SFG2140 V1

INTEGRATED PEST MANAGEMENT PLAN (IPMP)

FOR THE

West Africa Regional Disease Surveillance Systems Enhancement (REDISSE) Project

&

Staple Crop Processing Zone (SCPZ) PROJECT

DRAFT FINAL REPORT

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EXECUTIVE SUMMARY

ES 1 Context

This IPMP was originally prepared for the Staple Crop Processing Zone (SCPZ) project, and has now been updated to include the Regional Disease Surveillance Systems Enhancement (REDISSE) project . The REDISSE project is planned to strengthen weak human health, animal health, and disaster response systems to improve the preparedness of the West African region to handle future epidemics, and thereby minimize the national, regional, and potential global effects of such disease outbreaks.

The REDISSEE project's development objective (PDO) is to strengthen national and regional cross-sectoral capacity for collaborative disease surveillance and epidemic preparedness in West Africa. It will address systemic weaknesses within the animal and human health systems that hinder effective disease surveillance and response.

The REDISSE project which is placed in environmental category B, triggers two World Bank safeguards policies dealing with Environmental Assessment (OP/BP 4.01) and Pest management (OP/BP 4.09) respectively. Thus three safeguards instruments, namely: (i) Medical waste Management Plan (MWMP); (ii) Environment and Social Management Framework (ESMF) and (iii) Integrated Pest Management Plan (IPMP have been prepared as complimentary documents. This document stands for the IPMP in relation to Nigeria. Other West African countries, namely: Guinea, Liberia, Nigeria, Senegal and Sierra Leone have prepared their respective safeguard documents. This ESMF covers Nigeria only.

The updating of this IPMP to include REDISSE project is to ensure that arthropod pests from agricultural and companion animals are identified, prevented, managed or controlled using appropriate, ecologically sound and economic strategies thereby, combating effectively and timely, animal disease emergencies and preventing epidemiology outbreaks.

It should be noted that 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.

ES 2 Project Components for the REDISSE

The REDISSE Project has five components as follows:

Component 1: Surveillance and Information Systems:

- support the enhancement of national surveillance and reporting systems and their interoperability at the different tiers of the health systems.
- support national and regional efforts in the surveillance of priority diseases (including emerging, re-emerging and endemic diseases) and the timely reporting of human public health and animal health emergencies in line with the IHR (2005) and the OIE Terrestrial Animal Health code.

Component 2: Strengthening Laboratory Capacity:

- establish networks of efficient, high quality, accessible public health, veterinary and private laboratories for the diagnosis of infectious human and animal diseases, and
- establish a regional networking platform to improve collaboration for laboratory investigation.
- address critical laboratory system weakness systems weaknesses across countries, fostering cross-country and cross-sectoral (at national and regional levels) collaboration.

Component 3: Preparedness and Emergency Response:

- support national and regional efforts to enhance infectious disease outbreak preparedness and response capacity.
- support (i) updating and/or development of cross-sectoral emergency preparedness and response plans (national and regional) for priority diseases, and ensuring their integration into the broader national all-hazards disaster risk management framework; (ii) regular testing, assessment, and improvements of plans; (iii) expansion of the health system surge capacity including the allocation and utilization of existing pre-identified structures and resources (at the national and regional level) for emergency response, infection prevention and control.

Component 4Human resource management for effective disease surveillance and epidemic preparedness:

- Cross-cutting given that animal and human health workers form the backbone of Disease Surveillance (Component 1), Laboratories (Component 2) and Preparedness and Response (Component 3) ensure effective human resource management aims at bringing the right people with the right skills to the right place at the right time.

Component 5: Institutional Capacity Building, Project Management, Coordination and Advocacy:

- focus on project management which includes fiduciary aspects (financial management and procurement), M&E, knowledge generation and management, communication, and management (capacity building, monitoring and evaluation) of social and environmental safeguard mitigation measures.

ES 3 Project Components for the SCPZ Project

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

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

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 and REDISSE projects based on the EA screening result are:

		SCPZ		REDISSE	
S/N	**Safeguard Policies Triggered**	**Yes**	**No**	**Yes**	**No**
1	Environmental Assessment (OP/OB/GP 4.01)	*		X	
2	Natural Habitats (OP/BP 4.04)		*		X
3	Pest Management (OP 4.09)	*		X	
4	Indigenous peoples (OP 4.10)		*		X
5	Physical Cultural Heritage (OP 4.11)	*			X
6	Involuntary Resettlement (OP/BP 4.12)	*			X
7	Forest (OP 4.36)		*		X
8	Safety of Dams (OP/BP 4.37)		*		X
9	Projects on International Waterways (OP/BP/GP 7.50)		*		X
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. The REDISSEE project will only involve the rehabilitation/construction of new buildings/structures and laboratory investigations, on the one hand. on the other hand, the SCPZ would involve major construction works r at the site (building of the Cargil plant, laboratories, access roads construction, etc). These activities thus trigger OP/BP 4.01

Together, also,SCPZ and the REDISSE projects are large scale agricultural project and animal disease vector risk control program respectively, and could lead to increased use of chemicals, reagents, and pesticides with potential negative impacts and risks on the environment and human health. Accordingly, in Bank-financed agricultural and/or pest/vector control projects, best practices that involve integrated pest management is required. Therefore, the SCPZ and REDISSE projects trigger the World Bank policy on pest management (OP 4.09).

ES4: Rationale for the IPMP

The surveillance, monitoring and containment of diseases including zoonosis anticipated under the REDISSE project could lead to increased use of chemicals, reagents, and pesticides with potential negative impacts and risks on the environment and human health. Given the situation-driven nature of the project, the extent of such an increased use cannot be ascertained in advance, and requires that borrowers will each prepare Integrated Pest/Vector Management Plans to identify the potential risks and ways to adequately mitigate them.

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.

Against this understanding, this 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".

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.

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.
- Livestock Disposal Manual S.244 of the Criminal Code Act Cap 77 LFN 1990
- Nigerian Public HealthLaw,1958

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, to ensure timely and successful processing and implementation of both projects, an in-depth institutional assessment will be carried out during project preparation and prior to appraisal to determine the level and amount of additional technical capacity building that the country needs to further strengthen her safeguards capacity to tangibly deliver this project.

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 (prepared only for the SCPZ) contain more comprehensive information on the public consultations held in the project area. Major groups consulted include:

- Federal Ministry of Health
- Federal Ministry of Agriculture
- Federal Ministry of Agriculture Veterinary Depatment
- 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
- NGOs and CSOs

ES9: Baseline Information on Pests

The animal health sector in the ECOWAS region is characterized by a high incidence and prevalence of infectious diseases communicable diseases, both zoonotic and non-zoonotic, impacting veterinary and public health, trade, rural development and livelihoods. Among the most serious infectious diseases,

contagious bovine pleuropneumonia (CBPP), foot and mouth disease (FMD), African Swine Fever (ASF), Rift Valley Fever (RVF), Peste des Petits Ruminants (PPR), African Animal Trypanosomiasis (AAT), highly pathogenic avian influenza (HPAI), and rabies are highlighted by ECOWAS and the GF-TADs for Africa. A recent summary of evaluations of Veterinary Services by the World Organization for Animal Health (OIE) in ECOWAS countries highlighted the services' lack of budgetary resources and mismatch between the human resources required and those actually available for preventing and controlling animal diseases. In terms of the strategic action required to sustain animal health, all of the countries identified the need to improve the coverage of their surveillance programs as well as the control of high-priority animal diseases. Lack of preparedness, insufficient human, physical and financial resources, and the lack of cross-sector collaboration were again emphasized by the FAO and OIE as causes for failure to address promptly and efficiently the resurgence of highly pathogenic avian influenza in the region.

With regard to SCPZ, key pests in the project area were identified through consultations with (*with relevant stakeholders.* Mainly, rodents (smaller bush rats and grass-cutters), monkeysand 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, social and health risks from increased and unsafe use of pesticides, chemicals and reagents for control of crop pests and arthropod or zoopodic pests that may be encountered during project implementation.

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.

Social and Health Concerns Effect of Disease outbreaks

Recent experience in disaster emergency management of Ebola in the west African region shows that control or intervention measures in disease outbreaks conditions could have direct effects of morbidity and mortality on health-care personnel thereby causing reduction in the labor force participation. Also, behavioral effects result from the fear of contagion.

1. **Health hazards and death from consumption of chemically grown crops and disease infected animals_-** Consumption of crops and plants grown under chemical pest control could cause health hazards to humans and animals within and around the project site. 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.

1. Skin, eye, and nose irritation
2. Possibility of cancers, neurologic, endocrine and reproductive problems form direct and indirect exposure to pesticides.
3. 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

This IPMP 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 which is relevant to the SCPZ project; b) for the REDISSE, an IPM for livestock/animal health which entails detection and identification of pests on the animals or within the environment that the

livestock occupy and appropriate strategies to manage them and their damage at acceptable levels with the least disruption to the environment. It also designs a program for capacity building in IPM, provides a stakeholder consultative and information disemination arrangement as well as institutional responsibilities for taking actions and responding to IPM needs.

