SFG2029

REPÚBLICA DE MOÇAMBIQUE

MINISTÉRIO DA TERRA, AMBIENTE E DESENVOLVIMENTO RURAL (MITADER)

Agriculture and Natural Resource Landscape Management Project

(PROJECT -- P149620)

PEST MANAGEMENT PLAN (PMP)

Final Draft Report

Maputo, March 2016

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ANE	National Roads Administration
ANRLMP	Agriculture and Natural Resources Landscape Management Project
CBNRM	Community-Based Natural Resource Management
CESMP	Contractor's Environmental and Social Management Plan
DA	District Administration
DCC	District Consultative Council
DLA	Department of Environmental Licensing
DNA	National Directorate of Environment
DNA	National Directorate for Water
DNE	National Directorate for Energy
DNOTR	National Directorate of Land Planning and Resettlement
DPASA	Provincial Directorate of Agriculture and Food Security
DPOPHRH	Provincial Directorate of Public Works, Housing and Water Resources
EA	Environmental Assessment
EDM	Electricidade de Moçambique/Electricity Company
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
ESIA	Environmental and Social Impact Assessment
ESMF	Environmental and Social Management Framework
ESMP	Environmental and Social Management Plan
FAO	Food and Agriculture Organization
GDP	Gross Domestic Product
GOM	Government of Mozambique
IDA	International Development Association
IDCF	Innovation and Demonstration Catalytic Fund

MEF	Ministry of Economics and Finance
MDP	Municipal Development Project
MICOA	Ministry for the Coordination of Environmental Affairs
MASA	Ministry of Agriculture and Food Security
MISAU	Ministry of Health
MITADER	Ministry of Land, Environment and Rural Development
MOPHRH	Ministry of Public Works, Housing and Water Resources
MSME	Micro Small and Medium Enterprises
MZM	Mozambique Metical (national currency)
NCSD	National Commission for Sustainable Development
NEMP	National Environmental Management Program
NGO	Non-Governmental Organization
PARPA	Action Plan for the Reduction of Absolute Poverty
PEDSA	Strategic Plan for Agricultural Development
PCU	Project Coordination Unit
PDD	District Development Plans (Plano Distrital de Desenvolvimento)
PDPF	Provincial Directorate of Planning and Finance
PDUT	District Land Use Plan
PEPA	Environmental Quality Standards of Mozambique Projects
PLPP	Provincial level project personnel (with monitoring responsibilities)
PNI	National Irrigation Program
PNISA	National Agriculture Investment Plan
PP	Urban Detailed Plan/Plano de Pormenor
PPP	Public Private Partnership
PPU	Provincial Project Unit
PPU	Partial Urban Plan/Plano Parcial de Urbanização
PRS	Poverty Reduction Strategy
RAP	Resettlement Action Plan

RPF	Resettlement Policy Framework
SDAE	District Services of Economic Activities
SDMAS	District Services of Women, Social Affairs and Health
SDPI	District Services of Planning and Infrastructure
TOR	Terms of Reference
UCA	Coordination and Support Unit
UNDP	United Nations Development Program
USD	United States of America Dollar
WB	World Bank
WHO	World Health Organization
ZVDA	Zambezi Valley Development Agency

EXECUTIVE SUMMARY

Introduction

The **Agriculture and Natural Resources Landscape Management Project** (ANRLMP) is expected to expand the introduction of advanced agriculture and agribusiness in the two provinces (Nampula and Zambezia) where it will be implemented. In its turn the process has a strong potential for increasing pest populations and subsequently a raise in pesticide usage to control them, including an increase in the use of chemical fertilizers in the entire agricultural cycle.

Mozambique, like many other developing countries, is assessed to have a low use of pesticides. However, a combination of factors explain that the country and other like, it is more vulnerable to agro-chemicals hazards due to poor regulatory, health and education systems.

In order to avoid and minimize the potential negative effects of pesticides in such contexts the adoption of Integrated Pest Management (IPM) is recognized as the best approach. IPM is a mix of farmer-driven, ecologically based pest control practices that seek to reduce reliance on chemical pesticides. It involves: i) managing pests (keeping them below economic impact levels) rather than seeking to eradicate them; ii) relying, to the extent possible, on non-chemical measures to keep pest populations low; and iii) selecting and applying pesticides, when they have to be used (rational use), in a way that minimizes adverse effects on beneficial organisms, humans and the environment.

Due to its characteristics ANRLMP is assessed to trigger World Bank Operational Policy 4.09 on Pest Management, which then is based on the Integrated Pest Management (IPM) approach with the aim of promoting good agricultural practices through the use of responsible and sustainable activities that will result in a rational and a reduction in pesticide use.

This document describes the issues that characterize the environment under which pest management is done in Mozambique, including the laws and regulations in place, institutions involved and their roles and capabilities. It contrasts these aspects with the WB principles and guidelines, identifies the best ways of making Mozambique and particularly ANRLMP more compliant with the recommended best practices at the same time that suggests a specific action plan tailored for the project and beyond.

The preparation of this document was based on (i) literature review; (ii) interviews and discussions with key informants (agriculture, irrigation, health and environment); (iii) review of similar projects, mainly PROIRRI and MOZBIO; and (iv) direct observations in the project area. PROIRRI's experience in particular was extensively examined as way of drawing lessons that could be applied under ANRLMP as a way of enhancing its ability to translate IPM principles into added value for the project.

Project Description

ANRLMP will have four main components and a number of subcomponents structured and funded as follows:

Component 1: Agriculture and Forest-Based Value Chain Development (US$57.0M IDA), with the objective of increasing smallholder and small emerging commercial farmers' participation in key agriculture and forest-based value chains; and enhancing their overall competitiveness, sustainability and resilience.

Component 2: Securing Land Tenure Rights and Increasing Natural Resources Resilience (US$18M IDA), with the following main objectives (a) promote integrated landscape management in the targeted landscape; (b) secure land tenure rights of 450 rural communities and 55,000 individuals; and (c) protect, enhance and restore 3,000 hectares of critical natural habitats in the landscape.

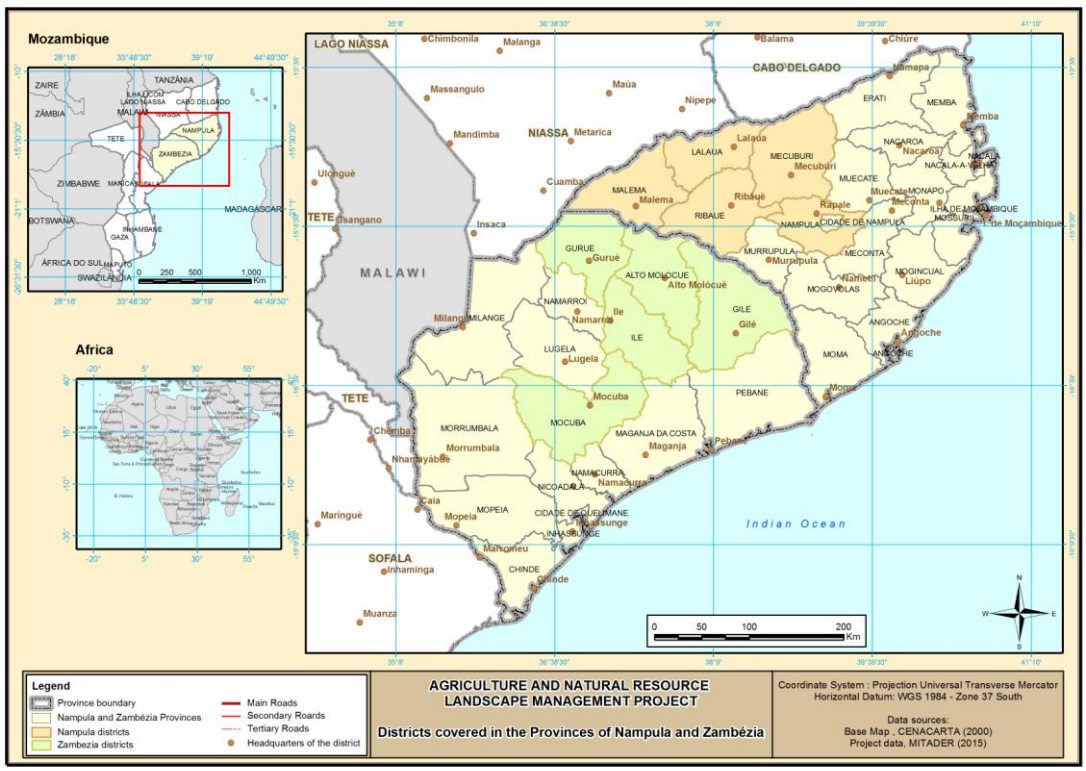
Component 3: Project Coordination and Management (US$6M IDA). This is a component that includes activities related to project coordination and management, fiduciary management, safeguards management, M&E, and communications.

