E4622 V2

MINISTÉRIO DO TURISMO

Pest Management Plan

Draft Report

MOZAMBIQUE CONSERVATION AREAS FOR BIODIVERSITY AND SUSTAINABLE DEVELOPMENT (MOZBIO) PROJECT

Prepared by: Madalena Dray

July 2014

List of Abbreviations

ANAC	National Conservation Areas Administration
BioFund	Biodiversity Fund
CA	Conservation Area
CAADP	Comprehensive African Agriculture Development Programme
CABI	Not-for-profit inter-governmental organization based in the United Kingdom
CBSV	Cassava Brown Streak Virus
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
CMD	Cassava Mosaic disease
DANIDA	Danish International Development Agency
DNEA	National Directorate of Agrarian Extension *(DNEA - Direcção Nacional de Extensão Agrária)*
DNSA	National Directorate for Agrarian Services *(DNSA - Direcção Nacional de Serviços Agrários)*
DPA	Provincial Directorates of Agriculture (*Direcção Provincial de Agricultura)*
FAO	United Nations Food & Agricultural Organization
GDP	Gross Domestic Product
GEF	Global Environmental Fund
GOM	Government of Mozambique
IFAD	International Fund for Agriculture Development
IIAM	Agricultural Research Institute of Mozambique (*IIAM - Instituto de Investigação Agrária de Moçambique)*
INNOQ	National Institute for Standardization and Quality
IPM	Integrated Pest Management
JMPM	Joint Meeting on Pesticide Management
M&E	Monitoring & Evaluation
MICOA	Ministry for Coordination of Environmental Affairs
MINAGRI	Ministry of Agriculture
MISAU	Ministry of Health
PARP	Poverty Reduction Action Plan
PEDSA	Strategic Plan for Agricultural Development
PMP	Pest Management Plan
REDD	Reducing Emissions from Deforestation and Forest Degradation in Developing Countries
SDAE	District Services for Economic Activities
SDAE	District Services for Economic Activities
TFCA	Tansfrontier Conservation Area
TFCAPISP	Transfrontier Conservation Areas Pilot and Institutional Strengthening project
USAID	US Agency for International Development
WHO	World Health Organization

PROJECTO MOZBIO
MOÇAMBIQUE

Quadro de Gestão de Pragas

(QGP)

Sumário Executivo

Introdução

O Governo de Moçambique, através do Ministério do Turismo (MITUR) tem vindo a implementar o Programa de Áreas de Conservação Transfronteiriça (ACTF) tendo como objectivos de longo prazo a conservação da biodiversidade e dos ecossistemas naturais nas ACTF e a promoção do crescimento e desenvolvimento económico, baseado no uso sustentável de recursos naturais pelas comunidades locais, com particular enfase no ecoturismo. Este programa tem sido financiado pelo GEF e pelo Banco Mundial.

O Programa foi TFCA projetado para um período de 15 a 20 anos, que será desenvolvido em três fases. A fase actual (3.ª fase) - **Áreas de Conservação de Moçambique para Biodiversidade e Desenvolvimento Sustentável (MozBio)** tem como Objectivo de Desenvolvimento do Projecto e como Objectivo Ambiental Global *aumentar a gestão efectiva das áreas de conservação e desenvolver a contribuição destas áreas para a diversificação de oportunidades económicas.*

Algumas atividades do projeto incluídas no MozBio poderão despoletar a Política de Salvaguarda do Banco Mundial de Gestão de Pragas (OP 4.09), que exige um Plano de Gestão Integrada de Pragas.

O Projeto

O Projeto MozBio, será implementado ao longo de um período de seis anos, a ser iniciado em 2015. Irá conter as seguintes componentes:

Componente 1: Fortalecimento das Instituições de gestão Área de Conservação

Componente 2: Promoção do Turismo em Áreas de Conservação

Componente 3: Gestão Áreas de Conservação

Componente 4: Apoio subsistência Sustentável das Comunidades

Componente 5: Gerenciamento do Projeto, Monitoramento e Avaliação

O projeto será executado pela Unidade Implementação do Projecto MozBio (UIP MozBio). Outras entidades, como ANAC, BioFund, MICOA, bem como organizações de nível comunitário, irão implementar as atividades específicas do projeto. A UIP MozBio terá um agente comunitário em cada área de conservação alvo, os quais serão directamente envolvidos na preparação e execução das

actividades da Componente 4, em conjunto com associações comunitárias e outros parceiros como ONGs.

O objetivo da Componente 4 é de melhorar os meios de subsistência das comunidades que vivem no interior e em torno alvo áreas de conservação por: (i) promoção da integração e contribuição das comunidades para as áreas de conservação; (ii) melhoria dos meios de subsistência dentro e ao redor das áreas de conservação - focada no nível de subsistência sustentável, como sistemas de produção e/ou outros rendimentos geradores de oportunidades, como é o caso do turismo relacionado e REDD+; (iii) redução dos conflitos homem-fauna bravia no seio e ao redor das áreas de conservação; e (iv) redução do desmatamento dentro e em redor da Reserva Nacional do Gilé e do Parque Nacional de Quirimbas.

Assim**, poderá haver a necessidade de gestão de pragas em subprojectos incluídos na Sub-Componente 4.2. que visa melhorar sistemas de produção sustentável e oportunidades de geração de rendimento**. À data de realização deste documento não há detalhes sobre esses projetos, nem qualquer definição sobre a sua localização.

O presente documento é o Plano de Gestão Integrada de Pragas do Projeto MozBio, que será divulgado em Moçambique e no InfoShop do Banco Mundial antes da apreciação do projeto.

Áreas-Alvo do Projecto

A Componente 4 do Projeto MozBio inclui intervenções dentro de áreas de conservação e/ou nos seus arredores. A Figura 1 apresenta a rede de áreas de conservação, incluindo marinhas e terrestres, que inclui: **Parques Nacionais** – *Bazaruto, Quirimbas, Banhine Gorongosa*, Limpopo e *Zinave*, **Reservas Nacionais** - *Chimanimani, Gilé, Marromeu*, *Niassa*, *Pomene* e Maputo *Reserva Especial*; **Reserva Biológica Marinha** - Inhaca; **Reserva Marinha Parcial** (um) - *Reserva Marinha Parcial da Ponta do Ouro;* **Coutadas*;*** e **Reservas Florestais**. Além disso, deve ser referenciada a existência da Programas de Gestão **Comunitária** como Tchuma-Tchato na província de Tete e Chipanje Chetu, próximo à reserva nacional do Niassa.

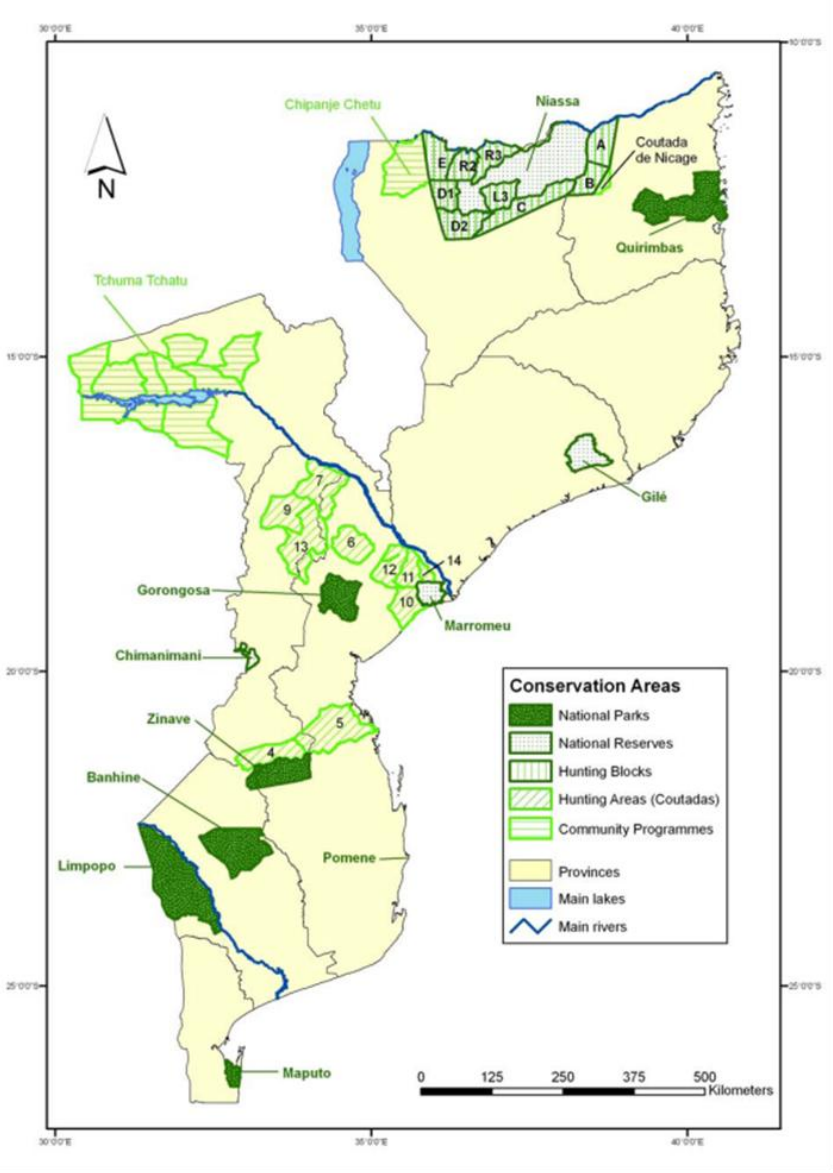

Figura 1 - Áreas de Conservação em Moçambique

Política, quadro legal e institucional para a implementação do PMP

A importância da gestão de pragas e mais especificamente da gestão integrada de pragas está incluída em planos estratégicos e de acção de Moçambique, como o Plano de Acção para a Redução da Pobreza (PARP) e o Plano Estratégico para o Desenvolvimento Agrícola (PEDSA).

Moçambique não tem qualquer legislação sobre gestão integrada de pragas ou produção orgânica embora tenha um bom regulamento sobre os pesticidas. A legislação sobre a produção de produtos agrícolas biológicos já foi elaborada, estando à espera de aprovação. O Regulamento de Gestão de Pesticidas visa assegurar que todos os processos que envolvam a utilização/manuseio de pesticidas sejam executadas sem prejuízo da saúde pública, animal e ambiental. Este regulamento, está em consonância com a Lei do Ambiente, que define o quadro jurídico ambiental em Moçambique, assim como os seus regulamentos.

O Ministério da Agricultura (MINAGRI) é a principal instituição responsável pela gestão de pragas. As seguintes direcções nacionais do MINAGRI são relevantes para gestão de pragas: Direcção Nacional de Serviços Agrária (DNSA), Direcção Nacional da Extensão Agrária (DNEA) e Instituto de Investigação Agrícola de Moçambique (IIAM).

Todas estas direcções são representadas em nível provincial, por Direcções Provinciais da Agricultura (DPA). A nível distrital, a utilização, a manipulação e o transporte de pesticidas é controlada pela SDAE, que trabalha com uma equipe de extensionistas oferecendo treinamento para os agricultores sobre o assunto.

MINAGRI estabeleceu um comitê Técnico Assessor, que fornece conselhos sobre questões relacionadas com a regulamentação de pesticidas. Esta Comissão inclui representantes de vários departamentos dentro MINAGRI e outras instituições (MICOA, MISAU, do Instituto Nacional de Normalização e Qualidade INNOQ) bem como do sector privado.

