YOUTH EMPLOYMENT SUPPORT PROJECT
(A World Bank Funded Program)

Pest Management Plan (PMP)
September 22, 2010

Prepared by:
Serigne Omar Fye, consultant

Ministry of Finance and Economic Development
Secretariat Building
George Street, Freetown
List of Acronyms

**BES**: Block Extension Supervisors

**CARE**

**CPS**: Crop Protection Services

**CRS**: Christian Relief Services

**FPR**: Farmer Participatory Research

**FBOs**: Farmer Based Organizations

**FAO**: Food and Agriculture Organizations

**ISPM**: International Standards for Phytosanitary Measures

**IITA**: International Institute of Tropical Agriculture

**IPPC**: International Plant Protection Convention

**IPM**: Integrated Pest Management

**ISPM**: International Standard for Pest Management

**IPMP**: Integrated Pest Management Plan

**JICA**

**MAFFS**: Ministry of Agriculture Forestry and Food Security

**NaCSA**: National Commission for Social Action.

**MPC**: Mobile Plant Clinics

**PDCU**: Pest and Disease Control Unit

**PL**: Participatory Learning

**PMP**: Pest Management Plan

**PCU**: Phytosanitary Control Unit

**PRA**: Pest Risk Analysis

**SP-IPM**: Systemwide Program–Integrated Pest Management
SLSB : Sierra Leone Standard Bureau
SLARI : Sierra Leone Agricultural Research Institute
YESP : Youth Employment Support Project
ZVA : Zonocerus Variegatis (Variagated Grasshopper)
ANNEXES
Annex 1: List of banned pesticides in Sierra Leone
Annex 2: Documents consulted
Annex 3: Persons met
A PEST MANAGEMENT PLAN FOR THE SIERRA LEONE YOUTH EMPLOYMENT SUPPORT PROJECT.

PART 1: BACKGROUND

AGRICULTURE IN SIERRA LEONE:
Sierra Leone is well endowed with substantial natural resources of croplands, forests, rangelands, freshwater, wetlands (swamps), biodiversity, wildlife, extensive fisheries and mineral resources—diamonds, gold, rutile, bauxite, iron ore, chrome ore etc. These resources have continued to determine the path and pattern of economic growth in the country, depending mainly on how they are being valued, used and managed which in turn depends on the economic policies and institutions in place. It is a truism that the exploitation of these resources during the colonial period and twenty years after Independence from 1961 to 1980 resulted in steady economic development in the country. However, starting from the early 1980s to recent years, the exploitation of these resources has not been effectively managed to the benefit of the country and has contributed very little to reducing poverty and the development of the country. Therefore, the irrational use of the environment and natural resources over the years resulted in environmental degradation and the deterioration in the quality of the natural environment.

CULTIVABLE LAND AREA
Sierra Leone has a land area of approximately 7.2 million hectares (72,000km2). About 5.4 million hectares of this total are cultivable of which about 4.3 million hectares are low fertile arable upland and 1.1 million hectares of more fertile arable swamps (Lands and Water Division, 1999). The agricultural sector which provides employment and exporting earnings in the country relies on land as basic input for crop cultivation, which in turn is affected by how well farmers maintain the soil, water and living resources. The combined effects of poor farming practices such as shifting cultivation, recurrent bushfires and overgrazing, increasing population and ensuing shorting of fallow periods of land have been recorded as contributing factors to soil erosion resulting to land degradation, which is perceived as widespread in Sierra Leone.

Agriculture is the major occupation in Sierra Leone, employing about 70% of the population. Agricultural production is largely in the hands of small scale farmers who produce barely enough for home consumption. Medium to large scale farmers are few and are mainly limited to plantation crop production and contribute to the domestic agro-industry such as coffee, cocoa, kola nut, oil palm and cashew. Cassava cultivation is becoming important for the supply of cassava chips, foofoo, gari, ethanol, etc.

DEVELOPMENT OBJECTIVE OF THE PROJECT
The development objective of the Youth Employment Support Project is to increase access to short term employment opportunities and to improve employability of targeted youth. Component two of the project will provide employability support and business development around agriculture and any other economically viable activity to be demonstrated by market demand. This includes continued support to individuals and youth groups with skills, or those engaged in agricultural production and processing. Some of the short term employment activities in agriculture that the YESP program will offer are Inland Valley Swamp (IVS) rice cultivation, groundnut production, vegetable gardening and horticulture, cassava cultivation, agri-processing and preservation and activities in livestock restocking. There will also be a Youth Agricultural Farm Scheme that will provide support for production centers for young people to receive training for a specific period. The World Bank Policy on pesticide management is triggered under component II because the project activities intends on financing utilizing pesticides and the project agrees to the acquisition of pesticides for increased agricultural production. As the Youth Employment Program is charged with the responsibility of developing programs aimed at creating employment plans at the national level. As the program covers the whole country and with emphasis on agricultural production, the approved PMP will have to be treated in that light to address all potential opportunities. In this regard the project is compelled to prepare a Pest Management Plan (PMP) which attempts to address the Youth Employment Support Project need to monitor and mitigate negative environmental and social impacts of the project and promote ecosystem management in Sierra Leone.

