biological Oxygen Demand (BOD) | Assess organic pollution | Quarterly | Accredited Laboratory |

| Parameter | Purpose | Monitoring Frequency | Responsibility |
|---|---|---|---|
| Pesticide Residues | Detect pesticide contamination | Quarterly | Accredited Laboratory |
| Heavy Metals | Assess contamination risks | Quarterly | Accredited Laboratory |
| Turbidity | Assess sediment pollution | Quarterly | Environmental Officer |

**Reporting Requirements**

Monitoring results shall be documented in quarterly environmental monitoring reports and submitted to ATC Management, OYSADA, and relevant regulatory agencies. Exceedances shall trigger immediate investigation and corrective actions.

### 4.6.8 Pesticide Waste and Container Management Procedure

**Overview**

Improper disposal of pesticide containers and pesticide wastes constitutes a significant environmental and public health risk. To prevent contamination of soil, water resources, agricultural produce, and communities, the Eruwa ATC shall implement a structured pesticide waste and container management programme.

The procedure applies to all farmers, pesticide applicators, storage operators, contractors, and project personnel involved in pesticide handling.

**Management Objectives**

The objectives are to:

- Prevent environmental contamination.
- Eliminate unsafe reuse of pesticide containers.
- Promote safe collection and disposal.
- Ensure compliance with NAFDAC, NESREA, FMEnv and AfDB requirements.

### Triple-Rinse Procedure

Immediately after emptying a pesticide container:

1. Fill approximately one-quarter of the container with clean water.
2. Close the container securely.
3. Shake vigorously for at least 30 seconds.
4. Pour rinse water into the spray tank.
5. Repeat the process three times.
6. Puncture the container to prevent reuse.

Triple-rinse water shall always be returned to the spray mixture and applied to the target field.

### Container Collection and Storage

The project shall establish designated pesticide container collection points at:

- Central pesticide stores.
- Farmer aggregation centres.
- Agro-processing facilities.
- Warehouse facilities.

Collected containers shall be temporarily stored in secure, labelled holding areas pending final disposal.

**Table 4.16: Approved Disposal Methods**

| Waste Type | Disposal Method |
|---|---|
| Triple-rinsed plastic containers | Approved recycling facility |
| Contaminated containers | Licensed hazardous waste contractor |
| Pesticide residues | Hazardous waste disposal facility |
| Spill clean-up materials | Hazardous waste disposal facility |
| Expired pesticides | Managed under Obsolete Pesticide Procedure |

The following practices are strictly prohibited:

- Open burning.
- Burying containers.

- Disposal into water bodies.
- Reuse for domestic purposes.
- Sale of used pesticide containers.

**Waste Manifest and Record Keeping**

A waste tracking system shall be maintained for all pesticide-related wastes.

**Table 4.17: Pesticide Waste Tracking Register**

| Date | Waste Type | Quantity | Source | Destination | Responsible Officer |
|---|---|---|---|---|---|

Records shall be maintained for a minimum of five years and reviewed during environmental audits.

### 4.6.9 Obsolete and Expired Pesticide Management Procedure

**Overview**

Obsolete pesticides include expired products, banned pesticides, deteriorated formulations, unidentified chemicals, damaged pesticide containers, and products no longer approved for use. Improper management of such materials can pose serious risks to human health, biodiversity, soil resources, groundwater, and surface water systems.

This procedure establishes requirements for the identification, segregation, storage, reporting, and disposal of obsolete pesticides within the Eruwa ATC.

**Identification of Obsolete Pesticides**

The following products shall be classified as obsolete:

- Expired pesticides.
- Products with damaged packaging.
- Banned pesticides.
- Unlabelled chemicals.
- Unidentified pesticide products.
- Contaminated pesticide stocks.

- Products prohibited under national regulations.

**Chance Discovery Procedure**

Where unknown, unlabelled, or suspected obsolete pesticides are discovered:

**Step 1: Stop Work**

All activities in the affected area shall cease immediately.

**Step 2: Secure the Area**

Access shall be restricted to authorized personnel only.

**Step 3: Notify Authorities**

The following shall be notified immediately:

- Site Supervisor.
- Environmental and Social Safeguards Officer.
- ATC Management.
- Relevant regulatory authorities where necessary.

**Step 4: Preliminary Assessment**

A qualified officer shall assess:

- Product identity.
- Quantity.
- Packaging condition.
- Potential risks.

**Step 5: Temporary Storage**

Materials shall be moved, where safe to do so, into a secure hazardous materials storage area pending disposal.

**Disposal Requirements**

**Table 4.18: Obsolete Pesticide Response Framework**

| Type of Material | Required Action | Responsible Party |
|---|---|---|
| Expired pesticide | Remove from inventory and isolate | Store Manager |
| Banned pesticide | Immediate quarantine | Environmental Officer |
| Unknown chemical | Restrict access and investigate | Safeguards Officer |
| Damaged containers | Repackage where safe | Store Manager |
| Large obsolete stockpile | Notify regulatory authorities | ATC Management |

Final disposal shall be undertaken only through licensed hazardous waste contractors approved by relevant authorities.

**Inventory Audits**

To prevent accumulation of obsolete pesticides:

- Quarterly inventory inspections shall be conducted.
- First-Expiry-First-Out (FEFO) principles shall be applied.
- Inventory reconciliation shall be undertaken quarterly.
- Procurement shall be based on demonstrated need to avoid overstocking.

**Reporting**

All obsolete pesticide discoveries, investigations, and disposal actions shall be documented and incorporated into quarterly PMP monitoring reports and annual environmental performance reviews.

## 4.7 Monitoring and Evaluation Framework

### 4.7.1 Purpose and Overview

The Monitoring and Evaluation (M&E) framework for the Eruwa ATC Pest Management Plan (PMP) is designed to ensure systematic tracking of pest management activities, farmer behavior change, and environmental safety. The M&E framework for Eruwa must be tailored to address the community's critical risks: 100% interest in training, the extreme chemical dependency (Grammazone), the 89.29% reliance on the informal market, and the inconsistent PPE usage (35.71% sometimes). Given the previously noted low frequency of extension visits and the

immediate need for a shift away from hazardous practices, the framework emphasizes learning-by-doing, field-based monitoring, and progressive feedback mechanisms.

This system will provide the evidence base for improving Integrated Pest Management (IPM) adoption, minimizing pesticide risks, and ensuring compliance with World Bank ESS3 (Resource Efficiency and Pollution Prevention) and Nigeria's environmental regulations.

### 4.7.2 Objectives

- Track progress in IPM awareness and adoption among smallholder farmers.
- Monitor the reduction of unsafe pesticide practices and poisoning incidents.
- Assess improvements in PPE use, chemical handling, and disposal.
- Evaluate environmental performance through soil and water residue checks.
- Strengthen institutional accountability and adaptive learning mechanisms.

### 4.7.3 Key Indicators and Targets

This table (Table 4.9) presents the Monitoring and Evaluation (M&E) Framework for the Pest Management Plan (PMP) in Eruwa. It sets out baseline data and three-year performance targets across a range of indicators. The framework clearly defines the monitoring frequency and the responsible institutions for tracking progress in crucial areas, including farmer training and knowledge application (% of farmers trained in IPM and using scouting), health and safety (PPE compliance and poisoning reports), and environmental quality (soil residue and container disposal), institutional performance (PMP committee meetings), and socioeconomic impact (% reduction in pesticide expenditure).

