FEDERAL REPUBLIC OF NIGERIA

THE THIRD FADAMA DEVELOPMENT PROJECT.

ADDITIONAL FINANCING

INTEGRATED PEST MANAGEMENT PLAN (IPMP)

NATIONAL FADAMA CO-ORDINATING UNIT.
Federal Ministry of Agriculture & Rural Development, Abuja

March 29, 2013
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EXECUTIVE SUMMARY

ES 1:
An Integrated Pest Management Plan (IPMP) was prepared, disclosed and implemented by FADAMA III project. However, for the purposes of the Additional Financing, this extant IPMP is updated to take into account the specific activities that may emanate from staple crop processing in line with international best practices. The Additional Financing for the Fadama-III project aims to scale up impacts on the ground and development effectiveness of a well performing Fadama-III project by aligning the project more closely with the new Agricultural Transformation Agenda (ATA) which was adopted by the Government of Nigeria (GoN) in 2011. The additional Financing (AF) will comprise of support for investments in: (i) sustainable common user facilities such as small scale water harvesting structures; (ii) investments and technical assistance to facilitate out grower schemes; seed multiplication and access to appropriate agricultural machinery; (iii) a competitive grant scheme for demand-driven adaptive and applied agricultural research, extension services and ancillary services; (iv) project management and monitoring and evaluation. The proposed additional financing is aimed at increasing the income of the farmers in prioritized Staple Crop Processing Zones (SCPZs). It is consistent with the development objective of the on-going parent Fadama III Project.

ES 2: Relationship of the OP 4.09-Pest Management with other triggered Safeguard Policies
Safeguard policies potentially triggered by AF Fadama – III project 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
- OP/BP 4.37 Safety of Dams
In order to address the above safeguard triggers a Resettlement Policy Framework (RPF) that was prepared for the original project was also updated as a separate document to address the involuntary resettlement issues that might result from project implementation. Also, an Environmental and Social Management Framework (ESMF) that was prepared for the original project has also be concurrently updated 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, this updated IPMP though is well aligned with the ESMF and RPF, 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 AF Fadama-III intervention sub-projects.
ES 3: **Rationale for the IPMP**

The It is not uncommon for agricultural development projects such as AF - Fadama-III, supported by the World Bank to involve agricultural diversification into new crops, intensification of low-technology production systems, expansion into new catchment areas and change of cultivation practices, irrigation development for agricultural production, reorganization of agricultural research and extension services, support for farmers organizations and similar programs, or procurement of pesticides. Although these agricultural programs are designed to assist farmers to boost agricultural production and increase farm incomes, they can have major implications for the use of inputs such as pesticides and fertilizers. Adequate measures are therefore required at project/program development to promote the appropriate management of pests and pesticides. This is to ensure that increased and sustainable agricultural production and farm incomes are achieved; that vector-borne diseases are managed in sustainable manner, and that the risks to human health and the environment associated with pesticide use are kept to an acceptable minimum.

The World Bank’s Pest Management Safeguard Policy (OP 4.09 and BP 4.01 Annex C) was established to address these concerns and to assist borrowers to manage pests in an appropriate manner. A major provision of the Safeguard Policy is the preparation of a comprehensive Pest Management Plan, or PMP, that will outline the various elements of and actions needed to be taken to adequately address these concerns during project implementation. The objective of this policy is to promote the use of biological or environmental control methods and reduce reliance on synthetic chemical pesticides and ensures that health and environmental hazards associated with pesticides are minimized. In Bank-financed agricultural operations, pest populations are normally controlled through Integrated Pest Management (IPM) approaches such as biological control, cultural practices, and the development and use of crop varieties that are resistant or tolerant to the pest.

The Bank may finance the purchase of pesticides when their use is justified under an IPM approach and following some criteria concerning selection of pesticides:

(a) They must have negligible adverse human health effects.
(b) They must be shown to be effective against the target species.
(c) They must have minimal effect on non-target species and the natural environment. The methods, timing, and frequency of pesticide application are aimed to minimize damage to natural enemies. Pesticides used in public health programs must be demonstrated to be safe for inhabitants and domestic animals in the treated areas, as well as for personnel applying them.
(d) Their use must take into account the need to prevent the development of resistance in pests.
ES 4: Scope of the Updated IPMP

The updated IPMP outlines the World Bank Safeguard process for due diligence in pest management that may be triggered in any FADAMA III 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.

ES 5: 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

- 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.
- 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.

**ES 6: 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 the additional Financing for the Fadama-III program in agriculture sub-projects additional training and awareness creation will be required as detailed in this report.