ES11: Framework for Implementation

Consistent with the relevant National Policy document this IPMP 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 implementing agencies/PCUs to ensure compliance with this IPMP. Some of these include the Federal Ministry of Agriculture and Rural Development, WAHO, SCPZ EMC, Kogi State FADAMA III and Agricultural Development Project (ADP),and MDAs.The proponent of the REDISSE project will be responsible for the implementation of this IPMP. In particular, the REDISSE aspect of this IPMP will be implemented by the Federal Ministries of Health and Agriculture through their designated project management units. The environmental safeguards officer will be recruited by the PMU and will be responsible for the day-to-day implementation of IPMP. The Federal Ministry of environment will carry out oversight functions to ensure that the implementation of the IPMP is in tandem with the Nigeria's EIA Act and World Bank Safeguards Policies. The World Bank will carry out supervision missions and provide capacity building and guidance to the PMU as needed.

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. Specific training modules on the principles for IPMP and use of personal protection equipment (PPE) will de delivered to farmer owners, farm workers, health facility workers and health facility based environmental officers. In addition awareness creation at farm, health care facility and community level.

ES13 Budget for Implementation

Approximately **US$ 1,282,750**will be required to effectively implement the IPMP for the REDISSE over a five-year period while **US$ 1,052,000** is needed for the IPMP of the SCPZ

Budget for the REDISSE IPMP Implementation

Line item	Yr. 1	Yr. 2	Yr. 3	Yr 4	Yr5	**Total**
1. Capacity building & Awareness						
All training programs	300000	150000	150000	90750	0	**690,750**
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	**504000**	**344,000**	**197000**	**130750**	**24000**	**1,282,750**

Budget for the SCPZ IPMP Implementation

Line item	Yr. 1	Yr. 2	Yr. 3	Yr 4	Yr5	**Total**
1. Capacity building & Awareness						
All training programs	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

High growth of agricultural and allied sector and the calibration of the health sector system to effectively respond to public health outbreak disaster including outbreak of zoonotic diseases have been key priorities of successive governments in Nigeria. Overview of country's context and efforts on agricultural transformation and disease surveillance and response system are each presented in this section.

The REDISSEE project's development objective (PDO) is to strengthen national and regional cross-sectoral capacity for collaborative disease surveillance and epidemic preparedness in West Africa. It will address systemic weaknesses within the animal and human health systems that hinder effective disease surveillance and response.

It should be noted that the Staple Crop Processing Zone Initiative is a pioneer sub-project under the Federal Government of Nigeria's (FGN's) Agricultural Transformation Agenda with special focus on attracting 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.

Below further information is given on both projects.
With regard to the Regional Disease Surveillance Systems Enhancement Project (REDISSE), over the last four decades, the world has witnessed one to three newly emerging infectious diseases annually. Of infectious diseases in humans,the majority has its origin in animals (**"**zoonotic" diseases), with more than 70% of emerging zoonotic infectious diseases coming from wildlife. Recent outbreaks such as Ebola Viral Disease (EVD), H7N9 avian influenza, Middle East Respiratory Syndrome (MERS-CoV), Marburg virus, Nipah virus infection, bovine spongiform encephalopathy and HIV/AIDS showcase the catastrophic health and economic effects of emerging zoonotic diseases**.**

In the West Africa region, the recent EVDoutbreak clearly eroded hard-won gains in the fight against poverty, including gainsin human development and economic growth in Guinea, Liberia and Sierra Leone, as well as in the entire region. In these three countries, the estimated forgone output reached US$1.6 billion, which represents over 12% of the countries' combined outputs. (World Bank). The outbreak also resulted in school closure for at least 6 months in the three countries and over 16,600 children lost one or both parents to the epidemic. Overall, the estimated loss in Gross Domestic Product (GDP) for the 15 countries in the ECOWAS region was approximately US$1.8 billion in 2014, and was expected to rise to US$3.4 billion in 2015 and US$4.7 billion in 2016. These economic losses were over and above the day to day burden that endemic human and animal diseases, including zoonoses, on the people of West Africa.

The performance of health systems in many countries in West Africa is weak includingchronic insufficient financial and human resources, limited institutional capacity and infrastructure, weak health information systems, prevailing inequity and discrimination in availability of services, absence of community participation, lack of transparency and accountability, and a need for management capacity building.

The REDISSE is therefore, planned to strengthen weak human health, animal health, and disaster response systems to improve the preparedness of the ECOWAS region to handle future epidemics, and thereby minimize the national, regional, and potential global effects of such disease outbreaks.

For the Agricultural Transformation Agenda and Staple Crop Processing Zone Initiative, 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

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:

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

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

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 Projects

Project location
The REDISSE will be implemented in five counties: Guinea, Liberia, Nigeria, Senegal and Sierra Leone. The SCPZ will only be implemented in Nigeria.

1.3 Proposed Project Components

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1.3.2 The REDISSE Project Components

The REDISSE project comprises of 5 components as follows:

Component 1: Surveillance and Information Systems. ***Total costs including contingencies US$62.32 million equivalent of which US$50 IDA Credit and US$12.32 million MDTF***

This component will support the enhancement of national surveillance and reporting systems and their interoperability at the different tiers of the health systems. It will support national and regional efforts in the surveillance of priority diseases (including emerging, re-emerging and endemic diseases) and the timely reporting of human public health and animal health emergencies in line with the IHR (2005) and the OIE Terrestrial Animal Health code. Component 1 comprises of three sub-components:

Sub-Component 1.1 Support coordinated community-level surveillance systems and processes across the animal and human health sectors (US$27 million).

This sub-component will involve the strengthening of community-level surveillance structures and processes in countries where gaps exist for detecting events in communities (human and animal). This will entail improving community-level surveillance capacity for active, passive and rumor surveillance including in cross-border areas, and the development and implementation of a plan to ensure adequate territorial coverage for surveillance from the community to the central level.

Sub-Component 1.2 Develop capacity for interoperable surveillance and reporting systems ($20 million)

Sub-component 1.2 will support: (i) assessment of existing human and animal health surveillance systems and networks for prioritization of interventions within and across key sectors; (ii) review and update of national and regional disease priorities, and review and development of harmonized guidelines, protocols and tools to enhance surveillance andreporting processes; (iii) development of common methodologies and protocols for efficient flow and utilization of surveillance data (applicable to both public and private actors involved in disease surveillance); (iv) development of the required information communication and technology (ICT) infrastructure to facilitate cross-sectoral interoperability of surveillance and reporting systems at the national and regional level; and (v) establishing the necessary linkage of surveillance and reporting systems to national incidence management systems.

Sub-Component 1.3 Establish an early warning system for infectious disease trends prediction (US$14 million)

This sub-component will involve the establishment of an early warning system including the use of Geographic Information System (GIS) techniques to study infectious disease patterns and make predictions on evolution of disease outbreaks, including zoonoses and identify potential high risk areas for disease outbreaks in the region. Activities under this will support the monitoring of trends that occur in infectious diseases such as antimicrobial resistance (AMR) and insecticide resistance, and the impact of climate change on infectious disease outbreaks in the region.

Component 2: Strengthening Laboratory Capacity (*US$58 million)*

The objective of this component is to establish networks of efficient, high quality, accessible public health, veterinary and private laboratories for the diagnosis of infectious human and animal diseases, and to establish a regional networking platform to improve collaboration for laboratory investigation. This component is divided into three sub-components.

Sub-Component 2.1 Review, upgrade and network laboratory facilities (US$28 million)

This sub component will include: (i) assessment of existing human and animal health laboratory facilities and networks for prioritization of interventions; (ii) increasing laboratories services, and biosafety and biosecurity; (iii) support for improved supply chain management including the establishment of efficient inventory tracking and management systems; (iv) technical support for integrated laboratory information systems and the interoperability with disease surveillance and reporting systems; and (v) support to the strengthening of quality assurance systems for diagnostic services.

Sub-Component 2.2 Improve data management and specimen management (US$12 million)

This sub-component will support strengthening specimen management including: (i) streamlining the laboratory specimen referral process, including use of strengthened sub-national laboratories for diagnosis rather relying on a central laboratory; where possible and (ii) improving efficiency of specimen transport and disposal systems including through the use of private sector partnerships, and the use of accredited private laboratory networks for case confirmation. In addition, measures to improve data management will include: (i) strengthening

the competencies of laboratory personnel to analyse and use laboratory surveillance data; (ii) strengthening laboratory data management systems to 'report up' and 'report down' more effectively; (iii) achieving interoperability between data management systems, where possible.

Sub-Component 2.3 Enhance regional reference laboratory networking functions (US$18 million)

This sub-component will provide support to improving quality assurance, notably (i) development of common standards, quality assurance systems, procedures and protocols; (ii) introduction of peer review mechanisms; (iii) application of the WHO/AFRO five-step accreditation process and technical assistance to support accreditation of laboratories; and (iv) support inter-laboratory external quality assessments among the participating countries and recruitment of experts to provide mentorship to laboratories. It will (i) strengthen existing and possibly identify new regional reference laboratories for specific diseases or diagnostic techniques, (ii) strengthen regional networking and information sharing between countries; and (iii) harmonize laboratory quality assurance policies across countries in the region, based on international standards

Component 3: Preparedness and Emergency Response (*US$34 million)*

This component will support national and regional efforts to enhance infectious disease outbreak preparedness and response capacity. It will be made up of two sub-components:

Sub-Component 3.1 Enhance cross-sectoral coordination and collaboration for preparedness and response (US$16 million)

This sub-component will support (i) partnership building activities (including the private sector) for outbreak preparedness and disaster risk management; (ii) improvement and harmonization of policies, legislations, and operating procedures that includes representation from other relevant sectors including environment, customs/immigration, education, law enforcement; and (iii) explore the establishment of national and regional financing mechanisms to ensure swift mobilization of resources for animal health and public health emergencies.