Component 4: Contingency Emergency Response (US$ 0M), which is expected to will provide immediate response in the event of an eligible crisis or emergency.

Component 1 in particular is expected to be associated with an increase and intensification of production in agriculture and forests and consequently with the possible increase in the use of pesticides.

Project Area

The Project will be implemented in 10 districts subdivided into five in Nampula (Malema, Ribáue, Lalaua, Rapale, and Mecubúri) and and five in Zambezia (Mocuba, Ile, Gilé, Alto Molócue, and Gurué) provinces, respectively.



Applicable Legal Framework and Institutional Base

IPM will result from a good and creative combination of the Mozambique's policy and institutional framework and prevailing practices with those of the World Bank.

Two instruments occupy central position in Mozambique's pesticide legislation, i.e. *Ministerial Diploma 153/2002 of 11 September 2002* (Pesticides Regulation) and *Decree 6/2009 of 31 March 2009* (Pesticides Management Regulation). These are complemented by Decree n. 18/2004 Regulation on Environmental Quality and Effluents' Emissions amended by Decree No. 67/2010. The WB relies mostly on two instruments to regulate how its funded projects should exercise PM, namely World Bank OP 4.09 Pest Management and BP 4.01, Annex B - Application of EA to Projects Involving Pest Management

The two sets of regulations have significant differences in that the GOM regulations focus more on operational matters in detriment of defining and regulating the overall context under which pesticides should be integrated, considered and possibly used. The country does not have any integrated pest management or any organic production strategy. On the contrary IPM is central to the WB approach. The WB policy calls for assessment of the nature and degree of pesticide use associated risks, taking into consideration the proposed use and the intended users for procurement of any pesticide in Bank-financed projects. Under the WB approach it is a requirement that any pesticides that will be used, will be manufactured, packaged, labeled, handled, stored, disposed of, and applied according to standards acceptable to the World Bank. This will be applied in the project's life cycle at the same time that existing national good practices will be promoted and enhanced.

The core institutions in pesticide management in Mozambique are the Ministries of Agriculture and Food Security (MASA), Land, Environment and Rural Development (MITADER) and the Ministry of Health (MISAU). Pesticides Regulation Ministerial Diploma 153/2002 entrusts these institutions with the responsibility of ensuring that pesticides are managed in a way that does not pose a threat to human, plant and animal health and to the overall health of the environmental components.

PM is marked by a series of institutional constraints in Mozambique in the form of (i) poor coordination; (ii) dependency on external funding; (iii) poor law enforcement; (iv) inconsistency and discontinuity in program implementation; (v) under-staffing; (vi) poor allocation of resources; and (vii) inconsistent and discontinuity in applied and adaptive research and capacity building. These come as obstacles for a proper policy formulation, consistent implementation, monitoring and evaluation, which make the adoption of IPM for ANRLMP required.

Pest Management

The potential use of pesticides will be associated with agricultural activities (plant production) for the control of pests, diseases, nematodes and weeds around maize, sesame, pigeon peas, cashew and soybeans, which, due to the expected intensification may involve the application of agrochemicals and inputs. In general pest attack is low in the Project targeted areas, but there is a range of pests, diseases and weeds reported by farmers, officials and in the literature. The current impact from these pests is not well known in the same way a pesticide use although, despite being slightly higher when compared to other regions in Mozambique, is estimated by agricultural officers to be currently low. However, an increase in crop area, especially of monoculture crops, may result in an increase of pest occurrence.

Traditional farmers have their own knowledge in regard to the use of some of the IPM principles in the Project command area in the form of intercropping and/or the use of remedies made from local plants. However this knowledge is not always supported by existing systems and risks to disappear if this trend is not reversed.

Data on pesticides poisoning and environmental contamination are often not available or are difficult to obtain, since no regular government system exists for regular monitoring of the risks. However, there is a need to improve current pest and pesticide management practices within the country and more in particular, in the Project areas, especially given the fact that one of the objectives of the Project is to set the path to be followed in the future regarding the promotion of rural development on the basis of lessons learned.

Adoption of IPM by ANRLMP

In line with OP 4.09 and BP 4.01 (OP 4.09/BP 4.01), to mitigate the potential impacts associated with uncontrolled proliferation of pesticides the general approach of the ANRLMP will be to keep pesticide use at a minimum or avoid it and ensure that any necessary use is intelligent, coherent and considered part of an IPM approach.

It is proposed that a step by step process of putting into place an effective IPM be adopted. The process comprises the following main phases (i) mobilization; (ii) diagnostic; (iii) formulation of specific action plans, mainly around IPM in general, pesticide regulation per se, research, extension, and pesticide use; (iv) Implementation of action plans; and (v) Monitoring and evaluation and lessons learned to feed into the project and the plant and animal health subsector in general. Main issues to be addressed include (i) change in current pest management practices; (ii) IPM mainstreaming; (iii) IPM research and extension; (iv) increased use and reliance on chemical pesticides; (v) enforcement of legislation; (vi) environmental hazards of pesticide misuse; (vii) increase in vector populations and of vector borne diseases such as malaria; and (viii) monitoring.

The success of the IPM strategy will depend not only on the ability of the Project to define an IPM program and link it with strategic partners (private companies or NGOs), but also on the capacity of the different actors (government, extension service, farmers, private organizations, strategic partners) to fulfill their commitments in these areas. This means extensive mobilization, training and capacity building will be the core of all interventions. Of particular relevance will be the encouragement of the use of pest control methods (e.g. biological, physical and mechanical and chemical), that are not pesticide dependent. These should be supported by applied research and extension and disseminated and demonstrated accordingly. Monitoring and evaluation will be continuous and lessons learned will feedback into the project and beyond.

Institutional Strengthening and Capacity Building

IPM success 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. IPM will be achieved through a good and practical combination of scientific and applied/participatory research involving farmers (including women), extension workers, and researchers.

Capacity building will be achieved through farmer-based collaborative management mechanisms under which all key stakeholders have to be regarded as equal partners whose role will be to facilitate the process and provide technical direction and any other support necessary for the implementation of the activities.

The PMP and related IPM for the project will be managed and facilitated by the Hired Service Provider. He will be responsible for facilitating the main stages of the process, i.e. mobilization, participatory diagnostic, formulation of the detailed plan of action

involving the main areas of intervention that have been identified, implementation, monitoring and evaluation and feedback to the system through lessons learned that are valid for the project and other similar interventions.

Budget

The costs of PMP implementation will depend on the scale and details of the program to be agreed upon. A preliminary budget estimate for the implementation of this PMP puts it at **USD$ 200,000.00** (**two hundred thousand American Dollars**), which is equivalent to 1% of the total budget for **Agribusiness finance to value chain actors (US$20M IDA). SECFs, Agribusiness, Weather based insurance**. This is slightly higher (close to double in terms of proportion to the total budget) than the proportion used for MOZBIO project for the same plan and considered adequate as a first estimate for this project as it is suggested that ANRLMP PMP will be more encompassing. Details of budget allocation by budget items will be worked out after project start-up.

SUMÁRIO EXECUTIVO

Introdução

Espera-se que o **Projecto *Landscape* de Gestão Integrada de Agricultura e Recursos Naturais** (ANRLMP) expanda a introdução de uma agricultura avançada assim como de agronegócios nas duas províncias (Nampula e Zambézia), em que o mesmo será implementado. Por sua vez, este processo de intensificação tem um forte potencial para aumentar as populações de pragas e, posteriormente, um aumento no uso de pesticidas para controlá-las, incluindo um aumento no uso de fertilizantes químicos em todo o ciclo da produção agrária.

Avalia-se que Moçambique, tal como muitos outros países em desenvolvimento, possui um baixo uso de pesticidas. No entanto, uma combinação de factores explica que o país e outros países similares, seja mais vulnerável a riscos de agroquímicos devido a sistemas de regulação, saúde e educação que são precários.

A fim de evitar e minimizar os potenciais efeitos negativos decorrentes dos pesticidas em tais contextos, a adopção de uma Gestão Integrada de Pesticidas (GIP) é reconhecida como sendo a melhor abordagem. A GIP assenta numa combinação de práticas com base ecológica de controlo de pragas que seja impulsionadas pelos agricultores, que buscam reduzir a dependência em pesticidas químicos. Trata-se de: i) gestão de pragas (mantendo-as abaixo dos níveis do impacto económico) ao invés de tentar erradicá-las; ii) basear-se, na medida do possível, em medidas não-químicas para manter baixas as populações de pragas; e iii) selecção e aplicação de pesticidas, quando estes tenham que ser usados (uso racional), de uma forma que minimize os efeitos adversos sobre organismos benignos, seres humanos e sobre o ambiente.

Devido às suas características o ANRLMP é avaliado como desencadeando a Política Operacional 4.09 do Banco Mundial sobre Gestão de Pesticidas, que, por sua vez, se baseia na abordagem de Gestão Integrada de Pesticidas (GIP) com o objectivo de promover as boas práticas agrárias através da adopção de práticas responsáveis e sustentáveis que resultarão numa redução no uso de pesticidas e que isso se faça de forma racional.