Política Operacional do Banco Mundial em Gestão de Pragas OP 4.09

Há dez Políticas de Salvaguarda do Banco Mundial, criadas para apoiar o processo de tomada de decisão, assegurando que os projectos financiados pelo Banco são ambientalmente e socialmente sustentáveis. Estas políticas operacionais incluem: Avaliação Ambiental (OP 4,01), Habitats naturais (OP 4.04), Floresta (OP 4.36), Gestão Integrada de Pragas (OP 4.09), Património Cultural (OP 11,03), Povos Indígenas (OP 4.10), Reassentamento involuntário (OP 4.12), Segurança de Barragens (OP 4.37), Projetos em Águas Internacionais (OP 7.50) e Projetos em Áreas Controversas (OP 7.60).

O objetivo da Política de Gestão de Pragas (OP 4.09) é minimizar e gerir os riscos ambientais e para a saúde associados à utilização de pesticidas promover e apoiar de forma segura, efectiva e ambientalmente sustentável a gestão de pragas.

Gestão de pragas em Moçambique

Moçambique possui dez zonas agro-ecológicas diferenciadas, determinadas principalmente pelo regime de precipitação e o tipo de solo. Há mais de 36 milhões de hectares de terras aráveis dos quais apenas 10% estão em uso, sendo 90% utilizado pelo familiar. Cerca de 3,3 milhões de hectares possuem potencial de irrigação, o que corresponde ao dobro da área irrigável na África do Sul. Mais de 80% do total da área cultivada é usado para agricultura de sequeiro, com produção de culturas alimentares básicas, como milho, mandioca e feijão que ocupa cerca de 60% do total. A horticultura ocupa apenas 5% e culturas de rendimento (como cana-de-açúcar, algodão, chá, plantas oleaginosas, tabaco) apenas 6%. A agricultura é essencialmente de subsistência, menos de 10% das famílias comercializa os seus excedentes de milho, mandioca ou algodão.

A pecuária desempenha também um papel vital para a população rural apesar de sua contribuição para a economia nacional ser incipiente. Na região norte, o desenvolvimento da pecuária é limitado pela alta prevalência de tsé-tsé e tripanosomose.

Segundo o inventário florestal de 2007, a cobertura florestal é estimada em 54,8 milhões de hectares, ou seja 70% do total de terras - 26,9 Milhões de hectares são floresta produtiva, 13,2 milhões de hectares composto por reservas florestais, e os restantes 14,7 milhões são ocupados por floresta multi-uso.

Não existe um levantamento sistemático e atualizado sobre as pragas e doenças que afectam as culturas e o gado nas áreas de conservação alvo do MozBio ou mesmo em Moçambique. Algumas das

principais pragas que afetam uma ampla gama de culturas dentro do país são o gafanhoto vermelho **(*Nomadacris septemfasciata***), o gafanhoto elegante (*Zonocerus elegans*) e a lagarta invasora (Spodoptera*exempta*) que afetam diversas culturas, como milho, feijão, tomate, arroz e sorgo e afetando consequentemente a segurança alimentar.

Em Moçambique o controle de pragas e de doenças de plantas é actualmente limitado por uma combinação de falta de conhecimento, equipamentos, suprimentos e finanças. Os pesticidas, os adubos são usados apenas por uma pequena proporção de famílias rurais, devido à deficiente rede de fornecimento e custo inacessível. Dados regionais e provinciais indicam que o uso destes insumos está associado primariamente com o tabaco e o algodão, em especial no centro e norte do país.

Há várias experiências de Gestão Integrada de Pragas no País, incluindo na maioria das áreas de conservação alvo, sendo implementadas por ONGs e pelo MINAGRI, através do IIAM e da rede de extensionistas das direcções provinciais de agricultura (DPAs).

No entanto, de um modo geral, em Moçambique,as práticas de Gestão Integrada de Pragas (GIP) raramente são postas em prática, à excepção daquelas que, em certas regiões do país já são práticas tradicionais, como a rotação ou consorciação de culturas.

Recentemente, foi anunciada a criação de uma rede de "Clínicas de Plantas" no país sob o *Iniciativa Global Plantwise*, a ser implementada pela ONG CABI internacional em parceria com o MINAGRI financiado pelo Fundo Internacional para o Desenvolvimento Agrícola (FIDA).

Nas áreas de conservação alvo do MozBio deve-se salientar experiência de GIP com um abordagem de campos escola experimentais, que a Fundação Agha Khan tem vindo a implementar desde 2008 no Parque Nacional Quirimbas.

A lista de pesticidas autorizados em Moçambique é continuamente atualizada e publicada pelo MINAGRI, conforme definido no Decreto nº 6/2009. Atualmente inclui, entre vários outros: cipermetrina e deltametrina (inseticidas) e mancozeb (fungicida) usados para uma ampla variedade de pragas e culturas. A lista inclui também agentes biológicos. No entanto, não estão disponíveis dados completos sobre os pesticidas utilizados. Observações em campo indicam que em geral os agricultores que não utilizam equipamentos de proteção adequados e revelam falta de conhecimento e aplicação de práticas de segurança. Os serviços de extensão das DPA fazem contudo treinamentos regulares sobre a forma adequada de utilização de pesticidas.

Moçambique tem tido o apoio de vários doadores para lidar com pesticidas obsoletos em termos de inventário, avaliação de riscos, segurança no transporte, armazenamento e eliminação, além comunicação e sensibilização .

Potenciais Impactos no Ambiente, Saúde Pública e Ocupacional, Medidas de Mitigação e Monitoramento

Tendo em conta que os projetos a serem incluídos no âmbito sub-componente 4.1 serão projectos de pequena escala, não é esperada a necessidade de uso intenso de pesticidas em actividades do MozBio.

Os impactos potenciais relacionados com o uso de pesticidas são os seguintes:

- Aumento da toxicidade do solo;
- Diminuição da qualidade da água para consumo e irrigação;
- Proliferação de ervas daninhas aquáticas;
- Perda de biodiversidade, nomeadamente de espécies aquáticas;
- Toxicidade para peixes;
- Baixa produtividade da cultura;
- Níveis inaceitáveis de resíduos de pesticidas em culturas e na cadeia alimentar;
- Envenenamento de trabalhadores/produtores e efeitos prejudiciais para a saúde humana;

- Aumento do número de acidentes e lesões.

As principais medidas de prevenção são evitar e/ou minimizar a utilização de pesticidas, dando-se preferência a outras técnicas, como as práticas tradicionais que podem contribuir para evitar o desenvolvimento de pragas, insumos biológicos e químicos. No caso da utilização de pesticidas, esta deve observar estritamente o Decreto nº 6/2009 - Regulamento de Gestão de Pesticidas .

A fim de implementar abordagens GIP nas actividades a serem incluídas na subcomponente 4, será crucial:

- Incorporar a abordagem GIP durante o desenho dos subprojectos, levando-se em conta outras experiências GIP na região.
- Implementar abordagens participativas no GIP em comunidades-alvo para aprender, testar, selecionar e implementar opções GIP para redução as perdas devido a pragas e doenças.
- Estabelecer um sistema de monitoria que permita detectar precocemente o estado da praga, espécies benéficas, regular e espécies migradoras.
- Colaborar com outros programas de GIP no alvo áreas de conservação e arredores.
- Melhorar a capacidade e formação em GIP.

Campanhas de sensibilização e treinamento

O sucesso da GIP depende em grande parte no desenvolvimento e capacitação institucional e humana para facilitar a aprendizagem experiencial para a tomada de decisão informada em matéria de integração do conhecimento científica e tradicional, para a resolução de problemas específicos. Uma má comunicação entre agricultores e extensionistas poderia levar a investigação mal-orientada ou à fraca adopção de opções promissoras, geradas pela investigação.

Como já discutido anteriormente, existem várias experiências de GIP em Moçambique, incluindo nas áreas de conservação alvo do MozBio que incluem uma componente de capacitação e treinamento. No entanto, a adesão a esta abordagem é algo que leva tempo, uma vez que está relacionada com alterações de comportamento. Há portanto, necessidade de formação complementar e contínua em todas as áreas, a fim de edificar nos agricultores, inclinação para a aplicação de técnicas de GIP, mantendo o uso de produtos químicos em valores mínimos.

Durante a fase de preparação de subprojetos da Componente 4, as associações comunitárias que irão propor e implementar as actividades deverão sempre que possível visitar outros programas de GIP na região.

Deverá ser definido e implementado um programa de treinamento para agricultores e extensionistas da DPA, baseado em culturas agrícolas, em que os agricultores sejam organizados em grupos liderados por um agricultor líder. O método para a formação de agricultores e lideranças de agricultores poderá incluir: programas de treinamento-fazendo/descobrindo (na machamba dos agricultores), Escola na machamba (onde grupos de agricultores são levados, passo a passo no crescimento da cultura durante a estação do plantio à colheita e cada vez mais em atividades de pós-colheita e até mesmo marketing); Grupos de discussão, Elaboração de material de comunicação, Integração de atividades no âmbito de programas de educação de jovens.

Deverá também haver treinamento sobre o uso seguro de pesticidas, que deve incluir os seguintes temas: Seleção de pesticidas, Rótulo do pesticida, Transporte de pesticidas, Mistura e carregamento de pesticidas, Armazenamento de pesticidas, Eliminação de embalagens de pesticidas, Pesticidas obsoletos, Calibração do produto, quantidade e aplicação de pesticidas, Determinação da quantidade

de químico de usar, Precauções importantes relacionados com a aplicação de pesticidas, toxicidade, Protecção humana e Primeiros Socorros.

Os programas de sensibilização e treinamentos em técnicas de GIP e utilização segura de pesticidas devem ser inclusivos, integrando para as mulheres e grupos vulneráveis, já que a experiência mostra que estas são as pessoas mais afetadas por pragas e pesticidas uso e armazenamento (crianças, deficientes, idosos, etc).

Deve haver uma articulação com outros atores com programas de MIP, a partir das Direcções Provinciais da Agricultura e outros parceiros.

Orçamento

O orçamento global para a implementação do PGP é estimado em US$ 210.000,00.

MOZBIO PROJECT
MOZAMBIQUE

Pest Management Plan

(PMP)

Executive Summary

Introduction

The Government of Mozambique, through the Ministry of Tourism (MITUR) has been implementing the Transfrontier Conservation Area (TFCA) Program which has as long-term objectives the conservation of the biodiversity and natural ecosystems within the TFCAs, and the promotion of economic growth and development, based on sustainable use of their natural resources by local communities, with a particular emphasis on ecotourism. This program has been funded by the GEF and the World Bank.

The TFCA Program was designed for a period of 15-20 years, to be developed in three phases. The present phase (3rd Phase) - **Mozambique Conservation Areas for Biodiversity and Sustainable Development (MozBio)** has as Project Development Objective (PDO) and Global Environment Objective (GEO) to increase the effective management of conservation areas and improve the contribution of these areas to the diversification of economic opportunities.

WB Safeguard Policy on Pest Management (OP 4.09) is provisionally triggered since the project intends to support livelihoods which may include farming and minimal use of chemicals, requiring a Pest Management Plan.

