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FEDERAL REPUBLIC OF NIGERIA

Youth Employment and Social Support Operation (YESSO)

INTEGRATED PEST MANAGEMENT PLAN (IPMP)

Project Coordinating Unit
Federal Ministry of Finance, Abuja

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EXECUTIVE SUMMARY

ES 1 Context

The YESSO is a support operation to Federal and State Government initiatives for youth employment and social services for the poor. At federal level the emphasis is on technical support to States on key building blocks of Social Safety Nets programs. It will be financed through a Specific Investment Loan (SIL) in an amount of US$300 million over a period of five (5) years. The operation will be implemented in 20 participating project States (Abia, Adamawa, Bauchi, Borno, Cross River, Ekiti, Enugu, Gombe, Imo, Kaduna, Kano, Katsina, Niger, Kwara, Ogun, Ondo, Osun, Oyo, Kogi and Yobe). These are States with evidence of ownership and funding of similar projects as YESSO.

The project will be implemented in two to three distinct phases with the prospect of 6 to 8 states (which may include Cross River, Kwara, Niger, Osun, Ekiti, Ondo, Kano and Enugu) benefiting in the first phase based on their assessed readiness in terms of being at the fore front of meeting basic requirements of the World Bank. The beneficiaries will include extremely poor families with children in the age bracket of 0 – 18 years, pregnant women, street children, the physically challenged, semi-skilled and unskilled unemployed youth aged 18 – 35 years, and other unemployed youth in the same age bracket in participating States. The target group for each participating State will, however, vary depending on the main focus within the overall objective of the operation. It is envisaged that close to 10 percent of the poor families and youth in these categories in each State would be covered by the project in its first three years of operation.

ES 2 Project Components

The project has four (4) components: **Component 1** is to assist the strengthening of the Social Safety Net coordination unit at Federal Government level for partnership with States, LGAs, and other partners for Coordination management and monitoring as well as evaluation of the assistance program and development of a Social Protection policy and program for the Country. **Component 2** will support the institutional strengthening of the public workfare scheme in the participating States to ensure provision of immediate, labor-based and temporary work opportunities for unskilled and semi-skilled unemployed youth and women. **Component 3** will support existing mechanism at Federal and State levels and the partnership between them and the private sector for enhancing employability of skilled unemployed youth and women from poor households. **Component 4** will promote the effectiveness of conditional cash transfer mechanisms to provide adequate incentives for extremely poor families to use available education and health services for children and pregnant women while at the same time increasing household consumption. Activities of the project, entail employing youth in State owned farms (component 2) or getting them trained by private partner agricultural farms in agricultural skill acquisition and empowerment. Under this, it is envisaged that pest management may be triggered because of the potential use of pesticides and herbicides. However, this is not anticipated to be in large scale but for the purpose of due diligence, this IPMP was prepared to safeguard the project beneficiaries and stakeholders against possible environmental and health risks.

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

Safeguard policies potentially triggered by YESSO Based on the EA screening result are:

- OP/BP 4.01: Environmental Assessment

- OP/BP 4.04: Natural Habitats
- OP 4.09 : Pest Management
- OP 4.36: Forests
- OP/BP 4.12: Involuntary Resettlement
- OPN 4.11: Cultural Property

In order to address the above safeguard triggers a Resettlement Policy Framework (RPF) was prepared as a separate document to address the involuntary resettlement issues that might result from project implementation. Also, an Environmental and Social Management Framework (ESMF) was prepared to provide guidance and principles for addressing the other safeguard issues that will potentially result from civil works activities. However, the ESMF did not adequately address the concerns which relate to pest control, and therefore, the preparation of this IPMP becomes necessary to complement the ESMF to particularly provide technical solutions to the environmental and health concerns that could result from pest control measures from the YESSO agricultural programs.

ES4: Rationale for the IPMP

Development and support of youth participation and innovation in agriculture is seen in many States as key to self-sufficiency in food production and mass youth employment creation. Based on this, many YESSO participating States have shown interest in supporting initiatives in agriculture by either engaging youth into State owned farms under Public Workfare program(Component 2) or in partnering with Agricultural Participatory Associations (APA) in training, skill acquisition and employment (component 3). Due to the anticipated agriculture support which may likely be implemented in many YESSO participating States, the World Bank Operational Policy on Pest Management (OP 4.09) may be triggered. IPMP is prepared as a suitable and standalone report required addressing pest management concerns. Integrated Pest Management Plan (IPMP) is prepared rather than a Pest Management Plan (PMP) because it is more robust and provides the eco system approach mix that is mild to the environment. The IPMP lays emphasis on biological and physical tools and less on chemicals particularly the ones that may be harmful to human health and the environment. Therefore, IDAs support of pest management in YESSO is to provide due diligence in the use and application of pest management practices. Under this project, IDAs finance will not be used in the procurement of pesticides or herbicides. However, it is not inconceivable that pesticides may be procured anyway by the farmers. Therefore, in order to ensure that pesticides that are not acceptable by the World Bank/WHO are not used the environmental officers at the SPCU will train and create awareness to farmers and communities on IPM including safe use of pesticides. In addition to this, the environmental officer will screen the pesticides procurement list prior to procurement and ensure that only pesticides that are acceptable and approved by the Bank/WHO/NAFDAC are procured. The outcome of the screening will be sent to World Bank for concurrence.

ES 5: Scope of the IPMP

The IPMP outlines the World Bank Safeguard process for due diligence in pest management that may be triggered in any YESSO State that will implement agricultural program. 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 includes 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; monitoring and evaluation measures that will ensure safe and sustainable implementation of the IPMP and, finally the IPMP budget. This IPMP was prepared to help individual project States and sub-projects in the pest

management context applicable to them. The IPMP will be reviewed and cleared by IDA prior to disclosure country wide in Nigeria and InfoShop along with the ESMF report.

ES6: Legislative and Regulatory Framework

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

National Laws and Policies

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

International conventions & Treaties

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

World Bank OP 4.09

This policy supports safe, effective, and environmentally sound pest management and promotes the use of biological and environmental control methods. It states that the assessment of the capacity of the country's regulatory framework and institutions to promote and support safe, effective, and environmentally sound pest management should be undertaken for any project that involves pest management. Projects that include the manufacture, use, or disposal of environmentally significant quantities of pest control products are classified as Category A. Depending on the level of environmental risk, other projects involving pest management issues are classified as A, B, C, or FI.

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

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

In order to reduce the incidences of pest in Nigeria a number of project based interventions have been carried including those funded by the World bank and FAO on IPM. They include the Cocoa farmers training on the use of IPM to pest control and the IPM for pest control in the National

FADAMA Agricultural Development in Nigeria. There are also other IPM implementation cases amongst the key crops in Nigeria, for example, for control of root knot nematodes in tomato and for downy mildew control in maize. Similarly, IPM recommendations for control of the African Rice Gall Midge include combination of resistant crop varieties with seed dressing, timely planting, pest monitoring to guide pesticide applications. Based on the successes recorded in the aforementioned IPM case studies, it can be concluded that there exist capacity within country on the use of IPM. However, for this YESSO program in agriculture sub-projects additional training and awareness creation will be required as detailed in this report.