Sub-Component 3.2 Strengthen Capacity for emergency response (US$18 million)

This sub-component will support the strengthening of emergency operations centres (EOC) and surge capacity at the national and regional levels. Activities under this sub-component will support (i) the establishment and management of a database of multidisciplinary rapid response teams (MRRTs) that will be available for rapid deployment; (ii) the development and management of stockpiling mechanisms (virtual and physical) to ensure availability of supplies to countries during an emergency response; and (iii) the swift mobilization and deployment of resources in response to major infectious disease outbreaks.

Sub-Component 3.3 US$0 Component for emergency response.

When a major outbreak affects the livelihoods of project beneficiaries, governments may request the World Bank to reallocate project funds to support mitigation, response and recovery. Detailed operational guidelines acceptable to the World Bank for implementing the REDISSE US$0 component for emergency response activity will be prepared at the national level during the first year of the project's implementation. All expenditures under this activity will be in accordance with paragraph 12 of World Bank OP 10.00 (Investment Project Financing) and will be appraised, reviewed, and found to be acceptable to the World Bank before any disbursement is made. Disbursements will be made against an approved list of goods, works, and services required to support crisis mitigation, response and recovery. Triggers and implementation details of the $0 component will be clearly outlined in the Project Implementation Manual (PIM) acceptable to the World Bank.

Component 4: Human resource management for effective disease surveillance and epidemic preparedness (*US$47 million).*

This component will include two sub-components.

Sub-Component 4.1 Health Workforce mapping, planning and recruitment (US$25 million)

This sub-component includes; (i) assessments of current workforce in terms of quantity, geographical distribution and capacity (including private actors); (ii) strengthening capacity for human resource management for disease surveillance and response; (iii) supporting the capacity of governments to recruit health workers and create an incentive environment which encourages skilled individuals to work for the public sector; and (iv) using private actors to deliver public sector activities through delegation of power (e.g. sanitary mandates for veterinarians).

Sub-Component 4.2 Enhance Health Workforce training, motivation and retention (US$22 million)

This sub-component includes training to develop human resource capacity in surveillance, preparedness and response. Cognizant of the importance of community involvement in disease surveillance, a key lesson from the Ebola crisis, the project places emphasis on training at the community level, rather than focusing solely on higher level cadres.

The project will analyse and seek to address the incentive environment within which healthcare workers operate. Armed with an improved understanding of this environment, the project will seek to implement activities which create incentives which not only draw those with relevant skills to the public sector, but also improve staff motivation and retention.

Component 5: Institutional Capacity Building, Project Management, Coordination and Advocacy (*US$41 million)*

This component focuses will include two sub-components:

Sub-component 5.1 Project coordination, fiduciary management, monitoring and evaluation, data generation, and knowledge management (US$30 million)

Under this sub-component, REDISSE will (i) strengthen the capacities of national and regional institutions to efficiently perform core project management functions including operational planning, financial management, procurement arrangements, and environmental and social

safeguards policies in accordance with WB guidelines and procedures; (ii) enhance M&E systems including routine health management and information systems (HMIS) and other data sources, including bi-annual Joint External Evaluations (JEE) of IHR (2005) and the PVS pathway; (iii) manage operational research program and economic analysis of disease outbreaks and epidemics in the ECOWAS region implemented by national and regional institutions; (iv) promote the design of impact evaluation studies to measure impact of project interventions; and (v) coordinate the roles of existing national and regional institutions to better support the planned project activities. Both the R-PCU and the individual N-PCUs will work closely with national environmental and social agencies to ensure due consideration of their respective legislations.

REDISSE will also finance the generation of data on animal and human health activities in the ECOWAS countries, which is critical to guide and calibrate investments.

Sub-component 5.2 Institutional support, capacity building, advocacy, and communication (US$11 million)

This sub-component will help assess and build capacities at national and regional level. It will provide technical and investment support to enhance provision of services by WAHO and other cross-cutting regional institutions or organizations relevant to animal and human health sector development. To this end, the project will support: (i) the conduct of capacity gap analysis (including staffing, skills, equipment, systems, and other variables); (ii) identify potential synergies and cross-fertilization possibilities among various operations pertaining to disease surveillance and response, using a progressive pathway for OH operationalization at country level, supported by regional institutions; and (iii) establishment or upgrading of national public health institutions. REDISSE will also assist in supporting greater engagement and coordination of the five countries in regional decision- and policy-making processes in ECOWAS, as well as among regional public and non-public organizations.

REDISSE will support advocacy and communication for sustained One Health approach. This will include: (i) generation and dissemination of lessons learned at the national and regional levels through One Health (OH) national and regional platforms respectively; and (ii) raising awareness on strategic issues at the decision and policy levels of countries, and regional economic communities to increase and sustain allocation of resources for disease surveillance, preparedness and response.

1.3.1 The SCPZ Project Components

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:

- **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

- **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.

a) 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".

IPM is necessary for the two projects, for example, 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.

Conversely, the surveillance, monitoring and containment of diseases including zoonosis anticipated under the REDISSE project could lead to increased use of chemicals, reagents, and pesticides with potential negative impacts and risks on the environment and human health. Given the situation-driven nature of the project, the extent of such an increased use cannot be ascertained in advance, and requires that borrowers will each prepare Integrated Pest/Vector Management Plans to identify the potential risks and ways to adequately mitigate them.

1.5 Scope of the IPMP

This IPMP spells out how infectious diseases, communicable diseases, both zoonotic and non-zoonotic pests, insects, vectors, viruses, vermin and so on would be managed to acceptable level under the REDISSE and SCPZ programs in Nigeria. Accordingly 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 Performance of Health Systems and Infectious & Communicable Diseases

Like any other developing countries, the performance of health systems in many countries in West Africa is weak. They suffer from chronic insufficient financial and human resources, limited institutional capacity and infrastructure, weak health information systems, prevailing inequity and discrimination in availability of services, absence of community participation, lack of transparency and accountability, and a need for management capacity building. Public sector spending on health is generally low. Only Liberia exceeded the Abuja target of 15% of Gross Government Expenditure (GGE) allocated to health. Out of pocket spending on health was high ranging from a low of 21% in Liberia to a high of 76% of total health expenditure in Sierra Leone. Guinea, Liberia and Sierra Leone have low density and inequitable distribution of health services and health workers as a result of low production, low motivation, inadequate training, lack of quality supplies and the loss of health workers, particularly physicians and nurses to emigration (a.k.a. brain drain). This was further aggravated during the EVD outbreak, which took a high toll on the lives of health workers.

Country led self-assessment on disease surveillance, preparedness and response capacity in Guinea, Liberia, Nigeria, Senegal and Sierra Leone as well as the lessons learnt from the EVD outbreak revealed some key weaknesses of health systems in terms of infectious disease surveillance, epidemic preparedness and response. These include: (i) a fit for purpose health workforce for disease surveillance, preparedness and response is lacking at each level of the health pyramid; (ii) community level surveillance and response structures either do not exist or need significant improvement; (iii) there is limited availability of laboratory infrastructure in place for timely and quality diagnosis of epidemic-prone diseases; (iv) lack of interoperability of different information systems hampers analysis and utilization of information for decision making and actions for disease mitigation measures; (v) infection prevention and control standards, infrastructure and practices are generally inadequate; (vi) management of the supply chain system is weak and inefficient; and (vii) there are significant gaps in regional level surge capacity for outbreak response, stockpiling of essential goods, information sharing and collaboration. Similar findings were also documented by the Global Health Security Agenda baseline assessments in a number of countries including Liberia, and Sierra Leone.

After the EVD outbreaks, health system recovery and strengthening plans were developed for at least the next five years in Guinea, Liberia and Sierra Leone. Building up a resilient health system to effectively respond to health emergencies has universally been identified as one of the strategic pillars in the plans. At the national level, broad-based health system strengthening committees or similar structures have been established to lead and coordinate the efforts for strengthening the national health system in the three countries. With the help from USAID, a plan for health system strengthening was also developed in Senegal. In all five countries REDISSE will build on and complement the ongoing health system strengthening initiatives of the national governments that are supported by the Bank and other development partners.

Animal Health

The animal health sector in the ECOWAS region is characterized by a high incidence and prevalence of infectious diseases communicable diseases, both zoonotic and non-zoonotic, impacting veterinary and public health, trade, rural development and livelihoods. Among the most serious infectious diseases, contagious bovine pleuropneumonia (CBPP), foot and mouth disease (FMD), African Swine Fever (ASF), Rift Valley Fever (RVF), Peste des Petits Ruminants (PPR), African Animal Trypanosomiasis (AAT), highly pathogenic avian influenza (HPAI), and rabies are highlighted by ECOWAS and the GF-TADs for Africa. A recent summary of evaluations of Veterinary Services by the World Organization for Animal Health (OIE) in ECOWAS countries highlighted the services' lack of budgetary resources and mismatch between the human resources required and those actually available for preventing and controlling animal diseases. In terms of the strategic action required to sustain animal health, all of the countries identified the need to improve the coverage of their surveillance programs as well as the control of high-priority animal diseases. Lack of preparedness, insufficient human, physical and financial resources, and the lack of cross-sector collaboration were again emphasized by the FAO and OIE as causes for failure to address promptly and efficiently the resurgence of highly pathogenic avian influenza in the region.