Table 1. Major Crops In Sierra Leone and Associated Pests and Diseases

<table>
<thead>
<tr>
<th>Number</th>
<th>Crop</th>
<th>Pests</th>
<th>Diseases</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>RICE</td>
<td>Weeds, Birds, Rodents, Stem Borers, Rice Bugs, Mole Crickets.</td>
<td>Rice blight, Brown Spot, False Smut, Yellow Mottle</td>
</tr>
<tr>
<td>2</td>
<td>CASSAVA</td>
<td>Cassava Green Mite, Termites, Cassava Mealbug, Grass Hoppers, Rodents, Weeds.</td>
<td>Cassava Mosaic virus, Cassava Bacterial Blight, Cassava Anthracnose Disease,</td>
</tr>
<tr>
<td>3</td>
<td>SWEET POTATO</td>
<td>Sweet Potato Butterfly, Sweet Weevil, Grain Tortine Bettle, Weeds</td>
<td>Sweet Potato Virus, Sweet Potato Scab Disease</td>
</tr>
<tr>
<td>4</td>
<td>GROUNDNUT</td>
<td>Birds, Weeds, Rodents, Termites</td>
<td>Groundnut Chlorotic Rosette Virus</td>
</tr>
<tr>
<td>5</td>
<td>MAIZE</td>
<td>Weeds, Rodents, Birds, Corn Borers, Maize</td>
<td>Maize Streak Virus</td>
</tr>
</tbody>
</table>
### PEST MANAGEMENT CONCERNS:

**IMPACT OF PESTS ON CROP YIELDS:** The prominent position of agriculture in Sierra Leone as in many countries in West Africa implies that any viable and sustainable economic development must be based on agricultural development. In spite of the country's considerable agricultural potential, the performance of the agricultural sector remained low to meet the food supply requirements of the country's growing population, as per capita output continued to decline. One of the major factors identified contributing to low agricultural production and poor quality of export crops is damage caused by insect pests, pathogenic diseases such as the cocoa necrosis virus, swollen shoot virus, and cocoa Blackpod disease Phythophthora palmivora, rodents, and post-harvest losses including poor fermentation and excess moisture. Any significant reduction in these losses would increase domestic food supply and export crop production and improve foreign exchange earning.

**NEW INVASIVE PESTS IDENTIFICATION:** Since 2003, new Fruit fly species have been recorded and identified in West Africa. These pests (Bactrocera invadens and Anastrepha spp) attack a wide range of fruits some of which are extensively grown nation-wide (e.g., mango, guava, papaya, tomato, citrus, banana, cashew, etc.) Fruit flies are a very important group of pests due to their potential to cause damage in fruits and to their potential to restrict access to international markets for plant products that can host fruit flies. The high probability of introduction of these pests associated with a wide range of hosts’ results in restrictions imposed by many importing countries to accept fruits from countries in which these pests are established. Surveys conducted since 2007 indicate the

<table>
<thead>
<tr>
<th>Plant</th>
<th>Pests</th>
<th>Diseases</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>TOMATO</td>
<td>Weeds, Tomato Fruit Borer, Enimatodes</td>
</tr>
<tr>
<td>7</td>
<td>ONIONS</td>
<td>Weeds, Grass Hoppers</td>
</tr>
<tr>
<td>8</td>
<td>PEPPER</td>
<td>Weeds, Birds</td>
</tr>
<tr>
<td>9</td>
<td>CACAO</td>
<td>Weeds, Rodents</td>
</tr>
<tr>
<td>10</td>
<td>COFFEE</td>
<td>Rodents, Weeds</td>
</tr>
<tr>
<td>11</td>
<td>OIL PALM</td>
<td>Rodents, Weeds, Birds</td>
</tr>
</tbody>
</table>
widespread of Fruit flies attacking a wide variety of crops across Sierra Leone. As fruits and vegetables production are an important economic activity in most parts of Sierra Leone and very good examples where Integrated Pest Management (IPM) can reduce farmers dependence on harmful pesticide regimes and increase income earning opportunities. As in most African countries, farmers in Sierra Leone respond to pest infestations in the crops by heavy application of pesticides which threaten environmental quality and pose risks to human and livestock health. Unfortunately most of the Sierra Leonean farmers do not have the requisite training and/or knowledge on pesticide use and as such overuse and misuse becomes very common and in the absence other viable pest control options. The weak institutional capacities and lack of enforcement allows farmers to continue to create these problems. These poor methods continue to be a great challenge to the Sierra Leonean authorities as it undermines national economic growth through farmers non-compliance with trade barriers on pesticide residues in export produce, MIGRATORY PESTS (Zonocerus variegatus): Sierra Leone suffers from the attack of the variegated grasshopper Zonocerus variegatus each year, From the end of the rainy season October-December throughout the dry season (April/May) each year, the variegated grasshopper (Zonocerus variegatus) destroys cassava and many other food, cash crops including Citrus, banana, plantain and vegetables across the country. The damage to cassava alone undermines agricultural productivity by causing significant loss of leaves (food), stems (planting material) and storage root (food). The damage causes significant short falls in availability of planting materials of improved cassava varieties. By end of October to early November, the 2010/11 infestations of the pest will start invading farmers fields. The reoccurrence of losses incurred in the previous years needs to be prevented. Over the years, farmers in Sierra Leone have tried many different kinds of insecticides against the grasshopper but found out that the practice is ineffective. The over-reliance on inappropriate synthetic chemical insecticides contaminates the farm and are hazardous to applicators, farmers, farm workers and farm families, livestock, fish, wild life and the environment. The practice of cultural controls against the pest is also ineffective and farmers now look for sustainable alternatives.