The Project

The MozBio Project, will be implemented over a six-year period, to be initiated in 2015. It will contain the following components:

Component 1: Strengthening Institutions for Conservation Area Management

Component 2: Promotion of Tourism in Conservation Areas

Component 3: Conservation Areas Management

Component 4: Support Sustainable Livelihoods of Communities

Component 5: Project Management, Monitoring and Evaluation

The project will be implemented by the MozBio Project Implementing Unit (MozBio PIU). Other entities, including ANAC, BioFund, MICOA as well as community-level organizations, will implement specific activities of the project. The MozBio PIU will have a community agent in each target conservation area, who will be directly involved in the preparation and implementation of activities under Component 4, jointly with community associations and other partners as NGOs.

The objective of Component 4 is to improve the livelihood of communities living in and around targeted Conservation Areas by: (i) enhancing community integration and contribution to Conservation Areas; (ii) improving sustainable livelihoods within and surrounding conservation areas - focused on sustainable subsistence level, production systems and/or other income generating opportunities such as tourism related and REDD+; (iii) reducing human-wildlife conflicts within and surrounding Conservation Areas; and (iv) reducing deforestation within and surrounding the Gilé National Reserve and the Quirimbas National Park.

There could be a need for pest management in subprojects included in Sub-Component 4.2 which aims to improve sustainable production systems and income opportunities. At the present stage there is no details about these projects, neither any definition on its location.

The present document is the Pest Management Plan for MozBio Project. It will be disclosed in Mozambique and at the World Bank's InfoShop prior to Appraisal of the Project.

Project Target Area

The Component 4 of MozBio Project would include interventions within conservation areas or in its surrounding areas. Figure 1 presents the network of conservation areas, including marine and terrestrial.

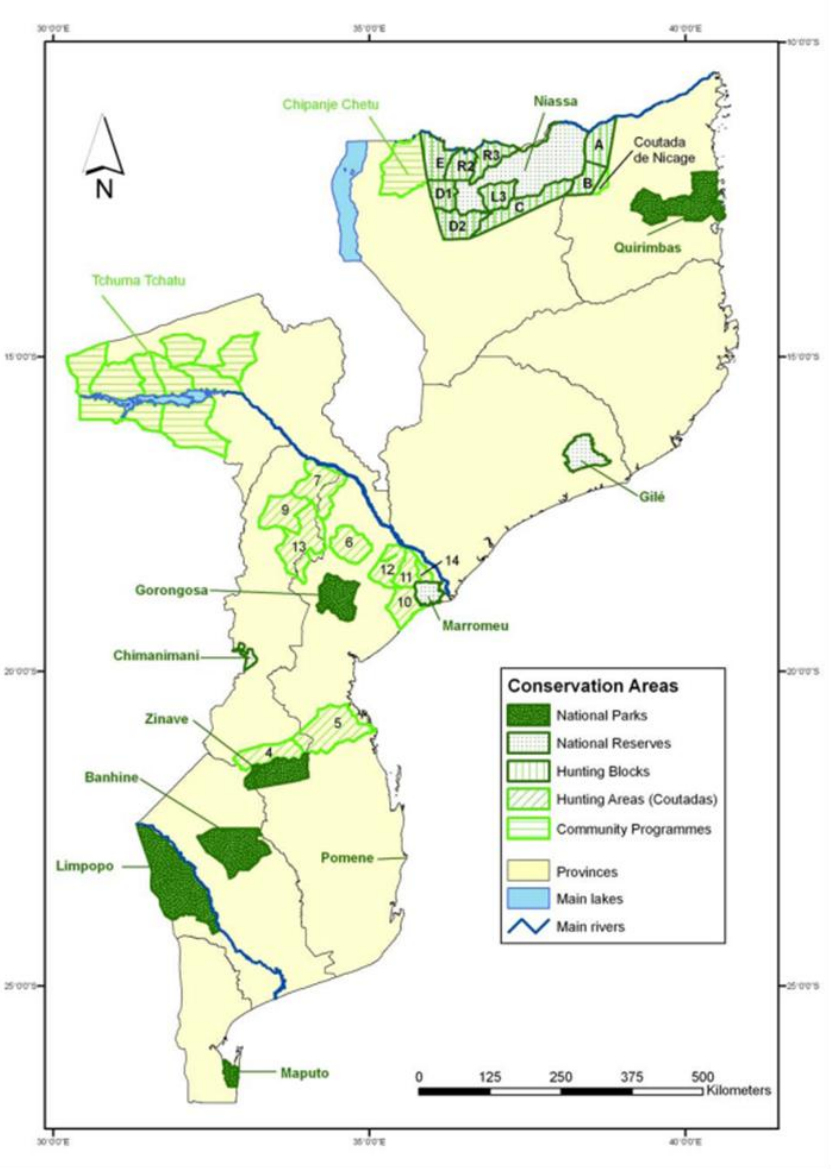

Figure 1 – Conservation Areas in Mozambique

The network of Conservation Areas in Mozambique include:**National Parks** – *Bazaruto, Quirimbas, Banhine, Gorongosa*, Limpopo and *Zinave*, **National Reserves**– *Chimanimani, Gilé, Marromeu*, *Niassa*, *Pomene* and *Maputo Special Reserve*; **Marine Biological Reserve**– Inhaca; **Partial Marine Reserve** (one) – *Reserva Marinha Parcial da Ponta do Ouro;* **Hunting Areas (*Coutadas)***; and **Forest Reserves**. In addition it shall be referred the existence of **Community Programes** as Tchuma-Tchato in Tete Province and Chipanje Chetu, close to the Niassa National Reserve.

Policy, Regulatory and Institutional Framework for Implementing the PMP

The importance of pest management and specifically integrated pest management is included in the existent strategic and action plans as the Poverty Reduction Action Plan (PARP) and the Strategic Plan for Agricultural Development (PEDSA).

Mozambique does not have any regulation on integrated pest management or organic production although has a good regulation on pesticides. Legislation on production of organic agricultural products was already drafted, waiting for approval. The Pesticides Management Regulation aims to ensure that all processes that involve working with or handling pesticides are executed without prejudice to public, animal and environmental health. This regulation in in line with the Environmental Law that defines the environmental legal framework in Mozambique and its regulations.

The Ministry of Agriculture (MINAGRI) is the main institution responsible for pest management. It comprise the following national directorates that are relevant for pest management: National Directorate for Agrarian Services, National Directorate of Agrarian Extension and the Agricultural Research Institute of Mozambique.

All these directorates are represented in provincial level, by the Provincial Directorates of Agriculture (DPA). At the district level pesticide use, handling and transportation is controlled by SDAE, which works with an extension team in providing training for farmers on this matter.

MINAGRI has established a Technical Advisory Committee, which provides advice on issues related to the Pesticide Regulations. This Committee includes representatives from various departments within MINAGRI and other Institutions (MICOA, MISAU, the National Institute for Standardization and Quality-INNOQ) as well as the private sector.

World Bank Operational Policy on Pest Management OP 4.09

There are ten safeguard policies in the World Bank, created to inform decision making, ensuring that projects financed by the Bank are environmentally and socially sustainable. These Operational Policies include: Environmental Assessment (OP 4.01), Natural Habitats (OP 4.04), Forestry (OP 4.36), Pest Management (OP 4.09), Cultural Heritage (OP 4.11), Indigenous People (OP 4.10), Involuntary Resettlement (OP 4.12), Safety of Dams (OP 4.37), Projects on International Waterways (OP 7.50) and Projects in Disputed areas (OP 7.60).

The objective of the Policy on Pest Management (OP 4.09) is to minimize and manage the environmental and health risks associated with pesticide use and promote and support safe, effective, and environmentally sound pest management.

Pest Management in Mozambique

Mozambique has ten differentiated agro-ecological zones, mainly defined by rainfall and type of soil. There are over 36 million hectares of arable land of which only 10% is in use, and 90% of that is used by the family sector. Around 3.3 million hectares could be irrigated, which is double the irrigable area in South Africa. Over 80% of the total cultivated area is used for rain fed production of basic food crops, with maize, cassava and beans occupying around 60% of the total. Horticulture occupies only 5%, and cash crops (sugarcane, cotton, tea, oil plants, tobacco) only 6%. Agriculture is mainly subsistence, less than 10% of households sell their surpluses of maize, cassava or cotton.

Livestock also plays a vital role for the rural population although its contribution to the national economy is incipient. In the northern region, cattle farming did not develop due to the high prevalence of tsé-tsé and tripanosomiasis.

According to the 2007 forestry inventory, forestry coverage is estimated at 54.8 million hectares, ie 70% of total land area. 26.9 million hectares consist of productive forest, 13.2 million hectares comprise forest reserves, and the remaining 14.7 million are occupied by multi-use forest.

There is no updated and systematic survey on pests and diseases affecting crops and livestock in the target conservation areas or even in Mozambique. Some of main pests that affect a wide range of crops within the country are the Red Locust/ Grasshoper **(***Nomadacris septemfasciata*), Elegant Grasshoper (*Zonocerus elegans*) and the African Armyworm (*Spodoptera exempta*) that affect several crops, as maize, beans, tomato, sorghum and rice and consequently affecting the food security.

At present pest and plant disease control in Mozambique is limited by a combination of lack of knowledge, equipment, supplies and finance. Pesticides as fertilizers are only used by a small proportion of rural households due to the deficient supply net and unfordable cost. Regional and provincial data shows that their use is primarily associated with tobacco and cotton production, particularly in the center and north.

There are several scattered experiences of Integrated Pest Management within the country, including in the majority of target conservation areas, which are implemented by NGOs and the Ministry of Agriculture, through the IIAM and the extension network of the Provincial Agriculture Directorates.

Nevertheless, IPM practices are rarely put into practical use in general in Mozambique, expect those ones that in certain regions of the country are already traditional practices, as crop rotation or intercropping.

Recently it was announced the establishment of a network of "Plant Clinics" within the country by the international NGO CABI in a partnership with MINAG under the *Plantwise Global Initiative*, funded by the International Fund for Agricultural Development (IFAD).

Within the target conservation areas it shall be stressed the IPM experience in Farmer Field School approach that the Agha Khan Foundation has been implementing since 2008 in Quirimbas National Park.

A list of registered pesticides in Mozambique is continuously updated and published by MINAGRI, as defined in Decree Nr. 6/2009. Currently it includes among several others: cypermethrin and deltamethrin (insecticides) and mancozeb (fungicide) used for a wide range of pests and crops. The list also includes biological agents. However, comprehensive data on pesticides use are not available. Field observations indicate that in general farmers to not use proper protection equipment and reveal limited knowledge and application of safety practices. The extension services of the Provincial Directorates of Agriculture (DPA) provide regular training on pesticide use.

Mozambique has being supported by several donors to deal with obsolete pesticides in terms of inventory, risk assessment, safe transport, storage and elimination, besides communication and awareness.

Environmental, Occupational and Public Health Potential Impacts, Mitigation Measures and Monitoring

Bearing in mind that the projects to be included under Sub-component 4.1 would be small-scale projects it is not expected the need of any intense use of pesticides in MozBio activities.

Potential impacts related with the use of pesticides are:

- Increase in soil toxicity;
- Decrease in water quality for consumption and irrigation;
- Proliferation of aquatic weeds;
- Loss of biodiversity in particular of aquatic species;
- Toxicity to fish;
- Poor crop yield;
- Unacceptable levels of pesticide residues in harvested produce and in the food chain;
- Poisoning of workers/farmers and detrimental effects on human health;
- Increased number of accidents and injuries.