Este documento descreve os problemas que caracterizam o ambiente em que a gestão de pragas é feita em Moçambique, incluindo as leis e regulamentos em vigor, as instituições envolvidas e as suas funções e capacidades. Ele contrasta estes aspectos com os princípios e directrizes do BM, identifica as melhores formas de tornar Moçambique e particularmente o ANRLMP mais compatível com as melhores práticas recomendadas ao mesmo tempo que sugere um plano de acção específico a ser adaptado ao projecto e para além dele.

A preparação deste documento foi baseada em (i) revisão da literatura; (ii) entrevistas e discussões com informantes-chave (na agricultura, irrigação, saúde e ambiente); (iii) avaliação de projectos similares, principalmente o PROIRRI e MOZBIO; e (iv) observações directas na área do projeto. A experiência do PROIRRI em particular foi extensivamente examinada como forma de extrair lições que possam ser aplicadas ao ANRLMP como uma forma de reforçar a sua capacidade de traduzir os princípios de GIP em valor acrescentado para o projecto.

Descrição do Projecto

O ANRLMP terá quatro componentes principais e um número de subcomponentes estruturados e financiados da seguinte forma:

Componente 1: **Desenvolvimento de Cadeias de Valor Agrárias e Florestais (US $ 57M)** com o objectivo de promover a agricultura e as cadeias de valor de recursos naturais relacionadas com as culturas (de segurança alimentar e de rendimento) e florestas (madeira e produtos não-madeireiros decorrentes de florestas plantadas e naturais).

Componente 2: Segurança dos Direitos de Posse de Terra e o Aumento da Resiliência dos Recursos Naturais (US$ 18 M IDA) com os seguintes objectivos principais (a) promover a gestão integrada da paisagem no ambiente receptor; (B) assegurar os direitos de posse de terra de 450 comunidades rurais e 55.000 indivíduos; e (c) Proteger, melhorar e restaurar 3.000 hectares de habitats naturais críticos na paisagem.

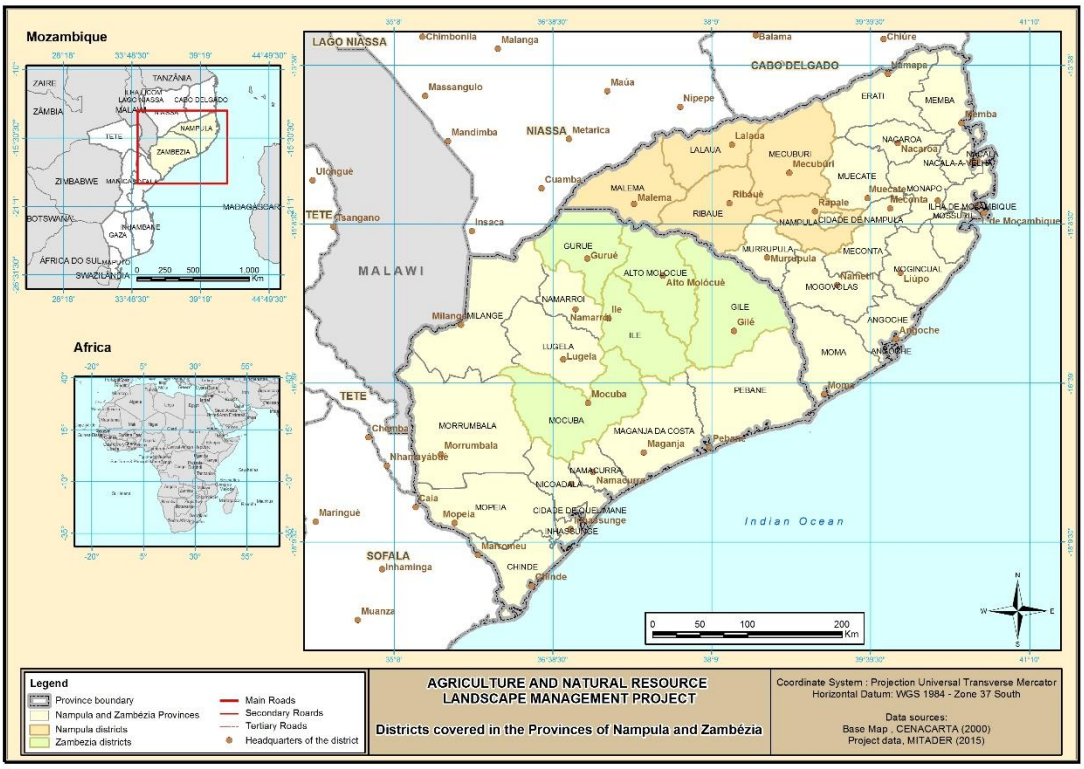
Componente 3: Coordenação e Gestão do Projecto (US$6M IDA). Esta componente inclui actividades relacionadas com a coordenação e gestão do projecto, consultas às e diálogo com a partes interessadas, M&E, um programa e estratégia de comunicação.

Componente 4: Contingência para Resposta a Emergências (US $ 0M,). Esta componente irá prestar resposta imediata para casos de uma crise ou emergência elegível, tal como para casos de desastres.

Está previsto que a Componente 1, em particular, estará associada a um aumento e intensificação da produção na agricultura e florestas e, consequentemente, com o possível aumento na utilização de pesticidas.

Área do projecto

O projecto será implementado em 10 distritos subdivididos por cinco distritos nas províncias de Nampula (Malema, Ribáue, Lalaua, Rapale, e Mecuburi) e cinco distritos da Zambézia (Mocuba, Ile, Gilé, Alto Molocué, e Gurué), respectivamente.



Visão geral da área do projecto

Quadro Legal Aplicável e Base Institucional

A GIP vai resultar de uma boa e criativa combinação das políticas de Moçambique e do seu quadro institucional assim como das práticas prevalecentes com os instrumentos e directrizes do Banco Mundial.

Dois instrumentos ocupam posição central na legislação sobre pesticidas em Moçambique, ou seja, *Diploma Ministerial 153/2002 de 11 de Setembro de 2002* (Regulamento sobre Pesticidas) e *Decreto 6/2009 de 31 de Março de 2009* (Regulamento sobre Gestão de Pesticidas). Estes instrumentos são complementados pelo Decreto n. 18/2004 Regulamento sobre Qualidade Ambiental e Emissões de Efluentes alterado pelo Decreto nº 67/2010. O BM baseia-se principalmente em dois instrumentos para regular como projectos por si financiados devem exercer a GP, ou seja, a PO 4.09 do Banco Mundial sobre Gestão de Pragas e o Anexo B da PO 4.01 – referente à Aplicação dos EA sobre Projectos Envolvendo Gestão de Pragas

Os dois conjuntos de regulamentos têm diferenças significativas sobretudo assentes no facto de que os regulamentos do GOM concentram-se mais em questões operacionais em detrimento de definir e regular o contexto geral em que os pesticidas devem ser integrados, analisados e eventualmente utilizados. O país não tem qualquer gestão integrada de pragas ou qualquer estratégia de produção orgânica. Contrariamente a isso, a GIP é central na abordagem do BM. A política do BM apela para a avaliação da natureza e do grau de riscos associados com a utilização de pesticidas, levando em consideração o uso proposto e os usuários que irão fazer a aquisição de qualquer pesticida em projectos financiados pelo Banco. Sob a abordagem do BM constitui-se numa exigência que quaisquer pesticidas que possam ser utilizados, fabricados, embalados, etiquetados, manuseados, armazenados, eliminados e aplicados o sejam de acordo com os padrões aceitáveis para o Banco

Mundial. Isto será aplicado no ciclo de vida do projecto, ao mesmo tempo que as práticas nacionais existentes que sejam boas serão promovidas e reforçadas.

As instituições centrais na gestão de agroquímicos em Moçambique são os Ministérios da Agricultura e Segurança Alimentar (MASA), Terra, Ambiente e Desenvolvimento Rural (MITADER) e Ministério da Saúde (MISAU). O Regulamento de Pesticidas, Diploma Ministerial n.º 153/2002 confia a estas instituições a responsabilidade de assegurar que os pesticidas sejam geridos de uma forma que não representem uma ameaça à saúde humana, animal e das plantasl e à saúde geral das componentes ambientais.

A GP é marcada por uma série de constrangimentos institucionais em Moçambique sob a forma de (i) falta de coordenação; (ii) dependência de recursos externos; (iii) deficiente imposição da lei; (iv) inconsistência e descontinuidade na execução de programas; (v) carências de pessoal; (vi) deficiente alocação de recursos; e (vii) inconsistências e descontinuidades na formação e na investigação aplicada e adaptativa. Estes constrangimentos constituem-se em obstáculos para a formulação de políticas adequadas, implementação consistente, monitoramento e avaliação, o que torna a adoção da GIP em relação ao ANRLMP necessária.