A research for development response is available from the International Institute of Tropical Agriculture (IITA) which has developed a fungus-based bio-pesticide as an effective biological agent against the grasshopper. The product is based on a fungal pathogen called Metarhizium anisopliae, a strain of which specifically kills the variegated grasshopper (ZVA). The product is mass produced on demand by IITA. The bio-pesticide has been field tested with excellent results in many countries in West Africa, In 2006 Care International Sierra Leone in collaboration with IITA and the Crop Protection Service of MAFFS field tested the bio-pesticide against the grasshoppers in Sierra Leone
with excellent results. It is with this background that a proposal has been prepared to build and strengthen national capacity in biological control technology and skills required by farmers to decisively control this migratory pest in cassava fields with spill over benefit to many other crops attacked by the pest.

**TABLE 2: SOME MAJOR PESTS AND DISEASES OF VEGETABLES AND OTHER CROPS IN SIERRA LEONE AND THEIR CONTROL METHODS**

<table>
<thead>
<tr>
<th>NO</th>
<th>CROP</th>
<th>PEST</th>
<th>DISEASE</th>
<th>CONTROL</th>
</tr>
</thead>
</table>
| 1  | *Oryzae sitiva* | Weeds, birds, rodents, stem borers, rice bugs, mole crickets | Rice blast- *Agriculmoria oryzae*  
Brown Spot- *Helminthospaori*  
False smut- *Ustilaginoidea versus* and yellow mottle- *Sesselia pacilla* | Use resistant varieties, cultural methods  
Use Resistant varieties and cultural methods  
The same as above |
| 2  | Manihot esculent | Rodents, weeds, termites, white flies, grass hoppers, cassava red and green mites, cassava mealy bug- *Hemiptera pseudoccidae* | Cassava mosaic virus- *Bemiisia tabaci* cassava bacterial blight, cassava  
Anthracose- *Glomerelle cingulata*, Tuber rot, cassava soft root knot- | Plant resistant varieties and apply biological methods |
| 3  | Ipomoea batatas | Sweet potato weevil, green Tortine beetle, sweet potato butterfly | Sweet potato virus disease | Use Resistant varieties, Quarantine measures and disease free planting materials |
| 4  | Arachis hypogae | Birds, weeds, rodents | Groundnut Chlorotic rosette virus | Setting of traps, hand weeding and use herbicides against weeds, Plant resistant varieties |
| 5  | Discorea spp | Weeds, rodents | Mosaic disease in white yams | Select disease free planting materials |
| 6  | Zea mays     | Birds, Rodents |                           | Set traps against and Scare birds     |
| 7  | Capsicum spp | Termites, Aphids, Birds | Pepper veinal mottle virus, Bacterial wilt- Pseudononas solanacerearum | Cultural Practices, select tolerant varieties |
| 8  | Lycopersicon esculentus | Tomato fruit borers, birds, nematodes | Tomato blight- Alternaria solani, Damping-off – Thamaephoros cucumeris | Monitoring, Cultural practices, Chemical use |
| 9  | Solanum melongena | Shoot and fruit borers, hairy caterpillars |                           | Farm Sanitation, Crop Rotation and the use of Chemicals |
| 10 | Abelmsuchus esculentus | Flea Beetle, Spiny boll worm, Cotton Stainer bug, |                           | Crop Rotation, Farm Sanitation, Resistant varieties |
| 11 | Arassica overacea | Diamond Black moth, Leaf worm, Yellowish Caterpillars, Crickets |                           | Cultural, use of Chemicals and Farm Sanitation |
| 12 | Allium cepa | Termites, Crickets, grasshoppers, | Anthracose-Glomerella cingulata, Pink rot-Pyrenochaeta terrstris Root knot-Meloidodyne | Cultural Methods, Farm Sanitation, Deep Ploughing, crop Rotation and the use of Chemicals |
| 13 | Theobroma | Rodents, Weeds | Cocoa black pod disease, Swollen Shoot Virus- | Use Resistant varieties, and Cultural Practices |
| 15 | Elaesis guineensis | Birds, weeds, Rodents | Leaf Spot, Fruit Rot | Embark on early harvesting |
| 16 | Cocos nucifera | Rodent |                           | Cultural, Chemical |
| 17 | *Daucus carota*<sub>e</sub>  
    *Daucus carota*<sub>e</sub> | Rodents | Cultural, Chemicals |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>18</td>
<td><em>Anacardium excelsum</em></td>
<td>Birds, rodents</td>
<td>Set traps or Cultural practices</td>
</tr>
</tbody>
</table>
| 19 | *Mangefera indica* | Mango mealy bug-  
    *Rastocous manihot*  
    Fruitfly-  
    *Bactrocera invadens* | Biological or Cultural practices |
| 20 | *Cola nitida* | Birds, Rodents, | Set traps or Cultural practices |
| 21 | *Cariba papaya* | Birds, Rodents,  
    Fruit Fly-  
    *Bactrocera invadens* | Cultural Practices |