**ES 7: 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 arise during project implementation, hence, the need for continuous public consultation throughout the project cycle will be done with all stakeholders.

**ES 8: Adverse Environmental & Health Impacts**

This IPMP identified a number of environmental and health risk that may be encountered through unsafe use of pesticides in the AF Fadama – III production centers in the Staple 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 causes oil 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 Projects Management Units (PMU) 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 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$ 732,000 will be required to effectively implement the IPMP over a three-year period. This cost covers IPM orientation workshop for all farmers, FCAs and PMUs in Nigeria, capacity building and awareness program, and project management including the cost of monitoring.

Table 7.1: Budget summary

<table>
<thead>
<tr>
<th>Line item</th>
<th>Yr. 1</th>
<th>Yr. 2</th>
<th>Yr. 3</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1. Capacity building &amp; Awareness</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IPM orientation workshop</td>
<td>60000</td>
<td>30000</td>
<td>0</td>
<td>90,000</td>
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<tr>
<td>Training of Trainers</td>
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<td>0</td>
<td>90,000</td>
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<tr>
<td>Farmer group training</td>
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<td>48000</td>
<td>48000</td>
<td>144,000</td>
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<td>Radio jingles and handbill on IPM</td>
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<td>20000</td>
<td>10000</td>
<td>60,000</td>
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<td><strong>Sub-total</strong></td>
<td>228000</td>
<td>98000</td>
<td>58000</td>
<td>384,000</td>
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<tr>
<td><strong>2. Environmental management</strong></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Equipment; bed nets; improved species</td>
<td>10000</td>
<td>20000</td>
<td>10000</td>
<td>40,000</td>
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<tr>
<td>Support to IPM research and development</td>
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<td>30000</td>
<td>20000</td>
<td>70,000</td>
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<tr>
<td>Pest/vector surveillance</td>
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<td>10000</td>
<td>6000</td>
<td>26,000</td>
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<td><strong>Sub-total</strong></td>
<td>40000</td>
<td>60000</td>
<td>36000</td>
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<tr>
<td><strong>3. Occupational Health &amp; Safety</strong></td>
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</tr>
<tr>
<td>Personal Protective Equipment (Hand gloves, gas mask, safety boot and overall wear)</td>
<td>50000</td>
<td>30000</td>
<td>20000</td>
<td>100,000</td>
</tr>
<tr>
<td>Chemical Neutralizer and first Aid</td>
<td>20,000</td>
<td>20,000</td>
<td>20,000</td>
<td>60,000</td>
</tr>
<tr>
<td><strong>Sub-total</strong></td>
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<td>50000</td>
<td>40000</td>
<td>160,000</td>
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<td><strong>4. Project management</strong></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>IPM coordination</td>
<td>4,000</td>
<td>4,000</td>
<td>4,000</td>
<td>12,000</td>
</tr>
<tr>
<td>Monitoring and evaluation</td>
<td>10,000</td>
<td>10000</td>
<td>20000</td>
<td>40,000</td>
</tr>
<tr>
<td><strong>Sub-total</strong></td>
<td>14000</td>
<td>14000</td>
<td>24000</td>
<td>52,000</td>
</tr>
<tr>
<td>Grand total</td>
<td>352000</td>
<td>222000</td>
<td>158000</td>
<td>732,000.00</td>
</tr>
</tbody>
</table>
1.0 INTRODUCTION

This pest management plan has been prepared and updated as part of the ESMF in the context of the Fadama III additional financing of two hundred million dollars. This is an agricultural and rural development project supported by The World Bank and based on the Community-Driven Development (CDD) approach strategy, explicitly supported by the Country Partnership Strategy (CPS).

This project has been prepared to support the Agricultural Transformation Agenda (ATA) of the government of Nigeria and address poverty under the catchment areas in the prioritized Staple Crops Processing Zones. ATA seeks to achieve dramatic increases in agricultural productivity, massive job creation in the agriculture sector, significant expansion of value-addition in agro-processing, drastic reductions in agricultural imports, and improved penetration of international markets. It targets a number of commodities, including rice, cassava and sorghum.