Improvement of animal health requires increased and sustained investments in national Veterinary Services to meet international standards of quality defined by the OIE. Any country failing to prevent, detect, inform, react and control sanitary issues, such as infectious diseases or antimicrobial resistance places other countries at risk, hence the importance of regional approaches. All countries in the region have engaged in the OIE Performance of Veterinary Services (PVS) Pathway, a program which provides independent qualitative (PVS evaluation) and quantitative (PVS Gap Analysis) evaluations of Veterinary Services, identifying their strengths and weaknesses, prioritizing interventions and costing activities needed to address deficiencies. Some countries have also received support to review their veterinary legislation.

Insufficient government funding and limited interest from donors to support Veterinary Services have not allowed significant progress to date in addressing systemic issues. Some important programs are worth noting though in the animal health sector, such as the EPT2 program, financed by USAID and implemented in many of the ECOWAS countries, through FAO and other implementing agencies; FAO support to HPAI infected countries; and, AU-IBAR support through the Vet-Gov program. In the last 15 years, two main regional and global programs significantly contributed to strengthening national Veterinary Services, namely the PACE program and the World Bank financed Avian Influenza Global Program which were implemented in many countries of the region. The lessons and best practices derived from these two programs are reflected in this project. The RESEPI and RESOLAB networks were also supported and facilitated by FAO under different projects and handed over in 2012 to ECOWAS.
Animal health is seen as a priority by the two regional economic communities in West Africa. ECOWAS and WAEMU have set a target of harmonizing national animal health systems. WAEMU, which covers 8 countries in the region, has moved forward on a number of fronts in particular on the harmonization of regulations on veterinary medicinal products, but progress has been slow due to administrative, human, organizational and financial constraints. In 2012, ECOWAS member countries declared the Regional Animal Health Center (RAHC)—an informal platform originally set up in 2006 by OIE, FAO and AU-IBAR as the ECOWAS specialized technical center for animal health. An operational plan for RAHC was developed in August 2014. However, delays in staff recruitment and establishment of a dedicated operational budget have kept the institution from implementing this plan and rolling-out activities in accordance with its mandate. The RAHC is currently supported through a limited number of initiatives with specific objectives, including to further develop the One Health agenda in the region, and to develop Integrated Regional Coordination Mechanisms for the Control of TADs and Zoonoses (IRCM). The WB-financed Regional Sahel Pastoral Support project (PRAPS), which supports the improvement of animal health in 6 West African Sahel countries, also specifically aims at contributing to the operationalization of the RAHC.
Tackling multisectoral issues efficiently requires working across sectors and disciplines. Yet, very few countries have adopted coordinated approaches, along the lines of the "One Health" concept. The response to the HPAI crisis since 2005 contributed to enhancing cooperation between the human and veterinary health sectors in many countries in the region, but in the absence of a dedicated program incentivizing such a joint approach, silos remain established. Nonetheless, important lessons have been learned and experience gained, and successful regional programs for the control of selected priority diseases, both within and outside the region, have demonstrated the efficiency of a regionally coordinated approach to diseases surveillance and response.

The Development Partner landscape in the sub-region is complex, particularly in the three countries most affected by the 2014-2015 EVD epidemic. The Ebola outbreak triggered a significant international response that brought many partners together to address the crisis and support the post-Ebola agenda of health systems recovery and strengthening. It also highlighted the need to focus attention on building the capacity for disease surveillance and response in the sub-region for both human and zoonotic diseases. The development partners engaged on these issues in the sub-region include major donor organizations including development banks, multilateral and bilateral donors and private foundations; UN systems agencies; technical agencies such as the US and China Center for Disease Control and Prevention; academic and research institutions and large numbers of international and local non-governmental organizations. As noted in Annex 2, in this type of environment duplication of effort, inefficient use of resources and failure to address resource, policy and programmatic gaps is a substantial risk. It is expected that there will continue to be an influx of funds and other forms of support to the region, in particular, to the three EVD affected countries (Guinea, Sierra Leone, and Liberia) in the next three to five years. As a result, coordination of resources and activities offered by the various partner organizations will remain a significant challenge for national governments. Therefore, coordination mechanisms at both national and regional levels that engage both the human and animal health sectors need to be developed to maximize the impacts of the increasing support and foster sustainability of the anticipated outcomes. The World Bank's convening power will be highly instrumental in forging a coalition of national, regional, and global technical and financial institutions to support the disease surveillance and epidemic preparedness agenda in West Africa.

The World Bank is well placed to mobilize substantial financing for this multi-sector initiative and to convene premier technical and financial partners engaged in the field of disease surveillance and epidemic preparedness. The World Bank has strategically engaged with a core group of development partners including those implementing the Global Health Security Agenda (GHSA) in the development of the REDISSE project. The REDISSE project itself will provide resources to regional institutions and national governments to establish the needed coordinating mechanisms

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 and Animals 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.Cassavaproduction 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.

Similarly, Ectoparasitism is a serious threat to both animals and humans in Nigeria. The painful bites of parasites could be a great nuisance, leading to loss of large amount of blood (Walker, 1996; Natala, 1997). Ticks alone transmit several important protozoal, rickettsial, bacterial and viral diseases to animals, thereby causing great economic losses. Lice and mites usually cause dermatitis, which is characterized by alopecia and necrotic foci. There is also intense pruritus (especially with mange) which leads to biting and vigorous scratching of affected parts (Lapage, 1968; Yeruham, 1985; Taylor et al., 2007).

2.3 Control methods of pests and animal diseases in Nigeria

Pest management methods in Nigeria vary with the type of pests and agriculture. In 1970s and 80s, pest control measures were usually heavily reliant on traditional methods which include the use of traps, biological control method of introduction of predators and crop rotation. In animal disease control, measures used in Nigeria were traditional herbs and roots.

The periods of late 80s and 90s came with paradigm shift that made the use of pesticides rampant for pest control operations in Nigeria.Pesticides were almost 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. Also the fact that multi-donor agencies are increasingly getting involved in the funding of agricultural and health related projects in Nigeria, there has been a new culture of alignment with best practices in pest control which emphasises the integrated pest management approach for environmental sustainability.

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**: This 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.

2.4 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 and disease outbreaks 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, the Avian Influenza project, the HIV/AIDsProgram development project,etc. 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. A record success was also achieved in the Nigerian Avian Influenza Control and Human Pandemic preparedness response Project amongst others. Based on the successes recorded in the aforementioned crop and animal pests IPM case studies, it can be conclude that there exists capacity within country on the use of IPM.

PART 3: EXISTING LEGISLATIONS 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 IN THE NIGERIA SCPZ PROJECT AND REDISSE

4.0 Introduction

This section describes baseline information on crop pests (for SCPZ) and the animal diseases (for REDISSE) in separate sub-sections. Sub-section 4.1 provides historical information of animal diseases in Nigeria. The baseline information was probed direct from the local Fulani herdsmen in the northern Nigeria, and corroborates literature account from M.A.Ibrahim (1984). Similarly, sub-section 4.2 provides baseline information on crop pests which were identified through consultations with local farmers,Kogi State FADAMA III Office and the Kogi Agricultural Development Project (KADP) Zonal Office in Alape.

4.1 Baseline Information on Common Animal Pests/Diseases in Nigeria

The baseline information was based on consultation from Fulani herdsmen in the northern Nigeria and corroborates secondary data from M. A. Ibrahim (1984) which gave an account of local baseline data on animal pests and diseases in Nigeria. Below are the accounts of animal diseases common in northern Nigeria.

1) ***Helminthic infections***

Bu'd'di is a general Fulfulde term for gastro-intestinal helminthiasis. Based on their observations of the clinical signs and of slaughtered animals, the Fulani appear to have correctly identified all the common and important types of helminthic infections, and classified the condition according to aetiology and/or signs as follows:

- Bu'd'di bu'deji is described as being caused by small reddish worms usually found attached inside the stomach of affected animals, and not seen in the faeces. The disease is associated with lokoje (oedematous swelling under the jaw) and is said by herdsmen to be the most difficult to treat. Samples of hookworms (Heligomina thamnomysi) from rats were recognized by informants as bu'deji. The term bu'd'di bu'deji may thus be translated as haemonchosis or trichostrongylosis.
- Bu'd'di pammare is caused by round white worms, which inhabit the intestines and are often passed in the faeces of affected animals. Informants identified specimens of Heterakis spumosa from rats and Toxacara vitulorum from calves as pammare. This term can thus be interpreted to mean ascariasis.
- Bu'd'di gyaju'di is caused by flat white worms which are also seen in the feces and in the intestines of affected animals. Samples of tapeworms from rodents (Inermicapsifer congolensis and Hymenolepis spp.) were identified as gyaju'di by herdsman. This term obviously refers to cestodiasis.
- Balku is a more appropriate term for liver fluke infestation or fascioliasis than the Hausa hanta. Fulani informers described the disease as affecting ruminants and characterized by 'poor doing'. The disease has been associated with streams and lakes but not with snails. The aetiological agents are said to be motile and flat, and are seen in the livers of affected animals.

- Hanta, on the other hand, is described as characterized by hyperaemia and discharges affecting the eyes in live animals, and a swollen liver in slaughtered animals. Same herdsmen distinguished between a 'black' and a 'white' form of the condition, based on the colour of the liver of affected cattle. This distinction suggests haemorrhages or congestion for the former, and anaemia or necrotic changes for the latter. The cause of hanta was not known. The term hanta hitherto widely interpreted to mean fascioliasis, does not seem appropriate for that disease. Further studies are required to establish the meaning of hanta.
- Goli is described as a disease of the young calf characterized by bloody diarrhoea. Worms were implicated as the cause of the disease by same informants. The term is usually freely translated to mean helminthiasis. Coccidiosis and bacterial enteritis should also be considered as possible translations.
- Madara (the Hausa work for milk) is described by herdsmen as a disease of very young calves characterized by diarrhoea or constipation and transmitted to the calf through the milk of the dam. The description is suggestive of toxocariasis or bacterial enteritis.

