

Annex 8

Integrated Pest Management Plan (IPMP)

for

Nigeria for Women Project (NFWP) (P161364)



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Abbreviations & Acronyms

BP	Bank Policy
CBOs	Community Based Organizations
CDA	Community Development Associations
EA	Environmental Assessment
ESMP	Environmental and Social Management Plan
EIA	Environmental Impact Assessment
ESMF	Environmental and Social Management Framework
EPA	Environmental Protection Agency
FEPA	Federal Environmental Protection Agency
FGN	Federal Government of Nigeria
FMENV	Federal Ministry of Environment
FPMU	Federal Project Management Unit
GoN	Government of Nigeria
HSE	Health, Safety & Environment
IPMP	Integrated Pest Management Plan
LGAs	Local Government Authority
LGIU	Local Government Implementation Unit
MDAs	Ministries Department and Agencies
M&E	Monitoring & Evaluation
MoE	Ministry of Environment
MoWASD	Ministry of Women Affairs and Social Development
NEWMAP	Nigeria Erosion Watershed Management Project
NESREA	National Environmental Standards and Regulatory Enforcement
Agency	
NFWP	Nigeria for Women project
NGP	National Gender Policy
NGOs	Non-Governmental Organizations
PCN	Project Concept Notes
PDOs	Project Development Objectives
PIM	Project Implementation Manual
PIU	Project Implementation Unit
PMP	Pest Management Plan
POP	Persistent Organic Pollutants
PSRs	Project Supervision Reports
RAPs	Resettlement Action Plans
RPF	Resettlement Policy Framework
SPMU	State Project Management Unit
TOR	Terms of Reference
WAGs	Women Affinity Groups
WB	World Bank

Executive Summary

Background

The Integrated Pest Management Plan (IPMP) is prepared as an annex to the ESMF of the for Nigeria For Women project (NFWP) as a requirement of the Nigerian EIA laws and the World Bank Environmental and Social Safeguard Policies by which the activities of Component 2 “Improved Livelihoods for Women” triggered four out of the ten safeguard polices: Environmental Assessment (OP/BP4.01), **Pest Management (OP/BP4.09)**, Physical Cultural Resources (OP/BP 4.11), and Involuntary Resettlement (OP/BP4.12).

Project Description

Due to the activities to be supported under component 2.2 in particular, the project will support agricultural livelihoods and while it will not procure pesticides directly, beneficiaries may not acquire pesticides using productive grants provided by the project. The project is planned as a Federal program originated by the Ministry of Women’s Affairs and Social Development (MoWASD); however, it will be implemented at the State and Local Government levels.

Rational for the IPMP

The Integrated Pest Management (IPM) harmonizes the best practice approach from a combination of the best strategies of all control methods that pertain to a given concern created by the activities of pests.

Scope of IPMP

This IPMP covers the existing national and international legislations on the use of chemicals for pest management. It also assesses the Nigerian experience in pest management and capacity on integrated pest management approach. Other areas addressed by it include training and awareness for the public and users of pesticides on safety measures, description of pesticides banned for use in Nigeria as well as those approved for use. Specifically, it also identifies institutional responsibility with regards to mitigation measures and monitoring indicators to be observed in order to evaluate the performance and effectiveness of the IPMP.

Specific IPMP Objectives

- Assist the target State Governments; Abia, Kebbi, Edo, Taraba, Ogun and Niger States, to plan and design location specific IPM activities.
- Promote participatory approaches in IPM to learn, test, select and implement “best-bet” IPM options.
- Promote biodiversity monitoring to serve as early warning systems on pest status, alien invasive species, beneficial species, and migratory pests.
- Monitor and evaluate the benefits of IPM including its impact on the environment and health

Regulatory framework

There are some legislations and institutional framework in Nigeria that exist for the regulation of the distribution and use of pesticides in Nigeria. Such as:

- Nigerian Agricultural Policy (1988)
- National Policy on the Environment 1989
- Federal Environmental Protection Agency Act 58 of 1988 as amended by Decree 59 of 1992

- National Environmental Standards and Regulations Enforcement Agency (NESREA) Act 2007
- The National Agency for Food and Drug Administration and Control (NAFDAC)
- The Factories Act 1990
- The Harmful Wastes (Special Criminal Provision) Act 42 of 1988
- **International Conventions & Treaties Relevant to Pest Management in Nigeria**
- **The Rotterdam Convention**
- **Basel Convention**
- **World Bank OP 4.09**

Project Locations

The six States selected for this project are Edo, Ogun, Taraba, Niger, Abia and Kebbi States representing one each of the six geopolitical zones of Nigeria. Two States were chosen for public consultations from the six project selected States to enable a representation of the northern & southern parts of Nigeria. The States are Kebbi State, for the North and Abia State, for the South.

Pest Management Concerns And Control Measures In Nigeria

Pests and disease vectors constitute serious hazards to public health, food security and general welfare of the citizenry in Nigeria. It is estimated that agricultural pests destroy over half of the yield of crops, fruits, ornamental plants, vegetables and livestock annually. Household pests also destroy property such as furniture items, clothing, books, etc. Estimated cost of damage caused by pests runs into millions of Naira annually.

Pest and diseases Problems of Agriculture in Nigeria

Vectors transmit several diseases of public health importance in Nigeria. These diseases have resulted in depopulation of many fertile farming areas thus contributing significantly to food insecurity and poverty. Lassa fever and Yellow fever transmitted by *M. natalensis* (rats) and Aedes mosquitoes respectively have been reported to occur in epidemic proportions in some parts of Nigeria.

Control methods of pests and diseases in Nigeria

Pest management methods in Nigeria vary with the type of pests and agricultural activities undertaken. Most of the pest control operations in Nigeria today are by the use of pesticides. Pesticides were once seen as the only answer to most of the pest problems. Pest management controls used in Nigeria include:

- Cultural control
- Biological Control
- Chemical control

Assessment of Capacity of Nigeria on Integrated Pest Management

Many cultural practices and physical control measures to pest control are currently in use in Nigeria and have been for several farming generations, however, some of them have not provided sufficient and environmentally friendly options for pest management. For instance, bush burning as a way of controlling pest accelerates deforestation and loss of biodiversity and therefore should be discouraged.

Identification of Potentially Adverse Impacts of Pesticides

Pesticides are toxic substances released most times intentionally into our environment. This includes substances that kill weeds (herbicides), insects (insecticides), fungus (fungicides), rodents (rodenticides), and others.

Persistent Organic Pollutants (POPs)

Nigeria became a signatory to the Stockholm Convention on Persistent Organic Pollutants, In May 2001. This was ratified in 2004. Under Annex A (listed for Elimination) of the convention, Parties must take measures to **eliminate** the production and use of obsolete chemicals. These obsolete pesticides are characterized by a high persistence in the environment (e.g. half-life for DDT in soil ranges from 22 to 30 years, Toxaphene -14 years, Mirex -12 years, Dieldrin- 7 years, Chlordcone up to 30 years), low water solubility and thus potential to accumulate in fatty tissue of living organisms including humans and toxicity to both human and wildlife.

Pesticides and Human Health

Pesticides have been linked to a wide range of human health hazards, ranging from short-term impacts such as headaches and nausea to chronic impacts like cancer, reproductive abnormalities, and endocrine disruption.

Identification of Potential Environmental and Health Risks Associated with Pesticides

Potential adverse environmental and health risks of pesticides use that are of concern to the proposed for Women project may include:

Environmental Risks

Air Pollution - The vaporized form of sprayed pesticides will be released into the air, and if the chemical compound is very stable, the vapor can travel beyond the project intervention sites.

Soil contamination - Pesticides, which are used in agricultural land areas in and around the proposed ‘for Women’ agriculture beneficiary sites could enter soil during spraying resulting in wash-off or run-off into soil.

Surface and Groundwater Contamination - Generally, there are four major routes through which pesticides reach the water: they may drift outside of the intended area when sprayed, may percolate, or leach through soil, may be carried to the water as runoff, or may be spilled.

Harm to Non-target Species - The environmental impact of pesticides consists of the effects of pesticides on non-target species.

Health Risks

The health risks are from:

1. Direct inhalation
2. Potential Site-related Health Concerns

Impact Mitigation through IPMP

Integrated Pest Management (IPM) is an effective and environmentally sensitive approach to pest management that relies on a combination of multiple practices with a view to reduce reliance on the use of pesticides. More importantly, knowledge of biological, cultural and mechanical control measures that have been used in other agricultural programs in Nigeria is crucial. In comparison with traditional pesticide applications which pose immeasurable health

and environmental risks, and may result in severe current and future losses (environmental, public, health, occupational health, social and financial), an Integrated Pest Management Plan (IPMP) will be the most appropriate pest management approach for the proposed project. The IPMP for the For Women project will lay down mitigation measures, institutional responsibilities and capacity building needs.

IPMP Implementation and Management

The fundamental areas essential to the successful implementation of this IPMP are:

- Training & Capacity Strengthening - Measures that will ensure capacity building among stakeholders that will implement the IPMP
- Institutional Arrangements
- Monitoring Measures to ensure that POPs pesticides and WHO class I and II pesticides considered to be extremely/highly and moderately hazardous are not procured and/or used;
- Stakeholder Participation measures that will ensure that farmers get the relevant technical aids and education on the implementation of safe and alternative pest control measures rather than the use of chemicals.
- Measures that ensure that pest resistant varieties of the value chains are procured as a better pest control alternative

Integrated Pest Management Plan

The IPMP for this project is designed to reduce dependency on synthetic chemical pesticides thereby mitigating negative impacts on human health and terrestrial, aquatic and atmospheric environments.

This IPMP also recommends practical and cost-effective actions to prevent or reduce significant impacts to tolerable levels. It further establishes institutional arrangements and personnel capacity building needs and shall complement the Environmental and Social Management Framework (ESMF) and other safeguards instruments of the project. The IPMP will promote biodiversity monitoring to serve as early warning systems on pest status, alien invasive species, beneficial species, and migratory pests.

Framework for Implementation

The IPMP identifies implementation arrangements and describes responsibilities at all levels. Institutional Arrangements, effective supervision and monitoring of IPMP implementation will be done through the FPMU in collaboration with the SPMU. An IPM Specialist will develop IPM packages and will provide technical support to Environmental Specialist for all IPM activities.

Capacity Development

Capacity building will be achieved through the collaborative management mechanisms with all key stakeholders represented. The roles of each stakeholder will be clearly defined so as to guarantee efficiency and effectiveness of the process which will help in providing sound technical direction needed for an optimal IPMP implementation.

Budget for Implementation

To effectively implement the IPMP measures suggested, the cost elements that will be vital towards implementing the plan is shown in the budget for implementation is
=N=7,150,000.00 or \$23,443.00 (NGN1 = USD305.00)

CHAPTER ONE

1.0 Background

In response to a request from the Government of Nigeria, the World Bank is supporting the design of a national program on “Women’s Initiative for Socio-Economic Engagement (FOR WOMEN)” with an objective to support women’s access to social and financial capital for improved livelihood opportunities in targeted communities of Nigeria.

The Integrated Pest Management Plan (IPMP) is prepared as an annex to the ESMF of the for Women project as a requirement of the Nigerian EIA laws and the World Bank Environmental requirement of the Nigerian EIA laws and the World Bank Environmental and Social Safeguard Policies by which the activities of Component 2 “Improved Livelihoods for Women” triggered four out of the ten safeguard policies: Environmental Assessment (OP/BP4.01), **Pest Management (OP/BP4.09)**, Physical Cultural Resources (OP/BP 4.11), and Involuntary Resettlement (OP/BP4.12).

1.1 Overview of the Nigeria ‘for women’ Project

Nigeria has experienced poverty reduction in recent years, but this varies considerably across geographic areas and demographic groups due to entrenched inequalities. Poverty remains a major challenge in the rural areas where 50 percent of the population is currently living below the poverty line. Significant rural-urban differences in income distribution impact women, particularly the 54 million of Nigeria’s 80.2 million women that live and work in rural areas, and provide 60-79 percent of the rural labor force. Therefore, increased rural poverty has translated into increased female poverty. Gender gaps in economic activities across Nigeria are largely explained by four main institutional and market failures, namely: (i) Unfavorable social norms; and (ii) discriminatory formal and informal institutions; (iii), information and knowledge asymmetries, and; (iv) non-competitive markets.

During the last three decades, the Government of Nigeria (GoN) has shown an increasing commitment to supporting social and economic empowerment of women and fostering gender equality. The proposed FOR WOMEN project responds to a number of priorities highlighted in the Buhari Plan as well as Nigeria’s National Gender Policy (NGP) which include:

- (i) Reorienting culture and sensitization to change gender perceptions and stereotypes;
- (ii) Improving women’s access to critical resources such as education, capital, labor, entrepreneurial skills and control over use of their time;
- (iii) Promoting the empowerment of women and integrating gender within key sectors; and
- (iv) Institutionalizing women’s empowerment through gender sensitive budgeting, gender benchmarking and gender impact assessment especially of public financial systems and building strategic partnerships.

FOR WOMEN Nigeria proposes to demonstrate the impact of a multi-dimensional and a medium to long-term approach to overcome the main institutional and market failures limiting women's economic outcomes in Nigeria. The proposed project intends to achieve this by implementing, across multiple local contexts across Nigeria, approaches that have proven to contribute to women's economic empowerment.

1.2 Objectives of the Nigeria-FOR WOMEN project

The FOR WOMEN project is proposed to enhance the socio-economic empowerment of vulnerable women in selected project areas in Nigeria. Part of which will be achieved by improving their opportunities for income generating activities through a package of training and financial support for implementing micro-activities that may lead to environmental impacts albeit minor. It is planned as a Federal program originated by the Ministry of Women's Affairs and Social Development (MoWASD); however, it will be implemented at the State and Local Government levels, and therefore requires strong buy-in and support from the States. Multiple relevant MDAs at Federal and State levels, including Finance, Budget and Planning, Trade and Competitiveness, Vice Presidency, Agriculture, Health, Education, and Information, Communications and Technology, will form part of the project design and implementation arrangements.