The AF will comprise of support for investments in: (i) small-to-medium-scale irrigation schemes around selected staple crop processing zones (SCPZs);
(ii) seed multiplication and access to appropriate agricultural machinery; (iii) demand-driven agricultural research and extension services; (iv) economic opportunities for women and unemployed youth; and (v) project management and monitoring and evaluation. The proposed additional financing is consistent with the development objective of the On-going parent Fadama III Project. No major changes are proposed to the Project Development Objective, design or implementation arrangements of the original project. The main difference is that rather than having national coverage as is the case under the parent project, the AF will have a geographical focus on a number of selected SCPZs. It will include the following among others:

- Provision of agro – inputs
- Aggregation of Large-, medium-, and small-scale farmers that produces fresh root/ crops requirement and provides services for typical operations of land preparation, planting, fertilization, weed control, and harvest for smaller out-grower farmers
- An off-take contract between farmers and the processor for delivery of agricultural produce to the factory
- Dedicated R&D support from national and international centres to recommend best practices crop production (including crop rotation), soil management, and pest/disease control
- Value addition and export markets development.

1.2 Project Description and Objectives

The project has six (6) components:

I. Component 1: Capacity Building, Communications and Information Support
The AF will upscale capacity of farmers especially in the area of contracting for inputs and output supply to the processing firms who will be in an out-grower contract with the
farmers, mobilization of farmers for group formation based on targeted value chains, identification of business plans, training of facilitators and Extension Agents (EAs) both in public and private sectors e.t.c.

In addition, strengthening existing ADP ICT centers and linking it with ICT platform of NAERLS, provision of media vans, undertaking farm broadcasts, production program, and partnership with ministry of information/existing communication agencies will be undertaken.

II. Component 2: Small-scale Community-owned Infrastructure (SCI)

The major focus of this component will be limited to small-scale irrigation facilities for those farmers that may have their farms in areas adjoining the SCPZs and which do not benefit directly from the irrigation facilities to be made available on the site through the AF. There shall also be adequate provision of roads and other infrastructure such as electricity.

III. Component 3: Advisory Services and Input Support and GES Scheme

The input support component of the parent project was retained since farmers that will be participating in the SCPZs might need more than the quantity of inputs that the GES can supply. This is to ensure that input availability at the right price does not restrict farmers’ production. In addition, it was suggested that the current matching grant of 50-50 be maintained for all kinds of inputs to be procured in the Fadama-AF. On tractorization, the provision of additional tractors ill have to be undertaken by Fadama-AF since GES is planning to provide 5 to 10 tractors per SCPZ with the necessary in-built maintenance which fixes the fertilizer sector by directly linking farmers with the fertilizer service providers.

IV. Component Four: Support to the ADPs and Adaptable Research and On-farm Demonstrations

Support to the ADPs and Adaptable Research and On-farm Demonstrations is the crux of component four. Mission noted the key roles of extension in agriculture and for the Additional Financing of Fadama. The extension intervention will be in targeted SCPZs, as pilot extension sub-projects, rather than the revival of the entire extension arm of the ADPs. Hence, additional financing will ensure adequate extension delivery at the SCPZs through support for capacity building, strengthening the capacity of ADPs to deliver advisory services (training, revised curricular, incentives, quality control), ability to set professional standards, register, certify, monitor service providers and to serve as farmers’ call center and manage internet based information linked to SMS service with a feedback loop to call center (public sector delivering content, while private tele-operators providing service). It emphasized the use of ICT and mobile-based interventions and other interventions such as farmers’ field and business schools.

In addition, the Fadama-AF will support key activities that can give quick wins nationally. This is to be done by prioritization of activities into the short, medium and long term ones. Also, the integration of KVK-REFILS in selected zones will be enhanced to coordinate
the scaling up of on-farm demonstrations and seed multiplication through the farmers’ field school (FFS) approach.

V. Component 5: Acquisition for Individual FUGs/EIGs Assets

The fifth component will involve the acquisition of production assets that are critical to the production of farmers. Mission felt that farming equipment and tools such as sprayers, water pumps, bull for traction, power tillers; and storage facilities for both produce and inputs should be eligible for funding. Since this is going to be CDD, other productive assets might be required by the farmers in the course of implementation.

Project Management, Monitoring and Evaluation

The current monitoring and evaluation systems being used in the Fadama-III projects require little modification to suit the targeted SCPZs’ activities. Essentially, the processes in the AF are similar to those in the parent projects. The only difference now is the specialization of location and value chain per SCPZ. The implication is that there is no multiplicity of activities as compared with the current Fadama.

Taking cognizance of the impacts of climate change, annual studies will have to be done on soil and water quality which directly impacts on crop production. There shall be adequate effluents and solid wastes monitoring wastes conversion to renewable energy schemes.

Project Location

Unlike the additional existing Fadama - III that is covering the entire 36 states and FCT, the AF will not be national in scope.