Based on the above and to help the Youth Employment Project and the farming population solve their pest problems, the project intends on designing a pest management plan geared towards capacity building of youth and farmer groups in the area of pest control. This will be an integral part of each crop targeted based on integrated pest and ecosystem management. The approach combines different management strategies and practices to grow healthy crops and minimize the use of pesticides. The Food and Agricultural Organization (FAO) promotes integrated pest management as the preferred approach to crop protection and regards it as a pillar of both sustainable intensification of crop production and pesticide risk reduction. The Youth Employment and Support Project will collaborate with the Crop Protection Services in the Ministry of Agriculture to implement the Plan.

**PEST MANAGEMENT AND CONTROL.**

In Sierra Leone, the Crop Protection Services in the Ministry of Agriculture is responsible for pest and phytosanitary control for the whole country. Despite the very weak institutional and human resources capacity, it continues to make efforts to control diseases, train farmers and enhance the awareness of the farmer groups country wide through Mobile Plant Clinics. Mobile plant health clinics are places where farmers are given information on what is wrong with their plants and what they need to do to solve them. The clinics operate in places close to where farmers work, live or visit regularly. The guiding principle is to reduce pesticide use as much as possible while recognizing farmers needs for pragmatic advice and guidance. Farmers need to also see positive progress and results in improving yields, reducing losses, and expanding markets. The clinics are also designed to help farmers understand and share information on problems affecting their crops and what to do to resolve those problems.
**Pest Control.** The Pest and Disease Control Unit of the Crop Protection Service deals with extension activities such as pest surveillance and provides guidance to farmers on IPM principles. The unit has offices and staff in all 14 Agricultural Districts working with the farming community in collaboration with the general extension services of the MAFFS' Smallholder Commercialization Programme, Mattru Oil palm Project, NERICA, SLARI, IITA-UPoCA, FAO-Seed Multiplication Project, and NGOs such as CARE, CRS, JICA, ActionAid, etc with crop production components. The Unit has the responsibility to ensure that farmers are educated and trained in effective control of diseases and pests that affect their crops in the field. The Unit is also responsible to train farmers and produce collectors and private produce buyers in best practices of fermentation and drying and moisture control, rodent control and reduction of post-harvest losses.

**Phytosanitary Control.** The Phytosanitary Control Unit deals with plant quarantine measures such as phytosanitary inspections, treatments and certification of plants and plant products for export and conform to the requirements of the International Plant Protection Convention (IPPC) and the WTO-SPS agreement. The Unit maintains presence at (i) the Lungi International Airport, (ii) the Queen Elizabeth II Quay, (iii) Kambia, (iv) Jendema (MRU), Buedu and Koindu in the Kailahun district border points of entry. These teams provide some level of quarantine measures to these border points with very limited technical and administrative support such as logistics including, office supplies, basic inspection and testing equipment, transportation, and in-service training. The lack of institutional and human resource capacity, training of Phytosanitary Inspectors and adequate inspection facilities severely limits the country’s ability to comply with the inspections and certification requirements of its trading partners and international phytosanitary obligations under the WTO-SPS Agreement.

Based on several years of experience before the civil war and within the Africa Region, what the Government of Sierra Leone needs are clearly recommended in Annex 2 of the report which are based on research and development within Regional Organizations in West Africa and other countries with similar climates and farming practices. The country also desperately needs a comprehensive pest management program to contain invasive pests as well as migratory pests. A supporting plant inspection laboratory could play an important role in providing some diagnostic and other technical support to the national crop protection service. A pest risk analysis (PRA) cannot be conducted in the absence of a national pest surveillance data. Therefore a pest surveillance system needs to be established to upgrade the current activities of the Crop Protection Services. There is therefore a need to train Crop protection personnel in PRA and modern phytosanitary procedures including International Standards for Phytosanitary Measures (ISPM). These standards govern international trade in agricultural commodities. There is also a greater need to bring awareness to other regulatory agencies such as Customs Department, Port Health, Airport and Seaport Authorities, Airline Operators, Clearing and Forwarding Agencies, the Sierra Leone Police Force, Trade and Industry representatives and the Sierra Leone Standards Bureau, at policy making as well as at operational level for adequate and effective Phytosanitary control system. Compliance with
WTO–SPS Agreements constitutes basic requirements for countries seeking increased market access for agricultural products in the international trading system. Sierra Leone currently lacks SPS systems which are needed to optimize participation both in the global market as well as within the sub-region for agricultural products.