2) Diseases with neurological signs

It appeared from interviews with herdsmen that most diseases with unknown (microscopic) causes and manifested by the neurological signs are referred to by the generic name daji. The causes are described by herdsmen as related to iskoki, meaning 'the unseen' or 'spirits' (Abraham, 1958). All forms of daji are however treated without the aid of incantations or magical rites, suggesting the imputation of unknown physical causes.

Three forms of daji were identified as follows:

- Mu'du is characterized by 'earth-eating' and 'poor doing'. Earth from abandoned ant-hills is included in prescriptions used in treatment. This term may refer to any disease manifested by pica, for example mineral deficiencies.
- Nauru is described as characterized by depression or stupor. One ear appears floppy, while the other remains erect. The affected animal seeks shade. It is said to be a killer disease. The term may have been derived from the Arabic word for 'light'. The condition called nauru by the herdsmen may refer to photosensitization, although skin reactions were not mentioned by the informants.
- Waire affects cattle and has a sudden onset. It is characterized by convulsions and recumbency. The herdsmen stated that the affected animal may recover without treatment. The description given was vague and could fit any of a number of diseases like cowdriosis, certain toxic reactions, etc.

3) Streptothricosis

Kirci, a Hausa word, is widely translated as streptothricosis. The Fulani describe kirci as a disease affecting the skin of cattle, and have associated it with ticks. They recognize three forms of *kirci* as follows:

- *Kirci mai she'ka:* the lesions start as boils or papules, mostly on the tail and udder, and are difficult to treat.
- *Kirci mai dusa*: this is manifested by crusty lesions, usually observed on the back. This is the form usually referred to simply as *kirci*, and is said to be easier to treat.

- *Bajale:* this is said to be a form of *kirci* in which the lesions consist of long cutaneous outgrowths, which do not coalesce and which appear mostly on the face. This form is said to be difficult to treat.

These descriptions given by herdsmen are strongly reminiscent of the descriptions given for three of the four forms of streptothricosis by Mornet and Theiry (1955) as the nodular, the ickthyotic and the tumorous forms respectively.

4) Brucellosis

The term bakkale is used to denote a disease of cattle manifested by lameness and hygromas, and abortions in pregnant cows. It can be translated as brucellosis.

5) Trypanosomiasis

Sammore has been so extensively used to mean trypanosomiasis of cattle that it has came to be accepted as such. It has been described by same Fulani as a disease of cattle characterized by weakness, emaciation and inappetence, and caused by tsetse fly bites (Ibrahim et al, 1983). However, descriptions given by some herdsmen are vague, do not include the vector, and seem to fit most debilitating diseases. In same instances the following definition was given: A disease of cattle manifested by loss of weight and disturbed hair coat (this was said to show only in the afternoons), without any association with tsetse. It seems that the term means different things to different groups of herdsmen even in the same locality. Trypanosomiasis is therefore not the only translation.

4.2 Baseline Information on Pests

Mainly, rodents (smaller bush rats and grass-cutters), monkeysand birds are 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 Table 4.0).

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	These birds feed on storage roots that have been exposed. They also scratch the soil surface to expose	

			bush fowl or francolins (*Francolinus* sp.) and wild guinea fowl.	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 (*Thryonomysswinderianus*), the giant rat (*Cricetomysgambianus*), 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.	

4.3 Pest Management Approaches in Nigeria

Generally pest management in Nigeria is characterized by the use of pesticides and rodencides. IPM is evolving and common with projects sponsored by international donors such as the World Bank.Examples of projects that have mainstreamed the use of IPM are National Fadama Project, Avian Influenza project, Malaria Control Booster Project and Commercial Agriculture Development Project.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, including veterinary* . It is appreciated that all potential IPMU users do not have standard procedures 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.

4.4 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.

4.4.1 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 eliminatethe 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.

4.5 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.

4.6 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:

4.6.1 Environmental Concerns

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.

4.6.2 Social and Health Concerns

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.

Effect of Disease outbreaks – Recent experience in disaster emergency management of Ebola in the west African region shows that control or intervention measures in disease outbreaks conditions could have direct effects of morbidity and mortality on health-care personnel thereby causing reduction in the labor force participation. Also, behavioral effects result from the fear of contagion.

Health hazards and death from consumption of chemically grown crops and disease infected animals_- **Consumption of crops and plants grown under chemical pest control could cause health hazards to humans and animals within and around the project site.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.

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

Pesticides	**Result of accidental exposure**		
	WHO Class (3)	**Effects of acute intoxication**	**Effects of chronic intoxication**
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, vomiting, diarrhea, blurred vision, pi-point pupils, difficulty breathing and muscle twitching	-
Carbaryl	II (Modrately hazardous	>>>>>>	-

Pesticides	**Result of accidental exposure**		
	WHO Class (3)	**Effects of acute intoxication**	**Effects of chronic intoxication**
Profenofos	II (Modrately hazardious	Muscarinic, nicotinic and central nervous system manifestations	There is no available data concerning chronic toxicity of profenofos

4.7 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 that affects animal health and causes disease out breaks in poultry and livestock will be subdued in an environmentally safe manner under the REDISSE program. Similarly,Alape-agbadu site will be managed in an environmentally safe manner using IPM, 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 Bank and partner funded programs in Nigeria (Fadama, Avian Influenza, Polio Control Project, IITA, FAO etc), will provide a strong platform for proffering practicable safe measures towards mitigating adverse impacts of identified pests in the project area.

PART 5: INTEGRATED PEST MANAGEMENT PLAN FOR THE SCPZAND REDISSE

5.1 Introduction

This section is subdivided into two sub-sections. Sub-section 5.2 is concerned with the IPMP for the REDISSE project, whilesub-section 5.3 deals with the IPMP for the SCPZ project.. The sub-division of the IPMP is for simplicity of understanding and project specific application of the IPM since the IPMP will be used by different agencies, operators and project coordinating units.

5.2 IPMP for the REDISSE Project

Establishing an IPMP for pests of animals is a function of the following 5 steps:

- ***Detection***

Pest detection requires thorough and regular monitoring of animals for pest invasions and/or other signs and sysmptons that indicate a pest is present on the animal or in the environment where animals live (Walker & Stacheki, 1996). This is done by observing an animal's body, feces, living quarters, bedding, surroundings and behaviours. Under REDISSE project, any unusual change noticed in an animal shall be recorded and brought to the attention of a veterinarian.

- ***Identification***

Identification step is required to determine if the pest detected is actually the organism causing the discomfort or disorder in the animal. This is best performed by a trained farm manager or a veterinarian.

- ***Economical or Medical Significance***

Medical judgements of the state of health of an animal is made on the basis of symptoms caused by pests. On the economic side, estimated losses which the pest has caused such as reduction in diary, meat production and egg production are the variable indicators, but high economic loss can be a function of duration of pest invasion or period within which it took for effective mitigation response to take place.

- ***Method Selection***

This involves selecting a method or methods for managing the observed pests such as are contained in this IPMP.

- ***Evaluation***

It is necessary under REDISSE to evaluate the effectiveness of the applied pest management procedures. Keeping records and evaluating pest control techniques will be followed as monitoring task for the REDISSE IPM outcome evaluation.

5.2.1 Methods or techniques that will be used for Animal Pest Management

IPM for animals includes biological, cultural, mechanical, physical, chemical (use of pesticides), use of resistant breeds and sanitation in the animal's environment.

- ***Biological Control***

This project will introduce, encourage and artificially increase plants and animals that are parasites or predators of identified pests. This will be effective in managing insects and mites.

- ***Cultural Control***
  - It is recommended that under REDISSE, maintaining overall good health of the animals should be a priority in pest management. This is necessary to keep the animal healthy which enhances its tolerant level to pests.
  - Animal diets should be well balanced and provided at consistent intervals and in appropriate portions.
  - Adequate ventilation should be provided for animals kept indoors to prevent heat, stress or the spread of diseases
  - Ensure that animals are not over crowded to avoid pest outbreaks.

- ***Mechanical tools***

Mehanical tools to be employed under REDISSE may include:

  - Grooming combs, brushes and flea combs with closely spaced teeth to monitor for insects and ticks;
  - Use of electronic devices such as lights that attract flying insects around barns or other animal quarters to reduce some nuisance pests
  - Use of traps for rodents that may be carriers of pests

- ***Physical control***

This may involve the following measures:

  - Use of sticky flypaper to reduce nuisance flying insects in confined areas.
  - Use of cages that separate animals from contact with one another which reduces the spread of insects from infested animals to non-infested ones.
  - Use of pest resistant breeds and breeds adapted to the climatic conditions of the surrounding environment where they are raised can avoid or reduce the effect of the pests.

- ***Sanitation***

Implementation of REDISSE IPM shall accord great importance to sanitation as measure to avoiding pest and diseases in animals. Keeping barnyards, stables, kennels, exercise areas and surrounding areas as clean as possible and ensuring that animals drink from safe water points can prevent reasonably pest invasion, and therefore highly recommended. Cleaning animal bedding and the surfaces of cages and other animal confinement with disinfectants also kills pathogens and reduces the tendencies of spread of diseases.