**Table 4.19: Pest Management Plan (PMP) Monitoring and Evaluation Framework: Baseline, Targets, and Responsibilities**

| Indicator Category | Indicator | Baseline (Eruwa) | Target (3 years) | Monitoring Frequency | Responsible Institution |
|---|---|---|---|---|---|
| Training & Awareness | % of farmers trained in IPM | 100% interested (but only 60.71% formally trained) | ≥95% | Quarterly | Oyo ADP / Eruwa ATC IPM Desk |

| Indicator Category | Indicator | Baseline (Eruwa) | Target (3 years) | Monitoring Frequency | Responsible Institution |
|---|---|---|---|---|---|
| Knowledge Application | % of farmers using scouting/economic thresholds before spraying | <10% (Reactive, chemical-first response) | ≥60% | Biannual | Extension Officers |
| Health & Safety | PPE compliance among applicators | 64.29% always / 35.71% sometimes | ≥95% | Biannual | NESREA / ADP |
| | Pesticide poisoning reports | Not formally tracked (likely underreported) | ≤3% | Annual | LGA Health Desk / Eruwa ATC |
| Environmental Quality | Soil pesticide residue levels (Grammazone/ Paraquat) | Extreme Risk (72.73% usage) | Below FAO/WHO limit | Annual | NESREA / FMARD |
| | Safe disposal of pesticide containers (ATC collection system use) | 28.57% unsafe disposal admission (no formal system) | ≥80% of containers collected | Quarterly | Eruwa ATC / LGA |
| Institutional Performance | PMP committee meetings held | Ad hoc | 4 per year | Quarterly | Eruwa ATC Management |
| | HHP Phase-Out Success (% reduction in Grammazone use) | 72.73% reliance on Grammazone | ≥50% reduction via certified | Biannual | Eruwa ATC / NAFDAC |

| Indicator Category | Indicator | Baseline (Eruwa) | Target (3 years) | Monitoring Frequency | Responsible Institution |
|---|---|---|---|---|---|
| | | | alternatives | | |
| Socioeconomic Impact | % reduction in certified chemical expenditure | 33.33% report high cost | ≥20% reduction via IPM/Biopesticides | Annual | ADP / Eruwa ATC |
| | Biopesticide/Safer Input Adoption Rate | 2.08% (Biopesticide use) | ≥30% | Annual | Eruwa ATC / Extension Unit |

### 4.7.4 Monitoring Approach

- Participatory Monitoring: Farmers and field officers collect and validate data through demonstration plots.
- Environmental Sampling: Conducted annually for soil and water testing at key farm clusters.
- Health Data Tracking: Local health centers compile pesticide-related illness reports.
- Supervision: The Eruwa ATC IPM Committee compiles reports quarterly and submits them to Oyo ADP and FMARD.

### 4.7.5 Reporting Mechanism

- Monthly Field Logs maintained by extension staff.
- Quarterly PMP Reports shared with NESREA and Oyo ADP.
- Annual Environmental Report summarizing monitoring results, lessons learned, and recommendations.

### 4.7.6 Expected Outcomes

- Regular tracking of pesticide uses and safety compliance.

- Data-driven decision-making for pest management.
- Reduced poisoning incidents and improved PPE use.
- Stronger linkages between extension services, health, and environment units.

## 4.8 Capacity Building and Training Plan

### 4.8.1 Context and Rationale

The pest management challenges in Eruwa stem from an extreme dependency on a single Highly Hazardous Pesticide (HHP)-Grammazone, coupled with a lack of safe alternatives and a systemic failure in the input supply chain. Farmers are highly commercially-oriented but face high costs (33.33%) and report high costs) and declining chemical effectiveness (23.81%) challenge. Crucially, while 60.71% of farmers have received some formal training, there is a unanimous (100%) interest in IPM training, indicating that current instruction is insufficient to address critical safety and sustainability gaps. The capacity-building plan must therefore be highly targeted, focusing on HHP substitution, safety enforcement for hired labour, and leveraging the (100%) demand for knowledge adoption through hands-on learning, frequent retraining, and local demonstration sites at the Eruwa ATC.

### 4.8.2 Training Objectives

- Build farmers' understanding of pest identification and non-chemical control.
- Improve safe pesticide handling, mixing, and PPE use.
- Strengthen extension officers' capacity to deliver IPM support.
- Introduce youth and women to biological pest management opportunities.

### 4.8.3 Target Groups

- Smallholder farmers (men and women)
- Youth and farmer-based associations
- Local pesticide applicators
- Input dealers and cooperative leaders
- Extension staff and health officers

### 4.8.4 Training Content and Modules

This table (Table 4.20) outlines the training curriculum designed to equip participants with essential knowledge and practical skills for effective and safe Pest Management Practices. The

modules cover everything from the fundamentals of IPM and pest identification to safe pesticide use, health protocols, and environmental responsibility.

**Table 4.20: Pest Management Plan (PMP) Training Curriculum: Modules, Focus Areas, and Delivery Methods**

| Module | Key Focus | Delivery Method |
|---|---|---|
| IPM Fundamentals | Principles, thresholds, and ecosystem balance | 2-day workshop |
| Pest Identification | Field recognition and scouting | Field demo |
| Safe Pesticide Use | Calibration, label reading, mixing | Practical sessions |
| PPE Use | Demonstration and proper maintenance | Hands-on |
| First Aid & Poisoning | Emergency response | Health officer session |
| Safe Disposal | Collection and reuse prevention | Community meeting |
| Biological & Cultural Methods | Neem, crop rotation, and resistant varieties | Field demo |
| Record Keeping | Spray logs, PHI tracking | Group training |

### 4.8.5 Delivery Approach

- Farmer Field Schools (FFS): Core learning platform, seasonal and interactive.
- Extension-Led Refresher Courses: Conducted biannually by ADP and Eruwa ATC staff.
- Lead Farmer Model: Trained farmers mentor peers to sustain outreach.
- Mobile Learning: SMS alerts and WhatsApp advisory groups.

### 4.8.6 Institutional Responsibilities

- Oyo ADP: Coordination, curriculum design, and ToT.
- Eruwa ATC IPM Unit: Implementation, monitoring, and record keeping.
- NESREA: Environmental and safety training.
- Health Department: First-aid and poisoning awareness.

### 4.8.7 Expected Outcomes

- ≥80% of farmers adopt IPM within 3 years.

- 90% PPE compliance during pesticide use.
- At least 50% reduction in unsafe container disposal.
- Youth and women integrated into IPM learning networks.
- Local trainers established within Eruwa ATC for sustainability.

### 4.8.8 PMP Roles and Responsibilities Matrix

The successful implementation of the Pest Management Plan (PMP) requires coordinated participation of project institutions, regulatory agencies, extension services, contractors, farmers, agro-processors, and community stakeholders.

**Table 4.21: PMP Roles and Responsibilities Matrix**

| Activity | Lead Responsibility | Supporting Institutions | Frequency |
|---|---|---|---|
| Pest surveillance and monitoring | Extension Officers | Farmers, ATC Management | Continuous |
| Implementation of IPM measures | Farmers | Extension Services | Continuous |
| Farmer training and awareness programmes | OYSADA/SAPZ PMU | Ministry of Agriculture | Quarterly |
| Procurement of approved pesticides | ATC Management | Procurement Unit | As Required |
| Verification of pesticide quality | Environmental Officer | NAFDAC | Quarterly |
| Storage inspections | Store Manager | Safeguards Officer | Monthly |
| Water quality monitoring | Environmental Officer | Accredited Laboratory | Quarterly |
| Medical surveillance | Health Officer | Designated Hospitals | Biannually |
| Pesticide waste management | Safeguards Officer | Contractors | Continuous |
| Emergency response coordination | ATC Management | Community Authorities | As Required |
| Environmental audits | Safeguards Officer | External Consultants | Annually |
| PMP performance reporting | PMU Safeguards Unit | All Stakeholders | Quarterly |

The SAPZ Project Management Unit shall have overall responsibility for coordination, supervision, monitoring and reporting of PMP implementation.