ES8: Stakeholder Consultation

Public consultation was a key process of this study as reported in the ESMF report which was prepared simultaneously with this report.. During the public consultation there were no major concerns by the farmers or stakeholders as concerning the potential impacts of pest management in this project. It is however, not inconceivable that unanticipated pest management issues may come up during project implementation, hence, the need for continuous public consultation all through the project cycle.

ES9: Adverse Environmental & Health Impacts

This IPMP identified a number of environmental and health risk that may be encountered through unsafe use of pesticides in YESSO agriculture including:

1. ***Impact on Aquatic Organisms***-pesticide residues lead to deterioration of water quality, hence reducing the number of aquatic organisms;

2. ***Water Pollution and Contamination***- Spraying pesticides adjacent to drinking water resources may lead to their contamination also, use of hazardous pesticides and wrong pesticides application approach could result to pollution of surface and underground water

3. ***Soil degradation/contamination***- long-term excessive use of pesticides will cause higher pesticide resistance and pesticide residues in the soil will cause soil contamination

4. ***Extinct of Non-target Species***- Highly toxic pesticides may have impact on the non-target species (natural enemies, etc.);

5. ***Air Pollution***-Unsafe handling, application and disposal of pesticides products such as empty containers and obsolete products will cause air pollution

Adverse Health Impacts

1. Consumption of crops and plants grown under chemical pest control could cause health hazards to humans. This is especially common in the consumption of fruits and vegetables without proper washing.

2. Application of pesticides could cause physical discomfort in the absence of protective equipment in spraying pesticides.

3. It is also likely to cause skin burns when not wearing protective clothing in pesticide spraying;
4. Drinking water sources contamination caused by pesticides spraying adjacent to the resources, or overflow and drain of chemicals adjacent to drinking water resources;
5. Chemical pesticides could cause harm to the health of human being when drinking waters polluted by pesticides and eating the polluted animals and agro byproducts

ES10: Mitigation of the Environmental & Health Impacts

The main body of this report contains the detail report on the mitigation of adverse impacts. Key to this lies in the implementation of the IPMP with emphasis on the biological control measures. Where pesticides must be used the report states that the Environmental officer at the SPCUs should screen the pesticide procurement list to ensure that only safe and approved pesticides are procured. More importantly, this IPMP underscores the importance of training and awareness of the beneficiaries/farmer groups on safe application and knowledge of hazardous and non-hazardous pesticides.

ES11: Framework for Implementation

A number of Ministries and agencies established by Nigerian law will carry out joint supervision missions with the World Bank and provide technical support to YESSO that will ensure compliance with this IPMP. These Ministries and agencies include the Federal Ministry of Environment, the NESREA, NAFDAC, Federal Ministry of Health and the Federal Ministry of agriculture.

ES12: Capacity Building and Awareness

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

ES13 Budget for Implementation

Approximately **US$ 844,000** will be required to effectively implement the IPMP over a five-year period. This cost covers IPM orientation workshop for all SPIU in Nigeria, capacity building and awareness program, and project management including the cost of monitoring.

Line item	Yr. 1	Yr. 2	Yr. 3	Yr 4	Yr5	**Total**
1. Capacity building & Awareness						
IPM orientation workshop	60000	30000	0	0	0	**90000**
Training of Trainers	90000	0	0	0	0	**90000**
Farmer group training	48000	48000	48000	48000	0	**192000**
Radio jingles and handbill on IPM	30000	20000	10000	0	0	**60000**
Sub-total	*228000*	*98000*	*58000*	*48000*	*0*	***432000***
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)	50000	30000	20000	0	0	***100000***
Chemical Neutralizer and first Aid	20000	20000	20000	0	0	***60000***

Sub-total	*70000*	*50000*	*40000*	*0*	*0*	*160000*
4. Project management						
IPMP coordination	4000	4000	4000	4000	4000	**20000**
Monitoring and evaluation	10000	10000	20000	12000	12000	**64000**
Sub-total	*14000*	*14000*	*24000*	*16000*	*16000*	***84000***
Grand total	**352000**	**222,000**	**158000**	**88000**	**24000**	**844000**

PART 1: INTRODUCTION

1.1 Project Background

The YESSO is a support operation to Federal and State Government initiatives for youth employment and social services for the poor. At federal level the emphasis is on technical support to States on key building blocks of Social Safety Nets programs. It will be financed through a Specific Investment Loan (SIL) in an amount of US$300 million over a period of five (5) years. The operation will be implemented in 20 participating project States (Abia, Adamawa, Bauchi, Borno, Cross River, Ekiti, Enugu, Gombe, Imo, Kaduna, Kano, Katsina, Niger, Kwara, Ogun, Ondo, Osun, Oyo, Kogi and Yobe). These are States with evidence of ownership and funding of similar projects as YESSO.

The project will be implemented in two to three distinct phases with the prospect of 6 to 8 states (which may include Cross River, Kwara, Niger, Osun, Ekiti, Ondo, Kano and Enugu) benefiting in the first phase based on their assessed readiness in terms of being at the fore front of meeting basic requirements of the World Bank. The beneficiaries will include extremely poor families with children in the age bracket of 0 – 18 years, pregnant women, street children, the physically challenged, semi-skilled and unskilled unemployed youth aged 18 – 35 years, and other unemployed youth in the same age bracket in participating States. The target group for each participating State will, however, vary depending on the main focus within the overall objective of the operation. It is envisaged that close to 10 percent of the poor families and youth in these categories in each State would be covered by the project in its first three years of operation.

1.2 Project Description and Objectives

The project has four (4) components as follows:

Component 1 -Strengthening the Social Safety Net System in Nigeria (US$ 10 million)

The proposed operation through this component would assist Government in defining and consolidating the *institutional responsibilities* and *implementation arrangements* to contribute to government efforts in creating and strengthening a social protection platform anchored on effective SSN coordination and monitoring units at Federal and State Government levels for partnership of all stakeholders in sustained and impactful implementation of social safety nets in Nigeria.

This component comprises two sub-components, which aim to assist both the Federal government and the participating State Governments.

Sub-component 1.1 -Strengthening the Federal level system for Coordination, Monitoring, Policy development and Co-financing mechanism for Social safety net programs.

Sub-component 1.2 Enhancing capacity at State level to implement a social safety net operating as a system and scale up key social safety net interventions. This sub-component would provide support to States to do the following:

- create a common targeting mechanism to identify beneficiaries according to poverty level and using a combination of geographic, community-based and household level (proxy means test) methods to minimize inclusion and exclusion errors;
- create a single registry of beneficiaries for social programs at the state level, which will use the targeting systems mentioned above as the screening mechanism to registry beneficiaries;
- develop an integrated management information system (MIS) to track and monitor programs' progress at beneficiary level –the integrated management information systems would comprise sub-systems and applications for each of the programs, so the latter should be developed to ensure compatibility when they are to be integrated into the state level MIS system; and

Component 2: Public Workfare Program (estimated cost $200m)

This component is to enhance the effectiveness of the mechanism of on-going public workfare programs and /or develop new ones. The objective of the public workfare program is to support the participating State governments putting in place an effective and efficient mechanism to provide immediate labor intensive work opportunities for unskilled youth from poor households. Sub-projects to be implemented under this component vary from State to State but include rehabilitation of drainage or water canal, land clearance for irrigation schemes, reforestation, agricultural activities especially value addition and marketing, construction of market stalls, rehabilitation of class room blocks, beautification of public spaces and planting of flowers, waste management, traffic control, civil/community policing and repairing of PHCs & public health sanitation facilities.