1.3 Scope of IPMP

This IPMP covers the existing national and international legislations on the use of chemicals for pest management. It also assesses the Nigerian experience in pest management and capacity on integrated pest management approach. Other areas addressed by it include training and awareness for the public and users of pesticides on safety measures, description of pesticides banned for use in Nigeria as well as those approved for use.

Specifically, it also identifies institutional responsibility with regards to mitigation measures and monitoring indicators to be observed in order to evaluate the performance and effectiveness of the IPMP. The IPMP will be an annexure to the ESMF report.

1.2 Rational for the IPMP

The Integrated Pest Management (IPM) harmonizes the best practice approach from a combination of the best strategies of all control methods that pertain to a given concern created by the activities of pests. IPM has been defined in various ways but a more scientific definition describes it as, "the **practical** manipulation of pest populations using sound **ecological** principles to keep pest populations below a level causing economic injury".

Considering the land mass required for the cultivation, breeding and processing of the different agricultural commodities that are yet to be selected under this project, there is undoubtedly the likelihood of infestation by pests, currently within the

proposed area or migratory pests. Consequently, as the project will support agricultural livelihoods and while it will not procure pesticides directly, beneficiaries may use acquire pesticides using productive grants provided by the project. Thus, in line with World Bank Environmental and Social Safeguard Policies, an agricultural development project such as this will trigger **World Bank's Operational Policy OP 4.09** (Pest Management), hence the need for an Integrated Pest Management Plan (IPMP) which is the suitable safeguard instrument for tackling pest management issues.

CHAPTER TWO

2.0 Project Description

The project includes four components. They are as follows:

Component 1: Building Social capital (approximately US\$ 32 million)

This component aims to build critical social capital by strengthening and galvanizing the formation of WAGs that can serve as institutional platforms for women in Nigeria. The project will aim to create an enabling environment to ensure the buy-in of key stakeholders and adequate support at the household level to facilitate investments focused on women. In doing so, an Awareness Creation and Communications Campaign including Behavior Change will be designed and implemented at the Federal, State, LGA and community levels and will ensure the identification of champions at the Federal, State, LGA and community levels. The project will build capacity of all WAGs members through holistic life skills, financial literacy and enterprise training. The WAGs will be supported to serve as savings and credit groups to allow for consumption smoothening of members and follow key principles of group functioning. The WAGs will be incentivized through grants for capital infusion in two tranches based on key performance criteria that include building of trust and social cohesion.

WAGs will be instrumental in: (i) influencing social norms that limit women's voice and participation in community and household level decision making, and access to critical economic opportunities; and (ii) improving life-skills, greater financial literacy through savings and inter-lending as well as a better understanding of value of money.

Component 2: Livelihoods Support (approximately US\$ 55 million)

- This component aims to support economically active women in the WAGs through provision of livelihoods grants and holistic as well as targeted skills trainings to include psycho-emotional entrepreneurship, market responsive technical skills and life skills; based on sound analysis of the livelihood sectors and market demand. Business plans prepared through this process of capacity building will support the implementation of livelihood grants to meet both capital and operational costs as detailed in the business plans while clearly highlighting the use of funds and its contribution to livelihood enhancement. This component will have two subcomponents for supporting individual business plans and for group based livelihood collective's business plans.

Component 3: Innovations, Partnerships and Pilots (approximately US\$ 5 million)

This component aims to utilize “Nigeria’s talent pool” to support innovations that can (i) transform women’s social and livelihood outcomes and (ii)

improve project delivery and overall impact. Under this component, the project will also support strategic partnerships for improving project delivery and impact. Successful pilots that have demonstrated scalable impact for improving women's socio-economic wellbeing in Nigeria or other countries will scaled up with project support.

Component 4: Project Management, Monitoring and Evaluation, and Learning (approximately US\$ 8 million)

The aim of this component is to support the socio-economic empowerment of women by supporting the advancement of policy dialogue, strengthening technical and implementation capacity of coordination and implementing partners at the Federal, State and LGA levels through the use of highly qualified technical professionals. This component will have provision for supporting technology-based solution for project management and project related service delivery and monitoring. Support will be provided for designing project's management information system (MIS); evaluation of outcome and impacts; environmental and social safeguards monitoring; and participatory M&E and internal learning. M&E activities will include regular monitoring of progress and performance of implementation; independent process monitoring of the community-level planning and effectiveness and quality of capacity-building efforts; and undertaking annual thematic studies and outcome as well as impact assessment of the project.

2.1 Environmental & Social Safeguards Issues

Nigerian EIA laws and the World Bank Environmental and Social Safeguard Policies by which the activities of Component 2 triggered four out of the ten safeguard policies: Environmental Assessment (OP/BP4.01), Pest Management (OP/BP4.09), Physical Cultural Resources (OP/BP 4.11) and Involuntary Resettlement (OP/BP4.12). This is shown in table 2.1.

Table 2.1 Potential Safeguard Policies Triggered

Policy	Yes	No	Applicability due to	How this Project Addresses Policy Requirements
Environmental Assessment (OP 4.01)	X		The nature of the activities to be supported under component 2.2	As targeted sites or areas are not yet defined, this ESMF has been prepared as part of the due diligence and will be disclosed in country and in the Info-shop prior to appraisal. For works that will be known before appraisal, a specific Environmental and Social Impact Assessment (ESIA) will be prepared and disclosed prior to appraisal.
Physical Cultural Resources (OP/BP 4.11)	X		The four states have rich cultural heritage resources and some road works may be located in the area of influence of some sites.	To mitigate this risk, specific procedures (such as chance find procedures) has been included in the ESMF

Pest management (OP 4.09)	X		Agricultural activities that form a part of the livelihood opportunities have pest management risks.	This standalone IPMP is being designed as an annex to the ESMF.
Involuntary Resettlement (OP 4.12)	X		Interventions could lead to restriction of access to sources of livelihoods. There could be encroachment to farmlands	A standalone RPF is being alongside this ESMF.

CHAPTER THREE

3.0 Regulatory Framework

Applicable national and international guidelines on use of chemicals for pest management that are relevant to the FOR WOMEN project are highlighted in this Chapter.

3.1 Extant Laws of Nigeria on Pesticides Management

There are some legislations and institutional framework in Nigeria that exist for the regulation of the distribution and use of pesticides in Nigeria. The existing legislative tools are:

- Federal Ministry of Agriculture & Rural Development (1988)
- National Policy on the environment, 1989
- FEPA Decree 58 of 1988 as amended by Decree 59 of 1992 and 1999 but complemented by rules and regulations such as FEPA S.1.5, FEPA S.1.9 dealing with disposal and distribution/use of pesticides.
- NAFDAC Decree 15 of 1993, as amended by Decree 19 of 1999.
- The Factories Acts 1990 being implemented by the Factories Inspectorate Division of FMLP.
- The Harmful Waste (Special Criminal Provisions etc) Decree 42 of 1988 being implemented by FMEV.

Nigerian Agricultural Policy (1988)

The general pest control objectives in the existing (1988) agricultural policy for Nigeria are to:

- Control, and/or eradicate and maintain good surveillance of the major economic pests whose outbreaks are responsible for large-scale damage/loss to agricultural production.
- Provide protection to man and animals against vectors of deadly diseases.

National Policy on the Environment 1989

This Policy aims to achieve sustainable development in Nigeria, and in particular to:

- Secure a quality of environment adequate for good health and wellbeing;
- Conserve and use the environment and natural resources for the benefit of present and future generations;
- Restore, maintain and enhance the ecosystems and ecological processes essential for the functioning of the biosphere to preserve biological diversity and the principle of optimum sustainable yield in the use of living natural

resources and ecosystems;

- Raise public awareness and promote understanding of the essential linkages between the environment, resources and development, and encourage individuals and community participation in environmental improvement efforts; and
- Co-operate with other countries, international organizations and agencies to achieve optimal use of trans-boundary natural resources and effective prevention or abatement of trans-boundary environmental degradation.

Federal Environmental Protection Agency Act 58 of 1988 as amended by Decree 59 of 1992

This Act specifies the guideline and rules guiding the dealing with distribution, use and disposal of pesticides in Nigeria. The Act also mandates the Agency to establish instruments for air quality standards, water quality standards, atmospheric protection and ozone layer protection. In discharging the mandate, the FEPA in 1991 published a number of regulations for the protection of the environment, including the waste management and Hazardous Waste Regulation- which provides a comprehensive list of chemicals and chemical wastes by toxicity classification.

National Environmental Standards and Regulations Enforcement Agency (NESREA) Act 2007

NESREA is charged with the responsibility for the protection and development of the environment, biodiversity conservation and sustainable development of Nigeria's natural resources in general and environmental technology, including coordination and liaison with relevant stakeholders within and outside Nigeria on matters of enforcement of environmental standards, regulations, rules, laws, policies and guidelines.

The National Agency for Food and Drug Administration and Control (NAFDAC)

NAFDAC was established by Decree 15 of 1993 as amended by Decree 19 of 1999 and now Act Cap N1 Laws of the Federation of Nigeria (LFN) 2004, to regulate and control the manufacture, importation, exportation, distribution, advertisement, sale and use of food, drugs, cosmetics, chemicals, medical devices and packaged water in Nigeria for the protection of human health. In discharge of its statutory responsibility, NAFDAC has approved the list of chemicals allowed in Nigeria for the control of pest. This list is attached in the annex 2 of this report.

The Factories Act 1990

The Factories decree 1990 was a landmark in legislation in occupational health in Nigeria. It provides a substantial revision of the colonial legislation, Factories Act 1958, in which the definition of a factory was changed from an enterprise with 10 or more workers to a premise with one or more workers thereby providing oversight for the numerous small-scale enterprises that engage the majority of the workforce in Nigeria. It stipulates the enforcement of compliance on factories, industries and

organizations that employ labour on the protection of the right of workers to friendly environment, health and safety.

The Harmful Wastes (Special Criminal Provision) Act 42 of 1988

This Act, which was established on The 25th of November 1988, was necessitated by the illegal use and dumping of toxic wastes in the port town of Koko in Southern Nigeria. The Act defines harmful waste to mean any injuries, poisonous or toxic substances, which are capable of subjecting anybody to the risk of health. As contained in the section 1, it is an offence to purchase, sale, import, transit, transport, deposit and/or store any banned or obsolete chemical or any other form of wastes in the Nigeria territory or water.

3.2 International Conventions & Treaties Relevant to Pest Management in Nigeria

Nigeria is a signatory to many conventions on the protection of the environment, which lay credence to the IPMP under study. Some of these conventions pertinent to this study include:

- Montreal Protocol
- Bamako Convention on Hazardous Wastes
- Basel Convention on Transboundary Movements of Hazardous Wastes and their Disposal
- Stockholm Convention on Persistent Organic Pollutants (POPs)
- International Code of Conduct for the Distribution and Use of Pesticides
- Rotterdam Convention

Among the aforementioned conventions, a certain number of them have a direct importance with pesticides and the fight against pollution, particularly the Stockholm Convention on persistent organic pollutants. This convention, in accordance with Principle 15 of the Rio Declaration on Environmental and Development, aims at protecting human health and the environment from persistent organic pollutants such as aldrin, dieldrin, chlordane, endrin, heptachloric, hexachlorobenzene, mirex, toxaphene, DDT and PCBs. It is a global treaty to protect human health and the environment from highly dangerous, long-lasting chemicals by restricting and ultimately eliminating their production, use, trade, release and storage. The Convention was adopted in Stockholm, Sweden on May 22, 2001. It calls for outright banning and destruction of 12 Persistent Organic Pollutants, 9 of which are pesticides. These are: Pesticides POPs: Aldrin, Chlordane, DDT, Dieldrin, Endrin, Heptachlor, Hexachlorobenzene, Mirex, Toxaphene. The Industrial POPs: Dioxins, Furans, Polychlorinated biphenyls (PCBs).

3.2.1 The Rotterdam Convention

The Rotterdam Convention on the Prior Informed Consent on Procedure for Certain Hazardous Chemicals and Pesticides in International Trade is a global treaty that came into force in February 2004. It is designed to protect public health and the environment by promoting informed decision-making by importing countries in

relation to products that have been banned or severely restricted by at least two other Parties to the Convention. It formalizes the voluntary principles established in the International Code of Conduct.

The Rotterdam Convention on Prior Informed Consent (PIC) aims to help participating countries make informed decisions about the potentially hazardous chemicals that might be shipped to them, and to facilitate communication of these decisions to other countries. The Convention requires exporting Parties to honour the decisions of importing Parties.

The key principles of PIC are:

- International shipment of a pesticide included in the PIC list should not occur against the wishes of the importing country.
- In the absence of a decision from an importing country, the export may proceed if the pesticide is registered in the country, or if it has previously been used or imported into the country.
- If an importing country decides not to consent to further imports, the decision must be applied to imports from all sources, and domestic manufacturing and use must cease.;
- Recommendations for inclusion of banned and severely restricted chemicals in the PIC procedure must be supported by risk evaluations reflecting prevailing conditions at the national level.

3.2.2 Basel Convention

The Basel Convention on the Control of Transboundary Movements of - Hazardous Wastes and their Disposal was concluded in Basel, Switzerland on March 22, 1989, and entered into force in May 1992. The Basel Convention contains specific provisions for the monitoring of implementation and compliance. A number of articles in the Convention oblige Parties (national governments which have acceded to the Convention) to take appropriate measures to implement and enforce its provisions, including measures to prevent and punish conduct in contravention of the Convention.