## 4.9 Budget and Financing Plan

### 4.9.1 Overview

The estimated budget for the Eruwa PMP is ₦28 million, reflecting the smaller farm size, lower training coverage, and weaker institutional capacity. The budget directly addresses the critical risks

identified in the Eruwa PMP including low knowledge of IPM, unsafe chemical handling, absence of disposal systems, and inadequate monitoring infrastructure.

Findings from Eruwa show:

- 74% of farmers have received some training, but mostly chemical-use focused.
- 25% of respondents reported acute poisoning, mostly hired sprayers.
- 58% rely primarily on chemicals, and paraquat and Sniper are common.
- Unsafe disposal (burning, reuse) and absence of collection systems persist.
- Biodiversity and pollinator decline observed.

These conditions justify immediate investments in training, PPE, monitoring, and waste management as outlined below.

### 4.9.2 Detailed PMP Implementation Budget and Justification

Effective implementation of the Pest Management Plan (PMP) requires adequate financial resources to support monitoring, capacity building, occupational health and safety, environmental protection, waste management, and regulatory compliance activities. The budget presented below has been developed to ensure that all proposed mitigation, monitoring, and institutional strengthening measures are implemented throughout the project lifecycle.

The total implementation budget as presented in the table below for the implementation of the PMP annually is Fifty Million and Fifty Thousand Naira Only (₦50,050,000) which is equivalent to Thirty One Thousand, Two Hundred and Eighty Five dollars only (US$31,285)

For budgeting purposes, an exchange rate of ₦1,600 = US$1 has been adopted. The exchange rate shall be reviewed periodically and adjusted where necessary.

**Table 4.22: Detailed PMP Implementation Budget and Justification**

| Activity | Description/Justification | Annual Cost (₦) | Annual Cost (US$) |
|---|---|---|---|
| Pest Surveillance and Monitoring | Routine pest scouting, pest incidence mapping, field inspections, and data collection across project sites | 4,500,000 | 2,813 |
| Farmer IPM Training and | Capacity building for farmers, extension officers, and agro-processors on | 8,000,000 | 5,000 |

| Activity | Description/Justification | Annual Cost (₦) | Annual Cost (US$) |
|---|---|---|---|
| Awareness Programmes | Integrated Pest Management (IPM), safe pesticide use, and environmental protection | | |
| Demonstration Farms and Farmer Field Schools | Establishment and operation of demonstration plots to promote adoption of IPM technologies and alternatives to chemical pesticides | 5,000,000 | 3,125 |
| Procurement of Personal Protective Equipment (PPE) | Provision and replacement of PPE for pesticide applicators, field workers, and storage personnel | 6,000,000 | 3,750 |
| Water Quality Monitoring Programme | Quarterly monitoring of Eruwa Dam and surrounding water resources for pesticide residues and water quality parameters | 4,500,000 | 2,813 |
| Occupational Health Surveillance Programme | Medical examinations, health screening, exposure assessments, and occupational health monitoring of pesticide handlers | 3,500,000 | 2,188 |
| Emergency Preparedness and Response Activities | Emergency drills, spill response equipment, first aid materials, and emergency awareness programmes | 2,500,000 | 1,563 |
| Pesticide Storage Inspection and Compliance Monitoring | Inspection of pesticide stores, inventory management, compliance checks, and regulatory monitoring | 1,500,000 | 938 |
| Pesticide Waste and Container Management Programme | Container collection, temporary storage, transportation, recycling, and disposal activities | 3,000,000 | 1,875 |
| Obsolete Pesticide Management Programme | Inventory audits, segregation, storage, handling, and disposal of expired or banned pesticides | 1,500,000 | 938 |
| Environmental and Compliance Audits | Periodic audits to assess PMP implementation effectiveness and compliance with AfDB, FMEnv, NESREA, and NAFDAC requirements | 3,000,000 | 1,875 |
| PMP Monitoring, Reporting and Documentation | Preparation of quarterly and annual PMP monitoring reports and documentation of implementation progress | 2,500,000 | 1,563 |
| Contingency (10%) | Provision for inflation, unforeseen activities, emergency interventions, and additional monitoring requirements | 4,550,000 | 2,844 |
| **TOTAL** | | **₦50,050,000** | **US$31,285** |

**Budget Justification**

The proposed budget is intended to ensure effective implementation of the Pest Management Plan and compliance with AfDB Integrated Safeguards System (ISS), national environmental regulations, and international best practices in pesticide management.

Key cost drivers include:

1. **Capacity Building and Training:** Continuous training is required to improve farmer awareness of IPM, reduce dependence on chemical pesticides, and strengthen safe pesticide handling practices.
2. **Environmental Monitoring:** Given the proximity of the Eruwa ATC to the Eruwa Dam and associated potable water infrastructure, regular water quality monitoring is essential to prevent contamination of surface and groundwater resources.
3. **Occupational Health and Safety:** Provision of PPE and medical surveillance is necessary to reduce risks associated with pesticide exposure among farmers, applicators, and workers.
4. **Waste Management and Pollution Prevention:** Dedicated resources are required for safe collection, transportation, recycling, and disposal of pesticide containers and obsolete pesticides.
5. **Emergency Preparedness:** Spill response, fire response, and pesticide poisoning incidents require adequate preparedness and response capacity.
6. **Monitoring and Compliance:** Periodic inspections, audits, and reporting are required to ensure continuous compliance with AfDB safeguard requirements and national regulatory standards.

The budget shall be reviewed annually and updated where necessary to reflect inflation, implementation experience, project expansion, and emerging pest management requirements.

### 4.9.3 Funding Sources

- Primary: Eruwa ATC operational funds under the Oyo State Ministry of Agriculture support.

- Co-Financing: Oyo ADP and NESREA through extension and environmental monitoring programs.
- Partners: NGOs and private agro dealers for awareness campaigns and PPE donations.

#### 4.9.4 Expected Outcomes

- Increase in IPM training coverage from 34% → ≥80%.
- Reduction in unsafe disposal by ≥70%.
- Reduction in poisoning incidents by ≥50%.
- Establishment of the first community-based pesticide container collection system in Eruwa.
- Improved soil and water monitoring capacity integrated into ESMP reporting.

### 4.10 Institutional Arrangements and Implementation Structure

#### 4.10.1 Overview

The successful implementation of the Eruwa ATC Pest Management Plan (PMP) depends on an effective and coordinated institutional arrangement that connects policy oversight with grassroots enforcement and farmer training. The current structure in Eruwa is characterized by extreme chemical dependency (58.33%) reliance), a near-complete failure of the supply chain (89.29%) reliance on the local market), and weak regulatory presence.

This framework focuses on strengthening local institutions, building technical capacity, and ensuring regulatory compliance through closer collaboration between federal, state, and community-level stakeholders to specifically mitigate the high-risk practices of the community.

#### 4.10.2 Implementation Structure

##### 4.10.2.1 Federal Level

1. Federal Ministry of Agriculture and Rural Development (FMARD):
    - Provides national coordination and oversight of pest management activities under ESS3 and the National Pesticide Policy.
    - Supports Oyo ADP through funding, capacity building, and monitoring.
    - Reviews quarterly implementation reports submitted by the ATC and State Ministry.
2. National Agency for Food and Drug Administration and Control (NAFDAC):
    - Regulates registration, importation, and quality control of pesticides.