Component 3: Skills for Job (estimated cost $35m)

Given that the need requirement for youth employment is building the skills of youth for existing and potential labor market opportunities, the YESSO will support existing systems at Federal and State levels and strengthen the partnership between them and the Private sector for enhancing employability of youth. Based on lessons of experience in-country and around the World, this component will support three major sets of activities; (a) Training, particularly for life skills, vocational skills, and entrepreneurial skills; (b) Internship/apprenticeship with private and public sector agencies; and (c) Tracking of participants through a robust Monitoring and Evaluation (M & E) system. The National Directorate of Employment in partnership with State Governments and the Private Sector will implement this component. States will be responsible for identification of beneficiaries, partnership with private sector groups and provision of a "start-up pack" or mentoring or other support services for graduates of the scheme. NDE will facilitate training, payment of stipends, on-the job placement, supervision and accreditation.

Component 4: Conditional Cash Transfer (estimated cost $55m)

This component will assist to improve the effectiveness of conditional cash transfer mechanisms in providing adequate incentives for extremely poor families, using available education and health services for children and pregnant women while increasing household consumption. Three levels of activities are planned in this component: (a) strengthening the capacity of NAPEP and MDG to coordinate, monitor, evaluate, provide technical assistance and funds to co-finance state CCT programs, (b) providing institutional support to State governments to design, implement and monitor CCTs, by providing assistance to develop and implement the following activities: beneficiary

Based on the outlined project components, and the environmental and social safeguards screening carried out, the following World Bank operational policies are potentially triggered:

- OP/BP 4.01: Environmental Assessment
- OP/BP 4.04: Natural Habitats
- OP 4.09 : Pest Management
- OP 4.36: Forests
- OP/BP 4.12: Involuntary Resettlement
- OPN 4.11: Cultural Property

In order to address the above safeguard triggers a Resettlement Policy Framework (RPF) was prepared as a separate document to address the involuntary resettlement (OP/BP 4.12) issues that might result from project implementation. Also, an Environmental and Social Management Framework (ESMF) was prepared to provide guidance and principles for addressing the other safeguard issues that will potentially result from civil works activities. However, the ESMF did not adequately address the concerns which relate to pest control, and therefore, the preparation of this IPMP becomes necessary to complement the ESMF to particularly provide technical solutions to the environmental and health concerns that could result from pest control measures from the YESSO agricultural programs.

1.3 Rationale for the IPMP

Nigeria has huge endowment of agricultural land and resources, which hitherto was the main stay of the economy before the discovery of oil in Nigeria. About 69 million hectares of the total land area of 193 million hectares in Nigeria have potentials for crop and livestock production in diverse agro-ecologies (FADAMA 2 IPM). However, agricultural activities in Nigeria are still largely subsistence. It is predominantly dominated by old people and the uneducated groups while youth and the educated persons in Nigeria often shun agricultural occupation in search of white collar jobs in the cities. This is largely because of the undeveloped nature of the sector and the volatile risk and constraints in agricultural sector.

Therefore, development and support of youth participation and innovation in agriculture is seen in many States as key to self-sufficiency in food production and mass youth employment creation. Based on this, many YESSO participating States have shown interest in supporting initiatives in agriculture by either engaging youth into State owned farms under Public Workfare program(Component 2) or in partnering with Agricultural Participatory Associations (APA) in training, skill acquisition and employment (component 3). Due to the anticipated agriculture support which may likely be implemented in many YESSO participating States, the World Bank Operational Policy on Pest Management (OP 4.09) may be triggered. IPMP is prepared as a suitable and standalone report required addressing pest management concerns. Integrated Pest Management Plan (IPMP) is prepared rather than a Pest Management Plan (PMP) because it is more robust and provides the eco system approach mix that is mild to the environment. The IPMP lays emphasis on biological and physical tools and less on chemicals particularly the ones that may be harmful to human health and the environment. Therefore, IDAs support of pest management in YESSO is to provide due diligence in the use and application of pest management practices. Under this project, IDAs finance will not be used in the procurement of pesticides or herbicides. However, it is not inconceivable that pesticides may be procured anyway by the farmers. Therefore, in order to ensure that pesticides that are not acceptable by the World Bank/WHO are not used the environmental officers at the SPCU will train and create awareness to farmers and communities on IPM including safe use of pesticides. In addition to this, the environmental officer will screen the pesticides procurement list prior to procurement and ensure that only pesticides that are acceptable and approved by the Bank/WHO/NAFDAC are procured. The outcome of the screening will be sent to World Bank for concurrence.

1.4 Scope of the IPMP

The IPMP outlines the World Bank Safeguard process for due diligence in pest management that may be triggered in any YESSO State that will implement large scale agriculture. 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 includes 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, monitoring and evaluation measures that will ensure safe and sustainable implementation of the IPMP and, finally the IPMP budget and financing.

This IPMP is adequate to guide farmers and SPCU in the pest management context applicable to them. The IPMP will be reviewed and cleared by IDA prior to disclosure country wide in Nigeria and InfoShop along with the ESMF report.

PART 2: PEST MANAGEMENT CONCERNS AND CONTROL MEASURES IN NIGERIA

2.1 Pest and diseases Problems of agriculture in Nigeria

A number of pest and diseases cases in agriculture exist in Nigeria. For example, ticks and mosquitoes are recorded as the major pests in cattle production in the northern Nigeria while Streptothricosis, Diarrhoea and BCPP are the very serious diseases of cattle in the area (Adekunle & Oladele, 2005).

Other pest management concerns in Nigeria particularly, in crops are presented in table 1.