**PART 2 PLANT HEALTH CLINIC FOR IMPLEMENTATION OF THE PEST MANAGEMENT PLAN FOR THE YOUTH EMPLOYMENT AND SUPPORT PROJECT.**

The overall goal of this PMP is to reduce the risk of livelihoods damage due to adverse effects of local or transboundary emergency pest problems in a sustainable manner in the country. This plan is a pest management system that systematically uses all available techniques to keep pest pressure below levels which can cause economic damage. This plan is to address the concerns relating to the risks associated with potential increases in the use of pesticides for agricultural production, discourage the development of pests’ populations and keep pesticides and other intervention to levels that are economically justified, and to strengthen national capacities to implement control measures to minimize the risks to human health and the environment. The plan also provides an information basis for the beneficiary groups to establish functional mechanisms enabling youth, women and farmer groups to identify, understand and manage pest and vector problems in the development of agriculture within the framework of this project as well as with all farmers.

The PMP also reduces personal and environmental health risks associated with pesticide use, and protect beneficial biodiversity such as natural enemies of pests and pollinators in the farmers’ efforts to increase productivity. The PMP raises the need for the beneficiary groups and farmers generally to understand and respond to the external IPM environment affecting their livelihoods. For example, quarantine pests, alien invasive species and stringent minimum pesticide residue levels limit the potential for farmers to benefit from international trade opportunities. Collaborative linkages between the project, the efforts of the Crop Protection Services in the Ministry of Agriculture and international IPM groups will help to bring relevant expertise and supporting IPM resources developed elsewhere to strengthen national and local capacity to address pest problems faced by farmers in Sierra Leone. Such a mechanism will also develop a national IPM policy to encourage national and local compliance with international conventions and guidelines on pesticides, and to further develop IPM.

**PLANT HEALTH CLINICS** Preventing the spread of pests saves crops and reduces the need to use pesticides. This is achieved through the introduction of plant health clinic system. Pest information is disseminated through the Farmer Based Organisations (FBOs) wherein farmers and extensionists are trained in the integrated production of various crops. There are currently 11 plant clinics established Sierra Leone with 55 satellite clinics nation-wide run by plant doctors. The clinic system was introduced to minimize the use of pesticides, introduce sustainable and environmentally sound agricultural practices that reduce health and environmental risks associated with the use of pesticides. For this reason, three activities areas were envisaged:

1. Plant health partnerships and clinics
   1. Identify potential plant doctors/partners
2. Develop plant doctor training manuals
3. Training of trainers/youths/women/farmers

ii. Advice delivery to smallholders through plant clinics
4. Collate advice options for crops in area of clinics
5. Review and participatory validation of advice
6. Set up clinic locations
7. Run clinics
8. Organise monthly meetings of plant doctors and experts to review, share/experience

iii. Early warning and rapid response systems established
9. Establish national database of plant clinics
10. Establish workflow for maintaining database with data from clinics
11. Analysis of plant clinic data
12. Disseminate regular summary reports on data to partners
13. Set up surveillance/response teams
14. Undertake surveillance in response to clinic data

**Purpose of the Plant Clinics.** As the Health Plant Clinics are the designated institutions responsible for the implementation of the PMP, it is important to know a bit about such clinics. They are places where farmers are given information on what is wrong with their plants and what to do to solve them. The guiding principle is to reduce pesticide use as much as possible while recognizing that farmers need pragmatic advice. The clinics also gather information about new pest and diseases and share them with the farmers. The operators of such clinics are front line extension workers called plant doctors.

After the initial pilot program of plant clinics in Makeni in 2007, evaluation results indicate success and the program was expanded nation wide for all Sierra Leonean farmers to benefit. The clinics have now been introduced in eleven of the 14 Districts of Sierra Leone. To reach large number of farmers, plans have been made to establish one clinic at every agricultural block in a district. While it is outside the scope of this project to build the national capacity, each agriculture and pest related project funded by the Bank and other donors, make a concerted effort to help build the requisite institutional and human resources capacity to reach the national goal of covering every block in all fourteen districts.

**PART 3 IMPLEMENTATION STRATEGY** Successful IPMP is based on sound community knowledge of the on-going agro-ecological processes of the farming environment. Youths, women and farmers are therefore technically empowered to make informed decisions on the most appropriate
management strategies to apply at the specific period of the crop development and production cycle. Currently, there are 142 both technically and extension staff attached to CPS distributed nationwide. Pest management activities of each of the 13 districts are coordinated by a Technical staff based at the district headquarters who work in collaboration with the District Agricultural officer and the District Council authority. Although most of the districts Crop Protection Officers have received training in Integrated Pest Management, some are very close to retirement from the service and therefore the need to recruit and train more staff for future replacements.

The lack of human resources capacity particularly after the war led to drastic reduction of extension workers commonly known as plant doctors. These front line extension workers have been given further training in Integrated Production and Pest Management to work as plant doctors in addition to their existing jobs. Through collaboration in the field of plant protection, plant doctors are trained to conduct interviews, diagnose plant disease, carry out pest risk analysis and surveillance, pesticide use and management, collect samples, formulate Green muscle and train on pesticide application procedures as well as spray maintenance following application. They are also trained on field evaluation, recording and making follow ups and training of farmers in new technologies in pest control. These training courses help plant doctors acquire the skills and confidence to help farmers solve their pest problems. For long term success and sustainability, extension staff are usually posted to operate within their blocks while plant doctors provide a ready means for routine and systematic surveillance of pests.