- Ensures that only approved products are distributed to Eruwa ATC farmers.
- Coordinates with FMARD to phase out banned chemicals such as Paraquat and Sniper.

3. National Environmental Standards and Regulations Enforcement Agency (NESREA):
   - Provides technical oversight on environmental safety and pollution control.
   - Periodically monitors soil and water samples in and around the ATC.
   - Supports enforcement of safe disposal and pesticide waste management standards.

#### 4.10.2.2 State Level

1. Oyo State Ministry of Agriculture and Rural Development (OYOMARD):
   - Integrates PMP activities into state agricultural policies and programs.
   - Ensures budgetary support and supervision of ADP-led interventions.
   - Organizes annual stakeholder coordination meetings for monitoring progress.
2. Oyo State Agricultural Development Programme (Oyo ADP):
   - Leads field-level implementation, particularly farmer training and monitoring.
   - Deploys extension agents to coordinate Farmer Field Schools (FFS) within the ATC cluster.
   - Maintains pesticide use records and submits periodic performance reports.

#### 4.10.2.3 Agro Hub/Community Level

1. Eruwa ATC Management Unit:
   - Serves as the operational centre for PMP activities, coordinating all training, awareness, and environmental monitoring.
   - Hosts the IPM Desk, responsible for data collection, record keeping, and logistics.
   - Oversees establishment of chemical storage facilities and container collection points.
   - Conducts quarterly meetings to evaluate performance with local farmer representatives.
2. Local Government Authorities (LGAs):
   - Support community sensitization and enforcement of environmental and health standards.
   - Facilitate linkage with local health facilities for pesticide poisoning surveillance.
   - Partner with NESREA on waste collection and disposal.
3. Farmer Associations and Cooperatives:
   - Actively participate in peer learning, demonstration activities, and safe handling initiatives.
   - Report cases of pesticide misuse or poisoning to the ATC management.

Encourage compliance with IPM practices and safe container disposal.

#### 4.10.2.4 Technical/Research Partners

1. Institute of Agricultural Research and Training (IAR&T) and NIHORT will:
    - Provide pest surveillance data and field-based technical support.
    - Develop locally adapted IPM modules for Eruwa's major crops (maize, cassava, yams, and vegetables).
    - Offer technical training for ADP staff and lead farmers.
2. NGOs and Private Partners:
    - Collaborate on community sensitization, PPE distribution, and capacity building.
    - Promote gender-sensitive and youth-led approaches in pest management.

#### 4.10.2.5 Coordination and Reporting

- The Eruwa ATC IPM Officer will compile monthly activity reports from extension agents.
- Reports are validated by Oyo ADP and submitted quarterly to FMARD and NESREA.
- An Annual PMP Review Workshop will assess progress, share lessons, and realign implementation priorities.

#### 4.10.2.6 Grievance Redress Mechanism (GRM)

A community-based GRM will be established to:

- Receive and resolve complaints regarding pesticide exposure, contamination, or unfair practices.
- Escalate unresolved issues to the State Ministry of Agriculture and FMARD.
- Maintain confidentiality, fairness, and transparency throughout the process.

#### 4.10.2.7 Institutional Strengthening Priorities

- Training of extension agents as certified IPM facilitators.
- Provision of monitoring tools and PPE for field inspections.
- Strengthening collaboration with NAFDAC to eliminate counterfeit products.
- Regular refresher courses for ATC and ADP personnel.

#### 4.10.2.8 Expected Outcomes

- Functional coordination between FMARD, ADP, and the ATC.

- Enhanced institutional accountability in pesticide regulation.
- Reduction in unsafe practices through improved local oversight.
- Empowered farmer cooperatives serving as IPM champions.

### 4.10.3 PMP Implementation Schedule

Implementation of the PMP shall occur throughout the project lifecycle and shall be integrated into routine project operations.

**Table 4.23: PMP Implementation Schedule**

| Activity | Pre-Construction | Construction | Year 1 Operation | Year 2 Operation | Year 3 Operation |
|---|---|---|---|---|---|
| PMP Disclosure and Awareness | ✓ | | | | |
| Farmer IPM Training | ✓ | ✓ | ✓ | ✓ | ✓ |
| Pest Monitoring and Surveillance | | ✓ | ✓ | ✓ | ✓ |
| Procurement of Approved Pesticides | | ✓ | ✓ | ✓ | ✓ |
| PPE Distribution | | ✓ | ✓ | ✓ | ✓ |
| Water Quality Monitoring | | ✓ | ✓ | ✓ | ✓ |
| Medical Surveillance | | | ✓ | ✓ | ✓ |
| Emergency Response Drills | | ✓ | ✓ | ✓ | ✓ |
| Waste Management Programme | | ✓ | ✓ | ✓ | ✓ |
| Obsolete Pesticide Inspections | | ✓ | ✓ | ✓ | ✓ |
| Storage Facility Inspections | | ✓ | ✓ | ✓ | ✓ |
| Environmental Audits | | | ✓ | ✓ | ✓ |
| PMP Performance Reporting | | ✓ | ✓ | ✓ | ✓ |
| PMP Review and Update | | | | ✓ | ✓ |

The PMP implementation schedule shall be reviewed annually and revised where necessary to reflect operational realities, emerging pest risks, regulatory updates, and lessons learned during implementation.

# CHAPTER FIVE: SUMMARY AND RECOMMENDATIONS FOR IPM AND ESMP INTEGRATION

## 5.1 Overview and Current Knowledge Levels

The farming system in Eruwa is dominated by older, commercially-oriented producers facing significant pest pressures across a mix of crops (cassava, cocoa, maize, yam, and vegetables). The community shows extreme chemical use (58.33% relying on chemical sprays) and an overwhelming reliance on the local, informal market (89.29%) for pesticide procurement, while institutional and technical support remain weak. Farmers possess a moderate understanding of common pests but rely on a single, highly hazardous chemical, indicating a critical lack of awareness regarding Integrated Pest Management (IPM) principles, chemical resistance, and the full scope of health/environmental risks of misuse.

This knowledge gap persists despite a massive opportunity: 100.00% of farmers expressed strong interest in IPM training, indicating a unanimous readiness for change. Information flow is currently constrained by occasional and irregular extension visits. The survey findings from Eruwa reveal shared challenges and unique opportunities in pest management (Table 5.1).

**Table 5.1: Baseline Survey Data and Implications for IPM/ESMP Integration (Eruwa)**

| Parameter | Eruwa Data | Implication |
|---|---|---|
| Dominant Gender | 90% male, 10% female | Highly male-dominated agriculture with limited female participation in direct pesticide handling and management decisions. |
| Age Distribution | 71% above 46 years | Aging farmer population: limited youth involvement threatens the sustainability of IPM adoption and labour supply. |
| Farm Size | 46% cultivate above 10 acres | Commercially-oriented and medium-to-large-scale farming demands professional, not subsistence, management solutions. |
| Training Coverage | 60.71% trained by the government | Inconsistent institutional support (irregular visits) despite the government being the main trainer; requires capacity building and multi-stakeholder support. |

| Parameter | Eruwa Data | Implication |
|---|---|---|
| Main Crops | Cassava, Cocoa, Maize, Yam, Vegetables | Supports a diverse, integrated cropping system vulnerable to multiple pest and disease pressures; demands flexible, crop-specific IPM. |
| Pest Severity | 50% rated pest problems serious/very serious | Farmers perceive substantial pest issues, correlated with rising input costs and resistance. |
| Pesticide Use | 58.33% rely on chemical sprays | Extreme dependence on agrochemicals, primarily one HHP (Grammazone); requires immediate regulation and transition support. |
| PPE Compliance | 64.29% always, 35.71% sometimes | Critical occupational health risk due to one-third of applicators (likely hired labour) using PPE inconsistently. |
| Container Disposal (Safe) | 71.43% safe (self-reported) | Unsafe practices (burying/burning) persist alongside open dumping; this requires a formal collection system. |
| Interest in IPM Training | 100% interested | Unanimous readiness for capacity enhancement, providing a massive opportunity for the Eruwa ATC. |

