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Draft Report

Integrated Pest Management Plan (IPMP)

Kogi State Alape-Agbadu Staple Crop Processing Zone

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EXECUTIVE SUMMARY

ES 1 Context

The Staple Crop Processing Zone Initiative is a pioneer sub-project under the Federal Government of Nigeria's (FGN's) Agricultural Transformation Agenda. The FMARD has set forward a plan to establish multiple staple crop processing zones (SCPZs) to attract private investors to set up food processing plants, to reduce post-harvest losses, to add value to local content of foods, to link farmers, create jobs and to drive rural economic growth in Nigeria.

As a start to the Staple Crop Processing Zone Initiative, the FGN and Kogi State Government have begun the development of the Kogi State Alape Agbadu SCPZ. The Kogi State Alape Agbadu SCPZ has been conceived primarily for the growing of Cassava for the production of Starch.

ES 2 Project Components

Project activities will be clustered around the following areas of interventions:

a) **Support to public infrastructure development for the model SCPZ in Kogi State** (*around 75% of project total cost*). In line with international best practices, and considering that Kogi Alape- Agbadu SCPZ is located in a remote area without surrounding infrastructure, the option proposed is support to Government to develop off-site infrastructure and subsequently identify and attract private sector investors willing to invest in on-site development, operations and maintenance of the zone. The Project is also considering to support part of the on-site infrastructure to guarantee minimum utility services (internal roads, water, gas, power) for up to 3 private investment projects (covering up to 40% of the 250 hectares of the core zones).The scope of infrastructure works and arrangements for their implementation will be determined by the technical studies undertaken by the Government with technical assistance form GEMS3, a DFID funded project, and with consideration of the specific needs and possible contribution of the anchor investor

b) **Support to farmers-agribusiness linkage and to economic opportunities along the value chains** *(around 15% of total project cost).* **I**n coordination with FADAMA III Additional Financing (FADAMA III AF) and other relevant operations in the portfolio, the project will provide support to link farmers, Small and Medium Enterprises (SMEs) and communities in the catchment areas. with the processing units as follows:

- Improving Farmers productivity
- Promotion of economic opportunities for the community
- **Institutional development in SCPZ which will involve the Structuring of PPP for zone development, operation and maintenance:** The project will provide support for the establishment of a Specific Purpose vehicle (SPV)

with a Board inclusive of all relevant stakeholders (Federal Government, State Government, Local Government, Developer(s), and Tenants). It is envisioned that the PPP transactions will result in specific contracts between the SPV and private investors

- **Land and safeguards management:** for appropriate management of farm land allocation to the nucleus farms and for coordinated implementation of the Master Plan in the catchment areas, the project will assist the State Government in developing responsible land allocation and management procedures following World Bank and international guidelines and standards.

ES3: Relationship of the OP 4.09-Pest Management with other triggered Safeguard Policies

Safeguard policies potentially triggered by Kogi Alape-Agbadu SCPZ project based on the EA screening result are:

S/N	Safeguard Policies Triggered by the Alape SCPZ Project	Yes	No
1	Environmental Assessment (OP/OB/GP 4.01)	*	
2	Natural Habitats (OP/BP 4.04)		*
3	Pest Management (OP 4.09)	*	
4	Indigenous peoples (OP 4.10)		*
5	Physical Cultural Heritage (OP 4.11)	*	
6	Involuntary Resettlement (OP/BP 4.12)	*	
7	Forest (OP 4.36)		*
8	Safety of Dams (OP/BP 4.37)		*
9	Projects on International Waterways (OP/BP/GP 7.50)		*
10	Projects in Disputed Areas (OP/BP/GP 7.60)		*

OP/BP 4.01 takes into account the biophysical and social environments. The Bank requires Environmental Assessment to help ensure that projects which it is financing are environmentally sound and sustainable. Since major construction works will occur at the site (building of the Cargil plant, access roads construction, etc) this project thus triggers OP/BP 4.01.

In Bank-financed agricultural projects, pest infestations/ populations are controlled through integrated pest management methods (biological, cultural etc), since the Kogi SCPZ is a major agricultural project, for the purposes of Bank involvement and the obvious need to address pest management, OP 4.09 is triggered.

The objective of OP 4.11 on Physical Cultural Resources is to avoid or mitigate adverse impacts of Bank- financed development projects on cultural resources. This could be well addressed in an Environmental and Social Management Framework (ESMF) or specifically, in and Environmental and Social Impact Assessment (ESIA) or Environmental and Social Management Plan (ESMP).

The Kogi SCPZ is also likely to cause involuntary resettlement of farmers and farm land originally part of the SCPZ. If farmers are to lose their farms and livelihood, under Bank safeguard policies, a resettlement policy framework (RPF) is needed for this project.

In order to address the above triggered safeguards a RPF was prepared as a separate document to address the involuntary resettlement issues that might result from project implementation. Simultaneously, an ESMF was prepared to provide guidance and principles for addressing potential environmental and social impacts that may result from civil works activities. However, the ESMF does not completely address the concerns, which relate to pest control for the project. Thus, the preparation of this IPMP becomes necessary to complement the ESMF as it is intended to proffer suitable IPM methods for the Kogi Alape-Agbadu SCPZ and ensure that pest applications are minimized or completely avoided.

ES4: Rationale for the IPMP

Integrated Pest Management (IPM) brings together, into a workable combination the best strategies of all control methods that apply to a given problem 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 and production design of the Alape Agbadu site, which is expected to grow cassava for the primary production of starch, there is undoubtedly the likelihood of infestation by pests, currently within the proposed area or migratory pests. 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.

ES 5: Scope of the 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 reviewed and cleared by IDA prior to disclosure country wide in Nigeria and InfoShop along with the ESMF report.

ES6: Legislative and Regulatory Framework

A number of legislations, policies and treaties were considered in this study. They include National extant laws, International conventions and treaties and the World Bank Operational Policy 4.09. These legislations are listed below, while comprehensive details are contained in the body of this report;

National Laws and Policies

- 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.

International conventions & Treaties

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

World Bank OP 4.09

This policy supports safe, effective, and environmentally sound pest management and promotes the use of biological and environmental control methods. It states that the assessment of the capacity of the country's regulatory framework and institutions to promote and support safe, effective, and environmentally sound pest management should be undertaken for any project that involves 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 FI.

The national extant laws in Nigeria are consistent with the international laws and the World Bank Operational Policy 4.09 and annex C of OP4.01 on the procurement, use, handling and disposal of pesticides. However, in the event of any discordance between the existing laws in Nigeria and the World Bank safeguard policies the more stringent will take precedence.

ES7: Assessment of the Capacity of Nigeria on the Implementation of IPMP

In order to reduce the incidences of pest in Nigeria a number of project based interventions have been carried including those funded by the World Bank and FAO on IPM. They include the 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. There are also other IPM implementation cases amongst the key crops in Nigeria, for example, for control of root knot nematodes in tomato and for downy mildew control in maize. Similarly, IPM recommendations for control of the African Rice Gall Midge include combination of resistant crop varieties with seed dressing, timely planting, pest monitoring to guide pesticide applications. Based on the successes recorded in the aforementioned IPM case studies, it can be concluded that there exist capacity within country on the use of IPM. However, for this Kogi State Alape-Agbadu SCPZ program additional training and awareness creation will be required as detailed in this report.

ES8: Stakeholder Consultation

Public consultation was a key activity conducted under the IPMP. Details of the outcome of public consultations are provided in Part Eight of this report. It is expected that the ESMF and RPF reports will contain more comprehensive information on the public consultations held in the project area. Major groups consulted include:

- Kogi Agricultural Development Project (KADP)
- FADAMA III, Kogi State
- Federal Department of Agriculture, Kogi State
- Ministry of Agricultural Resource, Kogi State
- Ministry of Lands
- Ministry of Women and Youth Development
- Zonal Management Team Alape
- Odo-Ape Community
- Agbadu-bunu Community

ES9: Baseline Information on Pests

Key pests in the project area were identified through consultations with (*i) local farmers, (ii) Kogi State FADAMA III Office and the (iii) Kogi Agricultural Development Project (KADP)* Zonal Office in Alape. Mainly, rodents (smaller bush rats and grass-cutters), monkeys and birds were identified as common pests in the area. The vast majority of insect species identified based on historical infestations, were mealy bugs and variegated grasshoppers. Further identification of pests was done through literature review.

ES10: Adverse Environmental & Health Impacts

This IPMP identified a number of environmental and health risk that may be encountered through unsafe use of pesticides in Kogi Alape-Agbadu SCPZ

Environmental

1. **Soil contamination**

   Pesticides which are still used in agricultural land in and around the proposed project area could enter soil during spraying causing 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 introduced into soil. Long-term excessive use of pesticides will cause higher pesticide residues in the soil which will further cause soil contamination within the area.

2. **Surface and Groundwater Contamination**

   Pesticides typically enter surface water when rainfall or irrigation exceeds the infiltration capacity of soil and resulting runoff then transports pesticides to streams, rivers, and other surface-water bodies. Contamination of groundwater may result directly if pesticide applications are adopted by the SCPZ 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. 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.

3. **Air Pollution**

   Vapour from sprayed pesticides will be released into the air, and if the chemical compound is very stable, vapour may travel beyond the SCPZ site. 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. Reliable data on how pesticides behave in air, such as distance travelled, are lacking, because adequate monitoring is unavailable.

4. **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.

Potential Site-related Health Concerns

1. Consumption of crops and plants grown under chemical pest control could cause health hazards to humans and animals within and around the project site.
2. 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.
3. Skin, eye, and nose irritation
4. Possibility of cancers, neurologic, endocrine and reproductive problems form direct and indirect exposure to pesticides.
5. Occupational health and safety risks. Long term inhalation of toxic pesticides sprayed, could eventually result in respiratory illnesses or disease conditions

ES10: Integrated Pest Management Plan

The IPMP for the Kogi State SCPZ is developed to reduce dependency on pesticides and encourage integrated pest control methods. It considers a) IPM methods before planting (site selection, soil improvement practices, selection of appropriate cassava varieties and selection of planting materials; and IPM methods to be applied after planting such as biological, cultural, physical, chemical methods. It also designs a program for capacity building in IPM. By identifying institutional responsibilities, the IPMP also provides an information basis for stakeholder groups to establish functional mechanisms which will help SCPZ actors and Partners understand and respond to IPM needs.