Gestão de Pesticidas

O potencial uso de pesticidas deverá surgir associado a actividades agrícolas (produção vegetal) para o controlo de pragas, doenças, nematoides e ervas daninhas em torno de culturas tais como o milho, gergelim, feijão bóer, caju e soja, que, devido à intensificação esperada pode envolver a aplicação de agroquímicos e insumos. De uma forma geral a presença de pragas é dita como sendo baixa nas áreas específicas do projecto, mas há uma série de pragas, doenças e ervas daninhas que são relatados pelos agricultores, funcionários e na literatura. O impacto actual destas pragas não é bem conhecido, da mesma forma que a utilização de pesticidas, que embora, apesar de ser um pouco maior quando se compara com a das outras regiões em Moçambique, é calculado pelos agentes agrícolas locais como sendo actualmente baixo. No entanto, um aumento da área de cultivo, especialmente de monoculturas, pode resultar num aumento da ocorrência de pragas.

Os agricultores tradicionais têm o seu próprio conhecimento no que diz respeito ao uso de alguns dos princípios de GIP na área do projecto o que é feito, entre outros, sob a forma de consociação de culturas e/ou o uso de remédios feitos a partir de plantas locais. No entanto, este conhecimento não é sempre apoiado pelos sistemas existentes e existe o risco de desaparecer se esta tendência não for revertida.

Os dados sobre intoxicação e contaminação do ambiente por pesticidas muitas vezes não se encontram disponíveis ou são difíceis de obter, uma vez que não existe qualquer sistema regular do governo para fazer o acompanhamento regular dos riscos. No entanto, há uma necessidade de melhorar as práticas de maneio de pragas e pesticidas actuais dentro do país e mais em particular, nas áreas do projecto, especialmente dado o facto de que um dos objectivos do Projecto é definir o caminho a ser seguido no futuro em matéria de promoção do desenvolvimento rural com base em lições aprendidas.

Adopção da GIP pelo ANRLMP

Em conformidade com a PO 4.09 e BP 4.01 (OP 4.09/BP 4.01), para mitigar os impactos potenciais associados à proliferação descontrolada de pesticidas a

abordagem geral do ANRLMP será a de manter o uso de pesticidas no mínimo ou evitá-los e assegurar que qualquer uso que venha a ser necessário seja parte inteligente, coerente e ponderada de uma abordagem de GIP.

Propõe-se que se adopte um processo faseado de colocação em prática de uma GIP eficaz. O processo compreende as seguintes fases principais: (i) mobilização; (ii) diagnóstico; (iii) formulação de planos de acção específicos, principalmente em torno da GIP em geral, como seja regulamentação dos pesticidas, em si, investigação, extensão e uso de pesticidas; (iv) implementação de planos de acção; e (v) acompanhamento e avaliação e lições aprendidas para alimentar o projecto e o subsector da saúde animal e vegetal em geral. As questões principais a serem abordadas incluem: (i) mudança nas práticas actuais de gestão de pragas; (ii) integração da GIP nos sistemas de produção; (iii) investigação e extensão em matéria de GIP; (iv) aumento do uso e dependência de pesticidas químicos; (v) aplicação da legislação; (vi) os riscos ambientais do uso indevido de pesticidas; (vii) aumento das populações de vetcores e de doenças transmitidas por vectores, tais como a malária; e (viii) acompanhamento.

O sucesso da estratégia de GIP dependerá não só da capacidade do projecto para definir um programa de GIP e vinculá-lo com parceiros estratégicos (empresas privadas ou ONGs), mas também na capacidade de os diferentes intervenientes (governo, serviços de extensão, agricultores, organizações privadas, parceiros estratégicos) cumprirem os seus compromissos nessas áreas. Isto significa que uma ampla mobilização, formação e capacitação será o núcleo de todas as intervenções. De particular relevância será o incentivo à utilização de métodos de controlo de pragas que não sejam dependentes de pesticidas (por exemplo: biológicos, físicos e mecânicos e químicos). Estes devem ser apoiados por pesquisa aplicada e extensão e disseminação e demonstração que estejam em conformidade com este quadro geral. O acompanhamento e a avaliação e a retirada de lições aprendidas e feedback para o projecto e para além do mesmo serão contínuos.

Fortalecimento Institucional e Capacitação

O sucesso da GIP depende em grande parte do desenvolvimento e manutenção da capacidade institucional e humana para facilitar a aprendizagem experimental para a tomada de decisões informadas na integração do conhecimento científico e tradicional para resolver problemas específicos. A GIP será alcançada através de uma boa e prática combinação de investigação científica e aplicada/participativa envolvendo agricultores (incluindo mulheres), extensionistas e pesquisadores.

O reforço das capacidades será alcançado através de mecanismos de gestão da colaboração centrados nos agricultores em que todas as partes interessadas têm de ser consideradas como parceiros iguais, cujo papel será o de facilitar o processo e fornecer orientação técnica e qualquer outro apoio necessário para a implementação das actividades. A gestão e implementação da subcomponente de GP e GIP será confiada ao Prestador de Serviços Contratado. Ele é que irá facilitar os processos de mobilização, diagnóstico participativo, elaboração de um plano de acção mais detalhado, implementação, avaliação e retorno das lições aprendidas na base de conhecimentos que seja útil para o projecto e outras iniciativas similares.

Orçamento

Os custos da aplicação do PGP dependerão da escala e detalhes do programa a ser acordado logo após o arranque do projecto. A estimativa de orçamento para a

implementação deste PGP coloca-se em **200.000,00 USD (duzentos mil dólares norte-americanos),** o que equivale a 1% do orçamento total para o **financiamento da componente do agronegócios para os actores da cadeia de valor (US $ 20M IDA). SECFs, Agronegócios, seguro contra acidentes atmosféricos.** Este valor é ligeiramente superior (quase o dobro em termos de proporção do orçamento total) do que a proporção utilizada para o projeto MOZBIO para o mesmo plano e considerado adequado como uma primeira estimativa para este projecto na medida que que se suge que o PGP do ANRLMP PMP seja mais abrangente. A alocação do orçamento por rubricas orçamentais será detalhada após o início do projecto.

1 INTRODUCTION

The possible and expected expansion of the introduction of advanced agriculture and agribusiness development associated with the **Agriculture and Natural Resources Landscape Management Project** (ANRLMP) has a strong potential for an increase in pest populations and subsequently a raise in pesticide usage to control them, as well as an increase in the use of chemical fertilizers across the agricultural cycle. Any increase in pest populations may be detrimental to agricultural productivity or human/animal health, which in turn will increase the dependency on pesticides. Any subsequent increase in the use of chemicals has the potential to cause harm to users, to the public and to the environment. Evidence shows that although developing countries like Mozambique lag far behind developed countries in the use of pesticides they experience the highest number of pesticide poisoning due to poor regulatory, health and education systems.

In the context of this project, a pest may be defined as any organism whose presence causes economic loss or otherwise detracts from human wellbeing and safety in general. The term covers a broad range of organisms (plants, animals and microorganisms) that reduce productivity of agriculture. Pest management issues can be raised on a variety of smallholder and small-scale commercial agriculture sub-projects such as:

- New land-use development or changed cultivation practices in a given area;
- Expansion of agricultural activities into new areas;
- Diversification into new agricultural crops, particularly if these tend to receive high usage of pesticides - e.g. sugar-cane, fruit, vegetables, cotton and rice;
- Intensification of existing low-technology agriculture systems and their gradual substitution by high-tech and capital intensive systems.

Integrated Pest Management (IPM) based pest management is a mix of farmer-driven, ecologically based pest control practices that seek to reduce reliance on chemical pesticides. It involves: i) managing pests (keeping them below economic impact levels) rather than seeking to eradicate them; ii) relying, to the extent possible, on non-chemical measures to keep pest populations low; and iii) selecting and applying pesticides, when they have to be used (rational use), in a way that minimizes adverse effects on beneficial organisms, humans and the environment.

This report presents the Integrated Pest Management Plan (IPMP) to manage potential pest problems that may arise in the course of ANRLMP implementation and help ensure that the use of all pesticides, insecticides, herbicides, chemical fertilizers and other chemicals associated with the Project will be handled appropriately and in accordance with World Bank Operational Policy 4.09 on Pest Management. According to this policy the PMP is based on the Integrated Pest Management (IPM) approach, which promotes good agricultural practices through the use of responsible and sustainable activities that will result in a rational and a reduction in pesticide use. This PMP is focused particularly on 10 main crop and product systems to be developed by the Project, namely:

<u>Agriculture-based</u>

- Maize

- Poultry
- Sesame
- Pigeon peas
- Cashew
- Soybeans
- Horticulture/Fruits

Forest-based

- Timber from natural forests
- Timber from planted Forests

Non-Timber Forest Products (e.g. natural oils; honey).