## 5.2 Key Implications for Pest Management and ESMP Implementation

The current practices in Eruwa present several critical challenges that the Environmental and Social Management Plan (ESMP) must directly address:

a. Environmental and Occupational Safety: Eruwas' pest control practices present extreme environmental and health risks due to the overwhelming reliance on a single Highly Hazardous Pesticide (HHP), Grammazone, and the fact that 35.71% of applicators use PPE only sometimes. The dependence on hired labor means the occupational risk is outsourced and high. Unsafe disposal of containers by 28.57% of farmers further contaminates soil and water. The ESMP must therefore prioritize the introduction of strict pesticide handling protocols, subsidized PPE distribution, and intensive, mandatory awareness programs to reduce occupational hazards and prevent contamination.

b. Knowledge Gaps and Institutional Support: Despite the high government training figure (60.71%), irregular extension visits constrain farmers' ability to apply IPM principles effectively. This results in reactive pest control decisions, often relying on chemical vendors. The high priority placed on training on IPM (30.43%) reinforces the technical knowledge deficit. Strengthening extension presence and integrating practical, consistent IPM learning into Eruwa ATC operations are critical for informed decision-making.
c. Socio-Economic Vulnerabilities: The farming population is predominantly older and male. The 90% reliance on hired labor for application highlights a potential labor shortage vulnerability and shifts the health risk burden entirely to contract workers. Addressing these vulnerabilities through labor-specific safety protocols and gender-sensitive, youth-inclusive capacity-building programs will ensure the long-term sustainability of the sector.
d. Overdependence on Chemicals and Supply Chain Risk: Farmers demonstrate extreme overdependence on chemicals (58.33% use chemical sprays), sourced almost entirely from informal markets (89.29%). This dependency, coupled with the 23.81% citing declining effectiveness, heightens the risks of counterfeit products, misuse, and rapid pest resistance. The high prioritization of "access to biopesticides" (21.74%) shows a strong desire for alternatives. Integrating biological and cultural pest control methods will help reduce the chemical load and promote ecosystem health.
e. Weak Waste Management and Disposal Systems: Unsafe disposal of empty pesticide containers remains a critical concern, with 28.57% of farmers admitting to non-compliant practices. This creates ongoing risks of environmental contamination. Establishing a structured collection and disposal system facilitated by the Eruwa ATC is necessary to mitigate these pervasive risks.
f. Crop and Pest Diversity Eruwa’s mixed farming system encompassing cassava, cocoa, maize, yam, and vegetables exposes the area to multiple pest species. This diversity demands crop-specific IPM solutions, combining pest surveillance, resistant varieties, and cultural practices suited to the local context.

### 5.3 Recommendations for IPM and ESMP Integration

To leverage the 100% farmer interest and address the critical risks, the following integrated actions must be implemented through the Eruwa ATC's ESMP framework:

i. **Strengthen Institutional Capacity and Farmer Training**

- Conduct regular farmer field schools and workshops on IPM and safe HHP use.
- Incorporate practical demonstrations on biological and cultural control methods, leveraging the high interest in biopesticides (21.74%).

ii. **Promote Safe Pesticide Management**

- Enforce procurement from certified agrochemical dealers only to bypass the 89.29% reliance on local markets.
- Implement a clear pesticide handling and locked storage protocol under the ESMP, focusing on hired labour safety.
- Facilitate access to PPE through subsidized Eruwa ATC channels to eliminate the 35.71% who use it sometimes.

iii. **Encourage Biological and Cultural Control**

- Prioritize the supply and promotion of biopesticides and natural pest control products, aligning with the 21.74% demand.
- Establish IPM demonstration plots to showcase the viability of non-chemical approaches.

iv. **Establish Eruwa ATC-Based Support Mechanisms**

- Create an IPM advisory desk at the Eruwa ATC for pest alerts and technical guidance.
- Set up pesticide container collection points for safe disposal and recycling to address the risk posed by 28.57% unsafe disposal.
- Use the ATC as a certified centre for the distribution of quality inputs and farmer training.

v. **Integrate IPM into ESMP Monitoring and Support Research**

- Include IPM adoption indicators (training participation, consistent PPE use, safe disposal) in routine ESMP reporting.
- Establish a local pest surveillance database to track infestations and the declining performance of existing pesticides.

vi. **Enhance Gender and Youth Participation**

- Engage youth and women as IPM facilitators through training and small-scale enterprise development (e.g., PPE supply, biopesticide production).

- Integrate gender inclusion targets into all Eruwa ATC training and monitoring frameworks.

## 6.0 Conclusion

In general Eruwa farmers operate under conditions of extreme chemical risk and economic vulnerability, marked by the single-chemical dominance, high input costs, and an unregulated supply chain. However, their 100% interest in training and high demand for biopesticides present a major opportunity for transformation. Embedding IPM within the Eruwa ATC's ESMP framework will promote safer, knowledge-driven pest management, strengthen environmental protection, and effectively transition the community from chemically dependent practices to a more sustainable model, enhancing long-term farmer livelihoods.

## 6.1 Summary of Key Findings

The Eruwa ATC survey highlights critical weaknesses in pest management systems:

- High chemical cost and inconsistent availability.
- Low training coverage (34%) and limited knowledge of IPM.
- Poor PPE compliance and lack of first-aid preparedness.
- Unsafe disposal of containers and weak environmental protection.
- Minimal institutional coordination and monitoring capacity.

However, there is strong farmer interest (87%) in IPM training and willingness to adopt safer, more sustainable pest control measures.

## 6.2 Strategic Priorities for Implementation

- Institutional Strengthening: Build ADP and ATC capacity to deliver IPM training and monitoring.
- Health and Environmental Safety: Promote full PPE use and proper pesticide storage and disposal.
- Capacity Building: Expand Farmer Field Schools and conduct regular community sensitization.
- Monitoring and Evaluation: Implement continuous data collection and environmental residue testing.

- Policy Linkages: Align local implementation with national pesticide control and ESS3 standards.

### 6.3 Sustainability Outlook

The PMP in Eruwa will transition the community from chemical dependence to integrated, environmentally friendly pest management. Through continuous training, strong institutional collaboration, and data-driven implementation, Eruwa will establish a model ATC for sustainable smallholder pest management.

### 6.4 Next Steps

- Establish and equip the Eruwa IPM Desk.
- Initiate baseline environmental monitoring and data collection.
- Conduct training-of-trainers (ToT) for ADP and lead farmers.
- Launch awareness campaigns on PPE use and safe disposal.
- Hold the first Annual PMP Review Workshop within the next project year.

It can be concluded that Eruwa ATC's PMP represents a vital opportunity to improve productivity while safeguarding health and the environment. With targeted training, robust institutional support, and regulatory oversight, Eruwa can achieve sustainable pest management practices that serve as a replicable model for other farming clusters in Oyo State.