Staple Crops Processing Zones (SCPZs) Potential Sites are those with comparative advantage in the following value chains. They are as identified below in the stated states of the federation:

<table>
<thead>
<tr>
<th>Value Chains &amp; Sites</th>
<th></th>
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</thead>
<tbody>
<tr>
<td>a. 4 Value Chains:</td>
<td></td>
</tr>
<tr>
<td>i. Rice</td>
<td></td>
</tr>
<tr>
<td>ii. Cassava</td>
<td></td>
</tr>
<tr>
<td>iii. Sorghum</td>
<td></td>
</tr>
<tr>
<td>iv. Horticulture</td>
<td></td>
</tr>
</tbody>
</table>
13 sites have been designated covering:


Some of these activities related to productive investments could lead to increase in agricultural activities which in turn could bring about the use of pesticides during production, storage, transportation and processing. (purchase of pesticides or spraying equipment) as farmers are finding some ways of improving their harvests. Increase of pesticides uses can be harmful to both the environment and public health. In accordance with the World Bank safeguard policies (OP 4.09 pest management) this pest management plan has been prepared to ensure that future sub projects do not engage in unsafe pest management practices.

The objective of this policy is to promote the use of biological or environmental control methods and reduce reliance on synthetic chemical pesticides and ensures that health and environmental hazards associated with pesticides are minimized. In Bank-financed agricultural operations, pest populations are normally controlled through Integrated Pest Management (IPM) approaches such as biological control, cultural practices, and the development and use of crop varieties that are resistant or tolerant to the pest.

The Bank may finance the purchase of pesticides when their use is justified under an IPM approach and following some criteria concerning selection of pesticides:

(a) They must have negligible adverse human health effects.
(b) They must be shown to be effective against the target species.
(c) They must have minimal effect on non-target species and the natural environment. The methods, timing, and frequency of pesticide application are aimed to minimize damage to natural enemies. Pesticides used in public health programs must be demonstrated to be safe for inhabitants and domestic animals in the treated areas, as well as for personnel applying them.
(d) Their use must take into account the need to prevent the development of resistance in pests.

One of objectives of the pest management is to assess the capacity of the country’s regulatory framework and institutions to promote and support safe, effective, and environmentally sound pest management and to incorporate in the project components to strengthen such capacity.

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
- OP/BP 4.37 Safety of Dams

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 AF Fadama- III programs.

1.3 Rationale for the IPMP

Nigeria has huge endowment of agricultural land and resources, which hitherto was the mainstay 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. However, agricultural activities in Nigeria are still largely subsistence. Requisite infrastructures are lacking leading to huge losses of agricultural produce on – farm, during transportation, processing and storage. Impacts of unpredictable weather as a result of climate change impacts: either flood or drought brings its own attendant challenges with attendant pests’ problems. This might necessitate the use of chemicals, pesticides, preservation or enhancement products that might trigger 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 AF Fadama - III 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 unwholesome/ hazardous 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 SCPZs/ or at the FCA level, 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 the NFCO 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 FADAMA III State. 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 NFCO and PMU 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 Info-Shop along with the ESMF report.
PART 2: PEST MANAGEMENT CONCERNS AND CONTROL MEASURES IN NIGERIA

2.1 Pest and diseases Problems of agriculture in Nigeria

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

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

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” Ipomoeaisarifolia 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” Delariumsenegalense 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 FADAMA III 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:

- 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.
- 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.


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.


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

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

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

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

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

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

The Factories Act 1990

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

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

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

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

- Montreal Protocol
- Bamako Convention on Hazardous Wastes
- Basel Convention on Transboundary Movements of Hazardous Wastes and their Disposal
- Stockholm Convention on Persistent Organic Pollutants (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.
- Trans-boundary movements of hazardous wastes or other wastes can take place only upon prior written notification by the State of export to the competent authorities of the States of import and transit (if appropriate).
- Each shipment of hazardous waste or other waste must be accompanied by a movement document from the point at which a trans-boundary movement begins to the point of disposal. Hazardous waste shipments made without such documents are illegal.
- Outright bans on the export of these wastes to certain countries; however, Trans-boundary movements can take place, if the state of export does not have the capability of managing or disposing of the hazardous waste in an environmentally sound manner.

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

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

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

### 3.3 World Bank 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 experts / 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 intra domiciliary malaria control from the requirement of preparing a pest management plan. In those cases preparation of a hazard assessment would suffice. A hazard assessment identifies risks associated with the transport, storage, handling and use of the pesticides and provides measures to minimize these risks. The policy further provides that the PMP may be limited to pest control product screening when all of the following conditions are met:

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

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

**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 the AF Fadama – III project.

Adverse Environmental Impacts

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

- **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;

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

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

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

Adverse Health Impacts

- 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.