- ***Use of Pesticides***

Pesticides may be used in REDISSE for animal pest control incombination with other methods of prevention and control, or used when other methods have failed or considered in applicable. For example, cultural or other management strategies discussed earlier may not be applicable to control or prevent deer flies and horse flies. In that or similar cases, the use of repellants or chemicals at appropriate application, quantities and methods for the environment are conceivable options. Nonetheless, banned and obsolete pesticides shall not be procured nor be used in any case under REDISSE.

5.2.2 Classes of insecticides/Acaricides that may be used in Animal Pest Management

- ***Chlorinated Hydrocarbons***

This class includes lindane and methoxychlor. Lindan has become a restricted use pesticide for *mange mites and lice.*

- ***Organophosphates (OP)***

Organophosphate compounds inhibit cholinesterase.Cholinesterase is a chemical catalyst found in mammals that helps regulate the activity of nerve impulses.It is a synthetic organic pesticide containing carbon, hydrogen and phosphorus. Cholinesterase includes a broad range of insecticides such as chlorpyrifos, malathion, DDVP, runnel, stiriphos, etc

Organophosphates have been found to be effective against a wide range of insects including but not limited to fleas and ticks.

Other classs of insecticides/acaricides that may be used in this project are:

- *Carbamates*
- *Synthetic pyrethroids*
- *Botanicals*
- *Lime sulfur (Calcium polysulfide)*
- *Mineral oil*
- *Amitraz*
- *Ivermectins and*
- *Insect growth regulators and hormone mimics*

5.2.3 Formulations that are allowed for Managing Animal Pests for use in REDISSE

Insecticides and acaricides formulations vary widely and must be selected to fit the particular situation. Noted below are various formulations that may be used but their applications must be based on effectiveness, cost, practicality and relative safety to human, the animal being treated and the environment.

- ***Ready to use (RTU)***

RTU formulations require no mixing or combining with other ingredients or diluents. They come in containers that serve as the application device, such as an aerosol can, pour-on bottle, roll-on, spot-on or spray bottle.

- ***Wettable powders (WP)***

This type must be mixed with water before application. They are concentrates in solid, powdered form and can be sprayed after mixing.

- ***Emulsifiable concentrates (EC)***

Emulsifiable concentrates are liquids that must be mixed with water before application. They can be sprayed after mixing or sponged on the animal being treated.

- ***Shampoo***

A Shampoo is a formulation of insecticide and other ingredients that is applied to an animal's wet haircoat and worked into a lather. Label direction should be looked out for to determine the

length of time that the shampoo must remain on the animal to achieve effective pest control before being thoroughly rinsed.

- ***Dust***

A dust is a ready-to-use dry formulation. The following safety caution must apply:

  - Protect the animal and applicator's eyes from the dust.
  - Applicators must wear appropriate personal protective equipment to protect exposed skin, the respiratory tract and eyes

- ***Baits***

Baits are either commercially prepared as dry granules or made as mixes of insecticides.

- ***Pastes, liquids, powders, tablets/pellets and injectables***

These formulations should be given orally or injected into animals to control internal parasites. Only licensed or qualified veterinarians shall administer this on the animal.

5.2.4 General Guidelines to be followed for insecticides/chemical use for animal pest control

- Read labels before using any pesticide, and follow strictly label instructions;
- Use only products labeled for use on animals or in animal environments'
- Do not exceed label dosages; measure carefully and know the animal's exact weight;
- Provide adequate ventilation while using pesticides;
- Remove animals from buildings if it is an area or premise spray;
- As much as possible, use dust formulation instead of spray on outdoor animals on cold days
- Use all appropriate personal protective equipment during applications of any pesticide;
- Do not add new insecticides to old, previously used dipping water, but start with fresh water.
- Avoid using pesticide when an animal has been, will be or is anesthetized;
- Keep records of pesticides applicatons;
- Always store and dispose of pesticide containers according to label directions (or see attached animal waste management protocol).

5.3 IPMP for the SCPZ Project

5.3.1 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.

5.3.2 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.

5.3.3 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.

5.3.3.1 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.

5.3.3.2 IPM practices to be implemented after planting

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

- **Biological control**

Natural enemies feed on other insects, including important cassava pests such as mites, mealybugs, scale insects, and whiteflies. The natural enemies commonly found in cassava fields include several kinds of beetles, predatorymites, 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 andkilling them. Predatory ladybird beetles can help to control cassava mealy bug orcassava white scale. Predatory beetles alsofeed 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 cassavagreen mite. The predator occurs mainly onyoung leaves at cassava shoot tips. It spreadsby wind and by being carried on stem cuttings.Ifpredatory 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.

- **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.

- **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, weedssuch 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 thecassava 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.

- **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 SCPZand REDISSE implementation agencies PCUs will interface with other donor agencies/partners in the country (FAO, USAID) to leverage on their success performances in animal and human health surveillance system and IPM strengthening. A lot of experience and success has been gained in Nigeria under FADAMA II and III projects, Avian Influenza project, Polio Eradication Projectamongst others. Therefore, both REDISSE and the Kogi Alape- Agbadu SCPZ stand to gain from shared experience and capacity of these existing projects and operations in terms of challenges and success drivers of IPM operations and other similar areas.

5.3.4 Pest Management Planning Matrix for the REDISSE and SCPZ Programs

Table 5A and 5B are prepared for the REDISSE and SCPZ respectively. Each of the Tables outlines the matrix of activities, expected results, milestones and performance indicators of the IPMPfor their respective projects. Table 5.1 is a continuation on the SCPZ IPM project monitoringperformance. It is designed specifically for the SCPZ which is site specific with line participants and stakeholders known in sufficient details. It is expected that the monitoring and evaluation officer incollaboration with the safeguard officer or consultant at the country's PCU will design and or adapt an IPMP monitoring framework for the REDISSE when all operational designs, and full methodological details have been sufficiently known.

Table 5A: Planning matrix for the REDISSE IPM Project

Narrative summary	Expected results	Performance indicators	Assumptions/risks
Goal: Enhance the capacity of health workers and veterinarians tocontribute to human and animal health disaster reduction through environmentally friendly pest management practices.	• Improved public& animal health • Increased national and community surveillance &preparedness on human and animal health risk disaster management • Increase capacity of institutions to manage health emergencies/outbreaks in environmental and socially safe manner • Increase number of private laboratories for diagnosis of infectious human and animal health	• Evidence of no of persons and institutions trained on • Increase in number of accredited private laboratories for diagnosis of infectious human and animal diseases • Evidence of reduction in use of pesticides • Evidence of increase in use of non-chemical or safe chemical applications on crop production and even mosquito control around human settlement	• National security remains stable • Government commitment to implement national regulations and conventions on pesticides/chemical storage, transportation and application

Purpose (i) improvement in efficiency of specimen transport and disposal system ii) Increase awareness on use and safety of application of chemicals for pest/vector control (iii) document and disseminate key lessons to users and stakeholders iv) reduction in the use of harmful or banned chemicals/pesticides in growing foods for human and animal consumptions	**Medium-term results/outcomes** • Health institutions and those that control/use pesticides are able to prioritize pest problems, specifically with the REDISSEand identify IPM opportunities to mitigate negative environmental and social impacts associated with pesticides. • Health institutions and and those that control/use pesticides are able to adopt ecologically sound options to reduce cassava crop losses with minimal personal and environmental health risks. • Policy makers in Health institutions and agric. Organizations and associations are strengthened and provided with guidelines enabling then to promote IPM approaches and options in animal health management • Collaborate linkages established to develop a national IPM policy to promote compliance with international conventions and guidelines on safe pesticide use	• Commitment of government to implement IPM across the national health and agricultural sector spread. • 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 5B: Planning matrix for theKogi 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 SCPZIPMP

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

Table 5.1 (contd.): Components activities and expected results of the SCPZ 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 at both REDISSE and SCPZ levels.
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
v. There will be need to ensure that funding and approval process for IPMP implementation are well coordinated and effective
vi. Monitoring and evaluation resources should be provided as and when due to ensure no set back in monitoring activities.

6.2 Capacity Building

Training is a fundamental component of this IPMP. In both REDISSE and SCPZprojects. This is because there is need to train and enlighten stakeholders on different aspects of the IPMP requirements necessary for their project support. Although, there exists capacities in Nigeria for implementation of IPMP, such capacities are not in large scale to cover the geographic spectrum and healthcare facilities needed to effectively implement IPMP. In addition to that, there is the need for farm owners, farm workers, herdsmen, vetenerians, heath facility based environmental officers, health care workers and MDAs to have proper insight into the need for IPMP and World Bank template for mainstreaming best practices in IPM.

Table 6.A identifies series of trainings that have been proposed for the REDISSE project while Tabe 6B is the equivalent for the SCPZ project.