Table 1: Crop pest list in Northern Nigeria, 1994

Crop	Pest	Disease
Vegetables		
1. Tomatoes	Nematodes (*Meloidogyne* spp)	Bunchy top diseases
	Crikets	Leaf curl disease
	Fruitworm (*Heliothis* spp)	Bushy stunt disease
	Whiteflies	Vascular wilt (*Pseudomonas solanacearum*)
		Fusarium spp
		Sclerotium spp
2. Onion	Crickets	Grey leaf blotch (*Alternaria alternata*)
	Thrips	Purple blotch (*Alternaria porri*)
		Onion anthracnose (*Colletotrichum cingulata*)
		Onion rot (*Fusarium oxysporium*)
3. Okra	Flea beetle (*Podagrica* spp)	Powdery mildew (*Erysiphe cichoracearum*)
	Cotton bollworm (*Dysdercus* spp)	Leaf mosaic
	Nematodes (*Meloidogyne* spp)	Leaf mosaic virus
Cereals		
1. Rice	Nematodes (*Aphelenchoides besseyi*; *Hirshmanniella grazilis*; *H. oryza*; *H. spinicaudata)*	Blast (*Pyricularia oryzae*)
	Stem borers (*Sesamia calamitis*; *Chilo zacconius; Maliarpha separetella)*	Brown leaf spot (*Cochliobolus miyabeanus*)
		Black kernel (*Curvularia* spp)
2. Wheat	Quelea birds (Quelea quelea)	Foot and root rot (*Drechsera rostrata; fusarium equiseti; F. culmorum; F. acuminatum*)
	Grasshoppers (*Hieroglypus daganensis; Aiolopus similatrix; Oedaleus senegalensis; Namadacris septemfaciata*)	Rusts (Stem rust, brown rust and leaf rust)
	Nematodes (*Meloidogyna incognita; Javancia*)	Smut: loose smut
	Termites (*Microtermes lepidus*)	
	Aphids (*Rhoplasosiphum maidis; Methapolophium spp; Microsiphum* spp)	
	Stem borer (*Sesamia calamistis*)	

Farmers often respond to pest infestations in these 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 Control methods of pests and diseases in Nigeria

Pest management methods in Nigeria vary with the type of pests and agriculture, and from place to place. However, the control methods can be classified under Cultural control method, chemical method, biological method and physical method.

Cultural and Physical Methods

Various indigenous methods exist in Nigeria for the control of pests. For instance, the control of pest and diseases in cattle by herds men is described below:

Hygiene- Many cattle farmers practiced this control method, this involves keeping the environment clean, setting fire to warm the environment at cold nights. This according to them prevents contagious *Bovine pleuropneumonia* .

Herbs- This is practiced by majority farmers and involves cutting herbs and boiling them for their animals to drink. In Kano the most common herb boiled for drinking is locally called "*Duma rafi" Ipomoea isarifolia or ipomoea repens.* It was also reported in Niger state to cure malaria in cattle. In Niger and Kogi states the most common herb used is locally known as "*Taura" Delarium senegalense* boiled for the animals to drink for curing Diarrhoea in cattle.

Change of Location-This method involves leaving an area for another when it is noticed that there is the presence or outbreak of pests or diseases especially in a case of sudden death of cattle.

Bush burning-Bush burning is also believed by many farmers as being effective in tackling common pests in cattle such as tick. Burning surrounding bush would reduce the menace of tick infestation by burning of the eggs of the tick, as well as the elimination of possible intermediate host for pests and diseases.

Chemical Control Measures

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.

Biological Method of Pest Control in Nigeria

Biological control to pest control in agriculture is relatively new in Nigeria but has begun to gain awareness among farmers. This is predominantly among agricultural research institutions and farmers in agricultural based development projects such as the FADAMA project. The biological approach to pest control is best described under the IPM. There are a number of these 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 buildup 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. The biological control of pests and diseases may also entail the use of insects, bacteria or fungi on the host to eliminate the pest or disease. For example in the control of water hyacinth specific weevils spp. are used to destroy the weed. This practice has not been widely applied in Nigerian agriculture.

2.3 Assessment of Capacity of Nigeria on Integrated Pest Management

Although, the cultural and physical control measures to pest control have been in use in Nigeria. They have not provided sufficient and environmentally friendly option for pest management. For instance, bush burning as a way of controlling pest (ticks in cattle) 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 agriculture in Nigeria. This approach has led to numerous cases of recorded intoxications each year, the resistance of numerous pests to many chemicals (case of *Helicoverpa armigera* to pyrethroids), the destruction of useful species, the perturbation of the ecological balance, the dependence towards synthetic chemical pesticides and the growing debt of farmers compelled to use increasingly expensive products, the deviances in the use of cotton pesticides on some food crops such as cowpea, etc.

In order to reduce the incidences of pest in Nigeria a number of project based interventions have been carried out on IPM. They include the Cocoa farmers training on the use of IPM to pest control and the IPM for pest control in the National FADAMA Agricultural Development in Nigeria. There are also other IPM implementation cases amongst the key crops in Nigeria. For example, for control of root knot nematodes in tomato and okra, farmers are encourage to integrate resistant crop varieties with seed dressing and compatible crop rotation schemes to prevent build up of the pests. For downy mildew control in maize, farmer training by the Rice/Maize center in Ibadan has promoted the integration of resistant crop varieties with seed dressing (using Apron plus), timely identification, rogueing and burning of affected plants and general farm hygiene. Similarly, IPM recommendations for control of the African Rice Gall Midge include

combination of resistant crop varieties with seed dressing, timely planting, pest monitoring to guide pesticide applications. Based on the successes recorded in the aforementioned IPM case studies, it can be conclude that there exists capacity within country on the use of IPM. However, for this YESSO program in agriculture sub-projects additional training and awareness creation will be required

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

3.1 Extant Laws of Nigeria on Pesticides Management

A number of other legislations and institutional framework are available using five main organizations (FMEV, FMA& RD, FMH, NAFDAC and FMLP) exist for the regulation of the distribution and use of pesticides in Nigeria. The existing legislative tools are:

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

Nigerian Agricultural Policy (1988)

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

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

National Policy on the Environment 1989

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

- secure a quality of environment adequate for good health and well being;
- 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.

BP4.01 annex C exempts procurement of impregnated bed nets and WHO Class 111 insecticides for intradomicilliary 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 the level of pesticide use;
- Products to be financed fall in class 111 or table 5 of the WHO Classification of pesticides by hazards.

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

1.Do no harm

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

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

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

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: IDENTIFICATION OF ADVERSE IMPACTS OF PESTICIDES

4.1 Adverse Environmental and Health Risk Associated with Pesticides Application

Pesticides when applied could easily bring adverse effects on ecological environment, as well as human and animal health. The following are the adverse environmental and health potential risks of pesticides application that are concerns for YESSO.

Adverse Environmental Impacts

6. ***Impact on Aquatic Organisms***-pesticide residues lead to deterioration of water quality, hence reducing the number of aquatic organisms;

7. ***Water Pollution and Contamination***- Spraying pesticides adjacent to drinking water resources may lead to their contamination also, use of hazardous pesticides and wrong pesticides application approach could result to pollution of surface and underground water

8. ***Soil degradation/contamination-*** long-term excessive use of pesticides will cause higher pesticide resistance and pesticide residues in the soil will cause soil contamination

9. ***Extinct of Non-target Species-*** Highly toxic pesticides may have impact on the non-target species (natural enemies, etc.);

10. ***Air Pollution***-Unsafe handling, application and disposal of pesticides products such as empty containers and obsolete products will cause air pollution

Adverse Health Impacts

6. Consumption of crops and plants grown under chemical pest control could cause health hazards to humans. This is especially common in the consumption of fruits and vegetables without proper washing.

7. Application of pesticides could cause physical discomfort in the absence of protective equipment in spraying pesticides.