The key principles/outcomes of the Basel convention are:

- In order to minimize the threat, hazardous wastes should be dealt with as close to where they are produced as possible.
- Trans-boundary movements of hazardous wastes or other wastes can take place only upon prior written notification by the State of export to the competent authorities of the States of import and transit (if appropriate).
- Each shipment of hazardous waste or other waste must be accompanied by a movement document from the point at which a trans-boundary movement begins to the point of disposal. Hazardous waste shipments made without such documents are illegal.
- Outright bans on the export of these wastes to certain countries; however, Trans-boundary movements can take place, if the state of export does not have the capability of managing or disposing of the hazardous waste in an environmentally sound manner.

There is also the support for the document of harmonization of rules governing the pesticide agreement in the ECOWAS zone adopted at the 60th ordinary session of the ECOWAS Council of Ministers held at Abuja on 17 and 18 May 2008. The aim of this common regulation is to:

- Protect the West African populations and environment against the potential hazards of pesticide use;
- Facilitate intra and inter-state trade in pesticides through the establishment of rules and principles accepted by common consent at the regional level to remove the trade barriers;
- Facilitate an appropriate and timely access by farmers to quality pesticides;
- Contribute to the creation of a suitable environment for private investment in the pesticide industry, and;
- Promote public-private sector partnership.

This regulation is applicable to all activities involving the experimentation as well as authorization; trade in utilization and control of pesticides and bio pesticides in the member countries.

3.3 World Bank's Environmental and Social Guidelines

The World Bank's environmental and social safeguard policies are a cornerstone of its support to sustainable poverty reduction. The objective of these policies is to prevent and mitigate undue harm to people and their environment in the development process. These policies provide guidelines for bank and borrower staff in the identification, preparation, and implementation of programs and projects. Safeguard Policies are illustrated below:

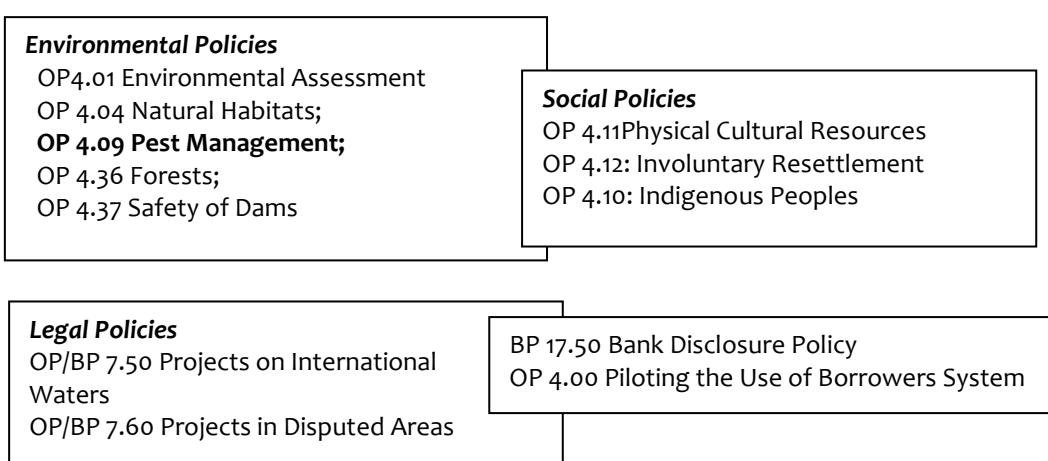


Figure 2.0: World Bank Safeguard Policies

The effectiveness and development impact of projects and programs supported by the Bank has substantially increased as a result of attention to these policies. Safeguard policies have often provided a platform for the participation of

stakeholders in project design, and have been an important instrument for building ownership among local populations.

3.3.1 World Bank OP 4.09

The OP 4.09 policy supports safe, effective and environmentally sound pest management and promotes the use of biological and environmental control methods. It encourages the assessment of the capacity of the country's regulatory framework and institutions to promote and support safe, effective, and environmentally sound pest management. Projects that include the manufacture, use, or disposal of environmentally significant quantities of pest control products are classified as Category A. Depending on the level of environmental risk, other projects involving pest management issues are classified as A, B, C, or F1.

The World Bank OP 4.09 ensures that EA covers potential issues related to pest management and considers appropriate alternative designs or mitigation measures. It places premium on using biological pest control measures, but where chemical pesticides must be used, it encourages the country's capacity to manage the procurement, handling, application and disposal of pest control products be evaluated and the capacity to monitor the precision of pest control and the impact of pesticide use, and to develop and implement ecologically based pest management program.

OP/BP4.01 annex C exempts procurement of impregnated bed nets and WHO Class III insecticides for intra-domiciliary malaria control from the requirement of preparing a pest management plan. In those cases, preparation of a hazard assessment would suffice. A hazard assessment identifies risks associated with the transport, storage, handling and use of the pesticides and provides measures to minimize these risks. The policy further provides that the PMP may be limited to pest control product screening when all of the following conditions are met:

- Expected quantities of pest control products are not significant from a health or environment standpoint,
- No significant environment or health concerns related to pest control need to be addressed,
- The project will not introduce pesticide use or other non-indigenous biological control into an area, or significantly increase the level of pesticide use;
- Products to be financed fall in class 111 or table 5 of the WHO Classification of pesticides by hazards.

The OP 4.09 principles provide general guidance that will be followed during appraisal on how to address pest management issues in different categories of projects to which OP 4.09 applies. These are provided as follows:

1. Do no harm

All projects: The do-no-harm principle applies to all projects under any circumstances. Its concerns entail that pest management activities in Bank projects are sustainable and that health and environmental risks of pesticide use are minimized and can properly be managed by the user.

Projects that directly or indirectly finance pesticides: For pesticides, directly or indirectly procured under Bank financed projects the policy states that it needs to be established that their use is justified under an IPM approach. It stipulates that optimum use should be made of available non-chemical pest management techniques to reduce reliance on synthetic chemical pesticides and that adequate measures be incorporated in the project design to reduce risks associated with the handling and use of pesticides to a level that can be managed by the users. The policy encourages monitoring of the effectiveness of these measures in order to achieve project objectives.

Projects that do not finance pesticides, but nevertheless indirectly increase or alter pesticide use, or affect pest management: If no pesticides are procured under the project, but if the project nevertheless affects pest management by maintaining or expanding pest management practices that are unsustainable, not based on an IPM approach, and/or pose significant health and environmental risks, then it would be appropriate to set out clear targets for moving current practices towards IPM and to provide the necessary support to this process. Immediate measures may be required to reduce risks associated with the handling and use of pesticides to a level that can be managed by the users. These may be addressed through the following:

- Determining justification of pesticide use (that is whether pesticides use is justified under an IPM approach);
- Determining if pesticides use is justified in economic terms;
- Determining appropriateness or otherfor Womenof products through selection and procurement of pesticides
- Identification of risks and risk management to mitigate environmental and health concerns.

2. Do-Good Principle

The do-good principle calls for enhancing policy reform and strengthening the regulatory framework and institutional capacity for the implementation of IPM and the control of pesticides. The expected level of project involvement depends on the circumstances and the scope of the project. Relevant factors in this respect are the:

- Magnitude of the activity involving or affecting pest management.
- Nature of the risks involved.
- Size of the gap between actual practices and good practices.
- Geographical scope of the project.
- Degree to which policy reform and capacity building fit in the project.

CHAPTER FOUR

4.0 Pest Management Concerns And Control Measures In Nigeria

Pests and disease vectors constitute serious hazards to public health, food security and general welfare of the citizenry in Nigeria. It is estimated that agricultural pests destroy over half of the yield of crops, fruits, ornamental plants, vegetables and livestock annually. Household pests also destroy property such as furniture items, clothing, books, etc. Estimated cost of damage caused by pests runs into millions of Naira annually.

4.1 Pest and diseases Problems of Agriculture in Nigeria

Vectors transmit several diseases of public health importance in Nigeria. These diseases have resulted in depopulation of many fertile farming areas thus contributing significantly to food insecurity and poverty. For example, in recent times in Nigeria, Lassa fever and Yellow fever transmitted by *M. natalensis* (rats) and *Aedes* mosquitoes respectively have been reported to occur in epidemic proportions in some parts of Nigeria.

Farmers often respond to pest infestations in crops by heavy applications of pesticides, which threaten environmental quality and pose risks to human and livestock health. Pesticides used in vegetable agro-ecosystems, for example, include WHO toxicity Class 1a materials such as **parathion**, and Class 1b materials such as **Furadan/carbofuran**. The incautious dependence on chemical pest control options undermines national economic growth through farmers' non-compliance with trade barriers on pesticide residues in export produce. According to EC directive 91/414, for example, approximately 80% of the active ingredients used in Africa will be banned for use in Europe, and IPM is a fast-emerging trade policy issue.

4.2 Control methods of pests and diseases in Nigeria

Pest management methods in Nigeria vary with the type of pests and agriculture. Most of the pest control operations in Nigeria today are by the use of pesticides. Pesticides were once seen as the only answer to most of the pest problems. Now, due to the increasing concerns about the environment, the development of pest resistance to pesticides and the increasing economic pressures on farming and the food Industry they are increasingly being seen as just one of a range of control measures available.

Pest management controls used in Nigeria include:

1. **Cultural control:** These are the adjustments made to agricultural practises and crop husbandry techniques by the farmer. These to a minimum include:
 - Crop Rotation
 - Alteration of planting date
 - Disposal of crop residues
 - Choice of resistant crop variety
 - Management of Irrigation

2. **Biological Control:** which involves either encouraging or introducing natural means for the control of the pest or employing natural means to disrupt the life cycle of the pest
3. **Chemical controls:** which employs the use of toxic pesticides to kill pests.

4.3 Assessment of Capacity of Nigeria on Integrated Pest Management

Many cultural practices and physical control measures to pest control are currently in use in Nigeria and have been for several farming generations, however, some of them have not provided sufficient and environmentally friendly options for pest management. For instance, bush burning as a way of controlling pest causes deforestation and loss of biodiversity and therefore should be discouraged.

The conventional chemical control has been the means generally used to control crop invasions by pests in large agricultural programs in Nigeria. This approach has led to numerous cases of recorded intoxications each year, the resistance of numerous pests to many chemicals (case of *Helicoverpa armigera* to pyrethroids), the destruction of useful species, the perturbation of the ecological balance, the dependence towards synthetic chemical pesticides and the growing debt of farmers compelled to use increasingly expensive products, the deviances in the use of cotton pesticides on some food crops such as cowpea, etc.

In order to reduce the incidences of pest in Nigeria a number of project-based interventions have been carried out on IPM. Some of these are:

- IPM for pest control in the Commercial Agriculture Development Project (CADP)
- Farmer's training on IPM under the Transforming Irrigation Management in Nigeria (TRIMING) project.
- Cocoa farmers training on the use of IPM to pest control and the IPM for pest control in the National FADAMA Agricultural Development in Nigeria

4.4 Assessment of Collaboration on IPM

The 'for Women project' will enjoy IPMP collaborative benefit from other existing world-bank/donor funded projects, currently being implemented in Nigeria, such as CADP. This is possible, considering the fact that a lot of experience and success has been gained in Nigeria under CADP, FADAMA II and III projects, and WAAPP including application of IPM operations. Therefore, the project stands to gain from shared experience and capacity with these existing projects in terms of challenges and success drivers of IPM operations and other similar areas. As such, project beneficiaries will enjoy knowledge transfer on IPM implementation.

CHAPTER FIVE

5.0 Pests & Pesticide Management

5.1 Concerns on the Use of Pesticides

Pesticides are toxic substances released most times intentionally into our environment. This includes substances that kill weeds (herbicides), insects (insecticides), fungus (fungicides), rodents (rodenticides), and others. Though they could be very useful in managing pest problems, they are also a great environmental and health risk.

5.1.1 Persistent Organic Pollutants (POPs)

Nigeria became a signatory to the Stockholm Convention on Persistent Organic Pollutants, In May 2001 and the commitment was ratified in 2004. Under Annex A (listed for Elimination) of the convention, Parties must take measures to eliminate the production and use of obsolete chemicals. These obsolete pesticides are characterized by a high persistence in the environment (e.g. half-life for DDT in soil ranges from 22 to 30 years, Toxaphene -14 years, Mirex -12 years, Dieldrin- 7 years, Chlordcone up to 30 years), low water solubility and thus potential to accumulate in fatty tissue of living organisms including humans and toxicity to both human and wildlife. Due to intensive releases to the environment in past several decades, and tendency to long-range trans-boundary atmospheric transport, they are now widely distributed and are found around a globe. Most agricultural pesticides could constitute any of the POPs chemicals, which if are in use pose adverse environmental, animal and human health risks.

Considering that Nigeria is a Signatory, the country is compelled to stop the use of POPs pesticides if still in use. For other pesticides, which are not POPs, the issues of toxicity still remains and the consequence of application on agricultural farmland and resultant wider environmental and social impacts.

5.2 Pesticides and Human Health

Pesticides have been linked to a wide range of human health hazards, ranging from short-term impacts such as headaches and nausea to chronic impacts like cancer, reproductive abnormalities, and endocrine disruption. Chronic health effects may occur years after even minimal exposure to pesticides in the environment, or result from the pesticide residues, which we ingest through our food and water. Pesticides can cause many types of cancer in humans. Some of the most prevalent forms include leukemia, non-Hodgkins lymphoma, brain, bone, breast, ovarian, prostate, testicular and liver cancers.