Table 6.A Capacity Building and cost estimate for the REDISSE Project

Modules	**Targets**	**Responsibility Arrangement**	**Budget in USD**
World Bank Environmental and Social Safeguards (emphasis on OP 4.09)	HCF Health workers, vetenerians, livestock farmers,NPI staff, Members of Disease surveillance committee	Safeguards Consultant	**45000**
Occupational Health and Safety (OHS) Basics in chemical pest applications	HCF Health workers, vetenerians, livestock farmers, NPI staff, Members of Disease surveillance committee	Independent Consultant	**68,000**
Safe Management of Chemical Pesticides (transportation, storage, handling, storage of empty pesticide containers and final disposal)	HCF Health workers, vetenerians, livestock farmers, NPI staff, Members of Disease surveillance committee zonal office	Independent Consultant,	**39,000**

Modules	**Targets**	**Responsibility Arrangement**	**Budget in USD**
Decision making on the selection of IPM approaches or options	HCF Health workers, vetenerians, livestock farmers, NPI staff, Members of Disease surveillance committee	Independent Consultant,	**57,500**
IPM Implementation and Monitoring	HCF Health workers, vetenerians, livestock farmers, NPI staff, Members of Disease surveillance committee	Independent Consultant,	**89,000**
Small group consultations	HCF Health workers, vetenerians, livestock farmers, NPI staff, Members of Disease surveillance committee Kogi Alape- Agbadu SCPZ PCU; MARD; KADP, KADP Alape zonal office, farmers	Independent Consultant,	**40,000**
Environmental management in pest control	HCF Health workers, vetenerians, livestock farmers, NPI staff, Members of Disease surveillance committee	Independent Consultant	**55,000**
Breeding of natural enemies of pests	HCF Health workers, vetenerians, livestock farmers, NPI staff, Members of Disease	Independent Consultant	**67,000**

Modules	Targets	Responsibility Arrangement	Budget in USD
	surveillance committee		
Total			**460,500**

Table 6B:Capacity Building and cost estimate for the SCPZ Project

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	Extension works, Kogi Alape- Agbadu SCPZ	Independent Consultant, FADAMA III, CADP	**39,000**

Modules	**Targets**	**Responsibility Arrangement**	**Budget in USD**
final disposal)	PCU/EMC; MARD; KADP, KADP Alape zonal office		
Decision making on the selection of IPM approaches or options	Kogi Alape-Agbadu SCPZ PCU/EMC; MARD; KADP, KADP Alape zonal office, farmers	Independent Consultant, FADAMA III	**57,500**
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	Alape- Agbadu SCPZ PCU; MARD; KADP, KADP Alape zonal	Independent Consultant	**67,000**

Modules	**Targets**	**Responsibility Arrangement**	**Budget in USD**
	office		
Total			**460,500**

6.3 Institutional Arrangements and Framework for Implementation

This chapter has been broken into two for ease of application. The first section (6.3.1) delves with the roles of the various stakeholders under the Kogi Alape-Agbadu SCPZ project while the next section (6.3.2)identifies stakeholders and their roles in the PMP for the REDISSE.

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 Institutional Arrangement and Responsibilities for Implementation of the IPMP for the REDISSE in Nigeria

A National Steering Committee will be responsible for reviewing and approving annual work plans and ensuring coordination and linkages across relevant agencies and international partners. The members of the steering committee shall include representatives from FMOH, Federal Ministry of Agriculture, Environment, information, Animal production and Quarantine service, NPHCDA, CSO, and development partners. The Steering committee will be chaired by the Hon Minister of Health and co-chaired by the Hon. Minister of Agriculture. The secretariat for the National Steering Committee shall be the Department of Public Health of the Federal Ministry of Health.

The Nigerian Center for Disease Control will host the project coordination unit (PCU) with the Department of Public Health in the Federal Ministry of Health having oversight and supervisory responsibility. The PCU will work with and sign Memorandum of Understanding (MOU) for technical support with development partners and service contract with implementing partners with demonstrable capacity to implement different components of the project.

6.5.1 Role of FederalMinistryof Health.

The Federal Ministry of Health with the support of partners shall:

- Be responsible for coordinating the implementation of IDSR.
- Conduct training and provide technical,supervisory,monitoringandevaluation support for IDSR activities.
- Providetechnicalguidelines,setupregulationsandensurequalitycontrolfor laboratory services in the country.
- Organize annual IDSR review meeting in collaboration with stakeholders.
- Provide prompt and efficient response mechanisms for emergencies including epidemics and notify appropriate authorities.
- Analyze IDSR data and disseminate to all levels for planning purposes.
- Provide feedback to States and the stakeholders involved in disease surveillance.
- Mobilize resources for IDSR activities.

6.5.2 Role of REDISSE Technical Advisory Committee

The REDISSE technical advisory committee shall exist at the Federal level**.**

The TAC shall:

- Provide technical advice on REDISSE to the Federal Ministry of Health and FMARD.
- Provide technical support to, and build capacity of States and LGAs on disease surveillance and response.
- Monitor REDISSE implementation at all levels.
- Review periodically health-related data to determine the frequency of occurrenceofcommunicablediseasesparticularlyepidemicpronediseases.
- Provide feedback through quarterly epidemiological bulletin, monthly newsletter and meetings.

6.5.3 Role of Agencies/Parastatals

National Primary HealthCare Development Agency

- Shall assist in the collection and collation of disease surveillance data in the LGAs.
- Shall mobilize the community for integrated disease surveillance and response activities.
- Shall assist in the investigation and control of disease outbreaks in the LGA levels.
- Shall assist in the training and supervision of LGA staff.

National Program on Immunization(NPI)

The NPI with the support of the Federal Ministry of Health shall:

- Be responsible for strengthening routine immunization and effective control of vaccine preventable diseases.
- Ensure that adequate and potent vaccines are available for supplemental immunization including epidemic response activities at all levels.
- Collaborate with the Federal Epidemiological Division to monitor Vaccine
- Preventable Diseases and contingency stock of vaccine for epidemic prone diseases.

Role of State Ministry of Health

The State Ministry of Health shall:

- Conduct training and provide technical support for planning,implementation and monitoring of disease trends at the LGAs.
- Establish a Disease Surveillance and Response Committee.
- Establish a public health laboratory to support surveillance activities.
- Ensure timely receipt and analysis of REDISSE data from all LGAs in the State and prompt transmission to FMOH.
- Coordinate all REDISSE activities in the LGAs and provide timely response and support to LGAs in emergency situation.
- Ensure proper pre-positioning of adequate vaccines, medicines and supplies.

- Mobilize resources for REDISSE for states and LGAs through advocacy to policy and decision makers.
- Reproduce and provide training materials ,REDISSE reporting forms and guidelines to LGAs.
- Provide regular feedback to LGAs through monthly newsletter and review meetings.
- Create a budget line for REDISSE activities.

6.5.4 Role of State Disease Surveillance and Response Committee

- Provide technical advice on REDISSE to the State Ministry of Health.
- Provide technical support to, and build capacity of LGAs on disease surveillance and response.
- Monitor REDISSE implementation at LGA level.
- Review periodically health-related data to determine the frequency of occurrenceofcommunicablediseasesparticularlyepidemicpronediseases.
- Plan and coordinate epidemic response activities.
- Mobilize resources for REDISSE activities.
- Establish an Epidemic Rapid Response Team.
- Review response plan where necessary
- Provide feedback through monthly newsletter and review meetings.

6.5.5 Role of LGAs

The LGA is the primary level of REDISSE implementation and shall:

- Create a budget line for REDISSE activities.
- Report on weekly basis cases of epidemic prone diseases and monthly for all other priority diseases.
- Monitor disease trends and detect impending epidemics within the LGA.
- Ensure that REDISSE forms, medicines and other supplies are available to health facilities.
- Establish LGA Disease Surveillance and Response Committee.
- Notify the State immediately of any disease outbreaks within 48 hours of detection.
- Conduct training and retraining of health personnel on REDISSE.
- Provide feedback to the health facilities and communities.
- Ensure collection of data from all public and private health facilities within the LGA.
- Provide logistics support and communication facilities for REDISSE operations in the LGA.

6.5.6 Role of Health facilities

All Tertiary, Secondary and Primary health facilities shall:

- Ensure timely and regular provision of disease data to the LGA where they are located using approved REDISSE reporting format
- Conduct training and retraining of health personnel on REDISSE
- Assist in Laboratory diagnosis and effective case management using standardised management guidelines
- Provide technical and logistic support for epidemic response.
- Provide regular routine immunization services
- Provide regular feedback to the communities

6.5.7 Role of National Health Management Information System (NHI)

Data on disease surveillance shall be fed into the NHMIS system for effective health planning, implementation, monitoring and evaluation of programme policy formulation, evidence based decision making and research. There shall be proper stream lining of data management between the NHMIS and Federal Epidemiology Division to avoid duplication of efforts.

The NHMIS shall:

- Collate, analyze REDISSE data on a National basis.
- Monitor progress towards stated goals and targets of REDISSE.
- Provide feedback to other levels.

6.5.8 Role of World Bank/Partners

The role of partners in REDISSE IPMP implementation amongst others shall be to:

- Provide technical and financial support.
- Support the establishment of REDISSE resource center at the Federal and State Ministries of Health.
- Support research on new trends in REDISSE.
- Provide technical guidance and support to the REDISSE Technical Advisory Committee and Disease Surveillance and Response Committee.
- Collaborate with all tiers of government for improving disease surveillance activities.
- Mobilize resources from other interested partiesto support REDISSE
- implementation
- Carry out supervision mission and provide technical support as needed.

6.6 Monitoring and Evaluation (M&E)

The objectives of monitoring and evaluation are to measure and assess the implementation of the IPMP against the set objectives with a feedback loop that would subsequently inform the implementation of the IPMP for result. The overall impact of the M&E is to detect early, gaps in the implementation as well as areas where planned measures were not sufficient to address pest management for categories of animal and/or crop pests. Information feedback from M&E will be

helpful to REDISSE and SCPZ implementation agencies in redesigning their methods of IPMP mix to ensure effectiveness of intervention.
Therefore, the specific targets of the M&E of the REDISSE and SCPZ IPMPs 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 pests infestation
- 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.