ES11: Framework for Implementation

Consistent with the National Draft Policy document for SCPZs, the IPMP also identified implementation arrangements and describes responsibilities at the State and National levels. The institutions will carry out joint supervision missions with the World Bank and provide administrative and technical support to the Kogi Alape – Agbadu SCPZ project to ensure compliance with this IPMP. Some of these include the Federal Ministry of Agriculture and Rural Development, SCPZ EMC, Kogi State FADAMA III and Agricultural Development Project (ADP), and MDAs

ES12: Capacity Building and Awareness

Capacity building and awareness will be very important to the project beneficiaries in the understanding and implementation of this IPMP. Training modules, communication strategy are well spelled out in this report.

ES13 Budget for Implementation

Approximately **US$ 1,052,000** will be required to effectively implement the IPMP over a five-year period.

Line item	Yr. 1	Yr. 2	Yr. 3	Yr 4	Yr5	**Total**
1. Capacity building & Awareness						
All training programs (See table 6.0)	200000	100000	100000	60500	0	**460,500**
Radio jingles and handbill on IPM	30000	20000	10000	0	0	**60000**
Sub-total	*230000*	*120000*	*110000*	*60500*	*0*	***520,000***
2. Environmental management						
Equipment; bed nets; improved species	10000	20000	10000	10000	0	**50000**
Support to IPM research and development	20000	30000	20000	10000	4000	**84000**
Pest/vector surveillance	10000	10000	6000	4000	4000	**34000**
Sub-total	*40000*	*60000*	*36000*	*24000*	*8000*	***168000***
3. Occupational Health & Safety						
Personal Protective Equipment (Hand gloves, gas mask, safety boot and overall wear)	70000	70000	50000	0	0	***190000***
Chemical Neutralizer and first Aid	50000	30000	20000	0	0	***100000***
Sub-total	*120000*	*100000*	*70000*	*0*	*0*	*290000*
4. Project management						
IPMP coordination	4000	4000	4000	4000	4000	**20000**
Monitoring and evaluation	10000	10000	10000	12000	12000	**54000**
Sub-total	*14000*	*14000*	*30000*	*16000*	*16000*	***74000***
Grand total	**404000**	**294,000**	**147000**	**100500**	**24000**	**1,052,000**

PART 1: INTRODUCTION

1.1 Project Background

1.1.1 Agricultural Transformation Agenda

The Federal Government of Nigeria (FGN) considers high growth of agricultural and allied sectors as a means to accelerate the country's GDP growth to enable farmers to earn higher income and ensure food security. Furthermore, The Federal Ministry of Agriculture and Rural Development, (FMARD) in its commitment to agricultural development in the country, has embarked on an Agricultural Transformation Agenda (ATA –Nigeria) program.

The primary focus of ATA as envisaged by FGN would include:

1. Focusing on agriculture as a business instead of a development project
2. Utilizing the transformation of the agricultural sector to create jobs, create wealth and ensure food security
3. Focusing on value chains where Nigeria has comparative advantage
4. Sharp focus on youth and women

1.1.2 Staple Crop Processing Zone Initiative

The Staple Crop Processing Zone Initiative is a pioneer sub-project under the FGN's Agricultural Transformation Agenda. The FMARD has set forward a plan to establish multiple staple crop processing zones (SCPZs) to attract private investors to set up food processing plants, to reduce post-harvest losses, to add value to local content of foods, to link farmers, create jobs and to drive rural economic growth in Nigeria.

The SCPZ program aims to channel infrastructure investments to facilitate efficient value chain linkages, reduce the cost of doing business, and improve the competitiveness of Nigeria's agro-industrial production. By creating an enabling business environment around selected value chains clusters, the FGN and State Governments seek to attract private sector investors to set up processing plants in high food production areas, in order to boost import substitution, create wealth opportunities for farming communities, reduce post-harvest losses, create employment in agricultural production, processing and related activities, and drive rapid rural development.

The concept of the Staple Crop Processing Zones under ATA as proposed by the Federal Government of Nigeria is based on the following three guiding principles:

1. Take an integrated approach to the value chain by addressing critical upstream and downstream bottlenecks and facilitating market linkages;

2. Offer a superior operating environment that reduces the cost of doing business, and

3. Take a private sector-led approach. The Operating Principles are proposed as follows; *(i) investment-driven strategic partnerships with the private sector; (ii) integrated value chain approach; (iii) Self-sustaining, government-support and private sector managed. Although the proposed project does not cover the entire agenda of the FGN's SCPZ Program, its design is aligned with these principles.*

1.2 General Description of the SCPZ Program

1.2.1 Planning Process of the SCPZ Program

The planning process includes four (4) overlapping phases as follow:

1. ***The Preliminary phase*** which started since 2012 and consists of developing the SCPZ concept (Framework Document), preparing legal enablement (Policy Document, and SCPZ-Authority Bill, development of structures (Master Plans);

2. ***The Building phase*** which started in 2013, and consists of developing the first Model SCPZs which will be located at the Alape Agbadu Site in Kogi State, and starting with detail technical studies for public and private investments by the anchor investor, and a market assessment study supported by the International Finance Corporation (IFC);

3. ***The Consolidation Phase*** which will commence in 2014 and will consist of developing five other Model SCPZs for which Master Plans have been already prepared (Bunkure-Gafan in Kano State, Badeggi in Niger State, Adani-Omor in Enugu/Anambra States, Ketu-Ereyun Corridor in Lagos State, and Okorolo in Rivers State). This phase also anticipates the development of a full private Model SCPZ in Shao, Kwara State; and

4. ***The Expansion phase which*** is anticipated to start from 2015 onward, with development of SCPZs across the country.

1.2.2 Selection process of the SCPZ sites

The selection process was initiated by FMARD in early 2012, working with State Governments, and with assistance from international consulting firms. Major crop production clusters were first identified in 2012 with State Governments based on criteria such as cultivated areas, production volumes, surpluses volumes, and yield per hectare for major crops. Following an evaluation of identified clusters based on agricultural potentials, existing agro-industrial activities, competitiveness factor, state business environment and implementation support, Fourteen (14) production clusters have then been selected for development of Model SCPZs on priority value chains (i.e. rice, sorghum, cassava, fisheries and horticulture have been identified).

1.3 Proposed Project - Kogi State Alape Agbadu SCPZ

The Kogi State Alape Agbadu SCPZ has been conceived primarily for the growing of Cassava for the production of Starch.

Project activities will be clustered around the following areas of interventions:

c) **Support to public infrastructure development for the model SCPZ in Kogi State** (*around 75% of project total cost*). In line with international best practices, and considering that Kogi Alape- Agbadu SCPZ is located in a remote area without surrounding infrastructure, the option proposed is support to Government to develop off-site infrastructure and subsequently identify and attract private sector investors willing to invest in on-site development, operations and maintenance of the zone. The Project is also considering to support part of the on-site infrastructure to guarantee minimum utility services (internal roads, water, gas, power) for up to 3 private investment projects (covering up to 40% of the 250 hectares of the core zones).The scope of infrastructure works and arrangements for their implementation will be determined by the technical studies undertaken by the Government with technical assistance form GEMS3, a DFID funded project, and with consideration of the specific needs and possible contribution of the anchor investor

d) **Support to farmers-agribusiness linkage and to economic opportunities along the value chains** *(around 15% of total project cost).* **I**n coordination with FADAMA III Additional Financing (FADAMA III AF) and other relevant operations in the portfolio, the project will provide support to link farmers, Small and Medium Enterprises (SMEs) and communities in the catchment areas with the processing units as follows:

- **Improving Farmers productivity:** The project will work with agro-processors to develop off-take agreements with farmers , aimed at structuring their organizations, and facilitating their access to inputs and services, including financing, extension, mechanization, land clearing, etc.; equipment and small scale production and marketing infrastructures (such as small scale processing and aggregation centers), grading, quality and standards, as skills development, etc. Specifically, Project intervention will consist of structuring the off-take contracts while Fadama III AF will provide on-farm support to assist farmers deliver on the contracts.

- **Promotion of economic opportunities for the community:** The Project will establish a matching grants scheme to support activities aim at strengthening agribusiness farmers linkages which could create jobs and increase income for the communities, thus contributing to reducing poverty in the project intervention areas. This will include support to women and youths and their groups, promoting development of mechanization services, transport, application of chemicals, business planning for SMEs, training , financial literacy, and ancillary activities of

the value chains. Eligible beneficiaries and activities as well as selection and approval processes will be spelt out in a specific manual.

e) Institutional development in SCPZ *(around 10% of total project cost)*

i. **Structuring of PPP for zone development, operation and maintenance:** The project will provide support for the establishment of a Specific Purpose vehicle (SPV) with a Board inclusive of all relevant stakeholders (Federal Government, State Government, Local Government, Developer(s), and Tenants). It is envisioned that the PPP transactions will result in specific contracts between the SPV and private investors

ii. **Land and safeguards management:** for appropriate management of farm land allocation to the nucleus farms and for coordinated implementation of the Master Plan in the catchment areas, the project will assist the State Government in developing responsible land allocation and management procedures following World Bank and international guidelines and standards, as well as adequate instruments and M&E system for environmental and social safeguards. The project will also support the establishment of a land management unit to ensure coordinated development and proper use of natural resources in the catchment areas. It will also support FMARD to adequately manage the project environmental safeguards in the core and catchment areas of the zones. Seasoned environmental and social safeguards specialist will be included as core staff of the PCU.

1.4 Rational for the IPMP

Integrated Pest Management (IPM) brings together, into a workable combination the best strategies of all control methods that apply to a given problem 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 and production design of the Alape Agbadu site, which is expected to grow cassava for the primary production of starch, there is undoubtedly the likelihood of infestation by pests, currently within the proposed area or migratory pests. 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.

1.5 Scope of the 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 reviewed and cleared by IDA prior to disclosure country wide in Nigeria and Info-Shop along with the ESMF report.

PART 2: PEST MANAGEMENT CONCERNS AND CONTROL MEASURES IN NIGERIA

2.1 Pest and diseases Problems of Agriculture 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 about 50% 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.

Vectors transmit several diseases of public health importance in Nigeria. Malaria, which is transmitted by the Anopheles mosquitoes, is responsible for considerable morbidity and mortality particularly among children less than 5 years and pregnant women. Onchocerciasis (River Blindness) transmitted by Black flies is responsible for the high incidence of blindness in most rural and remote areas of Nigeria. This disease has 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.

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.