5.3 Identification of Potential Environmental and Health Risks Associated with Pesticides

Potential adverse environmental and health risks of pesticides applications that are of concern to the proposed For Women project may include:

5.3.1 Environmental Risks

Air Pollution - The vaporized form of sprayed pesticides will be released into the air, and if the chemical compound is very stable, the vapor can travel beyond the project intervention sites. Whether pesticides are applied by spraying or by surface application, air is the usual medium through which the chemicals move to their intended and unintended targets. While some of the active ingredients in pesticides stay in the atmosphere for only a short while, others may last longer and may have the potential to contaminate the air, affecting humans and animals. Reliable data on how pesticides behave in air, such as distance travelled, are lacking, because adequate monitoring tools are unavailable.

Soil contamination - Pesticides which are still used in agricultural land in and around the proposed sites could enter soil during spraying resulting in wash-off or run-off into soil. Some pesticides such as soil fumigants and nematocides which are applied directly into soil to control pests and plant diseases are often retained in the soil. Long-term excessive use of pesticides will cause higher pesticide residues in the soil, which will cause soil contamination within the area.

Surface and Groundwater Contamination - Generally, there are four major routes through which pesticides reach the water: they may drift outside of the intended area when sprayed, may percolate, or leach through soil, may be carried to the water as runoff, or may be spilled. Pesticides typically enter surface water when rainfall or irrigation water exceeds the infiltration capacity of soil and resulting runoff then transports pesticides to streams, rivers, and other surface-water bodies. Groundwater contamination may occur when pesticide residue in surface water such as drainages, streams, and municipal wastewater is leached downward into groundwater. Also, if pesticide applications are adopted by the project as the most preferred measure for pest management. Groundwater contamination may also occur from pesticide residue in surface water, such as drainages, streams, and municipal wastewater.

Harm to Non-target Species - The **environmental impact of pesticides** consists of the effects of pesticides on non-target species. Over 98% of sprayed insecticides and 95% of herbicides reach a destination other than their target species, because they are sprayed or spread across entire agricultural fields. Runoff can carry pesticides into aquatic environments while wind can carry them to other fields, grazing areas, human settlements and undeveloped areas, potentially affecting other species. Other problems emerge from poor production, transport and storage practices. Over time, repeated application increases pest resistance, while its effects on other species can facilitate the pest's resurgence.

5.3.2 Health Risks

The health risks are from:

1. *Direct inhalation Concerns*

Pesticides can enter the body through inhalation of aerosols, dust and vapour that contain pesticides; through oral exposure by consuming food and water; and

through skin exposure by direct contact. The effects of pesticides on human health depend on the toxicity of the chemical and the length and magnitude of exposure. Farmer, farm workers and their families experience the greatest exposure to agricultural pesticides through direct contact. Bioaccumulation of pesticides in the body over time and toxicity increases as a consequence of this cumulative impact.

2. *Potential Site-related Health Concerns*

- A. Consumption of crops and plants grown under chemical pest control could cause health hazards to humans and animals within and around the project site.
- B. Certain kinds of chemical intoxication especially after drinking pesticide-contaminated water is a medium to high likelihood. This is a crucial potential impact considering that most of the locals get drinking water from surface and groundwater sources.
- C. Skin, eye, and nose irritation
- D. Possibility of cancers, neurologic, endocrine and reproductive problems from direct and indirect exposure to pesticides.
- E. Occupational health and safety risks. Long term inhalation of toxic pesticides sprayed, could eventually result in respiratory illnesses or disease conditions.

Table 5.1 shows details of the WHO Classified Pesticides and their Effects.

Table 5.1: WHO Classified Pesticides and their Effects

Pesticides	Outcome of accidental exposure		
	WHO Class	Effects of acute intoxication	Effects of chronic intoxication
Clorpyrifos ethyle (1)	II (Moderately dangerous)	Nausea. Dizziness. Vomiting. Cough. Loss of consciousness. Convulsions. Constriction of the pupil. Muscle cramps. Salivation. A severe exposure may cause inhibition of cholinesterase Exposure above the Occupational Exposure Limit (OEL) may result in death	The substance may have effects on the nervous system, cholinesterase inhibitor
Fenitrothion(1)	II (Moderately dangerous)	Cramps. Diarrhea. Dizziness. Headache. Nausea. Loss of consciousness. A severe exposure may cause inhibition of cholinesterase exposure above the OEL may result in death	The substance may have effects on the nervous system, cholinesterase inhibitor
Malathion (1)	III (Slightly hazardous)	The substance may have effects on the nervous system, causing convulsions, muscle cramps, vomiting, diarrhea, excessive salivation, sweating, difficulty breathing, loss of consciousness. A severe exposure may cause inhibition of cholinesterase Exposure above the OEL may result in death.	A prolonged or repeated contact may cause skin sensitization. Cholinesterase inhibitor; possibility of cumulative effects
Dizinon	II (moderately hazardous)	The main symptom of soft acute diazinon poisoning are headache, nausea, dizziness, pinpoint pupils, blurred vision, tightness in the chest, difficulty in breathing, muscle weakness or twitching, difficulty in walking, vomiting abdominal cramps and diarrhea Effects on the central nervous system may include confusion, anxiety, drowsiness, depression, difficulty in concentrating, slurred speech, poor recall, insomnia, nightmares and a form of toxic psychosis resulting in bizarre behavior.	Cholinstrase inhibitor.Accumulation of acetylcholine at junctions between nerves and glands results in gland secretion;and accumulation between nerves in the brain causes sensory and behavioral disturbances.
Cypermethrin	II (moderately hazardous)	Symptoms of acute poisoning include abnormal facial sensations, dizziness, headache, nausea, anorexia and fatigue, vomiting and increased stomach secretion	Chronic symptoms include brain and locomotry disorders, polyneuropathy and immuno-suppression and resembles the multiple chemical sensitivity syndrome
Carbosulfan	II (Moderately hazardous)	The acute symptoms of carbosulfan in humans are characteristics of other organophosphate and carbamate insecticides. Signs include dizziness, salivation, excess	-

Pesticides	Outcome of accidental exposure		
	WHO Class	Effects of acute intoxication	Effects of chronic intoxication
		salivation, nausea, abdominal cramps, vomiting, diarrhea, blurred vision, pin-point pupils, difficulty breathing and muscle twitching	
Carbaryl	II (Moderately hazardous)	Inhalation or ingestion of very large amounts can be toxic to the nervous and respiratory systems resulting in nausea, stomach cramps, diarrhea and excessive salivation.	-
Profenofos	II (Moderately hazardous)	Muscarinic, nicotinic and central nervous system manifestations	There is no available data concerning chronic toxicity of profenofos

5.4 Impact Mitigation through IPMP

Integrated Pest Management (IPM) is an effective and environmentally sensitive approach to pest management that relies on a combination of multiple practices with a view to reduce reliance or use of pesticides. IPM programs use current, comprehensive information on the life cycles of pests and their interaction with the environment. This information, in combination with available pest control methods, is used to manage pest damage by the most economical means, and with the least possible hazard to people, property, and the environment. By applying basic IPM principles historical and future pest with respect to the proposed project site will be managed in an environmentally safe manner thus reducing increased dependency on pesticides or other environmentally unsafe approaches.

Furthermore, transfer of knowledge on biological, cultural and mechanical control measures that have been used in other agricultural programs in Nigeria (such as the FADAMA projects, IITA, FAO, CADP, TRIMING project etc.) shall offer a strong platform for proffering practicable safe measures towards mitigating adverse impacts of identified pests in the project area.

In comparison with traditional pesticide applications which pose immeasurable health and environmental risks, and may result in severe current and future losses (environmental, public, health, occupational health, social and financial), an Integrated Pest Management Plan (IPMP) will be the most appropriate pest management approach for the proposed project. The IPMP for the For Women project will lay down mitigation measures, institutional responsibilities and capacity building needs.

CHAPTER SIX

6.0 Integrated Pest Management Plan

6.1 Review of IPM Initiatives

Even though the site locations and activities are yet to be identified, this Integrated Pest Management Plan (IPMP) is intended to anticipate and thereafter help manage the adverse effects of identified pests and pesticides that are likely to be encountered on the project sites to acceptable levels. The plan is designed to minimize potential adverse impacts on human health and the environment and to advance ecologically based IPM.

The IPMP further provides an information basis for stakeholder groups to establish functional mechanisms enabling the for Women project beneficiary farmers to identify, understand and manage pest and vector problems in the further development of agriculture, reduce personal and environmental health risks associated with pesticide use, and protect beneficial biodiversity such as natural enemies of pests and pollinators in the farmers' efforts to increase productivity.

For effectiveness, the IPMP recommends practical and cost-effective actions to prevent or reduce significant impacts to tolerable levels. It also establishes institutional arrangements and personnel capacity building needs. It shall complement the Environmental and Social Management Framework (ESMF) and other safeguards instruments of the project and has been designed to reduce dependency on pesticides and encourage integrated pest control methods such as biological, cultural, physical, chemical methods and design a program for capacity building in IPM.

6.2 Specific IPMP Objectives

Specific objectives of this IPMP are:

- Assist the ‘for Women’ in agriculture for Women project beneficiaries of the target State Governments; Abia, Kebbi, Edo, Taraba, Ogun and Niger States, to plan and design location specific IPM activities.
- Promote participatory approaches in IPM to learn, test, select and implement best practice IPM options.
- Promote biodiversity monitoring to serve as early warning systems on pest status, alien invasive species, beneficial species, and migratory pests.
- Monitor and evaluate the benefits of IPM including its impact on the environment and health

Table 6.1 outlines the matrix of activities, expected results, milestones and performance indicators of the PMP.

Table 6.1 Matrix of Activities, Expected Outcomes, Milestones & Key Performance Indicators

Overarching Target	Expected Outcome	Key Performance Indicators (KPIs)	Assumptions/Risks
Empower crop and livestock farmers to contribute significantly to household and national economies through environmentally friendly pest management practices.	Food security enhanced, environmental quality improved, crop and livestock productivity and farmers' income increased	Evidence of improvements in food availability, level of poverty, and environmental protection in areas implementing the for Women project	<ul style="list-style-type: none"> • National security remains stable • Government policies continue to food security programme
1.In the immediate future, halt and reverse losses from pest attacks with an aim of increasing food security by enhancing agricultural productivity and revenue from agriculture. 2.In the long run, strengthen national and local capacity to reduce environmental and health risks associated with pest management practices in the selected States.	Farmers that are beneficiaries of the 'for Women' project will adopt ecologically and environmentally friendly options to reduce crop and livestock losses with minimal personal and environmental health risks. For Women Project decision makers provided with clearer guidelines and embrace world class IPM approaches, thereby enabling them to promote IPM approaches and options in agriculture Establish collaboration linkages to develop a statewide IPM mechanism to promote compliance with international conventions and guidelines on pesticide use	Strengthened food security Improved perception of collaborating state agencies regarding the value of IPM in agricultural practices. Level of compliance with World Bank etc. Level of chemical control practices Types and level of use of alternatives to synthetic pesticides	

6.3 Overview of Potential Impacts of Pest Management Activities

In implementing IPM for the proposed project, the use of highly persistent and highly toxic chemicals must be avoided in pest management. Natural pest control methods should be employed to effectively reduce or eliminate pest or disease infestation without harming humans, animals, crops and other ecosystems. The *IFC Guidelines on Pesticide Handling and Application* provides a criterion for choosing pesticides based on the following factors in decreasing order of importance:

1. Biodegradability;
2. Toxicity to mammals and fish;
3. Occupational health and safety risks; and
4. Costs

6.4 Pest management Practices & Challenges

Effective control methods (cultural, biological and chemical) for managing common pests and diseases of the agricultural activities have been identified in the selected States. The combination of two or more natural methods may produce a more effective result

Table 6.2: Pests and Control methods in Nigeria

Crops	Cultivated in these States Visited	Pests	Control Methods		
			Cultural	Biological	Chemical
Horticulture (fruits & Vegetables)	Abia - Abia South Kebbi - Zuru & Yauri Emirates	Nematode Caterpillars (Moths and Butterflies) Beetles Grasshoppers Stem borers	Use of resistant species Adoption of crop rotation techniques.	Soil solarisation	-
Maize	Kebbi - Zulu & Yauri Emirates	Quelea birds Grass cutters Rats Bush fowls Termites and Mole cricket Stem borers Shoot flies Armyworms	Bird scaring using Scare-crows Use of traps for rats, grass cutters, bush fowls Removal and destruction of infested plants and plant residue (applicable to Stem borers, armyworms & termites)	Encouraging or introducing natural enemies of the pest or interfering with the life cycle of the pest	Aerial spraying of organophosphorus pesticides
Rice	Abia - Zacordi & Bende Kebbi - Arugungu LGA	Nematodes (Apelenchoïdes besseyi; Hirshmanniella grazilis; H.oryza;H.spinicaudata) Stem borers	Land fallow and planting of trap crops Adopting crop rotation techniques	Encouraging or introducing natural enemies of the pest or interfering with the life cycle of the pest	-
Cassava	Cultivated Statewide – Abia	Green mite Cassava mealy bug Variegated grasshopper.	Crop Rotation Alteration of planting date Disposal of crop residues Choice of resistant crop variety	Encouraging or introducing natural enemies of the pest or interfering with the life cycle of the pest	-

			Management of Irrigation.		
Soya bean	Zuru & Yauri LGAs	Caterpillars Whitefly	Adopting crop rotation techniques Removal and destruction of infested plants and plant residues	Encouraging or introducing natural enemies of the pest or interfering with the life cycle of the pest.	--
Fish	Arugungu LGA	<ul style="list-style-type: none"> • Flukes • Leeches • Anchor worm • Lice • Nematode 	Avoid introduction of raw plants or snails	--	Use of organophosphates Potassium Permanganate bath against fresh water parasites or salt water bath for fresh water parasites
Oil Palm	Abia South – Palm oil processing	Mealy Bugs (<i>Dysmicoccus brevipes</i>) Rhinoceros beetle (<i>Oryctes rhinoceros</i>)	-- Destroying of any decaying logs in plantation by chopping and burning to kill any larvae that may be inside Removal of any dead trees from plantation and destroy by burning Planting of cover crop to deter egg laying by females as they do not lay eggs in areas covered by vegetation	Mealy bugs can potentially be controlled by the introduction of natural enemies such as lady beetles	--