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

- It is also likely to cause skin burns when not wearing protective clothing in pesticide spraying;

- Drinking water sources contamination caused by pesticides spraying adjacent to the resources, or overflow and drain of chemicals adjacent to drinking water resources;

- 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 Fadama farmers across the catchment areas under the additional financing interventions. 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 AF Fadama- III project.
PART 5: INTEGRATED PEST MANAGEMENT PLAN FOR AF Fadama-III PROJECT:

The IPM approaches for AF Fadama - III 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 FADAMA III project. It includes the following detailed measures:

• Use of biological pesticides, such as Bt, Polynacfin, NPV, etc.; and
• 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 larvae and eggs; killing some pest larvae 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
AF Fadama - III will interface with the State ADPs, WAAP project, the agricultural research council and the project management units of the staple crops processing zones which has gained – a lot of experience and success in Nigeria. Therefore, AF FADAMA -III 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, project beneficiaries, agricultural associations/farmers groups 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 and processors partnering with AF Fadama-III Project 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 pest 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 FADAMA III project.**

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 AF Fadama-III farmers

<table>
<thead>
<tr>
<th>Narrative summary</th>
<th>Expected results</th>
<th>Performance indicators</th>
<th>Assumptions/risks</th>
</tr>
</thead>
</table>
| **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 caused 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 AF Fadama-III intervention sites. | | | |
| **Medium-term results/outcomes** | • Farmers in AF Fadama-III catchment areas shall prioritize their pest problems and identify IPM opportunities to mitigate negative environmental and social impacts associated with pesticides.  
• Farmers in AF Fadama-III areas shall adopt ecologically sound options to reduce crop and livestock losses with minimal personal and environmental health risks.  
• AF Fadama-III farmers decision makers will be provided with clearer guidelines enabling them to promote IPM approaches and options in crop production areas.  
• 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>
<thead>
<tr>
<th>Activities</th>
<th>Expected results</th>
<th>Milestones</th>
<th>Performance indicators</th>
<th>Assumptions/risks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Record stakeholders’ overviews on crop and livestock pests.</td>
<td><strong>Result 1:</strong> Members of Agricultural Partnering Associations and other relevant stakeholder groups develop common understanding of key pest problems and agree on corrective action.</td>
<td>• Pest problems diagnosed and related IPM opportunities identified</td>
<td>• Type and nature of participatory methods for problem analysis</td>
<td>Social, economic and political situation remain stable</td>
</tr>
<tr>
<td>2. Conduct field diagnosis to specify pests that undermine crop production, storage and processing in the intervention/catchment areas agriculture</td>
<td></td>
<td>• Potential constraints farmers may face in the use of the technologies specified</td>
<td>• Documented information on the status of pests and natural enemies of pest and pollinators in the catchment areas under additional financing.</td>
<td></td>
</tr>
<tr>
<td>2. Identify farmers’ coping mechanisms and researcher recommended IPM options against the pests.</td>
<td></td>
<td>• Pest lists including quarantine pests and alien invasive species developed.</td>
<td>• Inventory of alien invasive species and quarantine pests</td>
<td></td>
</tr>
<tr>
<td>3. Develop and explain historical profile of pesticide use and other pest control practices in the Fadama catchment areas</td>
<td></td>
<td>• Potential for improving existing pest control practices assessed</td>
<td>• Types and availability of natural enemies for use in biological control of named pest</td>
<td></td>
</tr>
<tr>
<td>5. Specify partnership opportunities at local, national and international levels to assist in the implementation of the PMP</td>
<td></td>
<td>• Pest monitoring schemes for early warning on alien invasive species and migratory pests are organized and functional</td>
<td>• Types and availability of microbial pesticides and botanical pesticides to replace chemical pesticides</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Action plan for location-specific IPM activities developed</td>
<td>• Type and number of crop rotation schemes to reduce build up of named pest species</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• PMP implementation mechanism developed by each cluster of neighboring agricultural partnering association (APA)</td>
<td>• Type of composting and mulching as alternatives to mineral fertilizers</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• List of principal actors and of partners</td>
<td></td>
</tr>
</tbody>
</table>
Table 3 (contd.): Components activities and expected results of the PMP