The main mitigation measures are the avoidance of pesticide use or use at a minimum, giving preference to other techniques as cultural practices that can help prevent build-up of pests, biological and chemical inputs. In case of use of pesticides it shall strictly enforce the Decree Nr. 6/2009 - Pesticide Management Regulation.

In order to implement IPM approaches in the activities to be included in Subcomponent 4 it will be crucial to:

- Embed IPM approach during the subprojects design, taking into account other IPM experiences within the region;
- Implement participatory approaches in IPM within the target communities to learn, test, select and implement IPM options to reduce losses due to pests and diseases;
- Establish a monitoring system that provides early warning on pest status, beneficial species, regular and migratory species;
- Collaborate with other IPM programmes in the target conservation areas and surroundings.
- Improve capacity building and training on IPM.

Capacity Building

The success of IPM depends largely on developing and sustaining institutional and human capacity to facilitate experiential learning for making informed decisions in integrating scientific and indigenous knowledge to solve specific problems. Poor communication between farmers and extensionists could led to poorly-targeted research or to poor adoption of promising options generated by research.

As discussed before there are already several experiences in IPM in Mozambique, including in the target conservation areas that included capacity building and training. However the adherence to this approach is something that take time, as it is related with changes in behaviour. Therefore there is a need of additional and continuous capacity building in all

areas in order to build up existing farmers' inclination of implementing IPM techniques, keeping chemical use at a minimum.

Community associations of Component 4 activities whenever possible should visit other IPM programmes in the region during the Subproject preparation.

A training program shall be defined and implemented for farmers, farmer leaders, and district extension workers, the training will be crop based with farmers being organized into groups led by a farmer leader. The method for training farmers and farmer leaders would include several methodologies: as Learning-by-doing/discovery training programs (in farmers own land), Farmer field school (where farmer groups are led, step by step in growing the crop during the season from planting to harvest and increasingly into post-harvest activities and even marketing); Discussion groups, Preparation of communication material, Activities under young education programs.

In addition training on use of pesticides shall include the following: Pesticide selection, Understanding the Pesticide Label, Pesticide Transport, Mixing and Loading Pesticide, Pesticide Storage, Container Disposal, Obsolete pesticides, Calibration, Product Quantity and Pesticide Application, Determining the Amount of Chemical to Use, Important Cautions related to the Application of Pesticides, Toxicity, Human Protection and First Aid.

Awareness-raising programs and training on IPM techniques and safe use of pesticides shall be inclusive for women and vulnerable groups, since experience show that these are the most impacted persons by pest and pesticides use and storage (toddlers, handicapped, elderly, etc.).

There should be an articulation with other actors with IPM programmes, as the Provincial Directorates for Agriculture and other partners.

Budget

The overall budget for implementation of the PMP is estimated at US$210,000.00.

Table of Contents

1. INTRODUCTION

The Government of Mozambique, through the Ministry of Tourism (MITUR) has been implementing the Transfrontier Conservation Area (TFCA) Program which has as long-term objectives the conservation of the biodiversity and natural ecosystems within the TFCAs, and the promotion of economic growth and development, based on sustainable use of their natural resources by local communities, with a particular emphasis on ecotourism. This program has been funded by the GEF and the World Bank.

The TFCA Program was designed for a period of 15-20 years, to be developed in three phases. The first phase (1998-2003) - Transfrontier Conservation Areas Pilot and Institutional Strengthening project (TFCAPISP), was developed in the context of a growing interest in large scale (including transfrontier) spatial development initiatives (SDI) within the southern African region. The TFCAPISP launched the TFCA concept in the region. The second phase (2005-2013) - Transfrontier Conservation Areas and Tourism Development Project (TFCATDP) intended to implement the TFCA concept on the ground in the original three TFCAs: Limpopo, Lubombo and Chimanimani of Mozambique.

The present phase - **Mozambique Conservation Areas for Biodiversity and Sustainable Development (MozBio)** has as Project Development Objective (PDO) and Global Environment Objective (GEO) to *increase the effective management of conservation areas and improve the contribution of these areas to the diversification of economic opportunities.*

The MozBio Project will contain the following components:

Component 1: Strengthening Institutions for Conservation Area Management

Component 2: Promotion of Tourism in Conservation Areas

Component 3: Conservation Areas Management

Component 4: Support Sustainable Livelihoods of Communities

Component 5: Project Management, Monitoring and Evaluation

During the implementation of the Component 4, community development subprojects related with agriculture, livestock and/or forestry there might be a need to manage pests and/or diseases, that if not controlled could be detrimental to the productivity or human/animal health. It is known that the use of pesticides may have negative consequences on the agro-ecosystem, increasing the risk of further pest problems as well as may have negative health, environmental and economic implications.

Integrated Pest Management (IPM) is an effective and environmentally sensitive approach to pest management that relies on a combination of common-sense practices. Itcomprise a mix of farmer-driven, ecologically based pest control practices that seek to reduce reliance on synthetic chemical pesticides. It involves (a) managing pests (keeping them below economically damaging levels) rather than seeking to eradicate them; (b) relying, to the

extent possible, on non-chemical measures to keep pest populations low; and (c) selecting and applying pesticides, when they have to be used, in a way that minimizes adverse effects on beneficial organisms, humans, and the environment (WB, 2006).

This report presents the Pest Management Plan (PMP) to manage potential pest problems that may develop during MozBio implementation and help ensure that the use of all pesticides, insecticides, herbicides, chemical fertilizers and other chemicals associated with the Project will be handled properly and in accordance with World Bank Operational Policy 4.09 – Pest Management and the Mozambican legal requirements.

According to this policy the PMP is based on the Integrated Pest Management (IPM) approach, which promotes good agricultural practice through the use of responsible and sustainable activities that will result in a rational and a reduction in pesticide use and storage. This PMP is not focused in any particular pest or crops as there is not yet a definition on this. It only refers to small to medium scale activities.

2. DESCRIPTION OF THE MOZBIO PROJECT

The MozBio Project, will be implemented over a six-year period, to be initiated in 2015. It will contain the following components:

Component 1: Strengthening Institutions for Conservation Area Management

The objective of this component is to improve the capacity of ANAC, BioFund and MICOA to develop and influence conservation and tourism policies and regulations, strengthen coordination and management of the national conservation areas system and critically endangered species conservation, increase the financial sustainability of conservation areas and tourism revenues, improve monitoring and evaluation systems and support communication strategies.

Component 2: Promotion of Tourism in Conservation Areas

The objective of this component is to increase revenues and the number of beneficiaries from tourism-related economic activities in Conservation Areas. To achieve that, it will address several barriers to nature-based tourism development in Mozambique, including: i) policy and regulations; ii) institutional challenges; iii) weak marketing; iv) inadequate planning; v) lack of investments in tourism infrastructure; and vi) negative relation between CAs and local communities.

Component 3: Conservation Areas Management

The objective of this component is to improve the infrastructure, equipment, protection, management, research, monitoring and planning in selected conservation areas in Mozambique. The conservation areas to be financed have been identified using selection criteria through a participatory process with key conservation stakeholders in the country.

Component 4: Support Sustainable Livelihoods of Communities

This component will improve the livelihood of communities living in and around targeted Conservation Areas by: (i) enhancing community integration and contribution to Conservation Areas; (ii) improving sustainable livelihoods within and surrounding conservation areas; (iii) reducing human-wildlife conflicts within and surrounding Conservation Areas; and (iv) reducing deforestation within and surrounding two selected Conservation Areas.

The project would include interventions across different types of Conservation Areas with integrated conservation and sustainable development approaches in coastal/marine, freshwater and terrestrial ecosystems. Intervention support to communities towards improved sustainable livelihoods would focus on sustainable subsistence level, production systems (e.g. fisheries, agricultural, forestry, and livestock) and/or other income generating opportunities such as tourism related and REDD+ (in Gilé National Reserve and the Quirimbas National Park). The specific number of community members supported would be determined once participatory and zoning interventions would have been undertaken in each of the intervention sites, considering the needs of local populations and the conservation priorities.

Component 5: Project Management, Monitoring and Evaluation

The component would support a team of experts in ANAC, whose task would be to ensure that the project planning, implementation, procurement, financial management and monitoring are carried out with diligence and integrity as describe by their respective manuals. The component includes the implementation of an M&E system to track and assess project implementation and impacts, and a system for adaptive management based on this information.

The MozBio project will be financed by a US$ 70 million IDA loan, a US$ 6.3 million GEF grant and US$ 23.5 million AfD loan. It will be implemented by the MozBio Project Implementing Unit (MozBio PIU), which will build on the existing TFCA Unit with some changes in staffing. Other entities, including ANAC, BioFund, MICOA as well as community-level organizations, will implement specific activities of the project. The MozBio PIU will have a community agent in each target conservation area, who will be directly involved in the preparation and implementation of activities under Component 4, jointly with community associations and other partners as NGOs.

There could be a need for pest management in subprojects included in **Sub-Component 4.2** which aims to **improve sustainable production systems and income opportunities** through sustainable production systems (e.g. fisheries, agricultural, forestry, livestock, and apiculture) besides other income generating opportunities such as tourism related interventions.

At the present stage there are no details about these projects, neither any definition on its location. The Conservation Area management plans would be guiding the prioritization and eligibility of interventions. Eligible activities would have to consider the full value chain of products and to distinguish between local, regional, national and international markets. Screening of interventions to become more rigorous as value invested and stakes become higher, and to include information about their financial viability and return on investment.

3. PROJECT TARGET AREAS

The Component 4 of MozBio Project would include interventions within conservation areas or in its surrounding areas. Figure 1 presents the network of conservation areas, including marine and terrestrial.

The following table lists the current gazetted conservation areas and the corresponent areas.

➢

Conservation Area	Area (Km^2)	% of the Country Area
National Parks		
- Bazaruto National Park	1 430	0.18%
- Quirimbas National Park	7 500	0.94%
- Banhine	7 000	0.87%
- Gorongosa	10 000	1.25%
- Limpopo	10 000	1.25%
- Zinave	3 700	0.46%
Natinal Reserves		
- Gilé	2 100	0.26%
- Marromeu	1 500	0.19%
- Niassa National Reserve	42 000	5.24%
- Chimanimani National Reserve	7 500	0.94%
- Pomene	200	0.02%
Marine Biological Reserve		
- Inhaca	100	0.01%
Hunting Areas		
- 13 Coutadas	42 117	5.25%
Partial Marine Reserve		
- Ponta do Ouro Partial Marine Reserve	678	0.08%
Forest Reserves		
- 30 Forest Reserves	495	0.06%
	136 320	**17.01%**

In addition it shall be considered the existence of community programes as Tchuma-Tchato in Tete Province and Chipanje Chetu, close to the Niassa National Reserve.

The majority of these areas were created before the independence and were hardly affected during the war periods, which resulted in an influx of population and loose of wildlife. Currently the main threats in the MozBio's target conservation areas are community pressures, illegal hunting; uncontrolled burning; over-exploitation of natural resources.