			Hooked wire can be used to extract larvae that are boring into young crowns		
Yam	Abia - Abia North	Mealy bugs (<i>Rastrococcus Spp</i>)	Pruning out of heavily infested branches	Introduction of natural Mealy Bug enemies like Ants etc.	Horticultural oils or soapy solutions can be used to treat heavy infestations It is not advised to use chemicals for control, as they may decrease the population of natural enemies, leading to Mealy bug outbreak
		White Scale insects – <i>Aspidiella hartii</i>	Inspection of yams in storage regularly, and removal of scale infested tubers Use of scale-free seed-yam for planting	--	Use of white oil (made from vegetable oils), soap solution or horticultural oil (made from petroleum) on yams infested with scale: (i) after harvest and before yams are stored; (ii) during storage, on yams when infestations begin; and (iii) at the time of planting before the tubers are cut Commercial horticultural oil can also be used. White oil, soap and horticultural oil-sprays work by blocking the breathing holes of insects causing

					suffocation and death. Spraying the undersides of leaves; the oils must contact the insects. The application of malathion is useful against scales insects, but it is likely to kill natural enemies
Cowpea	Kebbi – Arewa Emirates	Cowpea aphid <i>Aphis craccivora</i>	Use insect resistant varieties Multiplication plots and environs should be weed and ants free	--	Spray using pesticides like <i>Bacillus thuringiensis</i> (branded as Cyber Force or Cyber Diforce)
		Cowpea pod borer <i>Maruca vitrata</i>	--	--	Spray using pesticides like <i>Bacillus thuringiensis</i> (branded as Cyber Force or Cyber Diforce)
		Cowpea Weevil <i>Callosobruchus spp</i>	Host-Plant Resistance. Resistant varieties are available at Research Institutes in Nigeria Harvesting at the right time to prevent infestation of pods in the field Cold storage at 4 degrees Celsius	--	Fumigation of the storage facility Seed treatment with Phostoxin
		Army worms <i>Spodoptera exigua</i>	--	Biological control by natural enemies which	Use available chemicals such as Bifenthrin

				parasitize the larvae	
		Corn earworm <i>Helicoverpa zea</i>	Monitor plants for eggs and young larvae	Biological control of natural enemies that could be damaged by chemicals	<i>Bacillus thuringiensis</i> or Entrust SC may be applied to control the insects on organically grown plants
Cashew	Abia State	Tea Mosquite <i>Helopeltis antonii</i>	Dead trees and those which are beyond recovery should be removed from the plantation	--	--
		Cashew weevil <i>Mecicorynus loripes</i>	Remove bark from infested areas and destroy any larvae or pupae found, this process should be repeated every month for up to six months; severely infested trees should be removed and destroyed; remove all adult weevils from tree prior to destruction and also remove bark and kill all larvae and pupae	--	--
		Helopeltis bugs <i>Helopeltis schoutedeni</i>	Monitor crop regularly for signs of damage. avoid interplanting cashew with other crops which are hosts for helopeltis bugs such as tea and cotton	Conserve populations of natural enemies, weaver ants can reduce populations African weaver ants (<i>Oecophylla longinoda</i>) have proved to be very effective as bioagents to Helopeltis and other sucking bug control	--
		Stem borers <i>Mecocorynus loripes</i>	Control approach is basically physical confrontation to adults and larvae	--	--
		Mealy bug <i>Pseudococcus longispinus</i>	--	Use of bioagents such as Ladybird beetles (<i>Chilocorus spp</i>) and	--

				Lacewing flies (<i>Chrysopa spp</i>) have proved to be useful	
Sesame	Kebbi – Zuru & Yauri Emirates	Hawk Moth	Deep ploughing exposes the pupae for predation to insectivorous birds. • Hand picking (collection) and destruction of caterpillars	Use common biological practices	--
		Bihar hairy caterpillar	Dig the trenches of 1 inch depth between the fields to kill the larvae in pits. Irrigate once to avoid prolonged mid-season drought to prevent pre-harvest infestation	Use common biological practices	--
		Gall Fly	Use common Cultural methods	Use common biological practices	--
		Leaf Roller	Use common Cultural methods	Use common biological practices	--
		Leaf Hopper	Use common Cultural methods	Use common biological practices	Application of Oxydemeton-methyl
Tomato	Kebbi – Zuru & Yauri Emirates	Cutworms	Elimination of weeds around garden beds at least two weeks before planting. Hand-picking cutworms at night may help	--	--
		Aphids	Crushing aphids by hand or blasting them off with a strong jet of water	--	--
Groundnuts		Aphids (<i>Aphis craccivora</i>)	Crushing aphids by hand & cultivating with cowpea	Use common biological practices	Application of Phoshamidon 0.03%, M-O-D 0.025%, Dimethoate 0.03%

Table 6.3: Some Diseases and Control methods in Nigeria

Crops	Diseases	Control Methods		
		Cultural	Biological	Chemical
Maize	Rust Turcicum blight Curvularia leaf spot Maydis blight Smut. Nematode	Use of crop rotation Planting technique. Removal and burning of infected plants	Use of resistant varieties	Spraying with systemic fungicides eg. Benomyl and Dithane M45. Seed dressing with Furadan or Apron plus. Use of Furadan 3G and other fumigant nematicides
Rice	Blast (<i>Pyricularia oryza</i>) Brown leaf spot (<i>Cochliobolus miyabeanus</i>) Black kernel (<i>Curvularia spp</i>)	Adopting crop rotation techniques	--	--
Cassava	Cassava Mosaic Bacterial blight Anthracnose Root rot	Crop Rotation Alteration of planting date Disposal of crop residues Choice of resistant crop variety	--	--
Soya bean	Rust Bacterial pustule Phytophthora seedling blight and root	Use of Crop rotation planting techniques	Plant resistant varieties	Use of Foliar fungicide Treatment of seeds with systemic insecticides and

	and stem rot Frogeye leaf spot Cowpea mild mottle Soyabean mottle mosaic			application of one or two foliar sprays of insecticides to reduce the insect vector during pre-flowering stage
Fish	Coccidiosis Hexamitosis Streptococcosis Dropsy Vibrio	--	--	Use of coccidiostat monensin, sulfamidimine or amprolium
Oil palm	Bacterial Bud rot – Erwinia Spp	Plant oil palm varieties with resistance to the bacteria Rotting tissue on spear leaves should be removed to prevent bacteria spreading to buds	--	Palm buds can be protected using copper-based fungicides
	Ganoderma butt rot – Ganoderma Spp	Palms should be monitored closely for signs of disease, especially if a palm has died or been removed nearby as fungi can colonize old stumps and release spores Avoidance of replanting palm in soil where an infected palm has been removed	--	--
	Oil Palm Witt – Fusarium oxysporum	Dead or dying trees should be felled and burned to prevent spread in plantations If palms are replanted, then new palm should be	--	Treatment of soil within a 3m radius of infested stumps with dazomet, and subsequent covering with leaves for a

		planted a distance of 3.9m from infested stump		period of 30 days
	Pestalotiopsis Leaf spot – Pestalotiopsis Spp	Removal and destruction of severely diseased palms from plantation, Adequate spacing during planting of palms to allow air to circulate between trees Removal of weeds from palm plantation	--	Application of appropriate broad spectrum foliar fungicides can be used as a chemical method for control of Leaf Spot disease
Yam	Anthracnose - <i>Colletotrichum gleosporoides</i>	The most effective method of controlling the disease is to plant yam varieties that are resistant to anthracnose such as TDA 291 or TDA 297	--	The use of Benomyl, thiabendazole as a chemical method of control of yam anthracnose had been proven effective
	Dry rot disease – <i>Scutellonema bradys</i>	Treating tubers with hot water for 40 min at 50-55 C before sowing and after harvest to reduce disease both in field and storage Follow crop rotation with non-host or antagonist crops like ground nut, sorghum, maize, chill pepper etc.	--	--
	Yam Mosaic diseases – Yam Mosaic potyvirus	Use of healthy, large and disease free tubers or setts for planting Regular weeding of farm land Collection and destruction of crop debris		
Cowpea	Antracnose (<i>Collectotrichum spp</i>)	Use of resistant varieties for planting is the best method of control	--	--

		practice of good field sanitation such as removing crop debris from field after harvest to reduce levels of inoculum		
	Bacteria blight (Fungi) <i>Xanthomonas campestris</i>	Use of certified seeds and resistant varieties	--	Spraying of plants with an appropriate protective copper based fungicide before appearance of symptoms Treatment of seeds with an appropriate antibiotic prior to planting to kill off bacteria
	Brown blotch (Fungi) <i>Collectrichum capsici</i>	Use of resistant varieties for planting is the best method of control Use of only certified disease-free seed Good field sanitation practice such as removing crop debris from field after harvest to reduce levels of inoculum	--	--
	Brown Rust (Fungi) <i>Uromyces spp</i>	--	--	Sprays of sulphur or potassium carbonate can help to control the disease
Cashew	Anthracnose <i>Collectotrichum gloeosporoides</i>	--	--	A protective coating of copper-based fungicide on

				susceptible parts of plant can prevent the disease. Fungicide should be applied when buds begin to expand through to fruit set but are not required during dry periods
	Die Back or Pink Disease	This disease can be controlled by the pruning of the affected branches below the spot of infection and destroying them, protecting the cut surface by application of Bordeaux paste and spraying of Bordeaux mixture 1% twice in May - June and the second in October.	--	--
	Damping off of Seedling	It can be controlled by provision of adequate drainage in the nursery and drenching the beds/polybags with 0.1 % Cersen, Bordeaux mixture 1%, Diathane - M-45 0.25% or Feltef 0.1%.	--	--
	Powdery Mildew disease	--	--	Powdery is basically controlled by use of Sulphur dust, but due to likely environmental acidification problems, alternative fungicides have been tested and registered for use in Nigeria

	Leaf and nut blight disease	--	--	-
Ginger	Bacterial Wilt	<p>Use of disease free seeds.</p> <p>Sowing should be done on disease free land based on previous history.</p> <p>4 to 5 years of crop rotation will prevent disease incidence</p> <p>Provide proper drainage will prevent water stagnation</p>		Treatment with trichoderma viride or T. Herzianum + Pseudomonas florescens before sowing.
	Dry Rot	Seed rhizomes are to be selected from disease free garden	--	<p>Application of Trichoderma harzianum along with neem cake @ 1 kg/bed helps in preventing the disease.</p> <p>Use Bordeaux mixture or copper fungicides@ 2.5 gm / lit water as spot drenching</p>
	Soft Rot	<p>Use disease free, healthy rhizome for planting.</p> <p>Provision of good drainage</p>	<p>Bio fumigation with residues of cruciferous crops like mustard, toria, rapeseed</p>	<p>Application of neem cake @ 2.5 quintals along with Trichoderma viride @ 2.5 kg/ha at the time of planting.</p> <p>Drenching with Bordeaux mixture @1% or COC @0.3% for effective management of the disease.</p>
	Leaf Spot	Growing the crop under partial shade	--	Application of Bordeaux mixture at 1% or COC at 0.3%

Sesame	Alternaria leaf blight	Avoid planting overlapping crops in adjacent area. Crop rotations, viz., sesame-maize cabbage, okra-sesame - maize, maize - sesame -maize and sesame - finger millet-egg plant are reported effective in reducing disease incidence. Crop rotation with non-host crops, particularly with paddy. Provide good drainage	Use resistant/tolerant varieties. Use healthy, certified and weed seed free seeds. Use sowing in lines to facilitate inters culture operations. Adopt stale seedbed technique to control early germinating weeds. Use straw mulch to control weed growth and to conserve soil moisture	Treatment with Trichoderma @ 4 g/Kg of seed, Pseudomonas fluorescens @ 2 g/Kg seed or Bacillus subtilis @ 2 g/Kg seed or NSKE 4%
	Phytophthora blight	Avoid planting overlapping crops in adjacent area. Crop rotations, viz., sesame-maize cabbage, okra-sesame - maize, maize - sesame -maize and sesame - finger millet-egg plant are reported effective in reducing disease incidence. Crop rotation with non-host crops, particularly with paddy. Provide good drainage	Use resistant/tolerant varieties. Use healthy, certified and weed seed free seeds. Use sowing in lines to facilitate inters culture operations. Adopt stale seedbed technique to control early germinating weeds. Use straw mulch to control weed growth and to conserve soil moisture	Treatment with Trichoderma @ 4 g/Kg of seed, Pseudomonas fluorescens @ 2 g/Kg seed or Bacillus subtilis @ 2 g/Kg seed or NSKE 4%
	Dry root rot	Avoid planting overlapping crops in adjacent area. Crop rotations, viz., sesame-maize cabbage, okra-sesame - maize, maize - sesame -maize and sesame - finger millet-egg plant are reported effective in reducing disease incidence. Crop rotation with non-host crops, particularly with	Use resistant/tolerant varieties. Use healthy, certified and weed seed free seeds. Use sowing in lines to facilitate inter culture operations. Adopt stale seed bed technique to control early germinating weeds. Use straw mulch to control	Treatment with Trichoderma @ 4 g/Kg of seed, Pseudomonas fluorescens @ 2 g/Kg seed or Bacillus subtilis @ 2 g/Kg seed or NSKE 4%

		paddy. Provide good drainage	weed growth and to conserve soil moisture	
	Phyllody	Intercropping of sesamum + redgram (6 : 1)	Use common biological practices	Spray neem oil @ 5 ml/l for vector (leaf hopper) control
	Prussic acid poisoning	During grazing management: use certified seed select varieties low in prussic acid follow fertilizer application recommendations do not begin grazing until plants have reached a height of 18 to 20 inches allow frosted sudangrass to thoroughly dry before pasturing dilute intake of infected material with hay and other forages	--	--
	Acetonaemia (ketosis)	Prevention depends on adequate feeding and management practices	When using corticosteroids, it is important to supply an adequate amount of glucose either as a high carbohydrate diet and/or propylene glycol drenches to prevent excessive breakdown of muscle protein	A quick-acting glucose supplement is required immediately. Follow-up treatment is aimed at providing a long term supply of glucose.
Tomatoes	Early Blight	Avoid getting water on the leaves whenever possible, change the locations where you plant your tomatoes, mulch well around each plant, and clear away all dead or infected plant material at the end of each	--	--

		season. Picking off infected leaves may slow the progression of the disease until the weather is more favorable		
	Speck and Spot	Prevent and control these diseases as you would Early Blight, above. Bacterial spots stop spreading in dry, warm weather.	--	Chemical controls are usually not needed.
	Late Blight	Avoid sprinkler irrigation, very dense planting, or other things which keep humidity high. Remove volunteer potatoes or tomatoes, and clean up debris at the end of the season. Mulching may help prevent initial infection	--	--
	Fusarium Wilt	Cleaning up all tomato debris, including old roots, and solarizing the soil may help.	The typical solution in an infected garden is to grow resistant varieties	--
	Powdery Mildew	--	--	No control is necessary on mature plants, but in the case of young or severely affected plants, sulfur dust (1) provides good control.