2.2 Economic Pests and Diseases of Cassava in Nigeria

In Nigeria, cassava production is well developed as an organized agricultural crop. It has well-established multiplication and processing techniques for food products and cattle feed. There are more than 40 cassava varieties in use. Though the crop is produced in 24 of the country's 36 states, cassava production dominates the southern part of the country, both in terms of area covered and number of farmers growing the crop. Cassava production in the Nigeria is hampered with problems with green mite, the cassava mealy bug, and the variegated grasshopper. Diseases affecting cassava crop are mosaic disease, bacterial blight, anthracnose, and root rot.

2.3 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.

Mainly pest management controls used in Nigeria include:

1. **Cultural control**: which refers to the adjustment of 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 enemies of the pest or interfering with the life cycle of the pest

3. **Chemical controls**: which employs the use of toxic pesticides to kill pests.

The use of spray for control of pesticides and herbicides has been in long use in Nigeria. It has been estimated that about 125,000 - 130,000 metric tons of pesticides are applied every year in Nigeria. They have been applied to control pests in cereals, vegetables and cash crops like cocoa. In 1991, cocoa pesticides accounted for about 31% of the total agro-chemical market of which fungicides accounted for 65% and insecticides 35% (Ikemefuna, 1998).

Pesticide application equipment has been introduced into the Nigerian cocoa farming system, together with the pesticides to be applied, ever since they were used in the industrialized world. Practically, all the different techniques available have, at a given time, been introduced more or less successfully along with the screening of new insecticides, fungicides and herbicides, new spraying pumps are usually evaluated by the Cocoa Research Institute of Nigeria (CRIN), for their efficiency before they are recommended for use in the application of cocoa pesticides. CRIN has the mandate to screen and recommend potential cocoa pesticides and spraying equipment in Nigeria. However, with the new European Union (EU) Legislation on Maximum Residue Levels (MRLs) allowed on cocoa beans and products, some of the pesticides still undergoing screening and the previously recommended pesticides were banned. This new regulation, which came into effect September 1, 2008, has left very few pesticides for use on cocoa both on farm and post farm activities in Nigeria.

2.3 Assessment of Capacity of Nigeria on Integrated Pest Management

Although, the cultural and physical control measures to pest control have been in use in Nigeria. They 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. Other practices as outlined in the previous section are not in line with best practices and cannot support large-scale agriculture.

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. They include the 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. There are also other IPM implementation cases amongst the key crops in Nigeria. For example, for control of root knot nematodes in tomato and okra, farmers are encourage to integrate resistant crop varieties with seed dressing and compatible crop rotation schemes to prevent build-up of the pests. For downy mildew control in maize, farmer training by the Rice/Maize center in Ibadan has promoted the integration of resistant crop varieties with seed dressing (using Apron plus), timely identification, rogueing and burning of affected plants and general farm hygiene. Similarly, IPM recommendations for control of the African Rice Gall Midge include combination of resistant crop varieties with seed dressing, timely planting, pest monitoring to guide pesticide applications. Based on the successes recorded in the aforementioned IPM case studies, it can be conclude that there exists capacity within country on the use of IPM.

2.3 Assessment of Capacity of Kogi State on Integrated Pest Management

Currently, Kogi State is a beneficiary of the FADAMA III and GEMS 3 projects. As stated earlier, the FADAMA projects have introduced and practiced a wide range of IPM methods in country. This gives Kogi State an advantage in IPM capacity, as linkages will be built between the FADAMA III, and GEMS 3 projects and the Kogi Alape-Agbadu SCPZ project to build and strengthen the state's capacity in IPM. Direct beneficiaries of this linkage will include the Kogi State Ministry of Agriculture and Rural Development, local male and female, farmers, youth and community based agricultural organizations.

PART 3: EXISTING LEGISLATIONS ON AND POLICIES ON USE OF CHEMICAL FOR PEST MANAGEMENT

3.1 Extant Laws of Nigeria on Pesticides Management

A number of other legislations and institutional framework are available using five main organizations (FMEV, FMA& RD, FMH, NAFDAC and FMLP) 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 communities 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 into

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, NAFADAC 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 (POP)
- 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, heptacholic, 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).

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.

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.
- Transboundary 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 transboundary 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, Transboundary 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 OP 4.09

The 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 FI.

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-domicilliary 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 projectobjective.

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 via:

- 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 otherwise of 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.

PART 4: BASELINE INFORMATION ON PEST HISTORY, AND IDENTIFICATION OF ADVERSE IMPACTS OF PESTICIDES

4.1 Baseline Information on Pests

Key pests in the project area were identified through consultations with (*i) local farmers, (ii) Kogi State FADAMA III Office and the (iii) Kogi Agricultural Development Project (KADP)* Zonal Office in Alape. Mainly, rodents (smaller bush rats and grass-cutters), monkeys and birds were identified as common pests in the area. The vast majority of insect species identified based on historical infestations, were mealy bugs and variegated grasshoppers. Further identification of pests was done through literature review.

From review of extensive cassava crop research conducted in Nigeria mainly by the International Institute for Tropical Agriculture (IITA) and the Food and Agricultural Organization (FAO), predominant pests associated with cassava production are as follows (see page 17).

Table 4.0 Predominant pests associated with cassava production are as follows

S/n	Group		Pest Name	Impact on Cassava	
A	**Leaf and Stem Feeders**				
		1.	Mealy Bugs *Phenacoccus manihoti*	The cassava Mealy bug sucks sap from cassava leaves and shoot tips. The pest reduces the lengths of the internodes and causes the leaves to clump together into "bunchy tops". The pest also distorts the stems, dries up the leaves and eventually, if the attack is particularly severe, it defoliates the plants. The damage is more severe in the dry than in the wet season.	
		2.	Cassava Green Mite *Mononychellus tanajoa,*	Cassava green mite sucks sap from cassava leaves and shoot tips. The pest causes tiny yellow chlorotic spots the size of pin pricks, on the upper leaf surfaces. Cassava crop damage by the pest is more severe in the dry than in the wet season	
		3.	Variegated Grasshoppers *Zonocerus variegatus*	The variegated grasshopper chews cassava leaves, petioles, and green stems. It defoliates the plants and debarks the stems. The pest damage is more common on older than on younger cassava plants, and is more severe in the dry than in the wet season.	
		4.	Spiraling Whitefly *Aleurodicus dispersus*	The spiralling whitefly sucks sap from cassava leaves. As it feeds, it secretes large amounts of honeydew which supports the growth of black mold on the plant. The blackened leaves dry up and drop.	
		5.	Bemisia whitefly *Bemisia tabaci*	*Bemisia* whiteflies suck sap from the leaves, but this does not cause physical damage to the plant. As they feed, the insects inject the plant with viruses which cause cassava mosaic disease	

S/n	Group		Pest Name	Impact on Cassava	
B	**Root and Stem Feeders**				
		1.	Termites	In newly planted cassava farms termites chew and eat stem cuttings. These grow poorly, die and rot. In older cassava farms, termites chew and enter the stems. This weakens the stems and causes them to break easily. Termite damage occurs mostly in the dry season.	
		2.	Cassava White Scale *Aonidomytilus albus*,	The insect sucks sap from cassava stems. This causes the stems to lose a lot of water and die.	
C.	**Vertebrate Pests**				
			The common vertebrate pests are birds, rodents, monkeys, pigs, and domestic animals.		
			The bird pests are usually bush fowl or francolins (*Francolinus* sp.) and wild guinea fowl.	These birds feed on storage roots that have been exposed. They also scratch the soil surface to expose the storage roots. The remaining portions of the attacked roots later rot. Birds are particularly a problem where cassava is planted in soils that are loose and easy to scratch away.	
			The major rodent pests of cassava are the grasscutter or cane rat (*Thryonomys swinderianus*), the giant rat (*Cricetomys gambianus*), other rats, mice, and squirrels.	Among these, the grasscutter causes the greatest damage to cassava. It cuts down and chews the stems, and also feeds on the storage roots.	
			Pigs and Monkeys.	Dig, uproot, and feed on cassava storage roots	
			Cattle, goats, and sheep	Cattle, goats, and sheep defoliate cassava by eating the leaves and green stems.	

4.2 Pest Management Approaches in the Project Area

Consultations also proved useful in the acquisition of information on *a) State-wide adopted pest management practices, and b) Applied pest management practices by local farmers*. On a state basis, it is understood that Kogi State does not have a standard procedure or guidelines for pest management, hence programs/initiatives implemented in the state, and farmers utilize pest management practices as deemed appropriate for the type of pest infestation.

Currently, local farmers in the project area use mechanical and chemical methods for pest management. The mechanical methods employed usually include the use of manual traps for rodents and monkeys, and scarecrows for birds. Chemical methods generally imply the use of pesticides and herbicides.

4.3 Global 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. The use of toxic pesticides to manage pest problems has become a common practice around the world. Pesticides are used almost everywhere not only in agricultural fields, but also in homes, parks, schools, buildings, forests, and roads. Though they could be very useful in managing pest problems, they are also a great environmental and health risk.

4.3.1 Persistent Organic Pollutants (POPs)

In May 2001 Nigeria became a signatory to the Stockholm Convention on Persistent Organic Pollutants, and ratified in 2004. Under Annex A (listed for Elimination) of the convention, Parties must take measures to eliminate the production and use of the chemicals listed under Annex A. 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, Chlordecone 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 obligated to stop the use of POPs pesticides if still in use. For other pesticides, which are not POPs, the issue of toxicity still remains and the consequence of application on agricultural farm land, and resultant wider environmental and social impacts.

4.4 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.

4.5 Identification of Site-Specific Potential Environmental and Health Risks Associated with Pesticides

Potential adverse environmental and health risks of pesticides applications that are of concern to the Kogi Alape- Agbadu SCPZ may include:

4.5.1 Environmental

5. **Soil contamination**

   Pesticides, which are still used in agricultural land in and around the proposed project area, could enter soil during spraying causing 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 introduced into soil. Long-term excessive use of pesticides will cause higher pesticide residues in the soil, which will further cause soil contamination within the area.

6. **Surface and Groundwater Contamination**

   Pesticides typically enter surface water when rainfall or irrigation exceeds the infiltration capacity of soil and resulting runoff then transports pesticides to streams, rivers, and other surface-water bodies. Contamination of groundwater may result directly if pesticide applications are adopted by the SCPZ 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. 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.

7. **Air Pollution**

   Vapour from sprayed pesticides will be released into the air, and if the chemical compound is very stable, vapour may travel beyond the SCPZ site. 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. Reliable data on how pesticides behave in air, such as distance travelled, are lacking, because adequate monitoring is unavailable.

8. **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.

4.5.2 Health

General

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.