<table>
<thead>
<tr>
<th>Activities</th>
<th>Expected results</th>
<th>Milestones</th>
<th>Performance indicators</th>
<th>Assumptions/risks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Develop participatory learning modules (PLM) in line with farmers identified training needs</td>
<td>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.</td>
<td>• One IPM orientation workshop organized in year 1&lt;br&gt;• PLM for crop/livestock and pest management practices developed and adapted to suit local needs&lt;br&gt;• 3 sets of 2 week training of trainers courses for 90 extension agents&lt;br&gt;• Farmers and selected potential youth farmers trained through participatory/experiential learning&lt;br&gt;• At least 3 sets of study visits organized for at most 12 technical support staff&lt;br&gt;• 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.&lt;br&gt;• At least 30% of trained farmers undertake participatory extension; and at least 50% farmers adopt new IPM options in targeted crop or livestock&lt;br&gt;• At least 70% of information materials developed is disseminated and used by extension agents and farmers.&lt;br&gt;• Significant reduction in pest damage by at least 30% of baseline data in target crop/livestock</td>
<td>• Type and number of PLMs developed&lt;br&gt;• Type of IPM skills covered in study visits by agric staff&lt;br&gt;• Number of farmers’ learning groups implemented&lt;br&gt;• Gender and number of extension agents and of farmers trained.&lt;br&gt;• Gender and number of trained farmers engaged in participatory extension&lt;br&gt;• Extent to which new knowledge/skills are used by extension agents &amp; farmers to promote adoption of IPM options&lt;br&gt;• Number &amp; type of IPM information materials developed/disseminated&lt;br&gt;• Number and type of new IPM options introduced and adopted.&lt;br&gt;• Gender and number of farmers adopting IPM technologies.&lt;br&gt;• Area of crops under IPM&lt;br&gt;• Incremental benefits due to pest control&lt;br&gt;• Type and number of user-friendly taxonomic keys for pest and natural enemy recognition by farmers</td>
<td>Farmers adopt and apply new improved technologies.&lt;br&gt;APA users and their service providers comply with international conventions guiding pesticide use and MRLs in trade&lt;br&gt;Critical mass of staff trained remain within the APA communities</td>
</tr>
</tbody>
</table>
Table 3 (contd.): Components activities and expected results of the PMP

<table>
<thead>
<tr>
<th>Activities</th>
<th>Expected results</th>
<th>Milestones</th>
<th>Performance indicators</th>
<th>Assumptions/risks</th>
</tr>
</thead>
</table>
| 1. Test and promote botanical alternatives to synthetic pesticides.        | **Result 3**: Harmful pesticide regimes replaced by environmentally friendly alternatives | • 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 communities |
PART 6: IMPLEMENTATION 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 AF Fadama - III 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 FADAMA III 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:

<table>
<thead>
<tr>
<th>Modules</th>
<th>Targets</th>
<th>Responsibility Arrangement</th>
<th>Budget in USD</th>
</tr>
</thead>
<tbody>
<tr>
<td>World Bank OP 4.09 Awareness &amp; IPM orientation</td>
<td>PMUs, Farmer Organizations, Youth Farmers</td>
<td>World Bank Consultant/ES</td>
<td>45000</td>
</tr>
<tr>
<td>Basic OHS( operation, handling and Safety in chemical pest application and Pesticide Spraying Technique</td>
<td>PMUs, Farmer Organizations, Youth farmers</td>
<td>NAFDAC</td>
<td>96000</td>
</tr>
<tr>
<td>Training of Trainers on IPM implementation Process</td>
<td>PMUs, Farmer Organizations</td>
<td>World Bank Consultant/ES</td>
<td>45000</td>
</tr>
<tr>
<td>Radio jingles and handbill on IPM</td>
<td>Farmer organizations, sellers, retailer and users of chemical pesticides</td>
<td>NFCO/PMU</td>
<td>300000</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td><strong>216000</strong></td>
</tr>
</tbody>
</table>

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 SCPZs 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 the NFCO and 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 W.H.O. Names and chemical class of banned chemicals will be brought to public attention through various awareness programs.
- AF Fadama –III project Management units in the respective Staple crops processing zones will ensure that the IPM options (materials, species, equipment, etc) are distributed to farmers early enough for timely implementation.
- There will be engagement of advisors (extension workers, etc) to assist farmers with technical know-how of the IPM in the formative years of operation;
- AF Fadama- III project 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 catchment areas of the staple crops processing zones.

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 Agriculture and Rural Development through the NFCO 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 SCPZs management units (PMUs) 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 banned or hazardous 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 their 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

NFCO responsibilities are to standardize training needs assessment across catchment areas; and organize national workshops to develop participatory learning modules.