6.5 Personal Protective Equipment (PPE)

It is vital that the people who will be involved in the application and handling of pesticides under the ‘for women’ project wear and use appropriate personal protective gears in the course of their activities. Wearing PPE can greatly reduce the potential for dermal, inhalation, eye, and oral exposure, of humans to pesticides and thereby significantly reduce the chances of a pesticide poisoning. PPEs to use when [Applying Pesticides](#) include the following:

- Chemical Goggles: It is important to use chemical goggles, which are specially developed to prevent chemical related accidents, rather than general safety goggles
- Gloves: Unlined, full-length plastic or rubber gloves should be used. If gloves are lined residue can become trapped in the lining and is hard to remove.
- Hat: The absorption rate of pesticides is also very high on the scalp and forehead. Plastic caps are recommended as they are waterproof and prevent absorption.
- Boots: Rubber overshoes are suggested since they prevent absorption and are easy to clean.
- Coveralls/Apron or Long-Sleeved shirt and full trousers made from closely woven fabric
- Respiratory Masks
- Ear Protection: Earplugs prevent pesticide exposure via the ear canal.

It is mandatory that pesticide contaminated clothing be kept from other fabric. PPE should be cleaned and dried in a well-ventilated place before storage.

Guide to Responsible Use and Storage of Pesticides

- Do not store pesticides in unlocked cabinets that are within the reach of children. Pesticides are extremely toxic to children.
- Do not transfer pesticides into containers that could be associated as something else such as food.
- Do not apply insect repellents over cuts, irritated skin, eyes, mouth, hands, or directly over the face
- Do not store unnecessary amounts of pesticides. Purchase only what you need at that time.
- Apply an appropriate level of caution to those who might come into contact and become exposed.
- Look for pesticide alternatives.

6.6 Patterns of functional Surveillance in Selected States

Patterns of the functional surveillance for early warning on alien invasive species and migratory pests for the ‘for Women’ IPM is as shown in table 6.4.

Table 6.4 Patterns of functional surveillance

Activities	Expected results	Milestones	Performance Indicators	Assumptions
<ul style="list-style-type: none"> • Record stakeholders' overviews on crop and livestock pests. • Conduct field diagnosis to specify pests that undermine agricultural activities. • Identify local coping mechanisms and researcher recommended IPM options against the pests. • Develop and explain historical profile of pesticide use and other pest control practices for the for Women project. • 5. Specify partnership opportunities at local, national and international levels to assist in the implementation of the PMP 	<p>Stakeholder groups develop common understanding of key pest problems and agree corrective action.</p>	<ul style="list-style-type: none"> • Pest problems diagnosed and related IPM opportunities identified • Potential constraints farmers may face in the use of the technologies specified • Pest lists including quarantine pests and alien invasive species developed. • Potential for improving existing pest control practices assessed • Pest monitoring schemes for early warning on alien invasive species and migratory pests are organized and functional • Action plan for location-specific IPM activities developed 	<ul style="list-style-type: none"> • Documented information on the status of pests and natural enemies of pest and pollinators in agriculture. • Inventory of alien invasive species and quarantine pests • Types and availability of natural enemies for use in biological control of named pest • Types and availability of microbial pesticides and botanical pesticides to replace chemical pesticides • Type and number of crop rotation schemes to reduce build up of named pest species • Type of composting and mulching as alternatives to mineral fertilizers • List of principal actors and of partners 	<p>Social, economic and political situation remain stable</p> <p>Major security threats to agricultural activities such as herdsmen problems are effectively resolved.</p>

CHAPTER SEVEN

7.0 IPMP Implementation and Management

The fundamental areas essential to the successful implementation of this IPMP are:

- Measures that ensure that banned pesticides are not procured for the project.
- Training & Capacity Development - Measures that will ensure capacity building among stakeholders that will implement the IPMP
- Institutional Arrangements
- Monitoring Measures to ensure that POPs pesticides and WHO class I and II pesticides considered to be extremely/highly and moderately hazardous respectively are not procured and/or used;
- Stakeholder Participation measures that will ensure that farmers get the relevant technical aids and education on the implementation of safe and alternative pest control measures rather than the use of chemicals.

7.1 IPMP recommendations for Implementing the ‘for Women’ Project

The following recommendations shall guide the implementation of the IPM:

1. Capacity development and training for key project personnel such as environmental safeguard specialist, monitoring team & also ‘for women’ project beneficiaries that will be involved in agricultural activities in the following key areas:

- Environmental Assessment & basic concept of Environment
- Environmental Regulations and Statutory requirements with focus on Government and World bank
- Introduction to Environmental & Social Safeguards
- Occupational Health and Safety (OHS) and importance of Personal Protective Equipment
- Train on the biological and cultural pest control options and prohibition of use of Bank funds to procure unacceptable pesticides and why.
- Developing Safe Practices in the Management & Handling of Chemical Pesticides (transportation, storage, handling, storage of empty pesticide containers)
- Patterns of functional pest surveillance & early warning systems
- IPM Implementation and Monitoring (with field exercises) to enable the beneficiaries have a proper hands-on knowledge of best practise pest control methods that do not involve use of chemicals, as contained in annex 5.

b. It is also vital that this training communicates measures to ensure that unacceptable pesticides are not procured with Bank’s funds, which will be verified by the environmental safeguards specialist at the State level.

2. Ensure provision of PPE by purchase of special protective clothing for pesticide use & handling - hand gloves, gas mask, safety boot and coverall.
3. The SPMU shall ensure proper Compliance Monitoring of IPMP requirements according to the IPMP monitoring plan.
4. Carry out the disclosure of Copies of this IPMP, like other safeguard instruments to enable stakeholders review and make inputs, where necessary.

7.2 Measures for Ensuring WHO Class 1 & Class2 Pesticides are not procured

For this IPM to be effective, measures to ensure that unacceptable pesticides are not procured with Bank's fund will be verified by the environmental safeguards specialist at the State level. The environmental specialists at the SPMU will screen the pesticides procurement list prior to procurement and ensure that only pesticides that are acceptable and approved by the Bank/WHO/NAFDAC are procured. The outcome of the screening will be sent to World Bank for concurrence.

Other measures for the overall success of IPM are:

- There will be adequate awareness program to educate farmers and stakeholders including sellers, users and farm workers on the adverse impact/risk associated with the use of certain chemicals by WHO. Names and chemical class of banned chemicals will be brought to the attention of project beneficiaries through various awareness programs.
- The SPMU in the respective States will ensure that the IPM options (materials, species, equipment, etc) are distributed to beneficiaries early enough for timely implementation. There will be engagement of advisors (extension workers, etc) to assist farmers with technical know-how of the IPM in the formative years of operation;
- SPMU will consider subsidizing IPM products to the target beneficiaries in order to discourage the use of chemical and harmful pesticides. If the alternative to chemical control to pest is available, and cost effective the tendency to use chemicals will be minimized, and that way, the proliferation of WHO Class 1 and Class 11 pesticides would have been avoided.

7.3 Assessment of Capacity Development & Support Needs

Training and Capacity Development is a fundamental component of the IPMP. A series of trainings have been proposed and are as follows:

Table 7.1 Training & Capacity Development

Modules	Targets	Responsibility	Budget
Environmental Assessment • Basic Concept of Environment • Environmental Regulations and Statutory requirements with focus on Government and World bank	FPMU/SPMU safeguards Unit, Environmental/Safeguard Unit, Procurements & other relevant groups, MoWASD, MoE/EPA	Environmental & Social Specialists of Design Consultant/External Agency engaged for capacity building	See ESMF Budget
Introduction to Environmental & Social Safeguards • Different safeguard policies & triggers • Applicable safeguard policies to For Women project (Pest Management - OP. 4.09) • Decision making on the selection of IPM approaches or options	FPMU/SPMU Safeguards Unit, MoE/EPA (Technical unit)	Environmental & Social Specialists of Design Consultant/External Agency engaged for capacity building	See ESMF Budget
Occupational Health and Safety (OHS) Basics in chemical pest applications.	SPMU Safeguards Unit, MoE/EPA (Technical unit), For Women beneficiaries in Agric	IPM Consultant	1,500,000.00
Developing Safe Practices in the Management & Handling of Chemical Pesticides (transportation, storage, handling, storage of empty pesticide containers and final disposal)	SPMU Safeguards Unit, MoE/EPA (Technical unit), For Women beneficiaries in Agric	IPM Consultant	1,500,000.00
IPM Implementation and Monitoring (with field exercises)	SPMU Safeguards Unit, MoE/EPA (Technical unit), For Women beneficiaries in Agric	IPM Consultant	1,000,000.00
TOTAL			4,000,000.00

7.4 Institutional Arrangements and Framework for Implementation

The need for institutions to collaborate is necessary for a successful implementation of the IPMP. It is vital that the FPMU collaborates with other supporting institutions, to appropriately utilize the capacity within the institutions to deploy or use the IPMP as an important portion of the ESMF, necessary for accomplishing environmental and pest management goals.

7.4.1 Safeguard Roles and Responsibilities of Institutions

The roles and responsibilities of these levels of institutions are outlined in Table 7.2.

Table 7.2 IPMP Safeguard Responsibilities	
Category	Roles & Responsibilities
Federal Government MDAs (Federal Ministry of Environment and other agencies (Such as NESREA))	<ul style="list-style-type: none">Lead role in provision of advice on screening, scoping, review of draft EA/ESMF, ESMP & IPMP safeguard instruments (in liaison with State Ministry of Environment), receiving comments from stakeholders, public hearing of the project proposals, and convening a technical decision-making panel, Project categorization for EA, Applicable standards, Environmental and social liability investigations, Monitoring and evaluation process and criteria, liaison with relevant stakeholders within and outside Nigeria on matter of enforcement of environmental standards, regulations, rules, laws, policies and guidelines. Disclosure of documents, where required.
State Government MDAs (Ministry of Lands, Survey and Urban Development, Ministry of Environment, etc. Other MDAs)	<ul style="list-style-type: none">Provide project related policy decisions and guidance regarding the ESMF/IPMP, through the State Technical Committee (STC)Ensuring compliance at State Level, on matters of Environmental Assessment and Pest ManagementSet up a functional Safeguards Unit in the SPMU that will be responsible for IPMP management and compliance monitoring. <ul style="list-style-type: none">Pursue mandates related to the core responsibility of the ministries, departments and agencies.Intervene when relevant areas or resources under their jurisdiction or management are likely to be affected by or implicated sub-projects.Participate in the EA, OP 4.09 pest management processes and in project decision-making that helps prevent or minimize impacts and to mitigate them.
World Bank	<ul style="list-style-type: none">Assess implementation process and ensure funds are not used for purchase of chemicals/pesticidesRecommend additional measures for strengthening the IPMP and implementation performance.
SPMU Safeguards Unit	<ul style="list-style-type: none">Liaise closely with Ministry of Environment in preparing a coordinated response on Pest Management activities and ensure they are in compliance with guidelines provided in IPMP and ensure adequacy under the World Bank Safeguard policies.Ensure that the project design and specifications adequately reflect the recommendations of the IPMPs;Develop, organize and deliver Safeguards training program that comprises an IPM component for the SPMU staff, the contractors and others involved in the project implementation, in collaboration with the SPMU

Table 7.2 IPMP Safeguard Responsibilities

Category	Roles & Responsibilities
	<ul style="list-style-type: none">• Develop and implement IPMP monitoring plan to ensure compliance• Ensures that project beneficiaries do not procure pesticides with bank funds provided
Local government	<ul style="list-style-type: none">• Liaising with the SPMU to set up LGA Implementation Units and Ward Facilitation Teams that will ensure compliance with IPMP requirements among the rural participants of the project.
NGOs/CSOs	<ul style="list-style-type: none">• Assisting in their respective ways to ensure effective response actions, Conducting scientific researches alongside government groups to evolve and devise sustainable IPMP strategies and rehabilitation techniques.
The General Public	<ul style="list-style-type: none">• Same as above

7.5 Monitoring and Evaluation

The objectives of monitoring and evaluation for the IPMP are as follows:

- Providing timely information about the compliance with or otherwise, of the for Women IPM operation process outlined in this report. This will ensure continuous improvement in the project areas
- To make a final evaluation in order to determine whether the mitigation measures incorporated in the IPMP have been successful.