Children are more susceptible and sensitive to pesticides, because they are still developing and have a weaker immune system than adults. Children may be more exposed due to their closer proximity to the ground and tendency to put unfamiliar objects in their mouth. Hand to mouth contact depends on the child's age. Children under the age of six months are more apt to experience exposure from breast milk and inhalation of small particles. Pesticides can bioaccumulate in the body over time.

Potential Site-related Health Concerns

6. Consumption of crops and plants grown under chemical pest control could cause health hazards to humans and animals within and around the project site.
7. 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.
8. Skin, eye, and nose irritation
9. Possibility of cancers, neurologic, endocrine and reproductive problems form direct and indirect exposure to pesticides.
10. Occupational health and safety risks. Long term inhalation of toxic pesticides sprayed, could eventually result in respiratory illnesses or disease conditions.

Table 4.1: Matrix of Some WHO Classified Pesticides and their Effects

Pesticides	**Result of accidental exposure**		
	WHO Class (3)	**Effects of acute intoxication**	**Effects of chronic intoxication**
Clorpyriphos ethyle (1)	II (Moderatly 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 (Moderatly 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 (moderatly 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, drowseness, 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(moderatly hazardious)	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, polyneurophasy and immuno-suppression and resembles the multiple chemical sensitivity syndrome
Carbosulfan	II (Modrately hazardous	The acute symptoms of carbosulfan in humans are characterstics of other organoposphate and carbamate insecticides. Signs include dizziness, salivation, excess salivation, nausea, abdominal cramps,	-

Pesticides	**Result of accidental exposure**		
	WHO Class (3)	**Effects of acute intoxication**	**Effects of chronic intoxication**
		vomiting, diarrhea, blurred vision, pi-point pupils, difficulty breathing and muscle twitching	
Carbaryl	II (Modrately hazardous	>> >> >>	-
Profenofos	II (Modrately hazardious	Muscarinic, nicotinic and central nervous system manifestations	There is no available data concerning chronic toxicity of profenofos

4.6 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 SCPZ Alape-agbadu site will be managed in an environmentally safe manner thus reducing increased dependency on pesticides or other environmentally unsafe approaches.

Specifically, knowledge on biological, cultural and mechanical control measures that have been used in other cassava programs by the FADAMA projects, IITA, FAO etc, will provide a strong platform for proffering practicable safe measures towards mitigating adverse impacts of identified pests in the project area.

Compared to 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 Kogi State SCPZ project. The IPMP for the project will lay down mitigation measures, institutional responsibilities and capacity building needs.

PART 5: INTEGRATED PEST MANAGEMENT PLAN FOR THE KOGI ALAPE- AGBADU SCPZ

5.1 IPMP Overview

Considering that the project is seeking financial support from the World Bank, it is of essence to note that World Bank lending operations are performed in line with the Bank's environmental and social safeguard policies. The policies recommend that certain safeguard instruments are prepared to proactively manage projects which may triggered safeguards.

This Integrated Pest Management Plan (IPMP) is intended to help manage the adverse effects of identified pests and pesticides on cassava in the SCPZ Alape-Agbadu site to acceptable levels. The plan is designed to minimize potential adverse impacts on human health and the environment and to advance ecologically based IPM.

This IPMP also 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.

The IPMP for the Kogi State SCPZ is developed 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. By identifying institutional responsibilities, the IPMP also provides an information basis for stakeholder groups to establish functional mechanisms which will help SCPZ actors and Partners understand and respond to IPM needs.

5.2 Specific IPMP Objectives

1. Assist the Kogi State Government to plan and design location specific IPM activities.
2. Promote participatory approaches in IPM to learn, test, select and implement "best-bet" IPM options.
3. Promote biodiversity monitoring to serve as early warning systems on pest status, alien invasive species, beneficial species, and migratory pests.
4. Establish linkages to drive the draft policy document for the Kogi Alape- Agbadu SCPZ and ensure compliance with national and international conventions and guidelines on pesticide use in agriculture.
5. Monitor and evaluate the benefits of IPM including its impact on the environment and health.

5.3 Integrated Pest Management Methods Suitable for Cassava Pests Concerned with the Project Area

The best way to control pests in the project area is to grow a healthy crop of cassava rather than simply aim at killing pest organisms. In order to grow a healthy crop a combination of plant production and plant protection practices are necessary. The SCPZ is proposed to be planted with *TMS (Tropical Manioc Selection) 419* variety of Cassava.

5.3.1 IPM practices to be adopted at planting

Integrated Pest Management practices for cassava at planting will include:

a) Site selection (in progress/concluded)

b) Soil improvement practices,

c) **Selection of appropriate varieties (TMS 419; IITA variety - NR 8082, used in Nigeria)**.

- The numbers of most cassava pests are higher and their damage is more severe in the dry season than in the wet season. It is therefore advisable that cassava for the purpose of the SCPZ is planted early, at the beginning of the raining season (March-April). This allows the crop to grow more vigorously and better withstand pest damage than in late planting.

d) **Selection of planting materials**.

- In selecting healthy planting material for SCPZ, cassava plants with robust stems and stem branches, lush foliage, and minima stem and leaf damage are most appropriate.
- Selecting planting material from cassava plants with stem-borne pests or their damage symptoms must be avoided.
- In areas where termites are particularly a problem, the cut ends of cassava stem cuttings can be smeared with a watery paste of soil mixed with kerosene. This can limit termite damage.
- Select the middle brown-skinned portions of the stems when cutting cassava stems into stem cuttings for planting. These parts sprout and ensure plant vigour better than the top green stem portions. The top green stems dehydrate quickly and are easily damaged by pests. Unhealthy stem cuttings must be avoided as planting material.

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5.3.1 IPM practices to be implemented after planting

The common IPM practices after planting are biological control, microbial control, and cultural control.

5.3.1.1 Biological control

Natural enemies feed on other insects, including important cassava pests such as mites, mealy bugs, scale insects, and whiteflies. The natural enemies commonly found in cassava fields include several kinds of beetles, predatory mites, and tiny wasps. The tiny wasps are called "parasitoids".

i) **Predators:** The introduction of Predators to the SPZC will reduce pests remarkably. Predators control pests by feeding on and killing them. Predatory ladybird beetles can help to control cassava mealy bug or cassava white scale. Predatory beetles also feed on cassava green mites, but the most important biological control agents of mite pests are predatory mites, called "phytoseiids". Certain weeds such as *Euphorbia heterophylla* and *Mallotus oppositifolius* should be introduced or managed on the Alape-Agbadu SCPZ site to attract phytoseiids. The predators live on these weeds when their food is scarce on cassava. This ensures a sustained presence of the predator whenever pests return.

   Typhlodromalusaripo is the most effective against the cassava green mite. The predator occurs mainly on young leaves at cassava shoot tips. It spreads by wind and by being carried on stem cuttings. If predatory mites already exist in the project area, their spread can be increased by plucking and carrying cassava shoot tips with the predator from one field to another. Growing cassava varieties whose new leaves clump together at the shoot tip can also increase the survival and spread of these predators. These will attract the predators better than varieties whose young leaves are widely spread.

Other biological controls suitable for the project site will include:

1. **Parasitoids** - natural enemies that kill insect pests by living and growing inside them. ***Examples*****:** *Apoanygyrus lopezi* is the most effective natural enemy against the cassava mealy bug; *Encarsia haitiensis*, is a common natural enemy of the spiraling whitefly.

5.3.1.2 Microbial control

Microbial control agents may occur naturally on cassava farms and, like other natural enemies, do their job without harming the crop or affecting man. Fungi have been found to kill the variegated grasshopper. The fungi are spread as "spores" which are like tiny seeds. The spores land on the pest, germinate, and the fungus then penetrates the body of the pest, growing and killing it within a few days. When a diseased grasshopper dies, its dead body may remain firmly gripped to the plant or drop to the ground.

Bio-pesticides" consisting of fungus spores mixed in oil are also available as commercial products and can be procured by the Kogi State Government for the SCPZ as potent control against the grasshopper. The product can be sprayed directly on cassava to kill nymphs and adults of the grasshopper on the plant. Bio-pesticides can be sprayed using the same equipment as ordinary pesticides. Biopesticides are much safer than chemical pesticides because they are

not poisonous to people and domestic animals. Moreover, bio-pesticides do not kill natural enemies, so they can be used to kill one kind of pest without disrupting other kinds of biological control in the cassava SCPZ.

5.3.1.3 Cultural control

The variegated grasshopper can also be controlled by cultural practices. In any year, the abundance of the variegated grasshopper depends largely on the number of egg pods that survive in the soil during the wet season.

The destruction of egg pods will therefore reduce the numbers of the pest. Farmers and extension workers through guidance by the KADP, FADAMA III, GEMS 3 and other specialized project groups can locate and mark egg-laying sites early in the wet season. At a later stage they can then dig up the soil at the sites to expose and destroy the egg pods. The digging up of eggs should be done before the eggs start to hatch early in the dry season, for example, in October in most of West Africa.

The variegated grasshopper does not lay egg pods deep in the soil. Therefore, it is easy to dig out the egg pods. However, egg pod destruction needs to be carried out over a wide area in the wet season in order to control the pest effectively. Certain weeds, for example, the Siam weed Chromolaena odorata harbor immature stages of the variegated grasshopper. From the weeds the pest will move onto cassava plants. You can therefore discourage the pests from gathering in your farm by removing these weeds in your farm

Mealy bugs and Cassava green mites: During weeding, weeds such as *Euphorbia heterophylla* and *Mallotus oppositifolius* could be spared and left to grow along the margins or in other parts of the SCPZ (they should not be so many, and must be expertly monitored so as not to compete with the cassava on-site). This cultural practice will be especially useful since the cassava for the SCPZ will be grown continuously, with little or no fallow.

Cultural practices for vertebrate pests: A number of cultural practices likely to help reduce possible crop damage by vertebrate pests will include:

- Making good seedbeds for planting cassava so that storage roots are not easily exposed later on. If storage roots are exposed, they should be covered with soil to prevent them from being attacked and eaten by birds and rodents;
- The SCPZ should be fenced to prevent entry by grasscutters, cattle, sheep, and goats
- Traps could be set at strategic positions but with safety, to manage grasscutters and other rodents;
- Periodic weeding will be most needed. This will help keep the ground bare, therefore ridding rodents of hiding and breeding grounds within the SCPZ.
- Strategic organization of hunters from Alape-Agbadu, and surrounding communities to hunt grasscutters. Also considering the growing Ebola Virus Disease outbreak in West Africa, and few cases in Nigeria, this practice may be worthwhile as grasscutters could be potential carriers of the virus since they are a viable source of bush meat in the project area, state and country.