Among other aspects the plan describes the issues that characterize the environment under which pest management is done in Mozambique, including the laws and regulations in place, institutions involved and their roles and contrasts these with the WB principles and guidelines, identifies the best ways of making Mozambique and particularly the Project more compliant with the recommended best practices and suggests a specific action plan tailored for the project and beyond.

The data and information in this document results from a combination of methods of data collection and processing, from the following main sources (i) literature review; (ii) interviews and discussions with key informants including experts in relevant project sectors (agriculture, irrigation, health and environment) and other key informants in the field as well as from public consultation meetings that took place in February 2016; (iii) review of similar projects, mainly PROIRRI and MOZBIO; and (iv) direct observations in the project area, which are combined with a rapid assessment by the Consultant. PROIRRI's experience in particular was extensively examined as way of drawing lessons that could be applied under ANRLMP as a way of enhancing its ability to translate IPM principles into added value for the project. PROIRI has been under implementation for close to five years now and its irrigation component is very similar with that of ANRLMP, which makes its outcomes very instructive for the project.

In addition to this introduction the document comprises the following main chapters: (i) project description; (ii) project targeted areas; (iii) policy and institutional framework; (iv) pest management approach; (v) towards the active adoption of the IPM; (vi) institutional strengthening, training and capacity building; (vii) indicative budget

2 PROJECT DESCRIPTION

The Development Objective (PDO) of ANRLMP is to contribute to integrating rural households into sustainable agriculture and forest-based value chains in the project area and in the event of an eligible crisis or emergency to provide immediate and effective response to said eligible crisis or emergency. The PDO will contribute to the overall Program Development Objective to improve the livelihoods of targeted rural households and the sustainability of natural resources in the Program area. For the purposes of this Project, agriculture and forest-based value chains are considered sustainable when they are profitable and do not result in the depletion/degradation of the natural resource base on which they depend (e.g. soil, water).

The project will have four main components and a number of subcomponents structured and with the preliminary allocation of funds that can be summarized as shown below:

Component 1: Agriculture and Forest-Based Value Chain Development (US$57.0M IDA), with the objective of increasing smallholder and small emerging commercial farmers' participation in key agriculture and forest-based value chains; and enhancing their overall competitiveness, sustainability and resilience.

Component 2: Securing Land Tenure Rights and Increasing Natural Resources Resilience (US$18M IDA), with the following main objectives (a) promote integrated landscape management in the targeted landscape; (b) secure land tenure rights of 450 rural communities and 55,000 individuals; and (c) protect, enhance and restore 3,000 hectares of critical natural habitats in the landscape.

Component 3: Project Coordination and Management (US$6M IDA). This is a component that includes activities related to project coordination and management, fiduciary management, safeguards management, M&E, and communications.

Component 4: Contingency Emergency Response (US$ 0M), which is expected to will provide immediate response in the event of an eligible crisis or emergency.

Component 1 in particular is expected to be associated with an increase and intensification of production in agriculture and forests and consequently with the possible increase in the use of pesticides.

As stated under WB OP 4.09, which ANRLMP is assessed to trigger, where pesticides have to be used in crop protection or in the fight against vector-borne diseases, the Bank-funded project should include a Pest Management Plan (PMP), prepared by the borrower, either as a stand-alone document or as part of an Environmental Assessment. The main objective of this WB OP is to assist rural development and health sector projects to avoid using harmful pesticides and encourage the use of Integrated Pest Management (IPM) techniques in the whole of the sectors concerned. These aspects justified the preparation of this safeguard instrument.

3 PROJECT TARGETED AREAS

The Project area was established on the basis of a combination of indicators related to current production, poverty incidence, potential to generate higher returns to investments in the selected value chains, and the landscape dimension that geared Project design. The project areas comprise the provinces of Nampula and Zambezia.

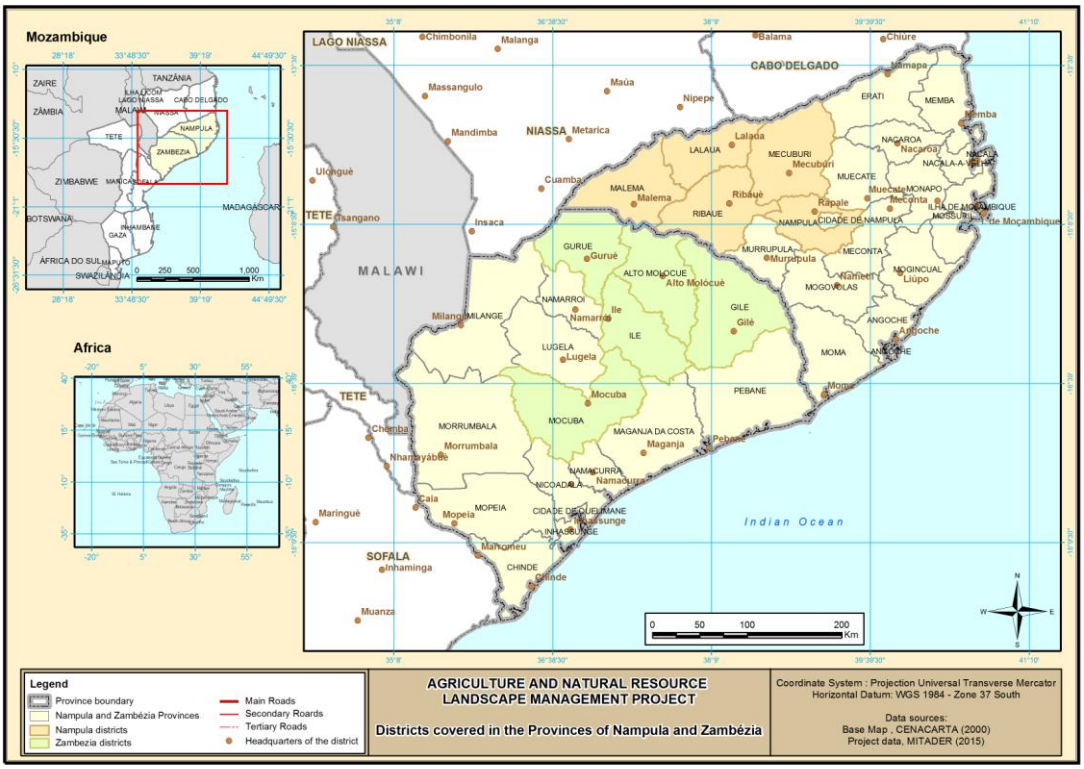


Figure 1: The two provinces defining the project area

Within these above-mentioned provinces and based on a set of criteria, it was agreed that the Districts to be targeted by the Project are:

- Nampula (districts selected are: Malema, Ribáue, Lalaua, Rapale, and Mecubúri)
- Zambézia (districts selected are: Mocuba, Ile, Gilé, Alto Molócue, and Gurué)