The monitoring requirements for the environmental and health impacts of the pesticides management activities are articulated under this management component. Monitoring and evaluation of the agricultural support IPMP will be mainstreamed into the overall monitoring and evaluation system for the project's ESMF. The key issues to be considered in the monitoring process are whether a pesticides procurement checklist is available and used during procurement and screening to carry out the following:

- 1) Ensure that POPs pesticides and WHO class (Ia) and (Ib) pesticides are not procured or used.
- 2) Monitor the progress of the IPM implementation.

Specifically, the following are monitoring indicators (see annex for checklist) required to achieving IPM project development objectives:

- Level of understanding of World Bank operational policy on pest management among Women farmers involved in agricultural activities under the For Women
- Level of involvement of youth and women in agriculture activities

7.6 Participation / Consultation Measures

The FPMU, coordinating activities through the SPMU will be largely responsible for ensuring participation of the relevant stakeholders/community at sub-project level. Involvement of

the stakeholders/community should not be limited to interactions with the community but also disclosing relevant information pertaining to the project tasks.

7.7 Budgets for the IPMP

To effectively implement the IPMP measures suggested, the cost elements that will be vital towards implementing the plan is shown in the budget contained in table 7.3.

Table 7.3: Estimated Annual Budget to Implement IPMP			
1	IPMP Requirements	Considerations	Total Cost per State/Year (N)
A	Training & Capacity Strengthening		
1	Capacity Building for FPMU & SPMU Personnel	Training Programs (from capacity building budget)	4,000,000.00
	Capacity Strengthening for relevant Stakeholders/MDA's	Workshops to be held in individual States.	
B	Mitigation & Management		
1	PPE - Occupational Health & Safety.	Purchase of special protective clothing for pesticide use & handling - hand gloves, gas mask, safety boot and coverall wear	2,500,000.00
C	Environmental & Social Monitoring		
4	Monitoring Compliance IPMP requirements	Mainstream into ESMF	See ESMF Budget
	Total Estimated Budget		6,500,000.00
	Contingency	10% of sub-total	650,000.00
Total			7,150,000.00

CHAPTER EIGHT

8.1 Disclosure Of Safeguard Instruments

Copies of this IPMP, like other safeguard instruments (such as ESAs/ESMFs etc.) that would be prepared for the For Women and its sub-projects will be made available to the public by the FPMU.

The FPMU will disclose the IPMP as required by the Nigeria EIA public notice and review procedures as well as the World Bank Disclosure Policy at the World Bank Infoshop. Copies of other safeguards instruments (such as ESMFs/RPFs etc.) are required to be disclosed in like manner. Table 8.0 outlines documents to be disclosed.

Table 8.0: Typical documents to be disclosed			
Topic	Documents to be disclosed	Frequency	Media
Public Consultation	Minutes of Formal Public Consultation Meetings	Within two weeks of Meeting	World Bank's Info-shop, Implementation agency's website/ Project Management Unit & Project Implementation Units (FPMU), Ministry of Environment, Local government Secretariat
Environment Management	IPMP, ESMF, ESIA, EMP with Key Actions, safeguard Monitoring reports, and audit	Prior to awarding works and to remain on website	World Bank's Info-shop. Implementation agency's website/ Project Management Unit (FPMU/SPMU) & Ministry of Environment, Local government Secretariat

REFERENCES

- IPMP for Nigerian Agro Processing, Productivity Enhancement and Livelihood Support Project –APPELISP (2016)
- The Agricultural Promotion Policy, Policy and Strategy Document – FMARD (2016)
- IPMP for the Youth Empowerment Social Support Operation –YESSO (2012)
- IPMP National FADAMA 2 PMP for Nigeria (2005)
- IPMP of the West African Agricultural Productivity Programme (2010)
- IPMP Transforming Irrigation Management in Nigeria - TRIMING (2013)
- Pest Control in Cassava Farms; IPM Guide for Field Extension Agent –IITA (2000)
- EHS Guidelines for Pesticide Handling and Application, IFC

Annexure

Annex 1

Good Management Practices Guide and Pesticides Management Measures

a. Required measures for the reduction of pesticides-related risks

Safe use of pesticides

Pesticides are toxic for pests and for humans. However, if sufficient precautions are taken, they should not constitute a threat either for the population or for non-targeted animal species. Most of them can have harmful effects if swallowed or in case of prolonged contact with the skin. When a pesticide is sprayed in the form of fine particles, there is a risk of absorbing them with the air we breathe. There is also a risk of water, food and soil contamination.

Specific precautions should therefore be taken during the transportation, storage and handling of pesticides. The spraying equipment should be regularly cleaned and well maintained to avoid leakages. The individuals using pesticides should learn how to use them safely.

Insecticides registration

Reinforce the registration process of insecticides by ensuring:

- Streamlining, between the national pesticides registration system and other products used in Public Health;
- Adoption of WHO specifications applicable to pesticides for national registration process purposes;
- Reinforcement of the pilot regulatory body;
- Collection and publication of data relating to imported and manufactured products;
- Periodical review of registration.

When planning to buy pesticides to control vectors, consult the guiding principles issued by WHO. For the acquisition of insecticides intended for public health use, the following guidelines are recommended:

- Develop national guidelines applicable to the purchase of products intended for vector control and ensure that all the agencies buying them strictly comply with those guidelines;
- Use synthetic Pyrethroids: Deltamethrin SC, Permethrin EC, Vectron, Icon, Cyfluthrin, as recommended by the national policy;
- Refer to the guiding principles issued by WHO or FAO on calls for tenders, to FAO recommendations regarding labeling and to WHO recommendations regarding products (for indoor spraying);
- Include in calls for tenders, the details regarding technical support, maintenance, training and products recycling that will be part of the after-sale service committing manufacturers; apply the back-to-sender principle;
- Control the quality and quantity of each lot of insecticides and impregnated supports before receiving the orders;
- Ensure that the products are clearly labeled in French and if possible in local language and in the strict respect of national requirements;
- Specify which type of package will guarantee efficiency, preservation duration as well the human and environmental security of handling packaged products while strictly complying with national requirements;

- Ensure that donated pesticides intended for public health, comply with the requirements of the registration process in Mali (CSP) and can be used before their expiry date;
- Establish a consultation, before receiving a donation, between the ministries, agencies concerned and the donors for a sound use of the product;
- Request users to wear protective clothes and equipment recommended in order to reduce their exposition to insecticides to the strict minimum;
- Obtain from the manufacturer a physic-chemical analysis report and the product acceptability certification;
- Request the manufacturer to submit an analysis report of the product and of its formulation along with guidelines to follow in case of intoxication;
- Request the buying agency to perform a physic-chemical analysis of the product before shipping and arrival.

Precautions

Labeling

Pesticides should be packaged and labeled according to WHO standards. The label should be written in **English** and in the local language (**Hausa, Igbo and Yoruba** as applicable); it should indicate the content, the safety instruction (warning) and any action to be taken in case of accidental ingestion or contamination. The product should always remain in its original container. Take all appropriate precautionary measures and wear protective clothes in accordance with recommendations.

Storage and transportation

Pesticides should be stored in a place that can be locked up and is not accessible to unauthorized individuals or children. The pesticides, should, in no event, be stored in a place where they could be mistaken for food or beverage. They should be kept dry and out of the sun. They should not be transported in a vehicle that also carries food products.

In order to ensure safety during storage and transportation, the public or private agency in charge of managing purchased insecticides and insecticide-impregnated supports, should comply with the current regulations as well as the conservation conditions recommended by the manufacturer regarding:

- Preservation of the original label;
- Prevention of accidental pouring or overflowing;
- Use of appropriate containers;
- Appropriate marking of stored products;
- Specifications regarding the local population;
- Products separation;
- Protection against humidity and contamination by other products;
- Restricted access to storage facilities;
- Locked storage facilities to guarantee product integrity and safety.
- Pesticides warehouses should be located far from human residences or animal shelters, water supplies, wells and channels. They should be located on an elevated surface and secured with fences with restricted access for authorized individuals only.
- Pesticides should not be stored in places where they could be exposed to sunlight, to water or to humidity, which could harm their stability. Warehouses should be secured and well ventilated.

- Pesticides should not be transported in the same vehicle with agricultural products, food products, clothes, toys or cosmetics as these products could become dangerous in case of contamination.
- Pesticides containers should be loaded in vehicles in order to avoid damages during transportation, that their labels will not tear off so that and they would slip off and fall on a road with an uneven surface. Vehicles transporting pesticides should bear a warning sign placed conspicuously and indicating the nature of the cargo.

Distribution

Distribution should be based on the following guidelines:

- Packaging (original or new packaging) should ensure safety during the distribution and avoid the unauthorized sale or distribution of products intended for vector control;
- The distributor should be informed and made aware of the dangerous nature of the cargo;
- The distributor should complete delivery within the agreed deadlines;
- The distribution system of insecticides and impregnated supports should enable to reduce the risks associated with the numerous handlings and transportations;
- In the event the purchasing department is not able to ensure the transportation of the products and materials, it should stipulated in the call for tenders that the supplier is expected to transport the insecticides and impregnated supported up to the warehouse;
- All pesticides and spraying equipment distributors should have an exploitation permit in accordance with the current regulation in Mali.

Safe Disposal of Pesticides

- Avoid disposing of pesticides whenever possible:
 - Mix up only enough pesticide for the job.
 - Use up small amounts of excess pesticides -- apply them according to the directions on the label.
 - If you cannot use it, ask your neighbors if they have a similar pest control problem and can use it up.
 - Follow all disposal instructions on the pesticide label.
 - Check with your local solid waste management authority, environmental agency or health department to find out whether your community has a household hazardous waste collection program or a similar program for getting rid of unwanted, leftover pesticides. These authorities can also inform you of any local requirements for pesticide waste disposal.
 - Never reuse empty pesticide containers. Pesticide residues can contaminate the new contents and cause serious harm.
 - Never pour pesticides down the sink, toilet, sewer, or street drain.

of by throwing it in a place where there is a risk of contaminating drinking water or for bathing or where it can reach a pond or a river. Some insecticides, such as pyrethroids, are very toxic for fish. Dig a hole to at least 100 meters from any stream, well or habitat. If in hilly areas, the whole must be dug below. Pour all waters used for hand washing after the treatment. Bury all containers, boxes, bottles, etc. that have contained pesticides. Reseal the hole as quickly as possible. Packaging or cardboard, paper or plastic containers—the latter cleaned—can be burnt, if allowed, far away from homes and drinking water sources, regarding the re-use of containers after cleaning. Pyrethroid

suspensions can be discharged on a dry soil where they are quickly absorbed and then will go through a decomposition process making them harmless for the environment.

If there is an amount of insecticide solution left, it can be used to destroy ants and cockroaches. Simply pour a little bit of solution on infested areas (under the kitchen sink, in corners) or to rub a sponge soaked with water on it. To temporarily prevent insect proliferation, a certain amount of solution can be poured inside and around latrines or on other breeding places. Pyrethroid suspensions for mosquito nets treatment and other fabrics can be used days after their preparation. It can also be used to treat mats and rope mattresses to prevent mosquito to bite from the bottom. Mattresses can also be treated against bugs.

Cleaning of empty pesticide packaging and containers

Re-using empty pesticide containers are risky and it is not recommended to do so. However, it is estimated that some pesticide containers are very useful to be simply thrown away after use.

Can we therefore clean and re-use such containers? This depends both on the material and the content. In principle, the label should indicate the possibilities for re-using containers and how to clean them.

Containers having contained pesticides classified as hazardous or extremely dangerous should **not** be re-used. Under certain conditions, containers of pesticides classified as dangerous or that do not present any risk under normal use, can be re-used unless they are not used as food or drink containers or as food containers for animal food. Containers made of materials such as polyethylene that preferentially absorb pesticides, must not be re-used if they have contained pesticides whose active ingredient has been classified as moderately or extremely dangerous regardless of the formulation. Once a recipient is empty, it should be rinsed, then filled completely with water and allowed to stand for 24 hours. Then it should be emptied and this process should be done over again.

General Hygiene

Do not eat, drink or smoke when handling insecticides. Food should be placed in tightly closed containers. Measurement, dilution and transfer of insecticides should be done with the adequate material. Do not shake or take liquid with unprotected hands. If the nozzle is blocked, press the pump valve or unblock the opening with a flexible rod. After each fill, wash hands and face with water and soap. Eat and drink only after washing hands and face. Take a shower or a bath at the end of the day.

Individual protection

- Adapted coveralls covering hands and legs
- Dust, gas and respirator masks, based on the type of treatment and product used
- Gloves
- Goggles
- Hoods (facial shield)

Protection of the population

- Minimize the exposure of local populations and livestock
- Cover wells and other reservoirs
- Sensitize populations on risks

Protective clothing

Treatments inside homes:

Operators should wear coveralls or a long sleeves shirt over a pair of pants, a flapped hat, a turban or any other type of headgear as well as boots or big shoes. Sandals are not suitable.

Nose and mouth should be protected using a simple method, for example a disposable paper mask, a disposable surgical or washable mask or a clean cotton cloth. Once the fabric is wet, it should be

changed. Clothing must be in cotton for easy washing and drying. It must cover the body and contain no opening. In hot and humid climates, it can be uncomfortable to wear additional protective clothing; therefore, one will be forced to spray pesticides during hours when it is very hot.