The reason why the availability of this capacity is deemed important and necessary is that in the absence of such a service, 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 definitely so in most parts of Sierra Leone. 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. Approaches that have so far been applied are training modules which includes (i) interview techniques, (ii) plant disease and diagnostic, (iii) pest risk analysis and surveillance, (iv) pesticide use and management (v) collecting samples, (vi) formulation of Green muscle, (vii) pesticide application procedure (viii) sprayer maintenance following application, (ix) field evaluation, (x) recording and making follow ups (xi) training of farmers on the lasts technologies in pest control . These training courses have helped both farmers and plant doctors acquire the skills and confidence to help solve pest problems.

If Sierra Leone is to effectively apply integrated pest management as spelt out in this and other PMPs, there is the need for youth and women groups as well as 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 and other kinds of interventions. Through the participatory approaches the Youth Employment Support Project will build local capacity to ensure rapid spread and adoption of ecologically sound and environmentally friendly management practices in all 14 districts. The best way forward is to strengthen the services of the Crop Protection Unit by building the institutional and human resources capacity and assigning them the responsibility and mandate to implement the project’s PMP. The beneficiary groups 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 all beneficiary groups to develop a shared vision on felt needs and IPM strategies. Through informal interviews, field visits, and planning
meetings, such 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 Crop Protection level with field action by youth and farmer groups which will receive training and advisory services from Extension Staff, Plant Doctors, Crop Protection experts and service providers who have been trained either within this project or in earlier agricultural programs. Training at all levels will be based on participatory learning modules for capacity building in IPM information delivery.

The main responsibilities of the staff to be trained include:

- Compiling regular monthly reports on status of crop production, incidence of pests and diseases;
- Storage and distribution of pesticides to farmers;
- Training farmers on pesticide application methods and the safe and effective use of pesticides;
- Diagnostic analysis of crop pests’ problems;
- Advising farmers on IPM Systems;
- Surveillance, setting up of pheromone traps and monitoring.

TRAINING OF TRAINERS

An initial training of trainers course (2 x 25 participants each lasting two weeks will be conducted during the cropping season at the Makali Agricultural Training Centre to provide field practical exposure to participants to modern concept and methods of IPM.

TRAINING OF BENEFICIARY GROUPS IN PESTICIDE MANAGEMENT

This second phase of training will involve youth, women and farmer groups of the Youth Employment and Support Project. These second sets of trainings will be location-based to involve all beneficiary groups to be conducted at district/block level by graduates from the ToT course to rapidly introduce IPM concepts and practices to project beneficiaries. Two groups of 30 beneficiary farmers, youth and women farmers will be trained national wide; starting from year 1 of the project cycle, The output of such trainings will be an estimated 500 farmers per year, and 1500 trained farmers at the end of year 3. The groups will be trained in:

i. making decisions to use pesticides
ii. transport, storage, handling and distribution of pesticides
iii. safe application of pesticides
iv. risks involved in handling and using pesticides
v. managing risks and pesticide poisoning
vi. use of protective gear, spray equipment and maintenance
vii. public awareness campaign on safe use of pesticides

TRAINING OF YOUTH GROUPS

Groups of 50 youths will be trained in each of the 13 districts in pesticide management, spraying, surveillance and monitoring, preparing and setting up of Fruit fly pheromone traps, and dissemination of pesticide safety information. Following training, surveillance teams involving these youth groups will be set in each district agricultural block to conduct regular surveys and monitor pheromone traps. The groups will be supervised by Block Extension Supervisors (BES) of MAFFS who will collate data for analysis.

COORDINATION: ESTABLISHMENT OF IPM COMMITTEES: For effective operations, supervision and monitoring, IPM Committees would be established in each of the 14 districts. The PMP will be coordinated by Crop Protection Service (CPS), MAFFS. In each District, the project will have a local oversight committee comprising community leaders who will play a pivotal role in planning and implementation of location-specific interventions in order to strengthen local ownership and sustainability of the activities. The PMP coordinator at CPS will liaise with this oversight committee for the project to identify, select and reach suitable activity locations, beneficiaries and beneficiary groups in the communities in each District. The Coordinator will also liaise with other project actors and partners to standardize technical resources, activity implementation methodologies, tools, and protocols, promote exchange of information, and extrapolation of results. The Coordinator will liaise with IITA to assure timely delivery of material and technical resources, verify reports of persisting pest problems, assess emerging needs, monitor and assess performance of interventions and organize mentored-study visits to IITA’s Biological Control Centre for Africa in Cotonou, Republic of Benin. Other study tours could also be made in some other countries in West Africa to learn more from their experience in their successful control of migratory pests.

Project actors are those agencies that are assigned the responsibility of implementing the project like the Youth Secretariat and the National Commission for Social Action (NaCSA) while Project partners are those responsible for the implementation of the project components like the Crop Protection Unit for the PMP, The NGOs, Youth Groups and EPA.
BENEFICIARY GROUPS:

Increased technical capacity within farming communities will be assured through interaction between project actors and partners. Small-scale farmers will benefit from increased crop productivity in a production environment with minimum insecticide use. The institutional support base of THE Crop Protection Services (CPS) will be greatly enhanced through their collaborative linkages with IITA and other related NGOs to address many other food production problems in Sierra Leone.