8. It is also likely to cause skin burns when not wearing protective clothing in pesticide spraying;
9. Drinking water sources contamination caused by pesticides spraying adjacent to the resources, or overflow and drain of chemicals adjacent to drinking water resources;
10. Chemical pesticides could cause harm to the health of human being when drinking waters polluted by pesticides and eating the polluted animals and agro byproducts

Impact Mitigation through IPMP

To avoid or mitigate the adverse environmental and health effects identified above, this IPM was prepared to provide an eco-system type of approach that is mild to the environment. It differs from the traditional pest management plan because it integrates various approaches that fit into different pest control circumstances that may be identified by YESSO farmers across the States. It however, places much emphasis on biological method because it is less expensive and most eco-friendly. The next section is the presentation of the integrated pest management plan for YESSO.

PART 5: INTEGRATED PEST MANAGEMENT PLAN FOR YESSO

The IPM approaches for YESSO agricultural beneficiaries is meant to reduce dependence on pesticides while strengthen innovation and productivity of the farmers. The integrated approaches include, biological method, cultural method, physical and mechanical method, chemical methods and training and awareness.

a) Biological methods

Biological method is carried out by making use of arthropods or insect pathogenic micro-organisms (viruses, bacteria, fungi and nematodes) and their metabolites. Biological methods are safe to human beings, animals, plants and the environment. It enables constant maintaining of the pest population at a low level, hence is the priority for pests/disease prevention and control for this YESSO project. It includes the following detailed measures:

• Use of biological pesticides, such as Bt, Polynacfin, NPV, etc.;

• Use of natural enemies, such as the genus *Bethylus* Latreille, Parasiotid *Chouioia cunea*, wood peckers etc.

b) Cultural measures

By strengthening technical measures, such as cultural, and tending etc, pests/disease resistant capacity of the forest plants are enhanced, thus curbing the occurrence and spread of pests/diseases. This mainly includes:

• Selection of tree species which are pests/disease resistant, to raise the self resistance capacity of the forests;

• Intercropping or mixed planting: properly intercropping trees with crops is carried out to reduce hazards

• Planting adaptive trees: Selection of tree species which are adaptable to the local environmental conditions;

• Proper planting times: select proper planting season;

• Production of sturdy seedlings: This refers to cultivating high-quality and strong seedlings and culling unhealthy seedlings;

• Rational use of fertilizers: This is to apply adequate amount of organic manure, with limited application of nitrogen and phosphorus fertilizers and increased utilization of calcium fertilizer;

• Slashing of forest land: tilling the soil to expose pests to the extreme weather conditions, removal of infected plants, branches and leaves;

• Reasonable thinning: promoting tree growth and improving the forest pest resistance capacity of the forests by reasonable thinning.

c) Physical and mechanical methods

Physical and mechanical methods are based on the occurrence rule and habits of forest pests/diseases. By using their weak links in its infection or life cycle, artificial, physical and mechanical methods are applied for purpose of prevention and treatment:

• Artificial and mechanical pest/disease control: The methods includes artificial capturing, removal of pest larvaes and eggs; killing some pest larvaes and adult pests by making use of mimi death of shaking down the pests; artificial clearing of overwintering pupae in the earth; artificial cutting the plant with pest/disease leavaes, etc

• Trapping and killing. Trapping and killing are possible by making use of preference on colors and smells of some pests, to realize damage prevention. The black light trap is used for moths, beetles and orthoptera pests and sweet and sour solution is used for some moths.
• Separation. This is to use the habits of some pest to prevent damage from happening, such as hanging on the trunk the plastic rings to prevent some pest which have the habit of overwintering under the trees or damaging the trees at night by climbing up on to the trees and hiding themselves under the trees during day time.

Such methods are simple, easy to apply and cost-effective. In addition, they are environment friendly. The main constraints are time consuming and effective only to some pests, hence can be used as a supplementary method.

d) Chemical methods

Physical and biological methods are always the most favorable methods in pests/disease control. Only when other methods are failed to function, and the monitoring results have indicated that the damage caused by forest pests is over the economic threshold, can chemical pesticides be applied. Attention should be paid to select the hazardless pesticides, so as to reduce the pesticide resistance of the pests and to avoid pollution to the environment.

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);
• Cleaning in the natural waters of the waste chemicals, the used chemical containers and the application equipment is forbidden, and safe location should be chosen for proper treatment, such as deep burial.

e).Training and awareness - this is to raise the capacity of the beneficiary and potential farmers on pesticides best practices as demonstrated in this IPMP. The training and awareness will help farmers to understand pesticides risks, handling, application, procurement, storage and disposal. In specific terms, the training and awareness campaigns will enhance:

- a better understanding of the biology, ecology, and population interactions of pests and hosts.
- minimizing the risks of pests' potential to destroy crops, or transmitting diseases.
- development of early warning systems in pest management
- reducing the probabilities of secondary pest outbreaks and pest resurgence
- developing selective control methods which are less destructive to natural competitors or enemies of pests.
- developing methodologies to manage pests, which do not harm the health of farm crops, animals, humans or the environment.
- beneficial exploitation of pests

f) Interfacing with other World Bank/FAO Agricultural development Projects

YESSO will interface with the State FADAMA offices in the ADPs – a lot of experience and success has been gained in Nigeria under FADAMA 2 and 3 projects including application of IPM operations. Therefore, YESSO agricultural projects States stand to gain from shared experience and capacity of these existing projects in terms of challenges and success drivers of the IPM operations and other similar areas. That way, YESSO agricultural associations/farmers would not require much experimentation time lag in the implementation of this IPM.

5.2 IPMP Objectives

The key objective of the IPMP is to enable farmers associations partnering with YESSO to monitor pests and disease vectors and mitigate negative environmental and social impacts associated with pest/vector control and promote agro-ecosystem management. The plan provides decision-makers users groups with clearer guidelines on integrated pest management (IPM) approaches and options to reduce crop and livestock losses with minimal personal and environmental health risks. Overall, the PMP will empower crop and livestock farmer groups to contribute significantly to household and national economies.

The specific objectives of the PMP are to:

- Assist crop and livestock farmer users to plan and design location specific IPM activities.

- Promote participatory approaches in IPM for farmers to learn, test, select and implement “best-bet” IPM options to reduce losses due to arthropod pests, diseases and weeds.

- Promote biodiversity monitoring to serve as early warning systems on pest status, alien invasive species, beneficial species, and migratory pests.

- Establish linkages to develop a national IPM policy to promote IPM and compliance with international conventions and guidelines on pesticide use in commercial agriculture.

- Monitor and evaluate the benefits of IPM including its impact on food security, the environment and health.

- To define clear profile of the institutional or partnerships mandates in the implementation of IPM within the basin

- To provide clear policy recommendations on how to address any risks related to pests that the project may stimulate, and finally

- Promote monitoring of pests attacks and the effectiveness of management approaches.

5.3 Pest Management Planning Matrix for YESSO Agriculture Support

Table 5.2 outlines the matrix of activities, expected results, milestones and performance indicators of the PMP.