**REFERENCES**


1 World Health Organization – The WHO Recommended Classification of Pesticides by Hazard and Guidelines to Classification (2019 edition, published 2020). WHO. The WHO Recommended Classification of Pesticides by Hazard and Guidelines to Classification. 2019 edition. Geneva: WHO; 2020. WHO Act 2020

2 World Bank – Environmental & Social Framework (ESF) (including ESS3) & Safeguard Policies (OP 4.09). World Bank. Environmental and Social Framework. Washington, DC: The World Bank; 2016 (approved). World Bank policy on Environment and hazardous chemicals

2 Food and Agriculture Organization of the United Nations (FAO) / WHO – International Code of Conduct on Pesticide Management (2014). Food and Agriculture Organization of the United Nations & WHO. The International Code of Conduct on Pesticide Management. Rome: FAO; 2014. FAO Code of Conduct on Pesticides

3 Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal (1989). United Nations. Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal. Basel, 22 March 1989. Basel convention on pesticides and harmful chemicals

4 Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade (1998). United Nations. Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade, with Annexes. Rotterdam, 10 September 1998.

5 Stockholm Convention on Persistent Organic Pollutants (2001). United Nations. Stockholm Convention on Persistent Organic Pollutants (POPs). Adopted 22 May 2001; entered into force 17 May 2004

6 Lallas, Peter L. (2001). "The Stockholm Convention on Persistent Organic Pollutants". American Journal of International Law. **95** (3): 692–708. doi:10.2307/2668517.

7 ILO Convention No. 184 (Safety and Health in Agriculture). International Labour Organization. Safety and Health in Agriculture Convention, 2001 (No. 184). Adopted 21 June 2001; entered into force 20 Sept 2003. ILO convention on health and environment

8 African Development Bank (AfDB) – Integrated Safeguards System (ISS): Operational Safeguard OS 3 (Resource Efficiency & Pollution Prevention) African Development Bank

Group. Integrated Safeguards System (ISS) – Policy Statement and Operational Safeguards. Approved 2013 (operational 2014). OS3: Resource Efficiency & Pollution Prevention. AfDB Integrated safeguard system

9 AfDB – Integrated Safeguards System (ISS): Operational Safeguard OS 4 (Community Health, Safety & Security). African Development Bank Group. Integrated Safeguards System (ISS) – Policy Statement and Operational Safeguards. OS4: Community Health, Safety & Security. AfDB policy statement on environment

10 Environmental Impact Assessment Act No. 86 of 1992 (Nigeria). Federal Republic of Nigeria. Environmental Impact Assessment Act No. 86 of 1992.

11 National Environmental Standards and Regulations Enforcement Agency (NESREA) – Establishment Act, 2007. Federal Republic of Nigeria. National Environmental Standards and Regulations Enforcement Agency (Establishment) Act, 2007.

12 NAFDAC Act (Cap N1 LFN 2004) & Pesticide Registration Regulations (2019. Federal Republic of Nigeria. National Agency for Food & Drug Administration and Control (NAFDAC) Act, Cap N1 LFN 2004. Federal Republic of Nigeria. NAFDAC Pesticide Registration Regulations 2019.

13 Factories Act (Cap F1 LFN 2004). Federal Republic of Nigeria. Factories Act, Cap F1 LFN 2004.

14 Harmful Wastes (Special Criminal Provisions) Act No. 42 of 1988 (Nigeria)

15 Federal Republic of Nigeria. Harmful Wastes (Special Criminal Provisions) Act No. 42 of 1988.

16 National Policy on Environment (Revised 2016) (Nigeria)

17 Federal Republic of Nigeria. National Policy on Environment (Revised 2016).

18 Federal Ministry of Agriculture and Food Security (FMAFS) – Policies

19 Federal Republic of Nigeria. Federal Ministry of Agriculture and Food Security Policies (various policy documents).

20 Oyo State Roadmap for accelerated Development 2019- 2023

21 FAO (2017). Integrated pest management of major pests and diseases in Eastern Europe and the Caucasus. Food and Agriculture Organization.

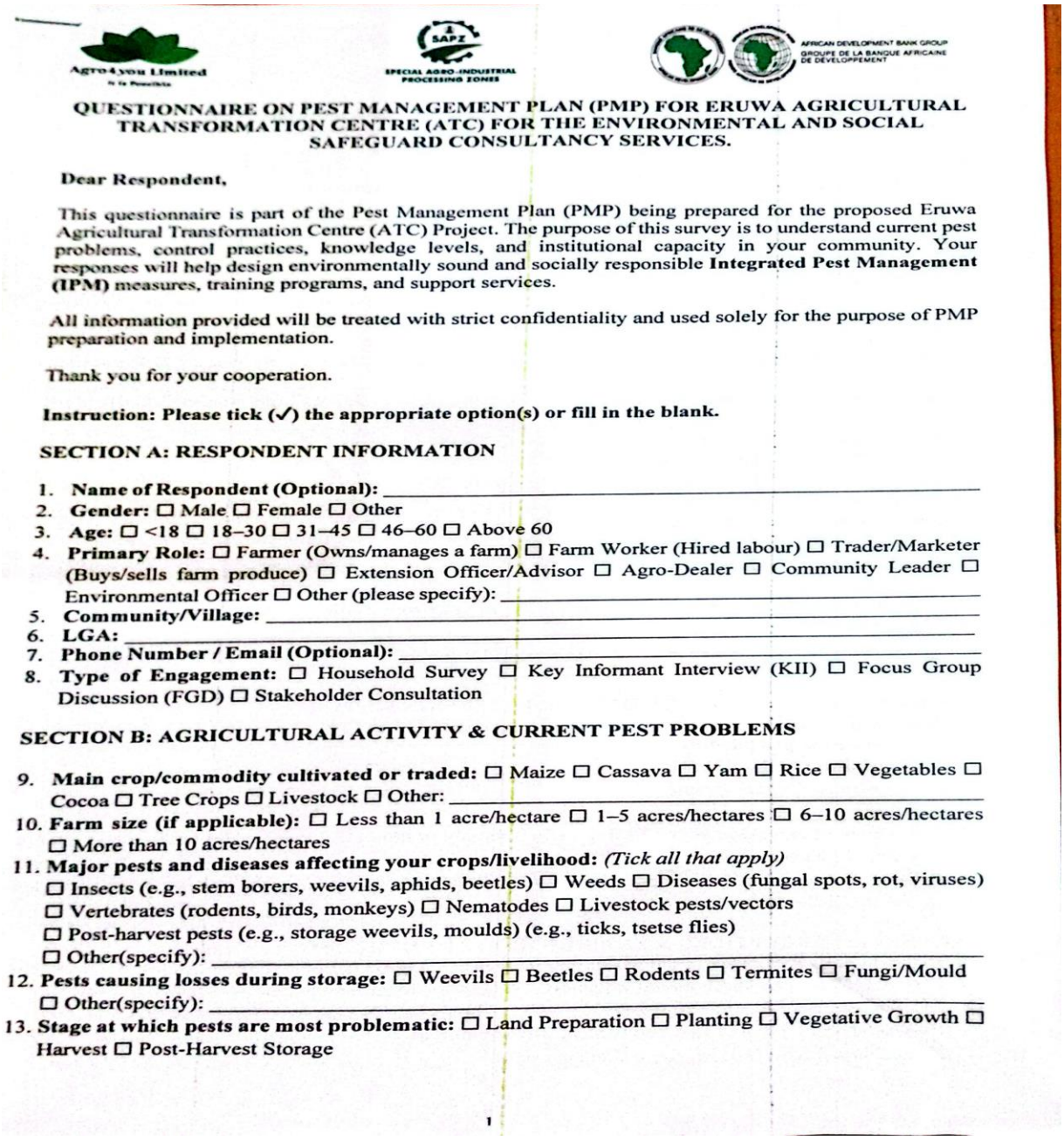
22 Federal Environmental Protection Agency (1994). Environmental impact assessment procedure for Nigeria, 19pp.