- Growing "bitter" cassava varieties where pigs and monkeys are a severe problem; pigs and monkeys prefer "sweet" cassava varieties;
- Harvesting cassava storage roots as soon as they are mature; this will reduce the length of time they can be exposed and damaged by the pests.

In Summary the integrated pest management practice proposed for the Kogi Alap-Agbadu SCPZ are:

- Identifying the common pests, their damage symptoms, and natural enemies correctly and taking into account the conditions under which the pests will cause severe losses.
- Select areas with dense vegetation, deep loamy soils, and flat or gently sloping land to plant cassava.
- Improve soils by manuring, mulching etc.
- Grow cassava varieties known to tolerate the common pests identified in the project area.
- Plant healthy stem cuttings or treat the stem cuttings against pest damage; avoid transporting and planting cassava stems infested with stem-borne pests; after harvesting, destroy cassava stems infested with stem-borne pests.
- Plant cassava mainly at the beginning of the wet season; late planting should be avoided.
- Use natural enemies against cassava pests.
- Pesticide applications should be avoided on cassava as this will kill the natural enemies of cassava pests.
- Dig egg-laying sites of the variegated grasshopper in the wet season to expose and destroy egg pods of the pest.
- In the control of bird, rodent, and other vertebrate pests of cassava, fence farms and set traps in the fence; cover exposed storage roots with soil; organize villages to hunt for grass cutters; weed the SCPZ on time to discourage rodent pests; and harvest cassava storage roots as soon as they are mature.

5.3.1.4 Chemical methods

IPM methods are always the most favorable methods in pests/disease control. Only when other methods manage pests in SCPZ, and monitoring results have indicated that damage caused by pests is over the economic threshold, can chemical pesticides be applied. Attention should be paid to select the less hazardous pesticides, to reduce environment and health impacts.

Chemical control methods should follow the following principles:

- Use of Cost-effective non-pesticide chemicals, such as $Ca(OH)_2$;
- Use of high efficiency, low toxicity and low residue pesticides (category III of WHO);
- Extension of the application technologies that have low toxicity to humans, animals and plants and with reduced pollution to the environment;
- Use of safe spraying devices to enhance the efficiency and effectiveness of the pesticides;

- Strengthen the awareness and education on safe and proper use of pesticides, extend safe application of pesticides through training, follow strictly the regulations on pesticide application, and pay attention to safety;
- Safe storage of chemicals (e.g. keeping pesticides away from food and children);

The Kogi Alape- Agbadu SCPZ will interface with the State FADAMA offices in the ADPs. A lot of experience and success has been gained in Nigeria under FADAMA II and III projects including application of IPM operations. Therefore, the Kogi Alape- Agbadu SCPZ stands to gain from shared experience and capacity of these existing projects in terms of challenges and success drivers of IPM operations and other similar areas. That way, the SCPZ agricultural associations/farmers would not require much experimentation time lag in the implementation of this IPM.

5.4 Pest Management Planning Matrix for the Kogi Alape-Agbadu SCPZ

Table 5.0 outlines the matrix of activities, expected results, milestones and performance indicators of the IPMP.

Table 5.0: Planning matrix for the Kogi Alape-Agbadu SCPZ

Narrative summary	Expected results	Performance indicators	Assumptions/risks
Goal: Empower the Kogi Alape- Agbadu SCPZ to contribute significantly to household and national economies through environmentally friendly pest management practices.	• In-country starch production capacity enhanced, environmental quality (Cargil will ensure that their processes an environmentally compliant, and that cassava waste is properly and safely managed). Improved, cassava crop and productivity (resistant, and high starch yielding varieties will be used). Employment opportunities, youth empowerment and increased income for Kogi State.	• Evidence of improvements in starch production, availability and sales • Increase in other forms of Public Private Partnership (PPP) involvement with regards to the SCPZ • Increase in employment (short and Long-term) for skilled and unskilled persons • Environmental protection	• National security remains stable • Government policies continue to support other SCPZs in the country.
Purpose 1. In the immediate future, halt and reverse losses cause by pests in order to increase profitability of the Kogi Alape-Agbadu SCPZ. 2. In the longer term, strengthen national and local capacity to reduce environmental and health risks associated with pest management practices in the SCPZs nationwide.	**Medium-term results/outcomes** • Kogi state is able to prioritize pest problems, specifically with the SCPZ and identify IPM opportunities to mitigate negative environmental and social impacts associated with pesticides. • Kogi State is able to adopt ecologically sound options to reduce cassava crop losses with minimal personal and environmental health risks. • Kogi Alape- Agbadu SCPZ decision makers provided with clearer guidelines enabling then to promote IPM approaches and options in agriculture • Collaborate linkages established to develop a national IPM policy to promote compliance with international conventions and guidelines on pesticide use	• Availability of sufficient starch. • Perception of state agencies regarding the value of IPM in agriculture. • Level of compliance with World Bank safeguards, and compliance parameters of other donors etc. • Level of chemical control practices • Types and level of use of alternatives to synthetic pesticides	

Table 5.1: Components activities and expected results of the IPMP

Activities	Expected results	Milestones	Performance indicators	Assumptions/risks
1. Record stakeholders' overviews on staple crop pests. 2. Conduct field diagnosis to specify pests that undermine staple crop production. 2. Identify farmers' coping mechanisms and researcher recommended IPM options against the pests. 3. Develop and explain historical profile of pesticide use and other pest control practices in the SCPZ. 5. Specify partnership opportunities at local, national and international levels to assist in the implementation of the PMP	**Result 1:** Staple crop farmers and other relevant stakeholder groups develop common understanding of key pest problems and agree on corrective action.	• 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 • PMP implementation mechanism developed by other in-country SCPZs	• Type and nature of participatory methods for problem analysis • Documented information on the status of pests and natural enemies of pest and pollinators in the SCPZ. • 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	Social, economic and political situation remain stable

Activities	Expected results	Milestones	Performance indicators	Assumptions/risks
1. Develop participatory learning modules (PLM) in line with identified training needs 2. Conduct short to medium term training of farmers, potential Kogi Alape- Agbadu SCPZ staff and support groups on skills relevant to the PLMs 3. Organize international study visits on specialized IPM skills of relevance to the PLMs 4. Intensify training of men and women farmers in IPM knowledge and skills. 5. Promote farmer-led extension to increase secondary adoption of proven IPM options 6. Strengthen researcher-farmer-extension linkages through participatory research on issues emerging from farmer training 7. Develop/disseminate IPM decision-support information resources for field agents, farmers, policy makers, and the general public	**Result 2**: Human resource capacity for IPM delivery and implementation developed. *In partnership with Nigeria/FAO project TCP/NIR/2903 (T) on sustainable legumes and cereal production through integrated production and pest management for synergy of efforts in participatory learning approaches, and with the CGIAR System-wide Program on IPM (SP-IPM) for supporting IPM resources*	PLM for crop pest management practices developed and adapted to suit local needs training of trainers programs are completed At least 3 sets of study visits organized for technical support staff Personnel of the Alape-Agbadu SCPZ accurately relate pests to respective damage symptoms; recognize natural enemies/biological control agents against the pests; test a range of IPM options and select "best-bet" options to implement and adopt. Trained farmers undertake participatory extension; and also adopt new IPM options At least 70% of information materials developed is disseminated and used by extension agents and farmers. Significant reduction in pest damage	Type and number of PLMs developed Type of IPM skills covered in study visits by agric staff Number of farmers' learning groups implemented Gender and number of extension agents and of farmers trained. Gender and number of trained farmers engaged in participatory extension Extent to which new knowledge/skills are used by extension agents & farmers to promote adoption of IPM options Number & type of IPM information materials developed/disseminated Number and type of new IPM options introduced and adopted. Gender and number of farmers adopting IPM technologies. Area of crops under IPM Incremental benefits due to pest control Type and number of user-friendly taxonomic keys for pest and natural enemy recognition by farmers and extension workers	PCU/EMC of the Kogi Alape-Agbadu SCPZ adopts and apply new improved technologies. Farmers, Kogi Alape- Agbadu SCPZ program and its counterparts comply with international conventions guiding pesticide use and MRLs in trade Critical mass of staff trained remain within the communities

Table 5.1 (contd.): Components activities and expected results of the PMP

Activities	Expected results	Milestones	Performance indicators	Assumptions/risks
1. Test and promote botanical alternatives to synthetic pesticides. 2. Test and promote microbial alternatives to synthetic pesticides 3. Develop/update a national IPM policy including legislation to govern the manufacture, importation, distribution and use of pesticides 4. Establish a state IPM advisory and oversight committee to guide national and local compliance with World Bank safeguard Policies, OP 4.09; OP 4.01, OP 4.12 and other international conventions concerning pesticide use 5. Sensitize the population on IPM issues and activities through formal and informal educational channels and public awareness campaigns	**Result 3**: Harmful pesticide regimes replaced by environmentally friendly alternatives *In partnership with the:* *1. SP-IPM for sustainable access to microbial pesticides.* *2. Nigeria node (at IAR/ABU) of the West African Network for Taxonomy (WAFRINET) and IITA biodiversity center for identification services.*	• Local commercial enterprises initiated and/or strengthened to produce and/or market botanical pesticides • At least one botanical pesticide widely used in place of chemical pesticides • At least one microbial pesticide registered and widely used in place of chemical pesticides • Surveillance systems to protect the Alape-Agbadu SCPZ from banned/harmful pesticide regimes is fully operational • Existing pesticide regulations are fully enforced • A multi-stakeholder State/National IPM advisory and oversight committee established to guide compliance with international conventions and guidelines on pesticide use, and promote the IPM development • Radio and other public campaigns on impact of pesticides in agriculture, environment and health conducted through radio and TV spots, mass field days, rural market days, information workshops, and focus groups discussions	• Level of reduction in chemical pesticide use; type and number of pesticides replaced by botanical or microbial pesticides • Number of commercial enterprises engaged in the production of botanical pesticides; and quality of the products • Volume of sale of microbial and botanical pesticides • Level of compliance with World Bank safeguard policies by PCU/EMC of the SCPZ and pesticide dealers/service providers • Effectiveness of the IPM advisory and oversight committee • Number of pest surveillance groups and pesticide law enforcement mechanisms • Effectiveness of public awareness of campaign	Government and development partners remain committed to international conventions and guidelines on safe pesticide use Critical mass of staff trained remain within the SCPZ communities