Table 5.2: Planning matrix for the IPMP of YESSO farmers

Narrative summary	Expected results	Performance indicators	Assumptions/risks
Goal: Empower crop and livestock farmers to contribute significantly to household and national economies through environmentally friendly pest management practices.	• Food security enhanced, environmental quality improved, crop and livestock productivity and farmers' income increased	• Evidence of improvements in food availability, level of poverty, and environmental protection	• National security remains stable • Government policies continue to support food security programme
Purpose 1. In the immediate future, halt and reverse losses cause by pests in order to increase profitability of agriculture. 2. In the longer term, strengthen national and local capacity to reduce environmental and heath risks associated with pest management practices in the YESSO APAs.	**Medium-term results/outcomes** • Farmers in YESSO prioritize their pest problems and identify IPM opportunities to mitigate negative environmental and social impacts associated with pesticides. • Farmers in YESSO adopt ecologically sound options to reduce crop and livestock losses with minimal personal and environmental health risks. • YESSO farmers decision makers provided with clearer guidelines enabling then to promote IPM approaches and options in APA agriculture • Collaborate linkages established to develop a national IPM policy to promote compliance with international conventions and guidelines on pesticide use	• Availability of sufficient food. • Perception of state agencies regarding the value of IPM in APA agriculture. • Level of compliance with World Bank etc. • Level of chemical control practices • Types and level of use of alternatives to synthetic pesticides	

Table 3: Components activities and expected results of the PMP

Activities	Expected results	Milestones	Performance indicators	Assumptions/risks
1. Record stakeholders' overviews on crop and livestock pests. 2. Conduct field diagnosis to specify pests that undermine APA agriculture. 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 YESSO APAs. 5. Specify partnership opportunities at local, national and international levels to assist in the implementation of the PMP	**Result 1:** Members of APAs 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 each cluster of neighbouring YESSO agricultural partnering association (APA)	• Type and nature of participatory methods for problem analysis • Documented information on the status of pests and natural enemies of pest and pollinators in APA agriculture. • Inventory of alien invasive species and quarantine pests • Types and availability of natural enemies for use in biological control of named pest • Types and availability of microbial pesticides and botanical pesticides to replace chemical pesticides • Type and number of crop rotation schemes to reduce build up of named pest species • Type of composting and mulching as alternatives to mineral fertilizers • List of principal actors and of partners	Social, economic and political situation remain stable

Table 3 (contd.): Components activities and expected results of the PMP

Activities	Expected results	Milestones	Performance indicators	Assumptions/risks
1. Develop participatory learning modules (PLM) in line with farmers identified training needs 2. Conduct short to medium term training of farmer support groups on skills relevant to the PLMs 3. Organize international study visits on specialized IPM skills of relevance to the PLMs 4. Intensify training of men and women farmers in IPM knowledge and skills. 5. Promote farmer-led extension to increase secondary adoption of proven IPM options 6. Strengthen researcher-farmer-extension linkages through participatory research on issues emerging from farmer training 7. Develop/disseminate IPM decision-support information resources for field agents, farmers, policy makers, and the general public	**Result 2**: Human resource capacity for IPM delivery and implementation developed. *In partnership with Nigeria/FAO project TCP/NIR/2903 (T) on sustainable legumes and cereal production through integrated production and pest management for synergy of efforts in participatory learning approaches, and with the CGIAR Systemwide Program on IPM (SP-IPM) for supporting IPM resources.*	• One IPM orientation workshop organized in year 1 • PLM for crop/livestock and pest management practices developed and adapted to suit local needs • 3 sets of 2 week training of trainers courses for 90 extension agents • Farmers and selected potential youth farmers trained through participatory/experiential learning • At least 3 sets of study visits organized for at most 12 technical support staff • Farmers accurately relate pests to respective damage symptoms; recognize natural enemies/biological control agents against the pests; test a range of IPM options and select "best-bet" options to implement and adopt. • At least 30% of trained farmers undertake participatory extension; and at least 50% farmers adopt new IPM options in targeted crop or livestock • At least 70% of information materials developed is disseminated and used by extension agents and farmers. • Significant reduction in pest damage by at least 30% of baseline data in target crop/livestock	• Type and number of PLMs developed • Type of IPM skills covered in study visits by agric staff • Number of farmers' learning groups implemented • Gender and number of extension agents and of farmers trained. • Gender and number of trained farmers engaged in participatory extension • Extent to which new knowledge/skills are used by extension agents & farmers to promote adoption of IPM options • Number & type of IPM information materials developed/disseminated • Number and type of new IPM options introduced and adopted. • Gender and number of farmers adopting IPM technologies. • Area of crops under IPM • Incremental benefits due to pest control • Type and number of user-friendly taxonomic keys for pest and natural enemy recognition by farmers	Farmers adopt and apply new improved technologies. APA users and their service providers comply with international conventions guiding pesticide use and MRLs in trade Critical mass of staff trained remain within the APA communities

Table 3 (contd.): Components activities and expected results of the PMP

Activities	Expected results	Milestones	Performance indicators	Assumptions/risks
1. Test and promote botanical alternatives to synthetic pesticides. 2. Test and promote microbial alternatives to synthetic pesticides 3. Develop/update a national IPM policy including legislation to govern the manufacture, importation, distribution and use of pesticides 4. Establish a national IPM advisory and oversight committee to guide national and local compliance with World Bank safeguard Policies, OP 4.09 and BP 4.01 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 APA agriculture from banned/harmful pesticide regimes is fully operational • Existing pesticide regulations are fully enforced • A multi-stakeholder 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 APA farmers 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 APA comunities

PART 6: IMPLENTATION STRATEGY

6.1 Context

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

i. Measures that will ensure capacity building among stakeholders that will implement the IPMP as well as farmers associations and youth expected to involve in agriculture under YESSO program;
ii. Measures to ensure that banned products 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 the farmers receive improve varieties of seedlings and crops that are pest resistant as a better pest control alternative

6.2 Capacity Building

The success of IPM depends largely on developing and sustaining institutional and human capacity to facilitate informed decision making by farmers, and empower farmers to integrate scientific and traditional knowledge to solve location-specific problems, and respond to market opportunities. Poor communication between farmers, extension agents and researchers has often led to poorly-targeted research or to poor adoption of promising options generated by research. The full benefits of investments in agricultural research thereby remain untapped under these circumstances. Farmer participatory research (FPR) and participatory learning (PL) approaches in capacity building efforts help to bridge this gap and make research results more understandable and useful by farmers. This is particularly the case in knowledge intensive disciplines such as IPM. In IPM, for example, there is the need for farmers to accurately identify and diagnose pests and pest problems, understand trophic relationships that underpin biological control opportunities, and use such knowledge to guide pesticide management and other kinds of interventions. Through the participatory approaches YESSO-APA will build local capacity to ensure rapid spread and adoption of ecologically sound and environmentally friendly management practices in agriculture activities. The farmers will learn biological and ecological processes underpinning IPM options, and use the newly acquired knowledge to choose compatible methods to reduce losses in production and post-harvest storage. A foundation element of the capacity building exercise is diagnosis of pest problem and IPM opportunities to provide baseline information that will enable APA stakeholder groups to develop a shared vision on felt needs and IPM strategies. Through informal interviews, field visits, and planning meetings, APA stakeholder groups will develop joint understanding of the key issues affecting production and develop a common IPM plan based on agreed concerns.