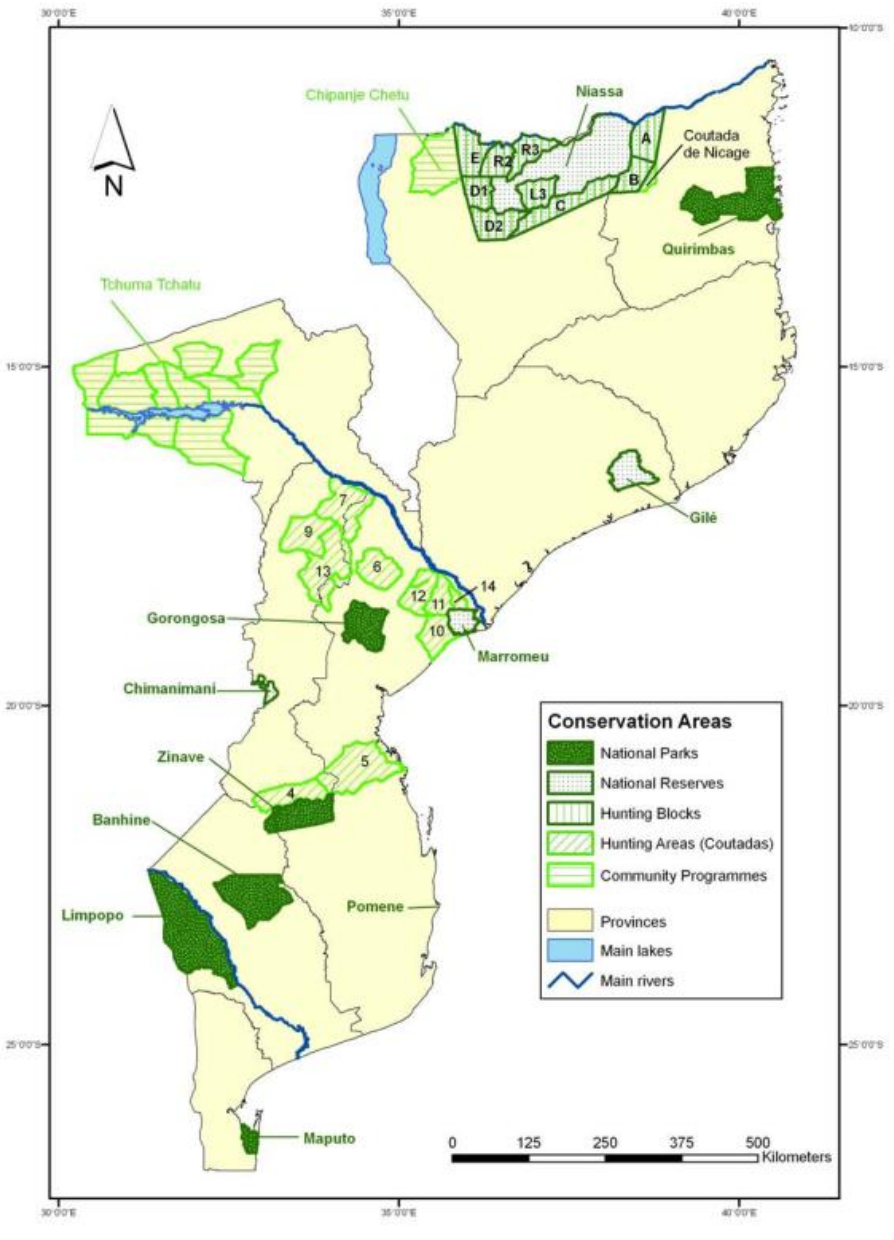

Figure 1 – Conservation Areas in Mozambique

4. POLICY, REGULATORY AND INSTITUTIONAL FRAMEWORK FOR IMPLEMENTING THE PMP

4.1 Strategic and Actions Plans

The importance of pest management and specifically integrated pest management is included in the existent strategic and action plans as the Poverty Reduction Action Plan (PARP) and the Strategic Plan for Agricultural Development (PEDSA).

Poverty Reduction Action Plan

The Poverty Reduction Action Plan (PARP) 2011-2014 is the medium-term strategy of the Government of Mozambique for putting into operation the Five-Year Government Program (2010-2014), focused on the objective of combating poverty and promoting a culture of work, with a view to achieving inclusive economic growth and reducing poverty and vulnerability in the country. The PARP 2011-2014 represents the continuation of the PARPA II, which was implemented with a timeframe of 2006-2009, extended to 2010, and had as its principal goal to reduce the incidence of food poverty from the current level of 54.7% to 42% by 2014.

One of PARP's main general objectives is increasing agricultural and fisheries production and productivity, with the attendant impact on food supply, is a determining factor for reducing the incidence of poverty, and plays an important role as a source of income for around 80% of the country's population. To achieve this the priority PARP's challenge is to expand access to factors of production, particularly for women, with greater emphasis on adequate technologies, quality inputs, and **enhancing the capacity for surveillance and control of plant and animal pests and diseases**, as well as improving and making better use of water for agricultural purposes.

Strategic Plan for Agricultural Development

The Green Revolution, approved by the GOM in 2007, signalled the Government´s re-affirmation of its priority to increase agricultural production and productivity, establishing a directive for the transformation of an essentially subsistence agriculture into commercial agriculture.

The PEDSA's strategic objective is to **"Contribute to food security and agricultural producer incomes in a competitive and sustainable way, guaranteeing social and gender equity".**

To achieve the vision and general objective in the medium and long term, the PEDSA establishes specific strategic objectives, aligned with the pillars of the Comprehensive African Agriculture Development Programme (CAADP):

1. Agricultural production and productivity and its competitively increased
2. Infrastructures and services for markets and marketing improved

3. Land, water, forest and wildlife resources used sustainably
4. Legal framework and policies conducive to agricultural investment in place
5. Agricultural institutions strengthened

In relation to the first general objective it shall be stressed the PEDSA's strategies to achieve pest and disease controls improved for crops and breeding animals:

- Strengthen quarantine systems for plants and animals, in particular imported ones;
- Invest in building and rehabilitating public infrastructures for veterinary services, production and marketing, involving farmers in their maintenance;
- Strengthen prevention and control of the main cattle diseases through obligatory vaccination programmes and use of dip tanks;
- Strengthen MINAG capacity to define standards and improve monitoring and compliance with regulations through training and investment in laboratories and other physical infrastructures;
- Implement programmes for eradicating plant and animal diseases whenever possible, especially those that are economically significant;
- **Increase public awareness of the importance of controlling pests and diseases in a safe and sustainable way and the respective control mechanisms**;
- **Promote the use of technologies for the integrated control of pests and diseases, including biological methods whenever viable**;
- Strengthen the cattle tracking system;
- Create a favourable environment for increasing the availability (through domestic production or imports), safe use and disposal of agro-chemicals for controlling plant diseases and medicines for controlling animal diseases;
- Take part in international protocols on safety standards for plant and animal production, storage, processing, marketing and consumption.

4.2 Legal Framework

4.2.1 Introduction

Mozambique does not have any regulation on integrated pest management or organic production although has a good regulation on pesticides. Legislation on production of organic agricultural products was already drafted, waiting for approval. The Pesticides Management Regulationaims to ensure that all processes that involve working with or handling pesticides are executed without prejudice to public, animal and environmental health. This regulation is in in line with the Environmental Law that defines the environmental legal framework in Mozambique and its regulations.

4.2.2 Environmental Law

The *Environment Law* (Law Nr. 20/97, dated 7 October) defines the legal basis for the sound use and management of the environment as a means to safeguard sustainable development in the country. This Law applies to all activities in the public or private sectors that may directly or indirectly affect the environment.

Some relevant principles of environmental management included in the National Environment Policy and Environment Law are:

- Environmental management should aim at improving the quality of life of citizens and protection of biodiversity and ecosystems;
- The recognition and appreciation of traditions and knowledge of the local community;
- The priority given to systems that prevent the degradation of the environment;
- A comprehensive and integrated perspective of the environment;
- The importance of public participation;
- The principle of polluter - payer;
- The importance of international cooperation.

4.2.3 Pesticides Management Regulation

The **Pesticides Management Regulation** (Decree Nr. 6/2009, of 31 March 2009) applies to the registration, production, donation, trading, importation, exportation, packing, storage, transport, handling, use and elimination of pesticides and adjuvants, by individual or collective persons, for agricultural, animal rearing, forestry, public health protection, domestic and other purposes.

According to this regulation only pesticides registered with the National Directorate of Agrarian Services (DNSA) can be used in Mozambique. These include a list of pesticides products that are regularly published, including the product classification according to their toxic potential (Article 9).

The Mozambican classification of pesticides comprises three toxicological classes: Class I, considered highly toxic; Class II, moderately toxic; and Class III, slightly toxic. The criteria for the toxicological classification of pesticides are defined Ministers supervising the areas of agriculture, environment and health, which shall comply with the international standards defined by FAO and WHO (Art 51).The list of authorized pesticides is continuously updated.

Composition and physical-chemical characteristics of the pesticides proposed for registration are conform to the specifications from the World Health Organization (WHO) and the United Nations Food and Agricultural Organization (FAO) and must appear on the label. The regulation also requires proper packaging and handling which meet the necessary requirements regarding occupational health and safety.

This decree also establishes some procedures regarding the use of pesticides, defining the requirements and required permits for individuals or companies to be allowed to apply pesticides including:

1. "*The application of Class I pesticides is subject to a 1-year renewable authorization to be issued by the CATERP, based on a formal request, with the following data attached: curriculum vitae, health certificate confirming appropriate health for the handling of pesticides and certificates confirming the technical training of the applier.*
2. *Pesticides can only be applied by adults. The appliers of Class I pesticides shall have a basic level of schooling granted by institutions recognized by the DNSA.*
3. *The DNSA can submit the applier in question to a test in order to measure his technical capabilities.*
4. *The application of pesticides is prohibited for pregnant or breastfeeding women and for minors.* (Art. 30)*"*

The importation, donation, trading and application of obsolete pesticides are prohibited. (Art. 45). Companies or other entities that have obsolete pesticides in stock shall communicate the fact immediately and in writing to the Registrar, with a copy to the DNGA. Art. 47 defines the procedures for the elimination of obsolete pesticides, which is prohibited without previous authorization of DNGA and consultation with the Registrar. Art 49 refers to the elimination of empty packages in order to avoid environmental contamination or human health problems.

Chapter VII of this regulation is focused on the technical training, dissemination and advertising - *companies or entities employing people for pesticide storage, trading, transport, application and elimination shall ensure continuing and updated training of their staff, including rules for combating fires, intoxication, first-aid, spills and other hazards.*

4.2.4 Regulation on Environmental Quality Standards and of Emissions and Effluents

The **Environmental Quality Standards and of Emissions and Effluents Regulation** (Decree Nr. 18/2004) establishes standards of environmental quality and of emission of effluents in order to ensure an effective control and surveillance on the quality of the environment and of the natural resources of the country, as defined in the Environmental Law. This diploma was revised by Decree 67/2010 which includes minimum and maximum limits for chemical substances (pesticides – see Annex 1).

These decrees regulates certain standards of water quality including, for human consumption, agricultural& livestock, aquaculture and recreational purposes, as well as standards for air emissions and for industrial and domestic effluents.

In relation to soil, Article 18 indicates practices for soil conservation, namely rotation of crops, fallow lands, soil fertilization and slope restrictions for agriculture and forestry.

Article 19 prohibits the deposit on the soil, outside the limits legally established of harmful substances, which may determine or contribute for soils degradation, as well as activities that imply earthworks, without taking the adequate measures for the conservation of soils, which may result or contribute for the degradation of soils.