Preparation of suspensions

People responsible for bagging insecticides and preparing suspensions, particularly for the treatment of mosquito bed net units must take special precautions. In addition to the abovementioned protective clothing, they must wear gloves, an apron and eye protection, for example a facial shield or glasses. Facial shields protect the entire face and keep less warm. Nose and mouth should be covered as indicated for treatment in homes. They should ensure that they do not touch any part of their body with gloves during pesticide handling.

Treatment of nets

To treat mosquito nets, clothes, grills or with tsetse traps with insecticides, it is necessary to wear long rubber gloves. In some cases, additional protection is required, for example against vapours, dusts or insecticide dusting that could be dangerous. These additional protective accessories should be mentioned on the product label and may consist of aprons, boots, facial masks, coveralls and hats.

Maintenance

Protective clothing should always be impeccably maintained and should be checked periodically to verify tearing, wearing that could lead to skin contamination. Protective clothing and equipment should be washed daily with water and soap. Particular attention should be paid to gloves and they must be replaced once they are torn or show signs of wear. After usage, they should be rinsed in water before removing them. At the end of each working day, they will need to be washed inside and outside.

Safety measures

During spraying

Spurt form the sprayer must not be directed towards a part of the body. A leaking sprayer must be repaired and skin must be washed if it is accidentally contaminated. The household and animals must stay outside during the whole spraying activity. Avoid treating a room where there is a person — a sick person for example — who cannot be taken outside. Before starting spraying activities, kitchen utensils should be taken out and all utensils as well as dishes containing drinks and food. They can be gathered in the centre of the room and covered with plastic film. Hammocks and paintings should not be treated. The bottom part of furniture and the side against the wall should be treated while ensuring that surfaces are effectively treated. Sweep or wash the floor after spraying. Occupants should avoid contact with walls.

Clothing and equipment should be washed every day. Avoid spraying organophosphate or carbamate for more than 5 to 6 hours daily and wash hands after each filling. If Fenitrothion is used or old stocks of Malathion are used, operators should control the level of cholinesterase in their blood every week.

Monitoring exposure to organophosphate

There are country kits available on the market to control cholinesterase activity in the blood.

If this activity is low, it can be concluded that their excessive exposure to organophosphate insecticide. These dosages should be done every week with people handling such products.

Any person whose cholinesterase activity is very low should be stopped from working until it returns to normal.

Fabric spraying

When handling insecticide concentrates, or preparing suspensions, gloves should be worn.

Attention should be paid particularly to spraying in the eyes. A big bowl not too high should be used and the room should be well ventilated to avoid inhaling smokes.

b. Measures to minimize transportation, storage, handling and usage risks

Annex 2

List of banned pesticides

1. Aldrin
2. Chlordane
3. DDT (Dichlochlorphenyl trichloroethane)
4. Dieldrin
5. Endrin
6. Heptachlor
7. Toxaphene
8. Chlordimeform
9. Mercury Compounds
10. Lindane
11. Parathion
12. Methyl Parathion
13. Methyl bromide
14. Hexachlorobenzene

Annex 3

List of crop and livestock protection products approved for use by NAFDAC

a) Insecticides

Organochlorines insecticides

1. Endosulfan 2. Helptachlor

3. Lindane (Restricted to use on Cocoa only)

Organophosphorus insecticides

Organophosphorus i 1. Diazinon

2. Dichlorvos (DDVP)

3. Chlorpyrifos

4. Chlorpyrifos – Methyl

5. Dicrotophos

6. Dimethoate

7. Monocrotophos

8. Perimiphos – Ethyl

9. Perimiphos – Methyl

Carbamates

1. Carbaryl 2. Carbofuran 3. Propoxur 4. Carbosulfan 5. Furathiocarb 6. Temik (Aldicarb)

Pyrethroids

1. Lambda – Cyhalothrin

2. Cypermethrin 3. Deltamethrin 4. Phenothrin 5. Permethrin

6. Tetramethrin 7. Cyfluthrin 8. Allethrin

10. Ethion

11. Rugby (Cadusofas)

12. Malathion

13. Temeguard (Temephos)

14. Isazofos 15. Parathion – 31 Methyl

16. Phosphamidon

17. Methidathion

b) Herbicides and fungicides

Organophosphorus Organophosphorus 1. Anilofos 2. Piperophos

3. Glyphosate

4. Glyphosate Trimesium (Touchdown or Sulfosate)

5. Amideherbicides (Acetochlor; Alachlor; Propanil; Butachlor; Metalochlor)

Triazines and Triazoles

Carbamates

1. Asulam

Other herbicides

1. Dimethachlor 2. Metazachlor

3. Monosodium Methyl Arsonate (MSMA)

4. Fluxixypyrr 5. Imazaquine

6. Triassulfuran (Amber)

7. Osethoxydim
8. Oxadiazon (Ronster)
9. Clomaone
10. Trifluralin
11. Stamp 500 (pendimethalin)
12. Fluazifop – P.butyl

Fungicides

1. Benomyl (Nitroheterocyclic Compound)
2. Dazomet (Thiadiazine Fungicide)
3. Folpet (Phthalimide Fungicide)
4. Metalaxyl (Acylalamine Fungicide)
5. Cyproconazole (Alto – 100SL)
6. Bavistin (Carbon) – Benzimidazole
7. Triadmenol (Bayfidon GR Conzole Fungicide)

(Atrazine; Desmetryn; Terbuthalazine; Terbutrex Terbutryne)

Chlorophenoxy herbicides (Prometryn; Simazine; 2.4-D (2.4 Dichlorphenoxy acetic acid)

7. **Urea and guanidines ;** (Diuron ; Linurex (=Linuron); Fluometuron; Chloroxuron; Neburon)

Quaternary nitrogen compounds (paraquat; diquat)

Ametryn;

Annex 4

IPM Screening Checklist

S/n	Description of Screening Parameters	Please Tick		Information Details
		Yes	No	
1	Is there a pest problem on farms in the community?			
2	Number of farmers and stakeholders aware of the pollution, contamination and toxicity associated with pesticides?			
3	Do we have any women farmers or female farmers association using biological methods of pest control?			
4	Number of persons trained in the method of spraying and handling of chemical pesticides			
5	The reported incidences of pest and herbicides concerns among farmers			
6	The level of use of resistant and improved species of crops among farmers			
7	Medical reports/incidences of toxicity among farmers			
8	Improvement in production/harvest of crops/livestock from use of IPM			
9	Level of understanding of IPM processes			
10	Level of understanding of World Bank operational policy			
	Level of involvement of youth and women in agriculture activities			

Annex 5

Pests and Control methods in Nigeria

Crops	Some of Cultivation Locations in States Visited	Pests	Control Methods		
			Cultural	Biological	Chemical
Horticulture (fruits & Vegetables)	Abia - Abia South Kebbi - Zuru & Yauri Emirates	Nematode Caterpillars (Moths and Butterflies) Beetles Grasshoppers Stem borers	Use of resistant species Adoption of crop rotation techniques.	Soil solarisation	-
Maize	Kebbi - Zulu & Yauri Emirates	Quelea birds Grass cutters Rats Bush fowls Termites and Mole cricket Stem borers Shoot flies Armyworms	Bird scaring using Scare-crows Use of traps for rats, grass cutters, bush fowls Removal and destruction of infested plants and plant residue (applicable to Stem borers, armyworms & termites)	Encouraging or introducing natural enemies of the pest or interfering with the life cycle of the pest	Aerial spraying of organophosphorus pesticides
Rice	Abia - Zacordi & Bende Kebbi - Arugungu LGA	Nematodes (Apelenchoides besseyi; Hirshmanniella grazilis; H.oryza; H.spinica udata) Stem borers	Land fallow and planting of trap crops Adopting crop rotation techniques	Encouraging or introducing natural enemies of the pest or interfering with the life cycle of the pest	-
Cassava	Cultivated Statewide Abia	Green mite Cassava mealy bug Variegated grasshopper.	Crop Rotation Alteration of planting date Disposal of crop	Encouraging or introducing natural enemies of the pest or interfering with the life cycle of	-

			residues Choice of resistant crop variety Management of Irrigation.	the pest	
Soya bean	Zuru & Yauri LGAs	Caterpillars Whitefly	Adopting crop rotation techniques Removal and destruction of infested plants and plant residues	Encouraging or introducing natural enemies of the pest or interfering with the life cycle of the pest.	--
Fish	Arugungu LGA	<ul style="list-style-type: none"> • lukes • eeches • nchor worm • ice • ematode 	Avoid introduction of raw plants or snails	--	Use of organophosphates Potassium Permanganate bath against fresh water parasites or salt water bath for fresh water parasites
Oil Palm	Abia South – Palm oil processing	Mealy Bugs (<i>Dysmicoccus brevipes</i>)	--	Mealy bugs can potentially be controlled by the introduction of natural enemies such as lady beetles	--
		Rhinoceros beetle (<i>Oryctes rhinoceros</i>)	<p>Destroying of any decaying logs in plantation by chopping and burning to kill any larvae that may be inside</p> <p>Removal of any dead trees from plantation and destroy by burning</p> <p>Planting of cover crop to deter egg laying by females as they do not lay eggs in areas</p>	--	--

			covered by vegetation Hooked wire can be used to extract larvae that are boring into young crowns		
Yam	Abia - Abia North	Mealy bugs (Rastrococcus Spp)	Pruning out of heavily infested branches	Introduction of natural Mealy Bug enemies like Ants etc.	Horticultural oils or soapy solutions can be used to treat heavy infestations It is not advised to use chemicals for control, as they may decrease the population of natural enemies, leading to Mealy bug outbreak
		White Scale insects – <i>Aspidiella hartii</i>	Inspection of yams in storage regularly, and removal of scale infested tubers Use of scale-free seed-yam for planting	--	Use of white oil (made from vegetable oils), soap solution or horticultural oil (made from petroleum) on yams infested with scale: (i) after harvest and before yams are stored; (ii) during storage, on yams when infestations begin; and (iii) at the time of planting before the tubers are cut Commercial horticultural oil can also be used. White oil, soap and horticultural oil-sprays work by blocking the breathing holes of insects

					causing suffocation and death. Spraying the undersides of leaves; the oils must contact the insects.
Cowpea	Kebbi – Arewa Emirates	Cowpea aphid <i>Aphis craccivora</i>	Use insect resistant varieties Multiplication plots and environs should be weed and ants free	--	The application of <i>malathion</i> is useful against scales insects, but it is likely to kill natural enemies
		Cowpea pod borer <i>Maruca vitrata</i>	--	--	Spray using pesticides like <i>Bacillus thuringiensis</i> (branded as Cyber Force or Cyber Diforce)
		Cowpea Weevil <i>Callosobruchus sp p</i>	Host-Plant Resistance. Resistant varieties are available at Research Institutes in Nigeria Harvesting at the right time to prevent infestation of pods in the field Cold storage at 4 degrees Celsius	--	Fumigation of the storage facility Seed treatment with Phostoxin
		Army worms <i>Spodoptera exigua</i>	--	Biological control by natural enemies which parasitize the larvae	Use available chemicals such as Bifenthrin
		Corn earworm <i>Helicoverpa zea</i>	Monitor plants for eggs and young larvae	Biological control of natural	<i>Bacillus thuringiensis</i> or

				enemies that could be damaged by chemicals	Entrust SC may be applied to control the insects on organically grown plants
Cashew	Abia State	Tea Mosquite <i>Helopeltis antonii</i>	Dead trees and those which are beyond recovery should be removed from the plantation	--	--
		Cashew weevil <i>Mecicorynus loripes</i>	Remove bark from infested areas and destroy any larvae or pupae found, this process should be repeated every month for up to six months; severely infested trees should be removed and destroyed; remove all adult weevils from tree prior to destruction and also remove bark and kill all larvae and pupae	--	--
		Helopeltis bugs <i>Helopeltis schoutedeni</i>	Monitor crop regularly for signs of damage. avoid interplanting cashew with other crops which are hosts for helopeltis bugs such as tea and cotton	Conserve populations of natural enemies, weaver ants can reduce populations African weaver ants (<i>Oecophylla longinoda</i>) have proved to be very effective as bioagents to Helopeltis and other sucking bug control	--
		Stem borers <i>Mecocorynus loripes</i>	Control approach is basically physical confrontation to adults and larvae	--	--

		Mealy bug <i>Pseudococcus longispinus</i>	--	Use of bioagents such as Ladybird beetles (<i>Chilocorus spp</i>) and Lacewing flies (<i>Chrysopa spp</i>) have proved to be useful	--
Sesame	Kebbi – Zuru & Yauri Emirates	Hawk Moth	Deep ploughing exposes the pupae for predation to insectivorous birds. • Hand picking (collection) and destruction of caterpillars	Use common biological practices	--
		Bihar hairy caterpillar	Dig the trenches of 1 inch depth between the fields to kill the larvae in pits. Irrigate once to avoid prolonged mid-season drought to prevent pre-harvest infestation	Use common biological practices	--
		Gall Fly	Use common Cultural methods	Use common biological practices	--
		Leaf Roller	Use common Cultural methods	Use common biological practices	--
		Leaf Hopper	Use common Cultural methods	Use common biological practices	Application of Oxydemeton-methyl
Tomato	Kebbi – Zuru & Yauri Emirates	Cutworms	Elimination of weeds around garden beds at least two weeks before planting. Hand-picking cutworms at night may help	--	--
		Aphids	Crushing aphids by hand or blasting them off with a strong jet of water	--	--
Ground nuts		Aphids (<i>Aphis craccivora</i>)	Crushing aphids by hand & cultivating with cowpea	Use common biological practices	Application of Phosphamidon 0.03%, M-O-D 0.025%, Dimethoate 0.03%