The PMP implementation will be anchored at APA level with field action by farmer groups which will receive training and advisory services from ADPs, appropriate NGOs, and community leaders who would have graduated from **Training of Trainers (ToT)** sessions. Training at all levels will be based on participatory learning modules for capacity building in IPM information delivery.

Detail training modules and participation and awareness program is as follows:

Modules	**Targets**	**Responsibility Arrangement**	**Budget in USD**
World Bank OP 4.09 Awareness & IPM orientation	SPIU Farmer Organizations Youth Farmers	World Bank Consultant	**45000**
Basic OHS in chemical pest application and Pesticide Spraying Technique	SPIU Farmer Organizations Youth farmers	NAFDAC Federal Pest Control Services of the FMARD	**96000**
Training of Trainers on IPM implementation Process	SPIU Farmer Organizations	World Bank Consultant Federal Pest Control Services of the FMARD	**45000**
Radio jingles and handbill on IPM	Farmer organizations, sellers, retailer and users of chemical pesticides	FPCU/SPCU	**300000**
Total			**216000**

6.3 Ensuring that WHO Class 1 and Class 11 Pesticides are not Used

Measures to ensure that unacceptable Pesticides are not procured with Bank's fund will be ensured by the environmental officer at the State level. The environmental officers at the SPCU will screen the pesticides procurement list prior to procurement and ensure that only pesticides that are acceptable and approved by the Bank/WHO/NAFDAC are procured. The outcome of the screening will be sent to World Bank for concurrence.

Other measures for the overall success of IPM are:

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

6.4 Institutional Arrangements and Framework for Implementation

The Federal Ministry of Environment(FMEnv)- has the overall responsibility of ensuring that the environment is protected by ensuring that hazardous and banned chemicals are not used under this project. This will be achieved through supervision missions meant to monitor compliance with its standards.

Federal Ministry of Health (FMoH) and NAFDAC- have the responsibility to ensure that public health is safeguarded. In this project the focus is to ensure that banned substances dangerous to health are not introduced in the project.They will achieve this through joint monitoring and supervision in the sites

Federal Ministry of Agriculture & Rural development (FMARD)- will carry out a supervisory role over the SPIU to ensure that the SPIUs implement this IPM including awareness campaign and technical support to farmers to ensure that IPM options recommended in this study are understood, embraced and applied by beneficiary farmers

The Federal Ministry of Finance
The Ministry of finance is the overall implementing agency. To that extent, it will ensure that project objectives are met through timely fund release, monitoring of project implementation in line with monitoring indicators and schedules. It will also ensure that SPIU are responsive to the safeguards implementation including IPMP in the respective sub-projects under their purview.

The World Bank
The World Bank will ensure that its fund is not used in the procurement of pesticides under this project. It will through supervisory missions ensure that the principles of OP 4.09 contained in this report are fully complied with.

The Environmental Officer
He/she will ensure that unacceptable Pesticides are not procured with Bank's fund by screening pesticides procurement list prior to procurement approval

He/she will ensure that the farmers associations are educated on the use of pesticides including the dangers inherent in there uses.

He/she will educate the farmers on handling, use and disposal of chemical pesticides and more importantly, will be responsible for educating the farmers on the practical implementation of the IPMP.

COORDINATION RESPONSIBILITIES

FPCU responsibilities are to standardize training needs assessment across States; and organize national workshops to develop participatory learning modules.

SPCU responsibilities are to liaise with farmers and/or agricultural partnership associations (APAs) to plan training implementation; provide technical support such as in preparing and delivering specific training materials, and evaluating resource materials; identify and select suitable local training resource persons and materials; and prepare training progress reports.

The Local Government department of agriculture will work in close collaboration with SPIU to identify, select and organize farmers groups for training; prepare, organize and supervise training implementation plan; verify reports of persisting pest problems and farmers training needs;

monitor performance of farmer trainers and post-training assignments; and prepare training progress reports

6.5 Monitoring and Evaluation

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

- To alert the PCU /SPCUs by providing timely information about the success or otherwise of the IPM operation process outlined in this report. This will ensure continuous improvement in the YESSO agriculture support sub-projects.
- To make a final evaluation in order to determine whether the mitigation measures incorporated in the technical designs and the EMP 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 YESSO ESMF.

The key issues to be considered in the monitoring process is whether the pesticides procurement checklist is available and used during procurement and screening to ensure that WHO class 1A and 1B pesticides are not procured or used. 2) Another major factor is to monitor the progress of the IPM implementation vi-a-viz the result.

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

- Number of farmers and stakeholders aware of the pollution, contamination and toxicity associated with pesticides
- 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 crops among farmers
- Medical reports/incidences of toxicity among farmers
- 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 in the rural areas implementing YESSO agriculture program

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 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 of APA farmers

Major benefits: Increase in crop/livestock production; increase in farm revenue; social benefits: e.g., improvement in the health status of farmers; level of reduction of pesticide purchase and use; and number of APA families using preventive mechanisms against diseases.

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 YESSO-agricultural programs/groups.

Evaluation of Results

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

PART 7: WORKPLAN AND BUDGET

Annual work plan will be developed in consultation with the SPCU/APA in line with their respective agricultural project support. Approximately **US$ 844,000** will be required to effectively implement the IPMP over a five-year period (Table xxx). This cost covers IPM orientation workshop for all SPIU in Nigeria, capacity building and awareness program, and project management including the cost of monitoring. It will be implemented over the 5 year project cycle. Detail of the work plan and cost are presented in table 7.1 below:

Table 7.1: Budget summary

Line item	Yr. 1	Yr. 2	Yr. 3	Yr 4	Yr5	**Total**
1. Capacity building & Awareness						
IPM orientation workshop	60000	30000	0	0	0	**90000**
Training of Trainers	90000	0	0	0	0	**90000**
Farmer group training	48000	48000	48000	48000	0	**192000**
Radio jingles and handbill on IPM	30000	20000	10000	0	0	**60000**
Sub-total	*228000*	*98000*	*58000*	*48000*	*0*	***432000***
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)	50000	30000	20000	0	0	***100000***
Chemical Neutralizer and first Aid	20000	20000	20000	0	0	***60000***
Sub-total	*70000*	*50000*	*40000*	*0*	*0*	*160000*
4. Project management						
IPMP coordination	4000	4000	4000	4000	4000	**20000**
Monitoring and evaluation	10000	10000	20000	12000	12000	**64000**
Sub-total	*14000*	*14000*	*24000*	*16000*	*16000*	***84000***
Grand total	**352000**	**222,000**	**158000**	**88000**	**24000**	**844000**

REFERENCES

IPM for the 2nd Phase of Lake Victoria Environmental Management Plan, Tanzania (2007)

IPM of the West African Agricultural Productivity Programme (2010)

National FADAMA 2 PMP for Nigeria (2005)