4.3 Institutional Framework

The Ministry of Agriculture (MINAGRI) is the main institution responsible for pest management. It comprise the following national directorates that are relevant for pest management:

- **National Directorate for Agrarian Services** *(DNSA – Direcção Nacional de Serviços Agrários),* agriculture and livestock production, animal and plants sanitary protection;
- **National Directorate of Agrarian Extension** *(DNEA – Direcção Nacional de Extensão Agrária)* to establishes, monitoring and evaluation of the director framework for training, communication and technical assistance and organization of producers;
- **Agricultural Research Institute of Mozambique** (*IIAM - Instituto de Investigação Agrária de Moçambique)* - the main research institution in the agrarian sector in Mozambique, focused on the improvement of crops production, seeds improvement, integrated pest management, capacity building and training.

All these directorates are represented in provincial level, by the Provincial Directorates of Agriculture (DPA). At the district level pesticide use, handling and transportation is controlled by SDAE, which works with an extension team in providing training for farmers on this matter.

MINAGRI has established a Technical Advisory Committee, which provides advice on issues related to the Pesticide Regulations. This Committee includes representatives from various departments within MINAGRI and other Institutions (MICOA, MISAU, the National Institute for Standardization and Quality-INNOQ) as well as the private sector.

In addition a strong collaboration with private sector should be stablished to control the pesticides imported and in use in Mozambique, trough development of a national database from its importation, use and disposal.

5. WORLD BANK OPERATIONAL POLICY ON PEST MANAGEMENT OP 4.09

There are ten safeguard policies in the World Bank, created to inform decision making, ensuring that projects financed by the Bank are environmentally and socially sustainable. These Operational Policies include: Environmental Assessment (OP/BP 4.01), Natural Habitats (OP/BP 4.04), Forestry (OP/BP 4.36), **Pest Management (OP 4.09),** Cultural Heritage (OP/BP 11.03), Indigenous People (OP/BP 4.10), Involuntary Resettlement (OP/BP 4.12), Safety of Dams (OP/BP 4.37), Projects on International Waterways (OP/BP 7.50) and Projects in Disputed areas (OP/BP 7.60).

The objective of the Policy on Pest Management (OP 4.09) is to minimize and manage the environmental and health risks associated with pesticide use and promote and support safe, effective, and environmentally sound pest management. It aims to promote the use of biological control and reduce the use of synthetic chemical pesticides; and consolidate the legislative powers of the countries and their institutions to promote and ensure a safe pest management, effective and environmentally sound.

More specifically, this policy aims, among other objectives: (a) Determine which activities related to pest management in WB financed operations is based on the principles of integration and seek to reduce the use of synthetic chemical pesticides; (b) ensure that the dangers to health and environmental risks associated with pest management, especially the use of pesticides are minimized and can be managed effectively by the user.

This policy is used if it is foreseen the acquisition of pesticides or application equipment (both indirectly through the project, as indirectly through co-financing or counter-parties Governments that finance) (ii) the project can affect the Pest Management even though without obtaining pesticides. This includes projects which may (I) conduct extensive use of pesticides and the subsequent increase in risk to health and environment; (ii) maintains or expand current unsustainable Pest Management practices, not based on the principles of IPM, and/or significantly jeopardize health or the environment.

In WB financed agriculture operations, pest populations are normally controlled through 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 WB may finance the purchase of pesticides when their use is justified under an IPM approach.

The procurement of any pesticide in a WB financed project is contingent on an assessment of the nature and degree of associated risks, taking into account the proposed use and the intended users. With respect to the classification of pesticides and their specific formulations, the WB refers to the World Health Organization's *Recommended Classification of Pesticides by Hazard and Guidelines to Classification*. The following criteria apply to the selection and use of pesticides in WB financed projects:

(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.

It is required that any pesticides it finances be manufactured, packaged, labelled, handled, stored, disposed of, and applied according to standards acceptable to the WB. The WB does not finance formulated products that fall in WHO classes IA and IB, or formulations of

products in Class II, if (a) the country lacks restrictions on their distribution and use; or (b) they are likely to be used by, or be accessible to, lay personnel, farmers, or others without training, equipment, and facilities to handle, store, and apply these products properly.

6. PEST MANAGEMENT IN MOZAMBIQUE

6.1Current status of agriculture, livestock and forestry

Mozambique has ten differentiated agro-ecological zones, mainly defined by rainfall and type of soil. There are over 36 million hectares of arable land of which only 10% is in use, and 90 % of that is used by the family sector. Around 3.3 million hectares could be irrigated, which is double the irrigable area in South Africa.

Over 80% of the total cultivated area is used for rain fed production of basic food crops, with maize, cassava and beans occupying around 60% of the total. Horticulture occupies only 5%, and cash crops (sugarcane, cotton, tea, oil plants, tobacco) only 6%. Apart from these, 40% of households use native plants and herbs in their diet and for medicinal purposes.

One of the main problems affecting agriculture is its low productivity, which is among the lowest in Southern Africa for many products. This is due to a combination of factors, including traditional farming practices and the low use of inputs. Agriculture in Mozambique is mainly subsistence, less than 10% of households sell their surpluses of maize, cassava or cotton. The plots are farmed with hand tools and manual labour, and a minimal use of improved seeds (10% in the case of maize, 1.8% for rice), chemical inputs (4-5%) or animal traction (11.3%).

Improved inputs are rarely used because of their cost and limited supply. Fertilisers and pesticides are only used by a small proportion of rural households. Regional and provincial data shows that their use is primarily associated with cash crops.

The traditional cash crops (cotton, sugarcane and tobacco) have been farmed since colonial times, and their organisation and regulation is at an advanced level. These crops are usually produced through a concession system in which the State signs contracts allocating territories to concession companies that will carry out development and rural extension. The companies in turn provide producers with technical assistance and training, as well as production inputs (seeds, fertilisers, pesticides, sacks) and in some cases credit for investment. The concession company is the exclusive buyer in its area of influence, and pays the producer full value less the cost of the inputs and the repayment of credit advanced for investment.

There are also market-oriented food crops, such as cashew nuts, vegetables and fruit. In addition, a series of new crops has emerged in recent times, aimed exclusively at the market, including sesame, paprika, jatropha and castor oil. These crops have been appearing and disappearing in accordance with the immediate pressures of the evolving market. Crops grown as raw materials for biofuels should also be highlighted here, as world demand is creating market opportunities whereby countries such as Mozambique can develop their agriculture sectors: Mozambique can be competitive thanks to its favourable agro-climatic

conditions, the availability of land and water (north of the Save River), availability of labour and access to infrastructures (ports, railways, etc.).

Livestock also plays a vital role for the rural population although its contribution to the national economy is incipient. In 2008 it represented 10% of total agricultural production and contributed only 1.7% of GDP, but 65% of rural families have chickens, 25%have small ruminants (mainly goats), 12% have pigs and 6% have cattle (TIA, 2007). Only 11.3% of small farms use animal traction, mainly oxen, most commonly in the southern and central provinces where there is greater experience in the use of animals for farming activities and transport. In the northern region, cattle farming did not develop due to the high prevalence of tsé-tsé and tripanosomiasis.

The main constraints on the development of livestock production, particularly of cattle, are the following: (i) low production and productivity of existing herds due to the low genetic quality of the breeding animals and unsuitable management practices; (ii) a weak network of veterinary assistance for the family sector; and (iii) lack of infrastructures for watering and managing cattle. With regard to livestock, the main cause of low productivity is the poor vigilance and disease control capacity and the deficient supply of veterinary services. This is also related to poor access to an extension system, which should not concentrate only on cattle, but also on the small animals that are mainly produced by women.

In relation to forestry, according to the 2007 forestry inventory, forestry coverage is estimated at 54.8 million hectares, ie 70% of total land area. 26.9 million hectares consist of productive forest, 13.2 million hectares comprise forest reserves, and the remaining 14.7 million are occupied by multi-use forest.

6.2 Current and anticipated pest problems

There is no updated and systematic survey on pests and diseases affecting crops and livestock in the target conservation areas or even in Mozambique.

Some of main pests that affect a wide range of crops within the country are the Red Locust/Grasshoper **(***Nomadacris septemfasciata*), Elegant Grasshoper (*Zonocerus elegans*) and the African Armyworm (*Spodoptera exempta*) that affect several crops, as maize, beans, tomato, sorghum and rice and consequently affecting the food security, occurring practically in the whole country, regularly.

Basically all provinces of the country have experienced periodic outbreaks and regular invasions by locusts and grasshoppers. The African armyworm (*Spodopteraexempta***)** is a major episodic migratory crop pest over much of Eastern and Southern Africa.

Other more specific pests and diseases occurring in Mozambique to be stressed out are:

- Lethal Yellowing disease of the coconut palm, is specific disease that affects coconut palms in Nampula, Zambezia and also Inhambane provinces, being responsible for the decrease of the coconut production.

- Cassava Brown Streak Virus (CBSV) and Cassava Mosaic disease (CMD) affects Cassava, the major vegetatively propagated crop with significance for resource poor

farmers in Mozambique. It has been disastrous for both the livelihoods and food security of people living particularly in the coastal districts of Nampula province.

- Invasive fruit fly (*Bactrocerainvadens)*, an exotic and devastating pest of fruits and vegetables that can have a severe impact on sustainable agriculture and rural livelihoods, as well as on the export markets, as it prevents producers from meeting sanitary and phytosanitary standards. The invasive fruit fly, *B. invadens*, is the main fruit fly of quarantine importance in Africa. It has a wide host range including 40 fruit species. In Mozambique, the invasive fruit fly, *Bactrocerainvadens*was first detected in Cuamba district, Niassa province in 2007. Subsequent detections were made in 2008, in the Northern provinces of Cabo Delgado, North of Nampula province, and punctually in Manica, Zambezia and Tete province. This invades speciesis spreading to Centre and South of Mozambique.To control the spread of the pest, the Mozambican government prohibited the transit of fruit from northern and and central Mozambique, slicing producers' revenues for the past two seasons.

- Granivorous birds affects rice plantations as well as sorghum and maize, while field rats rice also affects several crops.

In addition, it shall also be referred the occurrence of pests that cause damage to harvested grains that are being stored as the grain weevil (*Sitophilusgranarius)* and mycotoxins in seeds current post harvest and storage problem with significance for resource poor farmers.

6.3 Current pest management practices

At present pest and plant disease control in Mozambique is limited by a combination of lack of knowledge, equipment, supplies and finance. Pesticides as fertilisers are only used by a small proportion of rural households due to the deficient supply net and unfordable cost. Regional and provincial data shows that their use is primarily associated with tobacco and cotton production, particularly in the centre and north.

There are several scattered experiences of Integrated Pest Management within the country, including in the majority of target conservation areas, which are implemented by NGOs and the Ministry of Agriculture, through the Cotton Institute and the IIAM, and the extension network of the Provincial Agriculture Directorates. In addition there are also initiatives that have been supported by donors, as USAID, DANIDA and Austrian Cooperation, beside others.

The extension services of the Provincial Directorates of Agriculture (DPA) have been providing training in some IPM techniques and distributing some equipment/products for its implementation, as for instance traps and pheromones to control the African Armyworm.