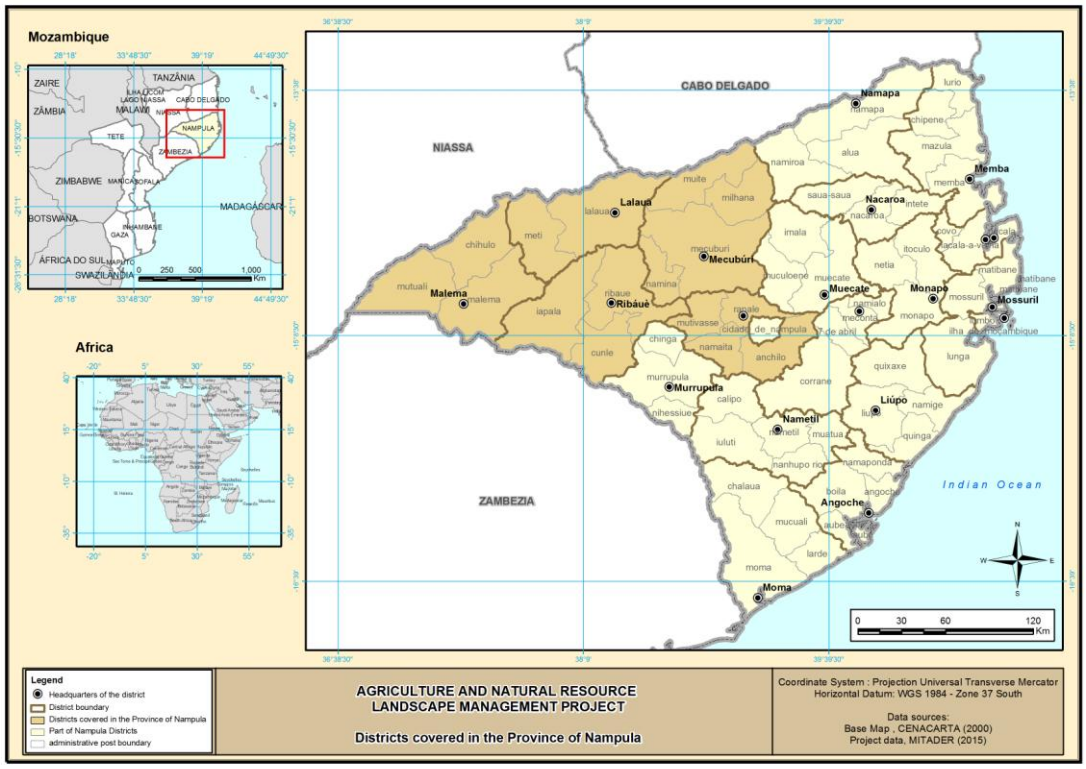


Figure 2: The Project districts in Nampula province

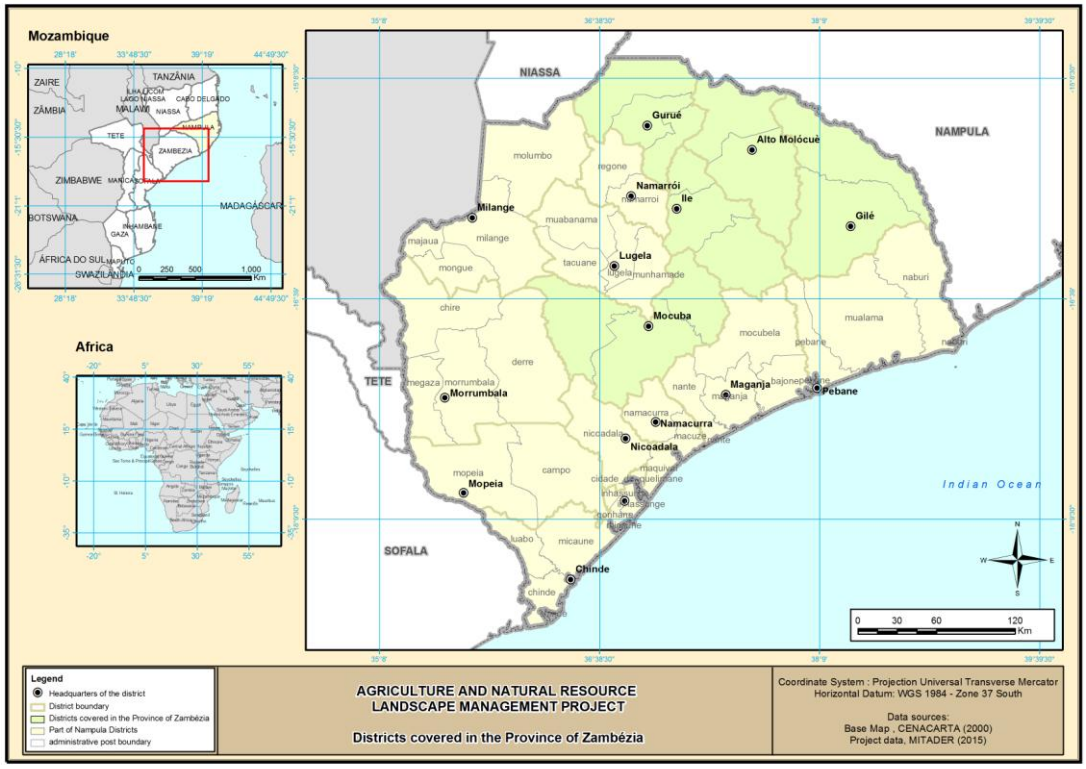


Figure 3: The Project districts in Zambezia province

4. POLICY AND INSTITUTIONAL FRAMEWORK

An effective Integrated Pest Management (IPM) will result from a good and creative combination of the Mozambique's policy and institutional framework and prevailing practices with those of the World Bank. A review of these elements is done in this chapter. It presents (i) Mozambique's main instruments and their applicability to the project; (ii) the WB policies and guidelines and their applicability to the project; and (iii) makes a brief comparison between the two sets of regulations as well as recommends the measures to be adopted by the project to bridge gaps between the two systems.

4.1 Mozambique's Legal Framework

Mozambique's pesticide legislation is embodied by a series of laws of regulations in which two instruments occupy central position, namely ***Ministerial Diploma 153/2002 of 11 September 2002*** (Pesticides Regulation) and ***Decree 6/2009 of 31 March 2009*** (Pesticides Management Regulation). The table below makes a summary of the main contents of these instruments and of other that are relevant for the subject:

Table 1: Relevant Mozambican laws and regulations

Laws and regulations and brief description	Applicability to the project
Ministerial **Diploma 153/2002 of 11 September 2002** (**Pesticides Regulation**) This is a joint diploma issued by the Ministries of Agriculture, Health, and Environment for the management and use of pesticides in Mozambique. It stipulates that the use of pesticides is subject to their prior product registration with the Ministry of Agriculture. The Ministry of Health establishes permissible levels of pesticide residue in food stuffs based on FAO guidelines. Pesticides must be clearly labelled and identified and be color-coded depending on their level of toxicity. The use, storage, handling, sale and removal or destruction of pesticides may be subject to environment licensing	It is applicable as many of its provisions are in line with the WB guidelines on pest management including integrated pest management
Decree 6/2009 of 31 March 2009 (Pesticides Management Regulation) The objective of the Regulation is to ensure that all processes that involve working with or handling pesticides are not performed in detriment of the public, animal and environmental health The Regulation 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, livestock, forestry, public health protection, domestic and other purposes Among other aspects the regulation identifies the institutions involved in pesticide management, sets up bodies with responsibility of performing specific tasks in the area such as the (i) Technical Assessment Committee for Pesticides Registration; and the (ii) Technical Advisory Committee for Agrochemicals It also provides and updates regularly (annually) the list of pesticides products that can be used in Mozambique. These are classified according to their toxic potential (Article 9). Out of the 188 registered pesticides, 109 are class III; 67 class II and only 12 class I (being Class I the most toxic ones)[1].	It is applicable for the same reasons as those stated above

[1] Article Article 51, of the Regulation on Toxicological Classification, stipulates that the Ministers supervising the areas of agriculture, environment and health define the criteria for the toxicological classification of pesticides, which shall comply with the international standards defined by FAO and WHO.

Laws and regulations and brief description	Applicability to the project
The Regulation also stresses that The 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. The companies are entrusted with the responsibility of training their staff with the government entities in the MASA being are responsible for the preparation and administration of the courses it also elaborates on the need for information dissemination and establishes limitations for pesticide advertisement	
Decree n. 18/2004 Regulation on Environmental Quality and Effluents' Emissions amended by **Decree No. 67/2010** (see below) The aim is to define environmental quality patterns for granting an effective control and management of pollutant concentration levels in environmental components. The annexed Regulation is composed of 26 articles and 6 annexes divided in six Chapters. It defines air quality standards and emission requirements, water classification according to the uses and related quality control requirements with special regards to potable water. Moreover, it rules on soil quality and noise emissions. The Annexes provide technical requirements and standards **Decree No. 67/2010** amending the Regulation on Environmental Quality and Effluents' Emissions amends articles 23 and 24 and Annexes I and V of the Regulation on Environmental Quality and Effluents' Emissions, related to taxes for special authorizations and new fines and sanctions for illegal activities. Annexes IA and IB deal new standards of air quality, atmosphere polluting agents and parameters for carcinogenic Inorganic and Organic agents. Annex V lists potentially harmful chemical substances	

4.2 World Bank Policies and Guidelines

The World Bank policies and guidelines on pest management are led by two main documents, namely World Bank OP 4.09 Pest Management and BP 4.01 Annex B – Application of EA to projects Involving Pest Management. The table below present a summary of each of these two documents and confirmation of application to the project.