PMU 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 Project Management Units 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 project co-coordinating unit (NFCO) 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 AF Fadama- III agriculture support sub-projects.
- To make a final evaluation in order to determine whether the mitigation measures incorporated in the technical designs and the Environment and Social Management Plans (ESMP) 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 Environment and Social Management Plan (ESMP) monitoring and evaluation system for the AF Fadama – III project during project implementation.

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 e.g. magnitude of reduction in product and harvest loss.

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 / varieties 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
Towards the course of the above monitoring indicator, 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 to FADAMA agricultural sub-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 the agricultural programs under the additional financing for the Fadama – III Project.

**Evaluation of Results**

The evaluation of results of IPM in AF Fadama – III agricultural 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 project management Unit in line with their respective agricultural project support. Approximately US$ 732,000 will be required to effectively implement the IPMP over a five-year period (Table 7.1). 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

<table>
<thead>
<tr>
<th>Line item</th>
<th>Yr. 1</th>
<th>Yr. 2</th>
<th>Yr. 3</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Capacity building &amp; Awareness</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IPM orientation workshop</td>
<td>60,000</td>
<td>30,000</td>
<td>0</td>
<td>90,000</td>
</tr>
<tr>
<td>Training of Trainers</td>
<td>90,000</td>
<td>0</td>
<td>0</td>
<td>90,000</td>
</tr>
<tr>
<td>Farmer group training</td>
<td>48,000</td>
<td>48,000</td>
<td>48,000</td>
<td>144,000</td>
</tr>
<tr>
<td>Radio jingles and handbill on IPM</td>
<td>30,000</td>
<td>20,000</td>
<td>10,000</td>
<td>60,000</td>
</tr>
<tr>
<td>Sub-total</td>
<td>228,000</td>
<td>98,000</td>
<td>58,000</td>
<td>384,000</td>
</tr>
<tr>
<td>2. Environmental management</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Equipment; bed nets; improved species</td>
<td>10,000</td>
<td>20,000</td>
<td>10,000</td>
<td>40,000</td>
</tr>
<tr>
<td>Support to IPM research and development</td>
<td>20,000</td>
<td>30,000</td>
<td>20,000</td>
<td>70,000</td>
</tr>
<tr>
<td>Pest/vector surveillance</td>
<td>10,000</td>
<td>10,000</td>
<td>6,000</td>
<td>26,000</td>
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<tr>
<td>Sub-total</td>
<td>40,000</td>
<td>60,000</td>
<td>36,000</td>
<td>136,000</td>
</tr>
<tr>
<td>3. Occupational Health &amp; Safety</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Personal Protective Equipment (Hand gloves, gas mask, safety boot and overall wear)</td>
<td>50,000</td>
<td>30,000</td>
<td>20,000</td>
<td>100,000</td>
</tr>
<tr>
<td>Chemical Neutralizer and first Aid</td>
<td>20,000</td>
<td>20,000</td>
<td>20,000</td>
<td>60,000</td>
</tr>
<tr>
<td>Sub-total</td>
<td>70,000</td>
<td>50,000</td>
<td>40,000</td>
<td>160,000</td>
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<tr>
<td>4. Project management</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IPMP coordination</td>
<td>4,000</td>
<td>4,000</td>
<td>4,000</td>
<td>12,000</td>
</tr>
<tr>
<td>Monitoring and evaluation</td>
<td>10,000</td>
<td>10,000</td>
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<tr>
<td>Sub-total</td>
<td>14,000</td>
<td>14,000</td>
<td>24,000</td>
<td>52,000</td>
</tr>
</tbody>
</table>
| Grand total                                  | 352,000   | 222,000| 158,000| 732,000.00
REFERENCES

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

IPM of the West African Agricultural Productivity Programme (2010)