Sierra Leone is presently experiencing difficulties in implementing those regional standards due to the absence of technical and enforcement instruments. In view of these constraints and deficiencies, the crop protection services as the agency responsible to implement this project’s PMP will use this as an opportunity to start creating an effective crop protection system which would improve quality agricultural production and minimize trade barriers. In the absence of an immediate intervention, Sierra Leone will continue to experience significant direct losses of export earnings as a result of lack of phytosanitary capacity, certification constraints and constant threats of introduction of exotic pests.

MONITORING AND EVALUATION

Successful implementation of this PMP requires regular monitoring and evaluation of activities undertaken by Crop Protection Services and the Producers. The main objective of the monitoring and evaluation exercise is to assess the institutional and human resources capacity built by the project at both the implementing agency level as well as at the producer level and the extent to which IPM techniques are being adopted and the economic benefits that beneficiary groups derive from it.

MONITORABLE INDICATORS

Capacity Assessment: Number of youth, women and farmers who successfully received IPM training in IPM methods, evaluate the training content, methodology and trainee response to training through feedback; rate of adoption of IPM practices.

Major benefits that members of the Youth Employment Support Project derived from adopting IPM:

Social Benefits:

reduced risk to pesticide exposure and improvement in the health status of farmers;

Increased knowledge of the IPM approach;

Economic benefits:

Increased productivity due to the adoption of IPM practices;
reduced use of pesticides and increased earnings.

Improved use, storage and handling of pesticides for crop production.

SUSTAINABILITY OF PROCESSES AND RESULTS

- Short-term technical study visits (to other West African countries with proven experience in IPM development and implementation) for hands-on laboratory and field training, and farmer participatory learning will help to create favourable conditions for continuity of IPM processes and results. The tour will involve the Crop Protection Unit in the Ministry of Agriculture and the National Commission for Social Action as well as the Youth Secretariat and National Youth Commission which are the implementing agencies for the project.

- Scientific information, adapted into user-friendly format will strengthen training and extension delivery, and increase IPM literacy in project areas. Strategic alliances with international IPM groups will strengthen national capacities to integrate new IPM options in crop and livestock production. Farmer-educational activities will be central to the exit strategy which will feature increased roles and responsibilities of committed national and local communities to take primary responsibilities in the development of action plans and expertise exchange for IPM development and promotion.

- To support these gains, the Youth Project will seek the assistance of FAO Regional Crop Protection office, FAORAFA Accra and the Global IPM Facility to develop/update a national IPM policy including national legislations governing the manufacture, importation, distribution and use of banned pesticides.

- Additionally a national IPM advisory and oversight committee (multi-stakeholder composition) will be established to promote national and local compliance with international conventions and guidelines on pesticides, and encourage the further development of IPM.
PART 4 WORK PROGRAM AND BUDGET

The National Commission for Social Action together with the Youth Secretariat will in collaboration with the Crop Protection Services as the implementer of the PMP develop a work plan and an implementation budget.

For such a small size project with a small agricultural sub component over a three a year period, it is estimated that the cost of implementing the PMP over the life of the project will be approximately 513000 US Dollars. This is so because the Crop Protection Unit is extremely weak and is only able to carry out the work with assistance and adequate funding from the project.

**TABLE 4 Work Program and Budget Estimate**

<table>
<thead>
<tr>
<th>ADVISORY SERVICES</th>
<th>YEAR ONE</th>
<th>YEAR TWO</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>PEST VECTOR SURVEILLANCE;</td>
<td>5000</td>
<td>5000</td>
<td>10000</td>
</tr>
<tr>
<td>SENTISIZATION/AWARENESS BUILDING PROGRAM;</td>
<td>5000</td>
<td>5000</td>
<td>10000</td>
</tr>
<tr>
<td>IPM PROBLEM DIAGNOSIS;</td>
<td>10000</td>
<td>10000</td>
<td>20000</td>
</tr>
<tr>
<td>IPM Materials;</td>
<td>11000</td>
<td>12000</td>
<td>23000</td>
</tr>
<tr>
<td><strong>CAPACITY BUILDING</strong></td>
<td><strong>YEAR ONE</strong></td>
<td><strong>YEAR TWO</strong></td>
<td><strong>TOTAL</strong></td>
</tr>
<tr>
<td>IPM WORKSHOP;</td>
<td>40000</td>
<td>20000</td>
<td>60000</td>
</tr>
<tr>
<td>TRAINING OF TRAINERS;</td>
<td>30000</td>
<td>0</td>
<td>30000</td>
</tr>
<tr>
<td>BENEFICIARY TRAINING;</td>
<td>50000</td>
<td>50000</td>
<td>100000</td>
</tr>
<tr>
<td>STUDY TOURS TO WEST AFRICA;</td>
<td>10000</td>
<td>10000</td>
<td>20000</td>
</tr>
<tr>
<td><strong>SUB TOTAL 63000</strong></td>
<td><strong>SUB TOTAL 230000</strong></td>
<td><strong>SUB TOTAL 230000</strong></td>
<td><strong>SUB TOTAL 230000</strong></td>
</tr>
</tbody>
</table>
### Summary of Recommendations

Collaborative linkages between the Ministry of Agriculture the Crop Protection Unit and international IPM groups is the source that leads to these recommendations as such collaboration will help to bring relevant expertise and supporting IPM resources developed elsewhere to strength national and local capacity to address pest problems envisaged to hamper this project in particular and agricultural production in Sierra Leone in general.