23 Canadian Centre for Occupational Health and Safety: Hazard and Risks. Canadian Policy on hazards and risks.

24 Shekhar, C., Khosya, R., Thakur, K., Mahajan, D., Kumar, R., Kumar, S., Sharma, A.K. (2024). A systematic review of pesticide exposure, associated risks, and long-term human health impacts. Toxicology Reports. 13: 101840. https://doi.org/10.1016/j.toxrep.2024.101840.

## ANNEXES

**Annex 1: Sample of the Structured Questionnaire administered to farmers and stakeholders during the field assessment for the Pest Management Plan (PMP), Eruwa ATC.**



Agro4you Limited

SAPZ
SPECIAL AGRO-INDUSTRIAL PROCESSING ZONES

AFRICAN DEVELOPMENT BANK GROUP
GROUPE DE LA BANQUE AFRICAINE DE DEVELOPPEMENT

**QUESTIONNAIRE ON PEST MANAGEMENT PLAN (PMP) FOR ERUWA AGRICULTURAL TRANSFORMATION CENTRE (ATC) FOR THE ENVIRONMENTAL AND SOCIAL SAFEGUARD CONSULTANCY SERVICES.**

**Dear Respondent,**

This questionnaire is part of the Pest Management Plan (PMP) being prepared for the proposed Eruwa Agricultural Transformation Centre (ATC) Project. The purpose of this survey is to understand current pest problems, control practices, knowledge levels, and institutional capacity in your community. Your responses will help design environmentally sound and socially responsible **Integrated Pest Management (IPM)** measures, training programs, and support services.

All information provided will be treated with strict confidentiality and used solely for the purpose of PMP preparation and implementation.

Thank you for your cooperation.

**Instruction: Please tick (✓) the appropriate option(s) or fill in the blank.**

**SECTION A: RESPONDENT INFORMATION**

1. **Name of Respondent (Optional):** _____
2. **Gender:** ☐ Male ☐ Female ☐ Other
3. **Age:** ☐ <18 ☐ 18–30 ☐ 31–45 ☐ 46–60 ☐ Above 60
4. **Primary Role:** ☐ Farmer (Owns/manages a farm) ☐ Farm Worker (Hired labour) ☐ Trader/Marketer (Buys/sells farm produce) ☐ Extension Officer/Advisor ☐ Agro-Dealer ☐ Community Leader ☐ Environmental Officer ☐ Other (please specify): _____
5. **Community/Village:** _____
6. **LGA:** _____
7. **Phone Number / Email (Optional):** _____
8. **Type of Engagement:** ☐ Household Survey ☐ Key Informant Interview (KII) ☐ Focus Group Discussion (FGD) ☐ Stakeholder Consultation

**SECTION B: AGRICULTURAL ACTIVITY & CURRENT PEST PROBLEMS**

9. **Main crop/commodity cultivated or traded:** ☐ Maize ☐ Cassava ☐ Yam ☐ Rice ☐ Vegetables ☐ Cocoa ☐ Tree Crops ☐ Livestock ☐ Other: _____
10. **Farm size (if applicable):** ☐ Less than 1 acre/hectare ☐ 1–5 acres/hectares ☐ 6–10 acres/hectares ☐ More than 10 acres/hectares
11. **Major pests and diseases affecting your crops/livelihood:** *(Tick all that apply)*
    ☐ Insects (e.g., stem borers, weevils, aphids, beetles) ☐ Weeds ☐ Diseases (fungal spots, rot, viruses)
    ☐ Vertebrates (rodents, birds, monkeys) ☐ Nematodes ☐ Livestock pests/vectors
    ☐ Post-harvest pests (e.g., storage weevils, moulds) (e.g., ticks, tsetse flies)
    ☐ Other(specify): _____
12. **Pests causing losses during storage:** ☐ Weevils ☐ Beetles ☐ Rodents ☐ Termites ☐ Fungi/Mould
    ☐ Other(specify): _____
13. **Stage at which pests are most problematic:** ☐ Land Preparation ☐ Planting ☐ Vegetative Growth ☐ Harvest ☐ Post-Harvest Storage

1

Agro4you Limited

SAPZ SPECIAL AGRO-INDUSTRIAL PROCESSING ZONES

AFRICAN DEVELOPMENT BANK GROUP GROUPE DE LA BANQUE AFRICAINE DE DEVELOPPEMENT

14. **Severity of pest infestation in your area:** ☐ Very Serious ☐ Serious ☐ Moderate ☐ Minor ☐ None
15. **Changes in pest problems over time:** ☐ Getting worse ☐ Getting better ☐ No change

**SECTION C: PEST CONTROL PRACTICES**

16. **Current pest control methods used (tick all that apply):**
    - ☐ Chemical Sprays (Pesticides, Insecticides, Herbicides)
    - ☐ Manual/Mechanical (e.g., handpicking, weeding)
    - ☐ Traditional/Local Remedies (e.g., plant extracts, ash)
    - ☐ Biological Control (natural predators, neem extracts)
    - ☐ Cultural Practices (e.g., crop rotation, early planting, clearing residues)
    - ☐ Resistant Seeds/Varieties
    - ☐ Traps/Barriers
    - ☐ None (I do not actively control pests)
17. **Specific chemical products used most often (e.g., Sniper, Gramoxone):** _____
18. **Where pesticides/pest control products are sourced:** ☐ Local Market ☐ Agro-dealer ☐ Cooperative ☐ Extension Office ☐ Other: _____
19. **Who applies pesticides on your farm:** ☐ Self ☐ Family Members ☐ Hired Labourers ☐ Extension Officer ☐ Commercial Applicator
20. **Use of protective clothing when applying chemicals:** ☐ Yes, always ☐ Yes, sometimes ☐ No, never
21. **Storage of pesticides before use:** ☐ Locked storage area ☐ Open/near food ☐ I do not use pesticides
22. **Disposal of empty pesticide containers:**
    - ☐ Safe disposal (buried/returned to seller)
    - ☐ Unsafe disposal (burning, throwing in trash, reusing for water/food)
    - ☐ I do not use chemicals
23. **Known cases of pesticide poisoning or misuse in your community:** ☐ Yes ☐ No ☐ Don't Know
    If yes, briefly describe: _____
24. **Use of natural or biological pest control methods (e.g., neem, predators, trap crops):** ☐ Yes ☐ No
    If yes, specify: _____

**SECTION D: KNOWLEDGE, TRAINING & EXTENSION SUPPORT**

25. **Have you received any training on pest management?** ☐ Yes ☐ No
26. **If yes, training provided by:**
    - ☐ Government (ADP/Extension)
    - ☐ NGO/Development Project
    - ☐ Cooperative/Farmer Group
    - ☐ Agro-dealer/Pesticide Seller
    - ☐ Other: _____
27. **Frequency of extension visits:** ☐ Regularly (monthly or more) ☐ Occasionally (a few times a year) ☐ Rarely ☐ Never
28. **Interest in receiving training on IPM and safe pesticide use:** ☐ Very Interested ☐ Somewhat Interested ☐ Not Interested

**SECTION E: PERCEPTIONS & ENVIRONMENTAL CONCERNS**

29. **Biggest challenges faced in controlling pests (select up to three):**
    - ☐ Cost – Chemicals/tools are too expensive
    - ☐ Knowledge – Unsure of best methods
    - ☐ Effectiveness – Pests seem resistant
    - ☐ Labour – Not enough workers or time
    - ☐ Availability – Hard to find good chemicals/alternatives
    - ☐ Health/Safety – Concern about chemical risks