Table 2: World Bank policies and guidelines

Policies and guidelines and brief description	Applicability to the project
World Bank OP 4.09 Pest Management Is meant to assist borrowers to manage pests that affect either agriculture or public health. It is in favor of a strategy that promotes the use of biological or environmental control methods and reduces reliance on synthetic chemical pesticides. In Bank-financed projects, the borrower addresses pest management issues in the context of the project's environmental assessment In appraising a project that will involve pest management, the Bank assesses the capacity of the country's regulatory framework and institutions to promote and support safe, effective, and environmentally sound pest management. As necessary, the Bank and the borrower incorporate in the project components to strengthen such capacity. The Bank uses various means to assess pest management in the country and support integrated pest management (IPM) and the safe use of agricultural pesticides: economic and sector work, sectoral or project-specific environmental assessments, participatory IPM assessments, and investment projects and components aimed specifically at supporting the adoption and use of IPM. IPM takes central stage in the whole process such that in Bank-financed agriculture operations, pest populations are normally controlled through IPM approaches, notably biological control, cultural practices, and the development and use of crop varieties that are resistant or tolerant to the pest. The Bank may finance the purchase of pesticides when their use is justified under an IPM approach. The procurement of any pesticide in a Bank-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. The Bank refers to the World Health Organization's Recommended Classification of Pesticides by Hazard and Guidelines to Classification (Geneva: WHO 1994-95), which results in the following criteria being applied to the selection and use of pesticides in Bank-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	Applicable. ANRLMP was assessed to requiring the application of the set of measures set out in this regulation

Policies and guidelines and brief description	Applicability to the project
frequency of pesticide application are aimed at minimizing 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. The Bank requires that any pesticides it finances be manufactured, packaged, labeled, handled, stored, disposed of, and applied according to standards acceptable to the Bank. It does not finance formulated products that fall in WHO classes IA[2] and IB[3], 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	
BP 4.01, Annex B - Application of EA to Projects Involving Pest Management Annex B of BP 4.01, defined as the Umbrella Policy (see ESMF of the Project) sets out a number of principles to be adhered to in conducting project assessment, approval, implementation, monitoring and evaluation. It highlights the following: In the sector review the project task team (TT) ensures that any environmental assessment (EA) of the agriculture (or health sector) evaluates the country's capacity to manage the procurement, handling, application, and disposal of pest control products; to monitor the precision of pest control and the impact of pesticide use; and to develop and implement ecologically based pest management programs During project identification, the TT assesses whether the proposed project may raise potential pest management issues. Projects that include the manufacture, use, or disposal of environmentally significant quantities of pest control products are classified as Category A. Depending on the level of environmental risk, other projects involving pest management issues are classified as A, B, C, or FI. When substantial quantities of highly toxic pesticide materials for use under the project are transported or stored, a hazard assessment may be appropriate. Overall and also from the pesticide management point of view ANRLMP has been classified as Category B project due to the fact that it is not expected that its potential use of pesticides will raise highly complex issues and the issues it will raise are controllable using recommended IPM approaches The annex then endorses the IPM as the as the best approach for reducing environmental and health hazards associated with pest	Applicable. It was in compliance of this instrument that the project was found to requiring a PMP (this document) and also assessed to falling into Category B, due to the low implications it has in bringing about environmental and social issues related with its various components and particularly control of plant and animal diseases.

[2] Classified under WHO system as Extremely hazardous

[3] Classified under WHO system as Highly hazardous

Policies and guidelines and brief description	Applicability to the project
control and the use of pesticides and is structured to ensure that during all phases of the project the issues related with IPM need to be verified and corrective measures should be put in place to correct any nonconformities.	

The following table makes a comparison between the country's laws and regulations and those of the WB as a crucial way of identifying conformities and gaps that will then be used to devise the best ways of using these two sets of regulations to fulfil the ultimate goal of "minimizing potential adverse impacts on human health and the environment and to advance ecologically based IPM".

Table 3: Comparison between the GOM regulations and the WB guidelines

Issues	Mozambican legislation	WB policies and guidelines	Assessment and Recommended Measures to Bridge the Gaps
Project assessment and identification and determination of the need for a PMP or an IPM for a project	Neither the EIA Regulations nor the pest management instruments (Ministerial **Diploma 153/2002** (**Pesticides Regulation**), Decree 6/2009 (Pesticides Management Regulation) and **Decree n. 18/2004 Regulation on Environmental Quality and Effluents' Emissions**) make reference of the need to assess a project in general to identify and determine if it needs a PMP or an IPM	The combination of both World Bank OP 4.09 Pest Management and BP 4.01, Annex B - Application of EA to Projects Involving Pest Management make it mandatory for an agricultural (or health) project to be assessed to identify and/or determine the need for a PMP or an IPM	The two sets of legislation differ. In compliance with the WB guidelines the project has been assessed and the need for both PMP and IPM has been ascertained. The implications of this will continue throughout the subsequent phases of the project
The financing and use of pesticides is only done when their use is justified under an IPM approach	Although Mozambican regulations (Ministerial **Diploma 153/2002** (**Pesticides Regulation**), Decree 6/2009 (Pesticides Management Regulation)) repeatedly make reference to the value of using alternative ways of combating plant and animal diseases using more environmental friendly means they do not condition to financing and use of pesticide to an IPM that justifies pesticides	This is also a crucial aspect of both World Bank OP 4.09 Pest Management and BP 4.01, Annex B - Application of EA to Projects Involving Pest Management. IPM approach is central and the financing of pesticides is conditional their use being justified under such an approach	This is a fundamental framework definition in which the two sets of regulation differ. The formulation of the PMP for this project and the subsequent actions are an affirmation of the fact that the WB guidelines prevailed and will prevail
Contingency of procurement of any pesticide to an assessment of the nature and degree of associated risks, taking into account the proposed use and the intended users	Although Mozambican regulations (Ministerial **Diploma 153/2002** (**Pesticides Regulation**), Decree 6/2009 (Pesticides Management Regulation)) set forth a series of measures to take precautions in the procurement and use of pesticides in line with the proposed use and potential users it does not make the process necessarily contingent to an assessment	This is one of the central provisions of the World Bank OP 4.09 Pest Management, i.e. that procurement of any pesticide in a Bank-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	There are significant differences in the general principles. The World Bank OP 4.09 Pest Management will be adhered to throughout the project life cycle.
Financed pesticides must be manufactured, packaged, labeled, handled, stored,	Both Mozambican regulations (Ministerial **Diploma 153/2002** (**Pesticides Regulation**), Decree 6/2009 (Pesticides	The Bank requires that any pesticides it finances be manufactured, packaged, labeled,	There are considerable similarities in the definition of standards and lists. In as far as the listing is concerned

Issues	Mozambican legislation	WB policies and guidelines	Assessment and Recommended Measures to Bridge the Gaps
disposed of, and applied according to clearly defined acceptable standards	Management Regulation)) and the latter in particular make it mandatory for any operation involving pesticides to strictly restrict to clearly defined acceptable pesticides standards. The list of acceptable pesticides exists and it in conformity with the WHO standards.	handled, stored, disposed of, and applied according to standards acceptable to the Bank. The classification of pesticides exists and is in line with the WHO standards	both sets of regulation can be used equally

As can be seen from the comparison table above the fundamental differences between the GOM laws and regulations and the WB policies and guidelines have to do with the lack of a framework by the former to deal with PM. The three regulations mentioned and particularly the two pertaining to the agricultural sector focus on operational matters in detriment of defining and regulating the overall context under which pesticides should be integrate, considered and possibly used. The country does not have any integrated pest management or any organic production strategy. Partial IPM related aspects are referred indirectly when encouragement for using other pest control methods (e.g. biological, physical, etc.) and other precautionary methods in dealing with pesticides are endorsed. However, IPM as such does not exist as a standalone policy and regulatory instrument. Under specific contexts, this situation also carries the potential to be an open door for farmers and other operators in the agro-chemicals value chain to embark on poorly thought and poorly controlled market, which could have unwanted consequences.

Conversely, IPM is central to the WB approach. IPM can be defined as 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. The WB policy calls for assessment of the nature and degree of associated risks, taking into consideration the proposed use and the intended users for procurement of any pesticide in Bank-financed projects. Under the WB approach it is a requirement that any pesticides that will be used, will be manufactured, packaged, labeled, handled, stored, disposed of, and applied according to standards acceptable to the World Bank. This will be applied in the project's life cycle.

As also shown by the table above, notwithstanding, the existing shortcomings in the national legislation, the instruments in place encompass a strong element of control over the whole cycle of pesticide use. Accordingly only pesticides registered with the then National Directorate of Agrarian Services (DNSA) now National Directorate of Agriculture and Silviculture (DNAS), under the current Ministry of Agriculture and Food Security (MASA), can be used in Mozambique. These include a list of pesticides products that are classified according to their toxic potential (Article 9). Out of the 188 registered pesticides, 109 are class III; 67 class II and only 12 class I (being Class I the most toxic ones). Composition and physical-chemical characteristics of the pesticides proposed for registration are to conform to the specifications from the World Health Organization (WHO) and the United Nations Food and Agricultural Organization (FAO) and should appear on the label. The regulation also requires proper packaging and handling, which meet the necessary requirements regarding occupational health and safety.

Additional measures to control the entire cycle of pesticides foreseen under the Pesticides Management Regulation include:

- The use of Class I pesticides is subject to a 1-year renewable authorization to be issued by the CATERP (Technical Assessment Committee for Pesticides Registration), 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 applicant.

- Pesticides can only be used by adults. The applicants for Class I pesticides shall have a basic level of schooling granted by institutions recognized by the DNSAS.
- The DNSAS can submit the applicant to a test in order to measure his technical capabilities.
- The use of pesticides is prohibited for pregnant or breastfeeding women and for minors (Art. 30)

These and other pieces across the entire pesticide cycle are control systems and procedures aimed at ensuring restrain in the use of pesticides. They are often offset by a series of institutional constraints and weaknesses including poor law enforcement capabilities, as it will be further described below.