Nevertheless, IPM practices are rarely put into practical use in general in Mozambique, expect those ones that in certain regions of the country are already traditional practices, as crop rotation (eg. tomato rotation with sprouts and beans or onions every two years) or intercropping (vegetables and legumes) which are efficient in controlling some pests especially insects and fungus and could be integrated in an IPM approach. Another example is the most common treatment to avoid pathogens that attack seeds - the exposure of seed to sunlight. When seeds are stored in containers it is common to mix them with ash, cow dung

or sand. Smoke treatment is a widespread practice for most seeds. In some areas, crushed eucalyptus or tobacco leaves or crushed hot peppers are used. Weed control is generally achieved through a combination of tillage-seedbed preparation by several passes of the traditional ox-drawn plough (or manually) and subsequent inter-row weed control cultivations in row crops.

Control of birds and wild animals are mainly done by using the traditional way of scaring (as the use of scarecrows), chasing and guarding of animals.

Recently it was announced the establishment of a network of "Plant Clinics" within the country by the international NGO CABI in a partnership with MINAG under the *Plantwise Global Initiative*, funded by the International Fund for Agricultural Development (IFAD). This initiative, led by CABI, to improve food security and the lives of farmers is already running in 7 countries (DRC, Ghana, Kenya, Rwanda, Sierra Leone, Tanzania, Uganda).It is expected that *Plantwise* will strengthen the national plant health systems through three interlinked components.

1. The spearhead of the initiative is a growing network of plant clinics, set up in market places and other locations readily accessible to small scale farmers. Plant clinics are run by extensionists from local organisations or extension services, trained as "plant doctors" to provide free, on-demand advice on any plant health problem on any crop.

2. The plant clinics are the starting point for reinforcing links in the plant health system. Better communication and coordination between actors in extension, research, regulation and input supply enables them to provide better plant health services to farmers.

3. The *Plantwise* knowledge bank is a free, open-access, online source of locally relevant information on plant health problems facing farmers.

Within the target conservation areas it shall be stressed the IPM experience in Farmer Field School approach that the Agha Khan Foundation has been implementing since 2008 in Quirimbas National Park, in the districts of Metuche, Quissanga, Macomia and Meluco. This project will finish in 2016. The current monitoring and evaluation indicators indicate some resistance from the community to adhere to the IPM techniques, but there are already some positive results. The same approach has been implemented in livestock corrals for caprines as well as poultry production.

6.4 Current pesticides management

A list of registered pesticides in Mozambique is continuously updated and published by MINAGRI, as defined in Decree Nr. 6/2009. Currently it includes among several others: cypermethrinand deltamethrin (insecticides) and mancozeb (fungicide) used for a wide range of pests and crops. The list also includes biological agents.

However, comprehensive data on pesticides use are not available. Field observations indicate that although farmers are aware that pesticides are poisonous their responses still create a major occupational health and environmental risk. In particular some pesticides are often sold in non-standard containers without proper instructions, effective protective clothing and equipment is seldom available (if it exists), on-farm storage sites are highly hazardous (sun

and rain exposure), used containers are washed-out in local waterbodies and the containers re-used. Conversations with farmers reveal limited knowledge and application of safety practices.

Data on pesticides poisoning and environmental contamination are also not available or difficult to obtain since no regular system exists for regular monitoring of the risks. Moreover, medical staff at rural clinics is not trained to recognize and treat pesticide poisoning, and antidotes are not available in rural areas.

The extension services of the Provincial Directorates of Agriculture (DPA) provide regular training in these subjects, which include among others: type and amount of pesticide per crop, time of application, poisonous effects of pesticides on humans (particularly women, elderly, youth/toddlers, and vulnerable groups such as handicapped), animals (i.e. direct impacts on the food-chain) and the environment. There are also distribution of protective clothing and equipment for pesticide applicators (as boots, masks, gloves, glasses, suites and hats) and application equipment. However, the extension network is poorly equipped and faces several limitations to properly conduct their work.

In addition, it shall be referred that Mozambique has being supported by several donors to deal with obsolete pesticides in terms of inventory, risk assessment, safe transport, storage and elimination, besides communication and awareness.330 ton of obsolete pesticides were already destroyed in Europe. Remaining problems include severely contaminated soils, DDT use in health leakage to agriculture, Pesticide burial sites and Pesticide container management. The Ministry of Agriculture and Ministry for Coordination of Environmental Affairs of Mozambique, with technical support by FAO has being implemented a project that comprise four phases:

1. Identify pesticides and pesticide use situations which can be considered highly hazardous pesticides (HHPs) under Mozambican conditions;
2. Elaborate a plan of action to reduce the risks posed by these HHPs;
3. Initiate implementation of priority risk reduction activities; and
4. Develop mid- and long-term policies, programmes and projects to reduce the risk of HHPs.

All pesticides registered in Mozambique were evaluated against HHP criteria recommended by the JMPM – FAO/WHO, using mainly international data sources.

7. EVIRONMENTAL, OCCUPATIONAL AD PUBLIC HEALTH POTENTIAL IMPACTS, MITIGATION MEASURES AND MONITORING

Bearing in mind that the projects to be included under Sub-component 4.1 would be small-scale projects it is not expected the need of any intense use of pesticides in MozBio activities. However potential impacts related with the use of pesticides are identified bellow.

These potential impacts are specially associated with the current pesticide management practices identified in section 5.3. Thus mitigation measures are designed to avoid the use of, or properly manage chemical use and improve IPM in the MozBio's target areas.

The strategy for implementation of suggested mitigation measures is to use the existing structure of DPA in which the extension team supervise and train farmers in the use of chemicals as well as in the use of IPM approaches.

The objective of this section is to ensure that:

- Any intensification of agriculture practices does not result in any increase in the use of agricultural chemicals;
- The farmers have support and advice in pest and soil management for coping with their new pattern of agriculture; and
- The supply of food for the construction and operation work force is safe in terms of pesticide minimum residue level and has been produced with the attention to human and environmental safety.

Pesticide management issue	**Potential impact**	**Mitigation measure**	**Indicators of monitoring**
Excessive use of (out-of-dated) chemicals, disposal of containers in rivers and stream, use of non-authorized and/or non-labelled pesticides.	Decrease in water quality for consumption and irrigation Proliferation of aquatic weeds Loss of biodiversity in particular of aquatic species	Application of Pesticides Regulation[1](type, labelling and quantity); Promote recycling of containers; Monitor aquatic biodiversity and weeds.	Number of farmers using pesticides properly (observing expiration dates and dosages); Number of aquatic weeds; Abundance (n/ha) of plant resource species (e.g medicine, food); Patterns of water quality referred in the regulation (Decree 18/2004)
Excessive use of (out-of-dated) chemicals, use of non-authorized and/or non-labeled pesticides	Increase in soil toxicity	Regulatory application of pesticides (type, labelling and quantity); Promote the use of cultural and biological control measures	Patterns of soil quality referred in the regulation (Decree 18/2004); Number of farmers using biological and cultural measures.
Excessive use of (out-of-dated) chemicals, use of polluted water	Poor crop yield; Unacceptable levels of pesticide residues in harvested produce and in the food chain.	Regulatory application of pesticides (type, labelling and quantity); Promote the use of cultural and biological control measures	Productivity per crop; Quality of the product; Number of farmers using biological and cultural measures.
Use of empty pesticide's packages, washed and disposed in rivers, consumption of polluted water, excessive use of chemicals	Poisoning of workers/farmers and detrimental effects on human health Toxicity to fish	Promote the recycling of packages; Regulatory application of pesticides (type, labelling and quantity); Monitor aquatic biodiversity and fishing activity; Promote first aid training to farmers.	Observed changes in the following areas: Number of farmers recycling containers; Number of packages washed and disposed in rivers; Patterns of water quality referred in the regulation (Decree 18/2004); Fishing yields; Number of farmers trained in first aid.

[1]Decree Nr. 6/2009

Application without Protective equipment	Increased number of accidents and injuries	Promote the use of protective equipment; Promote first aid training	Number of workers/farmers using protective equipment; Number of workers/farmers trained in first aid; Number of accidents/injuries per season.

Overall, pesticide misuse may also result in: (i) Elimination of the natural enemies of crop pests and consequent loss of natural pest control that keeps the populations of crop pests very low; and (ii) Development of pest resistance to pesticides, encouraging further increases in the use of chemical pesticides (vicious cycle).

To mitigate the impacts identified in Table 2 the overall approach of the Subcomponent 4.1 of MozBio Project should be to avoid or keep pesticide use at a minimum. Any necessary use should be intelligent and considered part of an IPM approach in line with OP 4.09. The exact IPM approach should be defined according to site conditions and capacity of the farmers to adopt and implement new techniques.

The following principles of IPM shall be considered:

- **Grow a healthy crop**. The focus is on cultural practices aimed at keeping the crop healthy. Selection of varieties that are resistant or tolerant to pests is an important aspect. Attention to soil, nutrient and water management is part of growing a healthy crop. Many IPM programs therefore adopt a holistic approach and consider a wider range of agro-ecological parameters related to crop production.
- **Manage the agro-ecosystem** in such a way that pests remain below economic damaging levels, rather than attempt to eradicate the pest. Prevention of pest build up and encouragement of natural mortality of the pest is the first line of defense to protect the crop. Non-chemical practices are used to make the field and the crop inhospitable to the insect pest species and hospitable to their natural enemies, and to prevent conditions favourable to the build-up of weeds and diseases.
- **Decisions to apply external inputs as supplementary controls are made locally, are based on monitoring of pest incidence and are site-specific**. External inputs may include predators or parasites (bio-control), labour to remove the pest manually, pest attracting lures, pest traps, or pesticides. The choice of external input varies for each situation. Pesticides are generally used if economically viable non-chemical pest control inputs are not available or failed to control the pest. They are applied only when field monitoring shows that a pest population has reached a level that is likely to cause significant economic damage and the use of pesticides is cost-effective in terms of having a positive effect on net farm profits. Selection of products and application techniques should aim to minimize adverse effects on non-target species, people and the environment.

The IPM approach shall include a wide variety of techniques that can be applied under IPM approaches, which applicability will depend on various factors, including: the crop, the

cropping system, the pest problems, the climate, the agro-ecological conditions, etc. Some examples of such techniques (WB, 2006) are:

Cultural practices that can help prevent build-up of pests

- Crop rotation
- Inter-cropping,
- Field sanitation and seed bed sanitation,
- Use of pest-resistant crop varieties,
- Managing sowing, planting or harvesting dates
- Water/irrigation management,
- Soil and nutrient management (including mulching, zero/low tillage, fertilizer management)
- Practices to enhance the build-up of naturally existing predator populations
- Hand-picking of pests or hand-weeding
- Use of traps or trap crops
- Post harvest loss prevention

Biological inputs

- Biological control through release of predators, parasites or pathogens
- Biological control through fish, ducks, geese, goats, etc.
- Release of sterile male insects
- Bio-pesticides
- Biological preparations (e.g. name extract)

Chemical inputs

- Chemicals that disrupt insect behaviour (e.g.: pheromones)
- Growth-regulators

Conventional pesticide - to be avoided or use at a minimum

In order to implement IPM approaches in the activities to be included in Subcomponent 4 it will be crucial to:

- Embed IPM approach during the subprojects design, taking into account other IPM experiences within the region;
- Implement participatory approaches in IPM within the target communities to learn, test, select and implement IPM options to reduce losses due to pests and diseases - special ;
- Establish a monitoring system that provides early warning on pest status, beneficial species, regular and migratory species;
- Collaborate with other IPM programmes in the target conservation areas and surroundings, as those ones being implemented by Aga Kahn Foundation, CARE, USAID and the Ministry of Agriculture (including through PROIRRI), beside others.
- Improve capacity building and training on IPM.