**Recommended actions.** Diagnose pest problems affecting agricultural crop and livestock production as the basis for project beneficiaries and farmers generally to develop a shared vision on priority needs and IPM opportunities.

Develop the capacity of farmers and youth groups in all the four Regions of Sierra Leone to understand and manage pest problems through farmer participatory learning approaches with complementary participatory research on feedback issues emanating from farmers’ field experiences:

<table>
<thead>
<tr>
<th></th>
<th>YEAR ONE</th>
<th>YEAR TWO</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>PMP Coordination</td>
<td>10000</td>
<td>10000</td>
<td>20000</td>
</tr>
<tr>
<td>MONITORING AND EVALUATION</td>
<td>15000</td>
<td>15000</td>
<td>30000</td>
</tr>
<tr>
<td>Equipment</td>
<td></td>
<td></td>
<td>SUB TOTAL 50000</td>
</tr>
<tr>
<td>TWO PICK UP TRUCKS FOR PMP IMPLEMENTATION and Monitoring BY CPS; CHEMICALS; RESEARCH AND DEVELOPMENT</td>
<td>100000</td>
<td>15000</td>
<td>115000</td>
</tr>
<tr>
<td></td>
<td>10000</td>
<td>5000</td>
<td>15000</td>
</tr>
<tr>
<td></td>
<td>20000</td>
<td>20000</td>
<td>40000</td>
</tr>
<tr>
<td>GRAND TOTAL</td>
<td></td>
<td></td>
<td>SUB TOTAL 170000</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>US$ 513000</td>
</tr>
</tbody>
</table>
Introduce and promote microbial pesticides and botanicals as alternatives to harmful pesticide regimes and thereby reduce environmental and personal health risks in agriculture; *With partnership inputs from the SP-IPM for sustainable access to microbial pesticides.*

Establish biodiversity monitoring schemes for early warning on changes in pest and vector status, natural enemy complexes, pollinators, and detect migratory pests and introduction of alien invasive species; with partnership inputs from the Crop Protection Services of the Ministry of Agriculture as the lead agency to champion this important effort.

Develop a national IPM policy including national legislations governing the manufacture, registration, importation, distribution and use of pesticides in order to promote compliance with the World Bank’s safeguard Policies, OP 409 and BP 401, and other international conventions and guidelines on pesticide use.

**Budget**

USD $130,000 will be required to effectively implement the proposed activities over three years. The budget is distributed for capacity building for pest control management and control, for equipment and the remainder for direct PMP management.

**ANNEX 1 LIST OF PESTICIDES BANNED IN SIERRA LEONE**

**LIST OF BANNED PESTICIDES**

1) Aldrin
2) Chlordone
3) Dieldrin
4) Endrin
5) Heptachlor
6) Hexachloro-benzene (HCB)
7) Mirex
8) Toxaphene
9) DDT

10) Polychlorinated biphenyls PCBS

11) Dioxins (PCDDS)

12) Furans (PCDFs)

Annex 2. References

The PMP development methodology and documents consulted

This Pest Management Plan (PMP) was prepared by reviewing and updating an existing PMP, holding discussion with staff of the Crop Protection Unit, The Permanent Secretary Ministry of Agriculture in Freetown and the Junior Minister Agriculture also in Freetown and by consulting a number of related documents. The contributions of the national expert listed below is highly recognized particularly staff of the Crop Protection Unit:

The following documents were consulted:

The PMP for the Gambia Growth and Competitiveness Project September 2009 by Ebrahima Secka;

The PMP for the FADAMA Project Phase II;

Health Plant for Healthy People by the Crop Protection Unit, Sierra Leone;

Government of Sierra Leone Crop Protection Service, Phytosanitary Control, Crop Protection Service Revised Legislation, November 2009;

Policy Guidelines for Integrated Vector Management by the Crop Protection Unit, Ministry of Agriculture, Sierra Leone;

Country Environment Profile, Sierra Leone, by Leslie Blinker, July 2006,
Integrated Pest Management, by the Crop Protection Unit;


**ANNEX 3 : PERSONS MET DURING THE MISSION.**

Dr. Ibrahim M.O. Shamie, Head Crop Protection Unit, Ministry of Agriculture, Sierra Leone;

Dr. William L. Farmer, Director of Surveys and Lands Division;

Raymond Johnson, Institute of Marine Biology and Oceanography, University of Sierra Leone; Dr. Ernest Ndomahina, Institute of Marine Biology and Oceanography, University of Sierra Leone;

Dr. William Konteh, Sr. Director of Programs, National Commission for Social Action;

Stephen Jusu, Ag. Executive Director Sierra Leone Environmental Protection Agency;

James Spencer Deputy Director Crop Protection Services, Ministry of Agriculture Sierra Leone;

Momodou A. Bah, Ag. Deputy Executive Director in charge of EIAs, Sierra Leone Environmental Protection Agency;