PART 6: IMPLENTATION STRATEGY

6.1 Context

To ensure that this IPMP is optimally implemented a number of steps are required to be taken. These include:

i. Measures that will ensure capacity building among stakeholders that will implement the IPMP as well as farmers associations and youth expected to be involve in agriculture under the Kogi Alape- Agbadu SCPZ program;
ii. Measures to ensure that POPs pesticides and WHO class 1 and 2 pesticides considered highly hazardous are not procured and/or used;
iii. 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
iv. Measures that ensure that pest resistant varieties of cassava are procured as a better pest control alternative

6.2 Capacity Building

Training is a fundamental component of the Kogi Alape- Agbadu SCPZ IPMP. A series of trainings have been proposed and are as follows:

Table 6.0 Capacity Building

Modules	Targets	Responsibility Arrangement	Budget in USD
World Bank Environmental and Social Safeguards (emphasis on OP 4.09)	Kogi Alape- Agbadu SCPZ PCU/EMC; MARD; KADP and KADP Alape zonal office	Safeguards Consultant	**45000**
Occupational Health and Safety (OHS) Basics in chemical pest applications	Kogi Alape- Agbadu SCPZ PCU/EMC; MARD; KADP, KADP Alape zonal office, Farmer Organizations, Youth farmers, extension workers	Independent Consultant	**68,000**
Safe Management of Chemical Pesticides (transportation, storage, handling, storage of empty pesticide containers and final disposal)	Extension works, Kogi Alape- Agbadu SCPZ PCU/EMC; MARD; KADP, KADP Alape zonal office	Independent Consultant, FADAMA III, CADP	**39,000**
Decision making on the selection of IPM approaches or options	Kogi Alape- Agbadu SCPZ PCU/EMC; MARD; KADP, KADP Alape zonal office,	Independent Consultant, FADAMA III	**57,500**

Modules	**Targets**	**Responsibility Arrangement**	**Budget in USD**
	farmers		
IPM Implementation and Monitoring	Kogi Alape- Agbadu SCPZ PCU; MARD; KADP, KADP Alape zonal office	Independent Consultant, FADAMA III, CADP	**89,000**
Small group consultations	Kogi Alape- Agbadu SCPZ PCU; MARD; KADP, KADP Alape zonal office, farmers	Independent Consultant, FADAMA III, CADP	**40,000**
Environmental management in pest control	Kogi Alape- Agbadu SCPZ PCU; MARD; KADP, KADP Alape zonal office, farmers	Independent Consultant	**55,000**
Breeding of natural enemies of pests	Kogi Alape- Agbadu SCPZ PCU; MARD; KADP, KADP Alape zonal office	Independent Consultant	**67,000**
Total			**460,500**

6.3 Institutional Arrangements and Framework for Implementation

6.3.1 Kogi Alape- Agbadu SCPZ Executive Management Committee (EMC)/PCU

The EMC will be the major driver of programs and activities that concern the SCPZ. For the purpose of the IPMP, it will be the overall facilitator, ensuring that IPM strategies are employed to ensure compliance to World Bank Safeguard policies. The EMC shall also synergize with the State Ministry of Agriculture, in supervision and coordination activities. Main implementation activities of the EMC shall include:

a) Implementation of the Master Plan for the Kogi Alape- Agbadu SCPZ
b) Overseeing the day-to-day administration of the Zone, including maintaining office in the Zone which shall ensure proper documentation, record keeping, information sharing and dissemination as may be necessary for the proper running of the Zone;
c) Facilitating the extension of desirable off-site infrastructure to the SCPZ through Federal, State and Local Government efforts
d) Facilitating the provision of desirable on-site infrastructure in the SCPZ through partnership with the private sector (Special Purpose Vehicles) and monitoring, continuously, the state of infrastructure on the SCPZ;
e) Leveraging on the support of the State Government to maintain such level of influence in the ABIR required in furtherance of the objectives of the SCPZ and to ensure that activities in the ABIR are consistent with the goals of the SCPZ.
f) Facilitating the day to day management of the SCPZ by Special Purpose Vehicles
g) Coordinating all activities required to ensure adequate and reliable feed stock supply to processors from farmers including

6.3.2 Ministry of Agricultural Resource Development (MARD), Kogi State

MARD will perform a supervisory role together with the EMC. MARD will be responsible for ensuring agricultural personnel availability, to enable sensitization programs and capacity building on IPM practices. MARD will also be responsible for preparing State-based IPM guidance manuals to foster IPM in the zone and state as a whole.

6.3.3 Kogi Agricultural Development Project (KADP); FADAMA III, Kogi State and Federal Department of Agriculture, Kogi State

The three are very specialized implementation actors with local and international knowledge on IPM, and in agricultural practices in Nigeria. They will establish linkage between each other to support the SCPZ in technical expertise and advisory. Technical responsibilities will include:

1. Development of subsequent IPM training programs for the Kogi Alape- Agbadu SCPZ project
2. Advice on selection of best cassava varieties to ensure project outputs are achieved and also foster IPM.
3. Ensure that proffered IMP controls as contained in this report are applied. They will be vital for providing guidance and directives on pest control applications and monitoring and evaluation (M&E).
4. **Breeding of natural enemies**: Through the provision of funding by the World Bank and Kogi State Government, each actor will be responsible for setting up facilities for breeding natural enemies and provide advice on subsequent capacity building needs in breeding of natural hosts.

6.3.4 Kogi Agricultural Development Project (KADP) Zonal Management Office, Alape

The zonal management management office will be responsible for direct on-site IPM activities. The office will liaise with local farmers, hunters, Community Based Organizations (CBOs) etc. It will be responsible for continuous trainings of SCPZ site personnel, and the management of planting materials. Together with the SCPZ PCU, it will perform M&E tasks and ensure coordination between the project and project communities.

6.3.5 Zone Level Special Purpose Vehicle (SPV)

The SCPZs are to be developed, managed and operated under investment driven strategic partnership with the private sector. A zone-specific project company shall be established at the level of each SCPZ. This project company will be registered as a Special Purpose Vehicles (SPV), under Public-Private-Partnerships between either of the Federal, State and Local Governments (or a combination) and private sector entities to provide the requisite

SPVs will provide services, including:

a) Infrastructure development of a SCPZ, including the rehabilitation, modernization, expansion, development and distribution of on-site infrastructure and utilities, including gas, water, electricity, communication, roads etc.,
b) Provision of specialized agriculture infrastructure and services, including primary processing centres, quarantine facilities, storage facilities etc.
c) Provision of general services, including warehousing, transportation etc.
d) Provision of support infrastructure, social infrastructure and the provision of real estate services
e) Facilities management, including general SCPZ site management, managing infrastructure on the site and the collection of fees and rates to cover for the services provided

f) Market the site and attract further investment.

On the aspect of IPMP implementation, SVCs will work closely with other implementation groups as where required.

6.3.6 Roles and Responsibilities of SCPZ Host Communities

Host communities would be adequately sensitized and organized to perform the following roles:

a) Integrate community developmental goals with those of the SCPZ for economic and social transformation.
b) Promote group formation and establishment of relevant security personnel for safeguarding the activities within the Zones and its environs.
c) Provision of appropriate security measures to protect lives and properties of Investors
d) Cooperate with the EMC and other partners to ensure that activities carried on in the ABIR are consistent with the goals of the SCPZs.
e) Organization of farmers into cooperatives for easy access to loan facility for production and processing facilities

6.3.7 Roles and Responsibilities of Non-Governmental Organizations (NGOs)

The roles of NGOs in the Kogi Alape- Agbadu SCPZ and to the benefiting communities would include the following:

a) Encouragement of marketing of processed goods of the SCPZ.
b) Participation in identification of beneficiary communities' project needs
c) Assistance in funding community development projects

6.3.8 Roles and Responsibilities of Donor Agencies (World Bank)

The roles of Donors shall include:

a) Assisting in providing financing and technical assistance toward the establishment and sustainability of the SCPZs and ensuring implementation of the IPMP to meet the donor's safeguard requirements.
b) The Donor will also ensure that other safeguard instruments prepared for the Kogi Alape-Agbadu SCPZ are implemented and used to complement each other where appropriate.

6.4 Responsibilities of Federal Ministries

6.4.1 Federal Ministry of Agriculture and Rural Development (FMARD)

The FMARD, through its Agro-Processing and Marketing Department, will provide overall leadership and direction to the other Ministries in the facilitation of the desired operational environment for the Kogi Alape- Agbadu SCPZ.

Specific roles will include:

a) Provision of the policy and legal framework for the SCPZ with a view to ensuring stability and sustainability.
b) Facilitating the provision of funding to support the development and sustenance of SCPZs
c) Engaging all the critical stakeholders and securing their support, cooperation and participation in the implementation of this policy
d) Establishing, through the ATA, FMARD's Development Partnership Projects like the CADP, Fadama and other donor Projects, a sustainable system of support to production activities in the ABIRs;

6.4.2 Federal Ministry of Works

a) Facilitation of the rehabilitation of existing/construction of new access roads/road infrastructure to link the SCPZ to major road networks
b) Rehabilitation/expansion of feeder roads connecting major clusters of agricultural production

6.4.3 Federal Ministry of Water Resources

a) Assist in the determination of hydrology potentials of SCPZ site
b) Facilitate full utilization of irrigation potentials of ABIRs, including facilitating the development and maintenance of dams, collection wells, pump stations and irrigation canals
c) Exploration and utilization of appropriate technologies to provide potable water to SCPZ beneficiary' communities

6.4.4 Federal Ministry of Environment

a) Establishment of SCPZ specific environmental and social policy guidelines to reduce delays in obtaining approvals for SCPZ development
b) Ensuring compliance of SCPZ to specific environmental and social policy guidelines

6.5 Monitoring and Evaluation

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

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

This section sets out requirements for the monitoring of the environmental and health impacts of the pesticides management activities. Monitoring and evaluation of the agricultural support IPM will be mainstreamed into the overall monitoring and evaluation system for the Kogi Alape-Agbadu SCPZ ESMF. The key issues to be considered in the monitoring process are whether a the pesticides procurement checklist is available and used during procurement and screening to 1) ensure that POPs pesticides and WHO class 1A and 1B pesticides are not procured or used. 2) Monitor the progress of the IPM implementation vi-a-viz the results.