Agro4you Limited

SAPZ
SPECIAL AGRO-INDUSTRIAL PROCESSING ZONES

AFRICAN DEVELOPMENT BANK GROUP
GROUPE DE LA BANQUE AFRICAINE DE DEVELOPPEMENT

30. **Perceived health risks associated with pesticide use in your community:** ☐ Very Serious ☐ Serious ☐ Moderate ☐ Low ☐ Not Sure
31. **Environmental effects noticed after pesticide use (e.g., dead fish, fewer bees, contaminated water):** ☐ Yes ☐ No ☐ Not Sure If yes, describe: _____
32. **Priority services the Agro-centre should provide (select up to three):**
    - ☐ Training on Integrated Pest Management (IPM)
    - ☐ Subsidized or group purchase of chemical pesticides
    - ☐ Access to biopesticides (natural alternatives)
    - ☐ Access to improved/safer storage facilities
    - ☐ Better and more regular extension support
    - ☐ Safe disposal of empty pesticide containers

**SECTION F: SUGGESTIONS & FOLLOW-UP**

33. **Suggestions for better pest control in your community:** (e.g., cooperative spraying, training, local herb use, safer chemicals, etc.) _____

34. **Would you like to be contacted for follow-up or training?** ☐ Yes ☐ No
If yes, provide contact: _____

**SECTION G: STAKEHOLDER CONSULTATION RECORD**

| Full Name | Gender | Role/Organization | Phone No. /Email Address | Signature/ Thumbprint | Photo (Yes/No) |
|---|---|---|---|---|---|
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

**Venue:** _____
**Date:** ____ / ____ / _____
**Type of Consultation:** ☐ FGD ☐ Interview ☐ Meeting ☐ Workshop ☐ Others _____
**Key Issues Raised:** _____
**Recommendations/Follow-Up Actions:** _____

Thank you for your response.

Annex 2: **Attendance Record of Respondents. Documentation showing the list and photographs of participants (farmers, community members, and stakeholders) engaged during the primary data collection for the Pest Management Plan (PMP).**

Agro4you Limited
It is Possible

SAPZ
SPECIAL AGRO-INDUSTRIAL PROCESSING ZONES

AFRICAN DEVELOPMENT BANK GROUP
GROUPE DE LA BANQUE AFRICAINE DE DEVELOPPEMENT

| | Full Name | Gender | Organization Role | Phone No. | Email Address | Signature/ Thumbprint | Photo (Yes/No) |
|---|---|---|---|---|---|---|---|
| 1 | Oludare Idowu | Male | | 08059283698 | | | |
| 2 | Okedare Gbade | " | | 08155411637 | | | |
| 3 | Hon Kayi Ojo | " | | 08077382455 | | | |
| 4 | Hon Adeyemi O. | male | | 07051552296 | | | |
| 5 | Dn. Ajayi O. D. | male | | 08024201513 | | | |
| 6 | Ogunlade E.O | male | | 08054188466 | E.O Ogun | | |
| 7 | Alayande Zara ~~Adebimpe Alayande~~ | Female ~~Female~~ | | 08024118891 | SA | | |
| 8 | Adeola Adedeji | Male | | 08056168638 | | | |
| 9 | Pelusa Babatunde | male | | 08054534747 | A.O. Ikeja | | |
| 10 | Babalola Peter | M | | 07050767787 | | | |
| 11 | Salami Abudu (Chief) | M | | 08037866804 | A-T Salami | | |
| 12 | Jimoh FASASI AJANAKU | M | | 07062312394 07048252280 | | | |
| 13 | Awofunde Sunday | M | | 08167992183 | | | |
| 14 | Azeez Dauda | M | | 08027637880 | Dauda | | |
| 15 | Okeleye Emmanuel O | M | | 09069976080 | | | |
| 16 | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |

Agro4you Limited
is to Possible

SAPZ
SPECIAL AGRO-INDUSTRIAL PROCESSING ZONES

AFRICAN DEVELOPMENT BANK GROUP
GROUPE DE LA BANQUE AFRICAINE DE DEVELOPPEMENT

| | Full Name | Gender | Organization Role | Phone No. | Email Address | Signature/ Thumbprint | Photo (Yes/~~No~~) |
|---|---|---|---|---|---|---|---|
| 1 | Falowo Kayode | M | Settlers Ass chairmen | 08089417903 | | | |
| 2 | Adelesole Felix | M | Settlers Ass v/c chairman | 07039789666 | | | |
| 3 | Adelakinfunmi | M | Ass. Sec. | 07056931253 | | | |
| 4 | Jire Fabian | M | Settler | 07086803210 | | | |
| 5 | Dn. Saokole | M | Settler | 08054302039 | | | |
| 6 | Adedoyin Kemi | M | Settler | 08057738364 | | | |
| 7 | Gbadebo Oluwadare | M | " | 08153611637 | | | |
| 8 | Hon Yemisi O,o | M | " | 2807753245 | | | |
| 9 | DN. Ajayi O. Daniel | M. | settler | 08024201513 | | | |
| 10 | Oludare Idowu | M | settler | 08059288638 | | | |
| 11 | Hon. Adeyemi O. | M | " | 07051552296 | | | |
| 12 | Ogunwale E. O | M | " | 08056188466 | | | |
| 13 | KOLAWOLE JOSEPH O | M | Settler | 08027875626 | | | |
| 14 | Tijani Rachael A | F | Settler | 07052243481 | | | |
| 15 | Mr. James Iroko | M | settler | 08059756196 | | | |
| 16 | Taibat Alimi | F | Settler | 08087403199 | | | |
| 17 | Alimi Kareem | M | Settler Farmer | 08050501609 | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |

Prof Azeez explaining project benefits and administration of questionnaires

Stakeholders being briefed on the questionnaires and their significance

Interaction and further explanation on questionnaires by the personnel

Settlers actively participating in the survey by completing the questionnaires

ANNEX 3: PESTICIDE INCIDENT REPORTING FORM

Project Name: _____

Date of Incident: _____

Time of Incident: _____

Location: _____

Reported By: _____

Type of Incident (Tick as applicable)

□ Pesticide Spill

□ Pesticide Poisoning

□ Fire

□ Environmental Contamination

□ Equipment Failure

□ Other (Specify) _____

Description of Incident:

Persons Affected:

Immediate Actions Taken:

Estimated Quantity of Pesticide Involved:

Environmental Impacts Observed:

Corrective Actions Recommended:

Reported to:

Signature: _____ Date: _____

Supervisor Signature: _____

ANNEX 4: CHEMICAL SPILL REPORTING FORM

Date of Spill: _____

Location: _____

Product Name: _____

Active Ingredient: _____

Estimated Quantity Released: _____

Cause of Spill:

Affected Area:

Containment Measures Undertaken:

□ Spill Isolated

□ Absorbent Material Applied

□ Contaminated Soil Removed

□ Water Source Protected

□ Other

Details:

Personnel Involved in Cleanup:

Follow-Up Actions Required:

Environmental Officer Signature:

## ANNEX 5: PESTICIDE STORAGE INSPECTION CHECKLIST

Facility Name: _____

Date of Inspection: _____

Inspector: _____

| Inspection Item | Yes | No | Remarks |
|---|---|---|---|
| Store locked and secure | | | |
| Warning signs displayed | | | |
| Adequate ventilation available | | | |
| Fire extinguisher available | | | |
| Spill kit available | | | |
| Inventory register updated | | | |
| Products labelled properly | | | |
| No expired pesticides observed | | | |
| PPE available | | | |
| No evidence of leakage | | | |
| Storage separated from food/feed | | | |

Overall Compliance Rating:

□ Satisfactory

□ Requires Improvement

□ Unsatisfactory