9 GUIDELINES FOR THE PREPARATION OF SPECIFIC PMP

At the present stage of the MozBio Project it is not yet defined in detail the subprojects to be developed to support livelihoods. It could comprise a wide range of types as agriculture, livestock, forests or fisheries and several type of crops/species.

In case of selection of subproject with potential to pest development, a specific Pest Management Plan shall be prepared, based on the principles defined in this PMP. In case of an agriculture subproject the Pest Management Plan shall include:

Description of the Subproject – identification its location, area, cropping system, , the climate, the agro-ecological conditions, technologies to be used, water source, the potential pest problems (key pests for each target crop).

Legal and Institutional Framework – including at the district and Administrative level

Identification of alternatives for pest management – Identification of current management of the identified key pests in the region and existent IPM experiences– in consultation with agricultural authorities, NGOs, extensionists and farmers, including the identification of farmers' indigenous IPM tactics. Identification of the pesticides authorized in Mozambique for the identified key specie. Identification of alternatives techniques on consultation with research institutions as IIAM or even international institutions that usually supports MINAGRI as FAO.

Definition of a strategy to manage the pest – identifying measures to be implemented along the crop cycle since the project preparation stage, to site preparation and planting, including cultural practices that can help prevent build-up of pests, listed in section 7 of this report. Select an appropriate blend of IPM tools.

Awareness and training to promote IPM and the safe use of pesticide – for extension workers, farmers and local communities; it shall include strategies to communicate with local communities, farmers, including the preparation of specific materials with photos/figures or even videos.

Monitoring and Evaluation – define a monitoring plan to ensure regular fields monitor and the preparation of quarterly evaluation reports.

This structure and contents would be similar in case of other type of subproject with potential pes occurrence.

9 INSTITUTIONAL ARRANGEMENT

Ministry of Tourism (MITUR) is the principal implementing institution for this project. MITUR's internal capacity to implement the proposed project has been strengthened over the years through TFCA I and II projects. The MozBio Project Implementing Unit, which will build on the existing TFCA Unit with some changes in staffing, will be responsible for leading the implementation of MozBio.

The MozBio Unit will be responsible for securing compliance with WB safeguards (including the OP 4.09 on Pest Management) in collaboration with other entities implementing project activities.

National Administration of Conservation Areas (ANAC), the parastatal agency recently created to manage more efficiently the Conservation Areas system of Mozambique, is expected to play a key role in implementing MozBio.

The environmental and social specialists to be recruited to ANAC will be directly responsible to ensure proper pest management in the MozBio projects, articulating with the institutions referred in section 4.3, namely at national level the National Directorate for Agrarian Services and National Directorate of Agrarian Extension and the Agricultural Research Institute of Mozambique. The provincial directorates for agriculture, the district agriculture services, NGOs and private sector would also play an important role in the definition of pest management plans.

The ANAC's social specialist will coordinate and supervise the engagement of local communities in the PMP, supervise the awareness campaigns for local communities regarding to human health and environmental impacts of pesticide and training of pesticide users.

The ANAC's environmental specialist would be responsible to supervise the preparation of specific pest management plans, articulate with the agriculture and environmental authorities and be responsible for the monitoring.

The CA's Community Agents would be directly engaged in all the PMP activities in the field, acting as a liaison point with the ANAC's environmental and social specialists

10 CAPACITY BUILDING, TRAINING AND AWARENESS-RAISING CAMPAIGNS

IPM is a knowledge intensive and interactive approach. Thus, the success of IPM depends largely on developing and sustaining institutional and human capacity to facilitate experiential learning for making informed decisions in integrating scientific and indigenous knowledge to solve specific problems. Poor communication between farmers, extension has often led to poorly-targeted research or to poor adoption of promising options generated by research.

The need to accurately identify and diagnose pests and pest problems and understand ecosystem interactions could enable farmers with biological and ecological control opportunities and in making pragmatic pest control decisions. Therefore it is required a strong linkage between researchers, governmental authorities and the implementers of IPM techniques.

As discussed before in Mozambique general farmers are aware that pesticides are poisonous but their responses still create a major occupational health and environmental risk. There is a need to implement awareness campaigns to raise the understanding of the potential environmental and human health impacts related with inadequate use of pesticide as well as the benefits of the integrated pest management practices.

On other hand more training is required for farmers on the implementation of integrated pest management and for pesticides users.

Training on IPM shall include:

Learning-by-doing/discovery training programs – experiences indicate that farmers are most apt to adopt new techniques when they acquire knowledge and skills through personal experience, observation, analysis, experimentation, decision-making and practice. This allows to identify farmers' own knowledge and for farmers to understand how IPM applies to their own farms.

Recovering collective memory - Pest problems often emerge because traditional agricultural methods were changed in one way or another, or lost. These changes can sometimes be reversed. This approach uses group discussions to try to identify what changes might have prompted the current pest problem.

Smallholder support and discussion groups -Weekly meetings of smallholders, held during the cropping season, to discuss pests and related problems can be useful for sharing the success of various control methods. However, maintaining attendance is difficult except when there is a clear financial incentive (e.g., credit).

Demonstration projects - Subsidized experiments and field trials at selected farms (farmer-field school) can be very effective at promoting IPM within the local community. These pilots demonstrate IPM in action and allow farmers to compare IPM with ongoing cultivation supported by synthetic pesticides.

Educational material - Basic written and photographic/figures guides or even videos to pest identification and crop-specific management techniques are essential for training and could be an important factor in motivating farmers to adopt IPM.

Youth education - Promoting and improving the quality of programs on IPM and the risks of synthetic pesticides has been effective at technical schools for rural youth. In addition to becoming better farmers in the future, these students can bring informed views back to their communities now.

Training on use of pesticides shall include the following:

Pesticide selection – Indicating the list of authorized pesticides per target pests, indicating its level of toxicity and hazardous, possible harmful effects and past experience using those pesticides for the pest and the crop.

Understanding the Pesticide Label – Explain all the information included in the label.

Pesticide Transport – Give indications on how to transport pesticides in order to avoid any leakages and avoiding the contact with persons or animals.

Mixing and Loading Pesticide – Explain the importance of ensure the proper dilution of the concentrated pesticide and the need to use protective clothing.

Pesticide Storage – Give indications on how to storage pesticides – site location (not allowed in flood areas), security (against illegal entries, as well as children and livestock), isolated from other houses, be well ventilated, waterproof roof, have a current inventory list of pesticide stock.

Container Disposal – Give indications on how to destroy used pesticide containers

Obsolete pesticides – Explain the risks associated with obsolete pesticides and procedures to be followed.

Calibration, Product Quantity and Pesticide Application – Explain the importance of application equipment calibration and how to do it.

Determining the Amount of Chemical to Use – Give explanations on methods to find out the amount of chemical to apply per hectare and its level of dilution

Important Cautions related to the Application of Pesticides – Give indications on important cautions for safe use of pesticide (see box bellow)

Toxicity, Human Protection and First Aid – Explain the possible effects of pesticide on human health, ways of pesticides entering in the body, importance of protective clothing & other protective equipment, basic first aid for pesticide exposure (with skin, mouth, eye or respiratory system).

Do NOT:

- Buy more pesticide than you'll need for a single season.
- Mix more pesticide than you'll need to treat the desired area.
- Apply sprays or dusts when leaves and small plants are continually moving because of the wind (this means a wind speed of 4 m/second).
- Apply pesticides during the hottest part of the day.
- Apply pesticides if you think it will rain within 12 hours.
- Eat, drink, smoke, or chew tobacco while applying pesticide.
- Carry tobacco, food or drinks with you while spraying.
- Get into the path of any spray drift, or let others get in its path.
- Try to blow out a plugged nozzle with your mouth.
- Keep working if anyone shows signs of pesticide poisoning (start first aid immediately).
- Wash contaminated clothes with any other clothing.
- Let water from washing contaminated clothes or equipment get into streams, ponds or wells.

(USAID, 2007)

Awareness-raising programs and training on IPM techniques and safe use of pesticides shall be inclusive for women and vulnerable groups, since experience show that these are the most impacted persons by pest and pesticides use and storage (toddlers, handicapped, elderly, etc.).

11 PMP IMPLEMENTATION BUDGET

The costs of implementing the PMP are related to the preparation of Specific Pest Management Plans, capacity building, training and awareness-raising campaigns, as in the following table.

	Y1	Y2	Y3	Y4	Y5	Y6	
Specific PMP		50 000					50 000
Preparation of Communication Material			10 000				10 000
Amareness-raising campaingsn and training				50 000	50 000	50 000	150 000
							210 000

The overall budget for implementation of the ESMF is estimated at US$210,000.00.

References

Cugala, D., Mangana, S., Suitability of different banana maturity stages for the development of the invasive fruit fly, *Bactrocerainvadens*i n Mozambique, 2010

Republic of Mozambique, Ministry of Agriculture, Strategic Plan for Agricultural Development, Strategic Plan for Agricultural Development - PEDSA 2010-2019

Republic of Mozambique, Ministry of Agriculture, Poverty Reduction Action Plan (2010 – 2014).

Donovan, c. et all, Coconut Farmers' Survey Report. Farmer Income Support Project (FISP). Research Paper Series, Research Report No.69E MADER, Directorate of Economics, November 2010.

World Bank, Pest Management Guidebook, 2006.

Wulff, E.&Torp, J. Seed Sector Country Profile: Mozambique. Volume I: Overview of seed supply systems and seed health issues Department of Plant Biology, Royal Vet. and Agricultural University, DK-1871, Copenhagen, Denmark, 2005

Tostão, E. Etal. Mosca Invasiva da Fruta (Bactrocerainvadens): Ocorrência e Impacto Socioeconómico em Moçambique. CEAGRE for USAID AgriFUTURO Program Mozambique Agribusiness Competitiveness.

FAO/WHO Report 6th FAO/WHO Joint Meeting on Pesticide Management and 8th Session of the FAO Panel of Experts on Pesticide Management, 9 – 12 October 2012.

Davis, M., The global problem of obsolete pesticides and the FAO strategy for solutions FAO, Geneva, May 2011.

USAID, Supplemental Environmental Assessment for Potential USAID Assistance to Locust/Grasshopper Control Operations in Mozambique, Mission Report, Maputo, Mozambique September 1993.

USAID, Environmental Guidelines for Small-Scale Activities in Africa: Environmentally Sound Design for Planning and Implementing Development Activities, 2007.

ANNEX 1

Standards for chemical substances (pesticides)

(in Annex V of Decree 67/2010)

Substances (mg/l)	Limits	
	Minimum	**Maximum**
Organoclorades (mg/l)		
Aldrin	0,003	0,01
Clordano	0,004	0,04
DDT	0,001	0,002
Demeton	0,1	0,1
Dieldrin	0,003	0,005
Endolssufão	0,001	0,001
Endrin	0,004	0,004
Heptacloro	0,001	0,01
Metoxicloro	0,03	0,03
Lindano	0,004	0,02
Mirex	0,001	0,001
Gution	0,01	0,0
Malatião	0,1	0,1
Paratião	0,04	0,04
Toxafeno	0,005	0,01
Herbicides (mg/l)		
2.4 D	4	10
2.4.5 T	10	10
2.4.5 TP	2	10
Compostos organofosforados ou carbamatos totais em paratião	10	10