In specifics, the following are **monitoring indicators** required to achieving IPM project development objectives:

- Reduction in the use and application of pesticides in the area
- Performance ratings in pest management using proffered IPM controls
- Number of farmers and stakeholders aware of the pollution, contamination and toxicity associated with pesticides
- Decline or increase in cassava pests within the SCPZ.
- The number of farmers or farmers association using biological methods of pest control
- Number of persons trained in the method of spraying and handling of chemical pesticides
- The reported incidences of pest and herbicides concerns among farmers
- The level of use of resistant and improved species of cassava
- Improvement in production/harvest of crops/livestock from use of IPM vi-a-viz the pre-IPM baseline
- Level of understanding of IPM processes
- Level of understanding of World Bank operational policy on pest management among SPCUs and farmers associations
- Level of involvement of youth and women in agriculture activities
- Level of unemployment/employment especially in project communities

Towards the course of the above monitoring indicators the following action indicators will be incorporated into a participatory monitoring and evaluation plan.

Capacity to inform: Types and number of participatory learning modules (PLM) delivered; category and number of extension agents and farmers trained and reached with each PLM; category and number of participants reached beyond baseline figures; practical skills/techniques most frequently demanded by extension agents and farmers; and crop/livestock management practices preferred by farmers.

Capacity to motivate: Category and number of agricultural workers and farmers who correctly apply the skills they had learnt; new management practices adopted most by farmers; category and number of other farmers trained by project trained farmers; types of farmer-innovations implemented**;** level of pest damage and losses**;** rate of adoption of IPM practices; impact of the adoption of IPM on production performance.

Major benefits: Increase in cassava crop production within the SCPZ; increase in farm revenue; social benefits: e.g., improvement in the health status of farmers; level of reduction of pesticide purchase and use.

Sustainability of Process and Results

Short-term technical study visits FADAMA agriculture projects and other ADP projects with proven success in IPM development and implementation will help to create favourable conditions for continuity of IPM processes and results. Scientific information, adapted into user-friendly format will strengthen training and extension delivery, and increase IPM literacy in SCPZ agricultural programs/groups.

Evaluation of Results

The evaluation of results of IPM in the Kogi Alape- Agbadu SCPZ agriculture program can be carried out by comparing baseline data collected in the planning phase with targets and post project situations.

PART 7: WORKPLAN AND BUDGET

Approximately **US$ 1,052,000** will be required to effectively implement the IPMP over a five-year period (Table xxx). This cost covers IPM orientation workshop, capacity building and awareness program, and project management including the cost of monitoring. It will be implemented over the 5-year project cycle. Detail of the work plan and cost are presented in table 7.1.

Table 7.1: Budget summary

Line item	Yr. 1	Yr. 2	Yr. 3	Yr 4	Yr5	**Total**
1. Capacity building & Awareness						
All training programs (See table 6.0)	200000	100000	100000	60500	0	**460,500**
Radio jingles and handbill on IPM	30000	20000	10000	0	0	**60000**
Sub-total	*230000*	*120000*	*110000*	*60500*	*0*	***520,000***
2. Environmental management						
Equipment; bed nets; improved species	10000	20000	10000	10000	0	**50000**
Support to IPM research and development	20000	30000	20000	10000	4000	**84000**
Pest/vector surveillance	10000	10000	6000	4000	4000	**34000**
Sub-total	*40000*	*60000*	*36000*	*24000*	*8000*	***168000***
3. Occupational Health & Safety						
Personal Protective Equipment (Hand gloves, gas mask, safety boot and overall wear)	70000	70000	50000	0	0	***190000***
Chemical Neutralizer and first Aid	50000	30000	20000	0	0	***100000***
Sub-total	*120000*	*100000*	*70000*	*0*	*0*	*290000*
4. Project management						
IPMP coordination	4000	4000	4000	4000	4000	**20000**
Monitoring and evaluation	10000	10000	10000	12000	12000	**54000**
Sub-total	*14000*	*14000*	*30000*	*16000*	*16000*	***74000***
Grand total	**404000**	**294,000**	**147000**	**100500**	**24000**	**1,052,000**

PART 8: SUMMARY OF PUBLIC CONSULTATIONS FOR THE IPMP

Groups consulted for the purpose of developing the IPMP include:

- Kogi Agricultural Development Project (KADP)
- FADAMA III, Kogi State
- Federal Department of Agriculture, Kogi State
- Ministry of Agricultural Resource, Kogi State
- Ministry of Lands
- Ministry of Women and Youth Development
- Zonal Management Team Alape
- Odo-Ape Community
- Agbadu-bunu Community

Table 8.0 Public Consultation

#	Date	Person(s)/Organisation /Group	Consultation and Inquiries	Responses/Recommendations
1.	21.07.2014	Prof. A. D. Akpa, Principal Manager, Fadama III Project, KGADP	The IPMP consultant introduced the proposed IPMP for the Alape SPCZ and the objectives of the appraisal visit.	The P.M. informed the team of key people to consult with within KADP and the Fadama III project. He also gave a description of the Zonal structure of KGADP
2.	22.07.2014	Mr. P. S. O. Ogunmola, and Fadama III Team (State Fadama Coordinating Office, SFCO), KGADP	The IPMP consultatnt briefed the Fadama III team about the IPMP for the Alape SPCZ project and requested to be offered relevant information on the Alape SPCZ project and institutional arrangements on	The Fadama III team identified GEMS III to have captured GIS data and developed maps on the project site. They also identified key persons involved in the project at the current stage including Mr. Femi Jimoh (Zonal manager, KGADP Zone-A in Ayetoro), Chief Awoniyi (Consultant to FMARD on the Alape project), and Prof. Olugbemiro Jegede

#	Date	Person(s)/Organisation /Group	Consultation and Inquiries	Responses/Recommendations
			the state level. Inquiries were made about the experiences of Fadama III project with Cassava pest management in the project area	(Secretary General to the State Government). The use of pesticides by subsistence cassava farmers in the project area was said to be not a common practice since their crops are not seriously threatened by pests. The most common pest was identified to be locusts that eat the young cassava plants during the dry-season. Army-ants were said to occasionally attack the roots of the plants. Other cassava pests identified were monkeys, partridges, and grass cutters. *Oko-Iyawo* (TME 7 variety) was identified as the local variety of cassava commonly planted by the local farmers. It was said to be a highly pest and disease tolerant variety.
3.	23.07.14	Mr. Arotiba Dare, FMARD, Kogi State Office	The IPMP team introduced the purpose of the IPMP appraisal visit and discussed the Alape project, the value chain and the institutional arrangement of the project.	A description of how the state ministry of Agriculture is structured was described. The ministry has LGA offices, one in each of the twenty-one (21) local government areas of Kogi State. KGADP was described as the implementation arm of the ministry and it has four (4) zonal offices across the state. Each zone is headed by a zonal manager while KGADP itself is headed by a state coordinator. 200 hectares of the land within the Alape SPCZ was cleared in 2013 while 150 hectares out of the cleared land was utilized to plant cassava for breading stems for further expansion.
4.	23.07.14	Director of Agric Services, Kogi State	The IPMP consultant inquired about state-based	As at date there is no documented Kogi State policy on the

#	Date	Person(s)/Organisation /Group	Consultation and Inquiries	Responses/Recommendations
		Ministry of agriculture	pest management and pesticide policies	use of pesticides. The Zonal Manager of the Zone-A, KGADP was identified as a key personnel with direct contact with the project activities on the site
	24.08.14	Mr. Femi Jimoh, Zonal Manager, KGADP (Zone A), Ayetoro, Kogi State	The IPMP requested for a description of the planting activities on the project site and pest issues experienced in cassava cultivation and harvest storage.	The Zonal manager described the ongoing cassava cultivation activities and the involved parties. IITA was said to have supplied a variety of cassava known as TMS419 for an initial cultivation of 150 ha and these are intended to be used to produce more stems. This variety was described to be known for its high starch content and big roots. It is also suitable for mechanized farming. IITA was said to have also engaged in the mechanized harrowing of the land before the planting was carried out. The plantation was reported not to have experienced any significant pest issues as at date. The ABIR cluster was said to cover 30,000 ha with an additional 15,000 reserved for future expansion. Variegated grasshoppers (Zonocerus Variegatus) were said to occasionally constitute a challenge on cassava farms in Kogi State generally. Improved Cassava varieties (inclusive of TMS 419) were said to easily overcome the attacks of cassava Mealybug so it does not constitute a serious challenge in the project area in the past. Common Herbicides used in the project area to deal with weed were said to be **Starforce**, **Paraquat** (e.g. **Paraforce**)

#	Date	Person(s)/Organisation /Group	Consultation and Inquiries	Responses/Recommendations
				for Post-emergence, while **Premenstral** and **Metaforce** are used for Post-emergence cases. Commonly used insectides in the project area were said to include **Perfet-Iron** for grasshoppers, and others that are for broad spectrum cases.
	24.07.14	Odo-Ape chiefs, community leaders and representatives (12.00pm to 2.00pm) Agbadu-Bunu chiefs, community leaders and representatives (3.00pm to 4.30pm)	The local dialect of the people was used in the consultation. Mr. Jimoh (Zonal Manager, Zone A, KGADP) interpreted between English and *Okun* languages. The IPMP consultant briefed the community representatives about the Alape SPCZ project and the focus on Cassava as the value chain. The involvement of the FMARD, The World Bank, and CAPD was also described. The team discussed the objectives of designing and implementing an Integrated Pest Management Plan for the project.	The two communities in the separate group consultations expressed acceptance and high interest in the project. They identified Fulani herd rearers and their cows to constitute a major issue to their farms. The herdsmen were said to encroach into their farms indiscriminately and have their cows feed on the grasses around and on their crops. Attempts to caution them commonly resulted to violent responses by the herdsmen who were said to be armed with swords. The farmers claimed that with a properly established buffer zone between a farmer's farmland and surrounding bushes cases of reptiles and monkeys feeding on their crops is usually minimized. Chemicals are used to control weed by spraying. Herbicides and other chemicals for pest and disease control are purchased from Kabba town (local agro-kiosks) on an individual basis. The farmers usually buy just the quantity they need for application per time, so not significant quantities are stored for further use (they are used up within