World Bank Safeguards Policies Basics

ANNEXES

Annex 1: List of banned pesticides

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

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

a) Insectcides

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 (Cadusofas) 12. Malathion 13. Temeguard (Temephos) 14. Isazofos 15. Parathion – Methyl 16. Phosphamidon 17. Methidathion	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

b) Herbicides and fungicides

Organophosphorus	**Carbamates**	Other herbicides	Fungicides
Organophosphorus 1. Anilofos 2. Piperophos 3. Glyphosate 4. Glyphosate Trimesium (Touchdown or Sulfosate) 5. Amideherbicides (Acetochlor; Alachlor; Propanil; Butachlor; Metalochlor) Triazines and Triazoles (Atrazine; Ametryn; Desmetryn; Terbuthalazine; Terbutrex Terbutryne) Chlorophenoxy herbicides (Prometryn; Simazine; 2.4-D (2.4 Dichlorphenoxy acetiacid) 7. Urea and guadinidines ; (Diuron ; Linurex (=Linuron); Fluometurone;	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)

Chloroxuron; Neburon)
Quaternary nitrogen compounds (paraquat; diquat)

Annex 3: Good Management Practices Guide and Pesticides Management Measures

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

Safe use of pesticides

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

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

Insecticides registration

Reinforce the registration process of insecticides by ensuring:

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

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

- Develop national guidelines applicable to the purchase of products intended for vector control and ensure that all the agencies buying them strictly comply with those guidelines;
- Use synthetic Pyrethroids: Deltamethrin SC, Permethrin EC, Vectron, Icon, Cyfluthrin, as recommended by the national policy;
- Refer to the guiding principles issued by WHO or FAO on calls for tenders, to FAO recommendations regarding labeling and to WHO recommendations regarding products (for indoor spraying);
- Include in calls for tenders, the details regarding technical support, maintenance, training and products recycling that will be part of the after-sale service committing manufacturers; apply the back-to-sender principle;
- Control the quality and quantity of each lot of insecticides and impregnated supports before receiving the orders;
- Ensure that the products are clearly labeled in French and if possible in local language and in the strict respect of national requirements;
- Specify which type of package will guarantee efficiency, preservation duration as well the human and environmental security of handling packaged products while strictly complying with national requirements;
- Ensure that donated pesticides intended for public health, comply with the requirements of the registration process in Mali (CSP) and can be used before their expiry date;
- Establish a consultation, before receiving a donation, between the ministries, agencies concerned and the donors for a sound use of the product;
- Request users to wear protective clothes and equipment recommended in order to reduce their exposition to insecticides to the strict minimum;
- Obtain from the manufacturer a physic-chemical analysis report and the product acceptability certification;

- Request the manufacturer to submit an analysis report of the product and of its formulation along with guidelines to follow in case of intoxication;
- Request the buying agency to perform a physic-chemical analysis of the product before shipping and arrival.

Precautions

Labeling

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

Storage and transportation

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

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

- Preservation of the original label;
- Prevention of accidental pouring or overflowing;
- Use of appropriate containers;
- Appropriate marking of stored products;
- Specifications regarding the local population;
- Products separation;
- Protection against humidity and contamination by other products;
- Restricted access to storage facilities;
- Locked storage facilities to guarantee product integrity and safety.
- Pesticides warehouses should be located far from human residences or animal shelters, water supplies, wells and channels. They should be located on an elevated surface and secured with fences with restricted access for authorized individuals only.
- Pesticides should not be stored in places where they could be exposed to sunlight, to water or to humidity, which could harm their stability. Warehouses should be secured and well ventilated.
- Pesticides should not be transported in the same vehicle with agricultural products, food products, clothes, toys or cosmetics as these products could become dangerous in case of contamination.
- Pesticides containers should be loaded in vehicles in order to avoid damages during transportation, that their labels will not tear off so that and they would slip off and fall on a road with an uneven surface. Vehicles transporting pesticides should bear a warning sign placed conspicuously and indicating the nature of the cargo.

Distribution

Distribution should be based on the following guidelines:

- Packaging (original or new packaging) should ensure safety during the distribution and avoid the unauthorized sale or distribution of products intended for vector control;
- The distributor should be informed and made aware of the dangerous nature of the cargo;
- The distributor should complete delivery within the agreed deadlines;

- The distribution system of insecticides and impregnated supports should enable to reduce the risks associated with the numerous handlings and transportations;
- In the event the purchasing department is not able to ensure the transportation of the products and materials, it should stipulated in the call for tenders that the supplier is expected to transport the insecticides and impregnated supported up to the warehouse;
- All pesticides and spraying equipment distributors should have an exploitation permit in accordance with the current regulation in Mali.

Disposal of pesticide stocks

After the operations, the remaining stocks of pesticides can be disposed of without risk by dumping them in a hole dug specifically or in a pit latrine. A pesticide should not be disposed of by throwing it in a place where there is a risk of contaminating drinking water or for bathing or where it can reach a pond or a river. Some insecticides, such as pyrethroids, are very toxic for fish.

Dig a hole to at least 100 meters from any stream, well or habitat. If in hilly areas, the whole must be dug below. Pour all waters used for hand washing after the treatment. Bury all containers, boxes, bottles, etc. that have contained pesticides. Reseal the hole as quickly as possible. Packaging or cardboard, paper or plastic containers— the latter cleaned — can be burnt, if allowed, far away from homes and drinking water sources, regarding the re-use of containers after cleaning. Pyrethroid suspensions can be discharged on a dry soil where they are quickly absorb and then will go through a decomposition process making them harmless for the environment.

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

Cleaning of empty pesticide packaging and containers

Re-using empty pesticide containers is risky and it is not recommended to do so. However, it is estimated that some pesticide containers are very useful to be simply thrown away after use.
Can we therefore clean and re-use such containers? This depends both on the material and the content. In principle, the label should indicate the possibilities for re-using containers and how to clean them.

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

General Hygiene

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

Individual protection

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

Protection of the population

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

Protective clothing

Treatments inside homes:

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

Nose and mouth should be protected using a simple method, for example a disposable paper mask, a disposable surgical or washable mask or a clean cotton cloth. Once the fabric is wet, it should be changed. Clothing must be in cotton for easy washing and drying. It must cover the body and contain no opening. In hot and humid climates, it can be uncomfortable to wear additional protective clothing; therefore one will be forced to spray pesticides during hours when it is very hot.

Preparation of suspensions

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

Treatment of nets

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

Maintenance

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

Safety measures

During spraying

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

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

Monitoring exposure to organophosphate

There are country kits available on the market to control cholinesterase activity in the blood. If this activity is low, it can be concluded that there excessive exposure to organophosphate insecticide. These dosages should be done every week with people handling such products. Any person whose cholinesterase activity is very low should be stopped from working until it returns to normal.

Fabric spraying

When handling insecticide concentrates or preparing suspensions, gloves should be worn. Attention should be paid particularly to spraying in the eyes. A big bowl not too high should be used and the room should be well ventilated to avoid inhaling smokes.

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

Annex 4: WHO Pesticides Classification

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