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PART 7: WORKPLAN AND BUDGET

Table 7.1a and 7.1b respectively provide indicative budget for implementation of the REDISSE and SCPZ IPMPs over a 5-year period each. Approximately **US$ 1,282,750**will be required to effectively implement the IPMP for the REDISSE over a five-year period while **US$ 1,052,000** is needed for the IPMP of the SCPZ

Budget for the REDISSE IPMP Implementation

Line item	Yr. 1	Yr. 2	Yr. 3	Yr 4	Yr5	**Total**
1. Capacity building & Awareness						
All training programs	300000	150000	150000	90750	0	**690,750**
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	**504000**	**344,000**	**197000**	**130750**	**24000**	**1,282,750**

Budget for the SCPZ IPMP Implementation

Line item	Yr. 1	Yr. 2	Yr. 3	Yr 4	Yr5	**Total**
1. Capacity building & Awareness						
All training programs	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:

- Federal Ministry of Health
- Federal Ministry of Agriculture
- Various Primary Health Centres in Abuja, Kano and Lagos
- 12 Private Hospitals in Abuja, Kano and Lagos
- 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

The consultations held with the different stakeholders was to inform and listen to them about the project development objectives of the two projects as well as possible concerns of the stakeholders. In particular, it provided the platform to inform stakeholders (operators, farmers, practitioners, MDAs, vetenerians) on the need to embrace and promote environmentally friendly pest management, which is the core value of the IPM. The gain of the consultations is the gathering of local data and information on the use of pesticides, common animal pests and diseases, prevailing culture of pest control and concerns of the livestock and crop farmers. In light of this, this IPMP(for the REDISSE and SCPZ) have benefitted immensely from the contributions of stakeholders including MDAs, farmers and practitioners which were also consolidated in the development of the present IPMP.

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)

National Policy onIntegrated Disease Surveillance and Response (2005)

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. Protocol for Managing Animal Wastes under the REDISSE Program.

Management of wastes generated at the animal laboratory: The project will provide funds in this area to ensure that the infectious wastes-sharps generated at the animal laboratory are properly managed. This involves collection of the infectious wastes-sharps separately from common wastes, on-site treatment of these wastes by autoclaving, and collection of the treated wastes along with garbage by the municipality for disposal. Procurement of another autoclave may become necessary if the existing treatment capacity is exceeded from infectious wastes generated as a result of the analysis of potential specimens/ samples.

Response to outbreaks by the veterinarians and livestock officers. The information contained in the Department of Livestock and Fisheries (DLF) manual will be updated for different audiences, including: (i) veterinarians and livestock officers, (ii) the commercial farm owners, (iii) backyard farm owners, and (iv) the general public. The manual for the veterinarians and livestock officers will be presented in the form of Standard Operating Procedures (SOPs).

Transportation of animal carcasses and farm wastes (if necessary). If proper measures are not taken, transportation of infected animal carcasses and farm wastes would likely spread the virus outside of the infected farm areas. Under this project, transportation of carcasses and farm wastes to another site for disposal will be avoided to the maximum extent possible. However, if transportation is required, then the SOPs will specify the specific requirements for vehicle design and operation as well as containment of carcasses and farm wastes for transportation. These SOPs will also include decontamination of vehicle surfaces (e.g. tires) prior to exiting the farm. The IATA Regulations for packaging of biological specimen will be adopted and included in the SOPs.

Culling of animals/poultry: It is important that culling of animal/poultry be conducted in a humane, safe, and efficient manner. The following methods for culling poultry were identified from the FAO guidelines: (i) neck breaking (manual), (ii) neck cutting (using mechanical devices), (iii) gassing with inhalation agents (e.g. carbon dioxide), and (iv) culling following electrocution or poisoning. The SOPs will specify the criteria for using one versus the other method; and will provide the design and operating requirements on of the gassing systems (e.g. specific locations and quantities of stocked carbon dioxide).

Personal hygiene: If proper hygiene measures are not taken, virus may spread to human. For this reason, for each of the above-mentioned activities to be conducted during outbreaks, the SOPs will specify the level of protection (e.g. gloves, masks, overalls, boots) to be used.

Selection of disinfectants: It is important that the disinfectants to be selected for the disinfection of farm surfaces, equipment, materials, and wastes do not have adverse impact on human health and the environment. The selection of disinfectants in this project will be based on such criteria as impacts of disinfectants on human health and the environment, and availability and cost of disinfectant, and compatibility of the disinfectants with the disposal methods of the wastes. The selected disinfectant, which will comply with the World Bank's Pest Management Policy (OP4.09), will be specified in the SOPs.

Disinfection of farm surfaces, equipment, materials, and wastes. Based on selected disinfectant, the type of equipment and procedures for preparing (e.g. dilution with water) and applying the disinfectant will be specified in the SOPs.

Disposal of carcasses and farm wastes: It is important that the selected disposal method does not have adverse impacts on human and the environment. For example, improper burial practices may cause contamination of ground or surface water, and poorly designed and/or operated cremation or incineration systems may create particulate emissions and objectionable odors to neighbors. The following options for the disposal of animal carcasses and farm wastes were considered: (i) burial in a pit, (ii) open air burning (cremation), (iii) composting, (iv) incineration at a fixed location or mobile incineration. However, criteria will be developed and included in the SOPs for the applicability of this disposal option for specific sites.

This criteria will include: (i) height of the water table (the base of the burial pit must be at least 1 meter above the water table), (ii) dry weather conditions (dry season), (iii) distance to watercourses, bores, and wells, (iv) slope of the land at the burial site to the nearest watercourse (drainage to and from the pit), (v) type of soil (or soil permeability), (vi) distance to human settlements and public lands (including roads), (vii) prevailing wind direction (for odor emissions), (viii) availability of space for temporary storage of excavated soil, and (viii) accessibility of burial site by digging equipment (e.g. excavator). For those situations where the burial criteria are not met (wet weather conditions, high water table), the SOPs will specify the most appropriate, environmentally-safe, and cost-effective disposal option The SOPs will provide detailed design (depth of the pit), construction, and operating requirements (how the pit will be filled).

Disposal of used PPE: It is important that the selected PPE and disinfectant be compatible with the disposal method of the PPE to avoid generation of hazardous wastes (used PPE will be incinerated). As incineration of chlorine-bearing material with organics might generate emissions of dioxins and furans, care will be exercised in selecting PPE and disinfectants. First of all, all PPE procured under this project will be chlorine-free. In addition, best effort will be made to select a chlorine-free disinfectant. However, if this is not possible, then before incineration, used PPEs will be washed before incineration and the washed water needs to be disinfected and waited before discharge. The SOPs will describe these procedures in detail.

Personal hygiene at hospitals: If proper hygiene measures are not taken, epidemics may spread to humans. For this reason, guidelines regarding personal hygiene procedures will be developed at designated reference health facilities. Specifically, for each of the above-mentioned activities to be conducted during disease outbreaks, the SOPs will specify the level of protection (e.g. gloves, masks, overalls, boots) to be used.

Healthcare waste management at hospitals to be receiving potentially infected patients: Animal virus may spread to humans if proper waste management measures are not taken at hospitals treating potentially infected patients. Under this project, only designated hospitals will receive infected (or potentially infected) patients.

Rehabilitation of existing laboratory: Rehabilitation and refurbishment of existing laboratories will be financed through the REDISSE program. The adverse impacts during rehabilitation would include dust and noise emissions, generation of construction waste, disturbance of traffic, and discharge of untreated sewage. These adverse impacts will be mitigated by including in the construction contract a clause regarding observation of standards for good construction practices.

Health laboratory-related personal hygiene measures: If proper hygiene measures are not taken, animal epidemics may spread to humans. For this reason, SOPs will be prepared for the collection, handling, and transportation of suspected specimens to the laboratory as well as handling of these specimens at the laboratory. In addition, PPE will be procured and supplied to the staff collecting, handling, and analyzing the suspected AI specimens. Training and then refresher training courses will be given to the staff on personal hygiene measures.

Waste management at the laboratory: Infectious wastes from the serology/virology, bacteriology and toxicology laboratories will be collected separately from the garbage and treated on site by autoclaving. The treated wastes and garbage are stored in an open-top basket and collected by the municipality twice a week for disposal. A consultant will be engaged to identify the quantity of infectious waste generated from the laboratory. The consultant will evaluate alternative options for waste management. The consultant will prepare a waste management plan for the laboratory solid (this plan will address all waste types, including infectious wastes, sharps, liquid wastes, and common wastes). In addition, various supplies (e.g. bins, bags, labels) will be procured. The laboratory staff will be provided training on waste management.

Annex 2: 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 3: List of crop and livestock protection products approved for use by NAFDAC

a) Insecticides

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

	(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;	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)

Simazine; 2.4-D (2.4 Dichlorphenoxy acetiacid)	
7. Urea and guadinidines ; (Diuron ; Linurex (=Linuron); Fluometurone; Chloroxuron; Neburon)	
Quaternary nitrogen compounds (paraquat; diquat)	

Annex 4: 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 5: 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 6: 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	**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

of the product (21).	the 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	*- new paragraph in revised Code -*

environmentally sound manner, including reuse with minimal 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 -*