#	Date	Person(s)/Organisation /Group	Consultation and Inquiries	Responses/Recommendations
			Enquiries were made on the commonly experienced pests and diseases, commonly practiced management of these issues, post-harvest losses, access to chemical-based pesticides supply, storage and disposal of these chemicals and health issues and cases related to their use and storage.	two to three days. The farmers said they have been advised by the KGADP to form farmer-groups of ten (10) farmers per group for effective corporation and resource sharing against the Alape project and other future developments. The communities claim that they have not experienced any known cases of pesticide poisoning. The small quantities of pesticides that the farmers buy are commonly stored either in their farm barns, stores or in their living rooms. Since buy just the quantities they need for each application, there is hardly any need to dispose any expired or unused chemicals.
	16.08.2014	Public Consultation with Odo-Ape, Agbadu-Bunu and Ape communities. Also present were representatives from FMARD, FMARD's consultant for the Alape SCPZ project (Chief. James Awoniyi), KGADP (project desk officer), and KGADP ZoneA (Zonal Manager).	The local dialect of the people was used in the consultation. Mr. Jimoh (Zonal Manager, Zone A, KGADP) interpreted between English and *Okun* languages. The IPMP consultant briefed the stakeholders about the project and the need for an	The communities reiterated their acceptance and interest in the project. Almost adult in the community practices farming either as a full-time occupation or by the side. They identified the pests that may attack cassava, even though they said they usually don't experience significant pest problems on their cassava farms or on their harvest. The pests include: 1. *Elete* (Grass Hoppers)

#	Date	Person(s)/Organisation /Group	Consultation and Inquiries	Responses/Recommendations
			Integrated Pest Management Plan to be developed. Through interactive discussions, the team verified information that had been gathered from the earlier consultations with in the previously group consultation engagements	2. Mealybugs 3. Termites 4. Grass Cutters 5. Wild Pigs 6. *Akparo* (Partridges) 7. Cows, driven by Fulani cattle rearers The grass hoppers get washed driven away naturally when the rains begin. The grass cutters and the squirrels are handled by setting traps. The communities complained that the Fulani cattle rearers and their cows constitute a threat to their farm crops and that they will need support from the government to come up with a solution to encroachment into the farms. The communities expressed their willingness to corporate and implement the Integrated Pest Management plan when it is developed and applied.

REFERENCES

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)

PIC (1998). Rotterdam Convention on the Prior Informed Consent (PIC) Procedure for Certain Hazardous Chemicals and Pesticides in the International Trade. Text and annexes. UNEP and FAO.

POPs (2001). Stockholm Convention on Persistent Organic Pollutants (POPs). Text and annexes. UNEP and FAO

ANNEXES

Annex 1: List of banned pesticides

1. Aldrin 2. Chlordane 3. DDT (Dichlochphenyl 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 2: List of crop and livestock protection products approved for use by NAFDAC

a) Insecticides

Organochlorines insecticides	**Organophosphorus insecticides**	**Carbamates**	**Pyrethroids**
1. Endosulfan	**Organophosphorus** i	1. Carbaryl	1. Lambda – Cyhalothrin
2. Helptachlor	1. Diazinon	2. Carbofuran	2. Cypermethrin
3. Lindane (Restricted to use on Cocoa only)	2. Dichlorvos (DDVP)	3. Propoxur	3. Deltamethrin
	3. Chlorpyrifos	4. Carbosulfan	4. Phenothrin
	4. Chlorpyrifos – Methyl	5. Furathiocarb	5. Permethrin
	5. Dicrotophos	6. Temik (Aldicarb	6. Tetramethrin
	6. Dimethoate		7. Cyfluthrin
	7. Monocrotophos		8. Allethrin
	8. Perimiphos – Ethyl		
	9. Perimiphos – Methyl		
	10. Ethion		
	11. Rugby (Cadusofas)		
	12. Malathion		
	13. Temeguard (Temephos)		
	14. Isazofos		

	15. Parathion – Methyl 16. Phosphamidon 17. Methidathion

b) Herbicides and fungicides

Organophosphorus	**Carbamates**	Other herbicides	Fungicides
Organophosphorus 1. Anilofos 2. Piperophos 3. Glyphosate 4. Glyphosate Trimesium (Touchdown or Sulfosate) 5. Amideherbicides (Acetochlor; Alachlor; Propanil; Butachlor; Metalochlor) Triazines and Triazoles (Atrazine; Ametryn; Desmetryn; Terbuthalazine; Terbutrex Terbutryne) Chlorophenoxy herbicides (Prometryn; Simazine; 2.4-D (2.4 Dichlorphenoxy acetiacid) 7. Urea and guadinidines ; (Diuron ; Linurex (=Linuron); Fluometurone; Chloroxuron; Neburon) Quaternary nitrogen compounds (paraquat; diquat)	1. Asulam	1. Dimethachlor 2. Metazachlor 3. Monosodium Methyl Arsonate (MSMA) 4. Fluxixpyr 5. Imazaquine 6. Triassulfuran (Amber) 7. Osethoxydim 8. Oxadiazon (Ronster) 9. Clomaone 10. Trifluralin 11. Stamp 500 (pendimethalin) 12. Fluazifop – P.butyl	1. Benomyl (Nitroheterocyclic Compound) 2. Dazomet (Thiadiazine Fungicide) 3. Folpet (Phthalimide Fungicide) 4. Metalaxyl (Acylalamine Fungcide) 5. Cyproconazole (Alto – 100SL) 6. Bavistin (Carbon) – Benzimide 7. Triadmenol (Bayfidon GR Conzole Fungicide)

Annex 3: 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 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.

Disposal of pesticide stocks

After the operations, the remaining stocks of pesticides can be disposed of without risk by

dumping them in a hole dug specifically or in a pit latrine. A pesticide should not be disposed

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 absorb 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 is 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 everyday. 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 there 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 4: WHO Pesticides Classification

Pesticides product	Active ingredient	Chemical class	Toxicological class	Main use
BASUDIN	Diazinon	Organophosphate	11	Insecticide
HERBOXONE	2,4-D	Chlorophenoxy-acid	11	Herbicide
TOPIK	Clodinafop-Propargyl	Arylozyphenoxy propionics	111	Herbicide
AATREX	Atrazineq	Triazines	U	Herbicide
MACHETE	Butaclor	Chloroacetanilides	U	Herbicide
CERTAINTY	Sulfosulfurone	Sulfonylureas	U	Herbicide
ERADICANE	EPTC	Carbamides	11	Herbicide
LASSO	Alachlone	Chloroacetanilides	111	Herbicide
DECIS	Deltamethrin	Pyrethroides	11	Insecticide
ALTO	Cyproconazol	Triazoles	111	Fungicide
SENCOR	Metribuzin	Triazines	11	Herbicide
CONFIDOR	Imidacloprid	Neonicotinides	11	Insecticide
GRANDSTAR	Tribenulon-methyl	Sulfonylureas	U	Herbicide

Annex 5: WHO Pesticides Classification

Code of Conduct - 2001 revised version	Code of Conduct - 1989 amended version
10.1 All pesticide containers should be clearly labelled in accordance with applicable guidelines, at least in line with the FAO guidelines on good labelling practice (3).	**10.1** All pesticide containers should be clearly labelled in accordance with applicable international guidelines, such as the FAO guidelines on good labelling practice.
10.2 Industry should use labels that:	**10.2** Industry should use labels that:
10.2.1 comply with registration requirements and include recommendations consistent with those of the recognized research and advisory agencies in the country of sale;	**10.2.1** include recommendations consistent with those of the recognized research and advisory agencies in the country of sale;
10.2.2 include appropriate symbols and pictograms whenever possible, in addition to written instructions, warnings and precautions in the appropriate language or languages (3);	**10.2.2** include appropriate symbols and pictograms whenever possible, in addition to written instructions, warnings and precautions;
10.2.3 comply with national or international labelling requirements for dangerous goods in international trade and, if appropriate, clearly show the appropriate WHO hazard classification of the contents (3,35,36);	**10.2.3** in international trade, clearly show appropriate WHO hazard classification of the contents (11) or, if this is inappropriate or inconsistent with national regulations, use the relevant classification;
10.2.4 include, in the appropriate language or languages, a warning against the reuse of containers and instructions for the safe disposal or decontamination of used containers;	**10.2.4** include, in the appropriate language or languages, a warning against the reuse of containers, and instructions for the safe disposal or decontamination of empty containers;
10.2.5 identify each lot or batch of the product in numbers or letters that can be understood without the need for additional code references;	**10.2.5** identify each lot or batch of the product in numbers or letters that can be read, transcribed and communicated by anyone without the need for codes or other means of deciphering;
10.2.6 clearly show the release date (month and year) of the lot or batch and contain relevant information on the storage stability of the	**10.2.6** are marked with the date (month and year) of formulation of the lot or batch and with relevant information on the storage stability of the

product (21).	product.
10.3 Pesticide industry, in cooperation with government, should ensure that:	**10.3** Industry should ensure that:
10.3.1 packaging, storage and disposal of pesticides conform in principle to the relevant FAO, UNEP[10], WHO guidelines or regulations (27,28, 37, 39, 40) or to other international guidelines where applicable;	**10.3.1** packaging, storage and disposal of pesticides conform in principle to the FAO guidelines for packaging and storage, the FAO guidelines for the disposal of waste pesticides and containers, and WHO specifications for pesticides used in public health;
10.3.2 packaging or repackaging is carried out only on licensed premises where the responsible authority is satisfied that staff are adequately protected against toxic hazards, that the resulting product will be properly packaged and labelled, and that the content will conform to the relevant quality standards.	**10.3.2** in cooperation with governments, packaging or repackaging is carried out only on licensed premises where the responsible authority is convinced that staff are adequately protected against toxic hazards, that the resulting product will be properly packaged and labelled, and that the content will conform to the relevant quality standards.
10.4 Governments should take the necessary regulatory measures to prohibit the repackaging or decanting of any pesticide into food or beverage containers and rigidly enforce punitive measures that effectively deter such practices.	**10.4** Governments should take the necessary regulatory measures to prohibit the repacking, decanting or dispensing of any pesticide into food or beverage containers in trade channels and rigidly enforce punitive measures that effectively deter such practices.
10.5 Governments, with the help of pesticide industry and with multilateral cooperation, should inventory obsolete or unusable stocks of pesticides and used containers, establish and implement an action plan for their disposal, or remediation in the case of contaminated sites (41), and record these activities	*- new paragraph in revised Code -*
10.6 Pesticide industry should be encouraged, with multilateral cooperation, to assist in disposing of any banned or obsolete pesticides and of used containers, in an environmentally sound manner, including reuse with minimal	*- new paragraph in revised Code -*

risk where approved and appropriate.		
10.7 Governments, pesticide industry, international organizations and the agricultural community should implement policies and practices to prevent the accumulation of obsolete pesticides and used containers (37).		*- new paragraph in revised Code -*