World Bank Safeguards Policies Basics
ANNEXES

Annex 1: List of banned pesticides

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

a) Insecticides

<table>
<thead>
<tr>
<th>Organochlorines insecticides</th>
<th>Organophosphorus insecticides</th>
<th>Carbamates</th>
<th>Pyrethroids</th>
</tr>
</thead>
<tbody>
<tr>
<td>3. Lindane (Restricted to use on Cocoa only)</td>
<td>3. Chlorpyrifos</td>
<td>3. Propoxur</td>
<td>3. Deltamethrin</td>
</tr>
<tr>
<td></td>
<td>5. Dicrotophos</td>
<td>5. Furathiocarb</td>
<td>5. Permethrin</td>
</tr>
<tr>
<td></td>
<td>7. Monocrotophos</td>
<td></td>
<td>7. Cyfluthrin</td>
</tr>
<tr>
<td></td>
<td>9. Perimiphos – Methyl</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>10. Methion</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>11. Rugby (Cadusofas)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>12. Malathion</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>13. Temeguard (Temephos)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>14. Isazofos</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>15. Parathion – Methyl</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>16. Phoshamidon</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>17. Methidathion</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

b) Herbicides and fungicides

<table>
<thead>
<tr>
<th>Organophosphorus herbicides</th>
<th>Carbamates</th>
<th>Other herbicides</th>
<th>Fungicides</th>
</tr>
</thead>
<tbody>
<tr>
<td>3. Glyphosate</td>
<td>3. Glyphosate Trimesium (Touchdown or Sulosate)</td>
<td>(Nitroheterocyclic</td>
<td></td>
</tr>
<tr>
<td>(Touchdown or Sulosate)</td>
<td></td>
<td></td>
<td>3. Folpet (Phthalimide</td>
</tr>
<tr>
<td>(Acetochlor; Alachlor;</td>
<td>6. Triassulfuran (Amber)</td>
<td>6. Oxadiazon (Ronster)</td>
<td>5. Cyproconazole (Alto</td>
</tr>
<tr>
<td>Propanil; Butachlor;</td>
<td>7. Osethoxydim</td>
<td>(pendimethalin)</td>
<td>100SL)</td>
</tr>
<tr>
<td>Triazines and Triazoles</td>
<td>9. Clomaone</td>
<td></td>
<td>Benzimide</td>
</tr>
<tr>
<td>(Atrazine; Ametyn;</td>
<td>10. Trifluralin</td>
<td></td>
<td>7. Triadmenol (Bayfidon</td>
</tr>
<tr>
<td>Desmetryn; Terbuthalazine;</td>
<td>11. Stamp 500</td>
<td></td>
<td>GR Conzole Fungicide)</td>
</tr>
<tr>
<td>Terbutrex Terbtryne)</td>
<td>(pendimethalin)</td>
<td>12. Fluazifop – P.butil</td>
<td></td>
</tr>
<tr>
<td>Chlorophenoxy herbicides</td>
<td></td>
<td>7. Triadmenol (Bayfidon</td>
<td></td>
</tr>
<tr>
<td>(Prometryn; Simazine; 2,4-D</td>
<td></td>
<td>GR Conzole Fungicide)</td>
<td></td>
</tr>
<tr>
<td>(2,4 Dichlorophenoxy aceticid)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Urea and guadinidines ;</td>
<td></td>
<td>7. Triadmenol (Bayfidon</td>
<td></td>
</tr>
<tr>
<td>(Diuron ; Linurex</td>
<td></td>
<td>GR Conzole Fungicide)</td>
<td></td>
</tr>
<tr>
<td>(=Linuron); Fluometurone;</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chloroxuron; Neburon)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Quaternary nitrogen</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>compounds (paraquat; diquat)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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

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

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

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

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

**Precautions**

**Labeling**

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

**Storage and transportation**

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

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

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

**Distribution**

Distribution should be based on the following guidelines:

- Packaging (original or new packaging) should ensure safety during the distribution and avoid the unauthorized sale or distribution of products intended for vector control;
- The distributor should be informed and made aware of the dangerous nature of the cargo;
- The distributor should complete delivery within the agreed deadlines;
- The distribution system of insecticides and impregnated supports should ensure reduced 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 be 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 hole 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.
Used Containers of pesticides are classified as hazardous or extremely dangerous and 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: Use of PPEs are advocated**
- 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 /warehouses:*
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, sprays form the sprayer must not be directed towards a part of the body. A leaking sprayer must be repaired before use 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 commencement of spraying activities, kitchen utensils should be taken out and all utensils as well as dishes containing drinks and food. They can be gathered in the centre of the room and covered with plastic film. Hammocks and paintings should not be treated. The bottom part of furniture and the side against the wall should be treated while ensuring that surfaces are effectively treated. Sweep or wash the floor after spraying. Occupants should avoid contact with walls.

Clothing and equipment should be washed every day. Avoid spraying organophosphate or carbamate for more than 5 to 6 hours daily and wash hands after each filling. If Fenitrothion is used or old stocks of Malathion are used, operators should monitor and 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 has been excessive exposure to organophosphate insecticide. These dosage tests 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

a. 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

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