The two main agricultural regulations are complemented by the Environmental Quality Standards and Effluents Emissions Regulation approved by the Council of Ministers in May 2004 (Decree 18/2004) and published in the government's gazette (*Boletim da República number 22 of 2 of June 2004*). It is aimed at controlling and maintaining the level of concentration of pollutants at an admissible level. The former Ministry for the Coordination of Environmental Affairs (MICOA) and current Ministry of Land, Environment and Rural Development (MITADER) is responsible for ensuring compliance with this Regulation, in close collaboration with the Ministry of Agriculture and Food Security (MASA).

4.3 Mozambique's Institutional Framework

4.3.1 The Institutional Set Up

The core institutions in pesticide management in Mozambique are the Ministries of Agriculture and Food Security (MASA), Land, Environment and Rural Development[4] (MITADER) and the Ministry of Health (MISAU). These are the institutions designated by the Pesticides Regulation Ministerial Diploma 153/2002 as being ultimately responsible for ensuring that the Regulation is translated into the set of actions that will guarantee that pesticides are managed in a way that does not pose a threat to human, plant and animal health and to the overall health of the environmental components.

The table below makes a summary of the roles and responsibilities of the above three main ministries/sectors and subsectors in what relates to pesticide management.

Table 4: Institutions, roles and responsibilities in PM

Sectors/Government Departments	Roles and Responsibilities
Agricultural Sector	
MASA is the central government department in PM. It is involved in the process through three main units and areas of operation, namely: The National Directorate of Agriculture and	In its capacity as the overall manager of plant and animal production and related services including health, MASA is the main institution responsible for pest management DNAS is the MASA's unity directly responsible for plant and animal production,

[4] Formerly Ministry for the Coordination of Environmental Affairs (MICOA)

Sectors/Government Departments	Roles and Responsibilities
Silviculture (DNAS) and its respective units at the central and provincial (DPASA) and district (SDAE) levels that deal with plant and animal diseases	which manages the subunits that deal with related health issues and pesticides
The National Agrarian Research Institute (IIAM)[5]	IIAM is 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
National Directorate of Agrarian Extension Services (DNEA)	DNEA is MASA's entity responsible for training, communication and technical assistance and organization of producers, mainly small and medium size farmers including the subsistence family sector
Health Sector	
MISAU is the central entity responsible for public health. It fulfils its role through one national directorate, the National Directorate of Public Health (DNSP), which has a series of units including the Department of Environmental Health (DSA)	DSA fits within the framework of MISAU's organizational structure. The DSA is part of the National Directorate of Public Health and falls under the Deputy National Director for the "Prevention and Control of Diseases". At provincial level, the DSA is a unit under the Department of Community Health within the DPS and at the district level, the activities are undertaken by the Community Health Unit that is part of the SDMAS
Environmental Sector	
MITADER is the central entity responsible for the health of the environmental components such as water, soil, air, flora and fauna. It exercises its role through two main units:	In its capacity as the overall manager of environmental aspects and related services MITADER is the main institution responsible for controlling the potential implication of pesticide use in the quality of the environmental components
AQUA (environmental quality agency)	AQUA is the leading institution in environmental quality management by, among other, establishing environmental standards to be adhered to and defining ways and procedures to put them in place
DNAB, which is responsible for environmental licensing of activities through the Department of Environmental Licensing (DLA) as well as Department Environmental Education (DEA)	DNAB is responsible for the licensing of activities and well as for promoting environmental education

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[5] The Faculty of Agronomy from the main public university in Mozambique (UEM) also participates in research work hand in hand with IIAM.

There is also the Instituto Nacional de Normalização e Qualidade (INNOQ), established on 24 March 1993 by Law Decree 02/93 of the Council of Ministers, under the Ministry of Industry and Energy. It is an autonomous body that acts as the recognized central body responsible for defining and implementing quality policy and for coordinating all standardization and quality activities at national level. INNOQ's main functions are: the promotion of standardization and quality in the manufacturing of products and the performance of services; and cooperation with regional and international organizations working in the fields of standardization and quality. The aim is to improve the conditions of industry, protect consumers and the environment, increase and facilitate domestic and international trade in order to improve the standard of living and strengthen the overall economy.

As summarized all institutions are represented at central, provincial and district levels.

In recognition of the multidisciplinary character of the PM the above mentioned institutions and other are organized in a series of collective management and technical bodies to deal with different aspects of PM. The most important, which are chaired by MASA and also include the private sector, are:

- Registration: through the Agrochemicals Registration and Control Department (RRCA) and its technical arm the Technical Assessment Committee for Pesticides Registration
- Advisory: through the Technical Advisory Committee for Agrochemicals.

Outside the public sector core actors are (i) the large producers of sugar cane[6] and the emerging fruit sector (that focus mainly on banana)[7] and rice[8] including the various share cropping, out growing and off-take agreements, organized spot buying, etc. undertaken by large agricultural companies with local smallholder farmers around crops such as cotton[9], tobacco (MLT), cassava[10] and cashew nuts[11]; (ii) NGO, although the weight of this category of actors in agriculture and/or assistance to production has been diminishing since 1992 after the end of war. Main actors from this category in Nampula and Zambezia were World Vision, CARE; IBIS, etc. and (iii) the smallholder farmers themselves who focus on food crops (maize, beans, cassava, sweet potatoes and a variety of fruits) and cash crops (mainly cotton, cashew nuts, cassava[12]

[6] In the provinces of Maputo and Sofala

[7] In the provinces of Maputo (Boane) and Nampula (Matanusca)

[8] Gaza province (Weibao)

[9] By companies like OLAM, SANAM and JFS across the country but mainly in the Northern provinces including Nampula.

[10] In Nampula province the country brewery company (CDM) has been producing beer using cassava outsources from local farmers as the main primary product

[11] In Nampula province in particular as well as in Cabo Delgado there are many cashew nut industrialists that procure the kernels from local smallholder producers.

[12] Particularly in Nampula (Ribaue and Malema) due to the presence CDM operation already mentioned.

4.3.2 Institutional Capacity and Strength

The ability of the above-mentioned institutions to carry out their mandates within PM is briefly assessed below. The assessment is of particular importance to delineate the PMP and the IPM foreseen under this document.

Table 5: Brief assessment of institutional capacity

Sectors/Government Departments	Capacity and Strength
Agricultural Sector	
MASA is the central government department in PM. It is involved in the process through three main units and areas of operation, namely:	
The National Directorate of Agriculture and Silviculture (DNAS) and its respective units at the central and provincial (DPASA) and district (SDAE) levels that deal with plant and animal diseases	DNAS capacity to carry out routine activities such as pesticide registration, licensing of actors and periodic publication of authorized pesticides is assessed to be stable and strong It is an understaffed institution to carry out inspection and other law enforcement attributions. For a country of close to 800,000 km² and close to 4.0 production units of which more than 90% are made of subsistence farmers it only has 6-7 technical staff members at the central level and only one in each province and no specialized technician and the district level It is also poorly equipped in terms of other basic necessities to carry out its activities such as vehicles, laboratories and other
The National Agrarian Research Institute (IIAM)	In the last 3-4 decades this institution has shown considerable inconsistence in undertaking research programs particularly adaptive programs capable of generating messages that could be used by extension workers/farmers to improve their work in crucial areas of the sector (e.g. improved varieties and seeds). The few exceptions, particularly in Nampula Province, have been for cassava, cashew nut trees and cotton, for which the development of new and improved varieties adapted to local conditions (agro ecological and socio economic) has shown remarkable results. IIAM is markedly underfunded, under staffed and extremely dependent on external support, which tends to be of short term (3-5 years). This goes against the nature of research work that more often than not requires long term commitment. The end result has been that most research programs that have ever been started are usually not completed. Pesticide research has not been at the top of the agenda. IIAM is also centralized with only a few research stations across the country,

Sectors/Government Departments	Capacity and Strength
Directorate of Agrarian Extension Services (DNEA)	with Nampula, one of ANRLMP target provinces, hosting one of the stations, in Namialo district Although the government employs close to 70% of all agricultural extension workers[13] extension work in Mozambique is also highly dependent on specifically funded projects. The government invests relatively low in the establishment and maintenance of extension services. The payment of extension workers' salaries as well as of other facilities needed for the sub sector such as bicycles, motor bikes and field work kits, etc. have usually been under the responsibility of donor and development assistance agencies. Whenever the involvement of these agencies decreases so does the vitality of and the means assigned to extension services. Extension network is marked by low coverage with only between 2 to 5% of the farmers having occasional direct contact with these workers (Gemo, 2006). Although the level of formal education has increased in the last few years[14] extension workers have little or no links with research services that could provide them with updated messages. Training in PM has not been at the top of the agenda. Under PROIRRI (2011-2017) a massive training and capacity building program has been underway since 2013 with the aim of building capacity of agricultural training institutes as well as extension workers. Focus is solely in irrigation.
Health Sector	
MISAU is the central entity responsible for public health. It fulfils its role through one national directorate, the National Directorate of Public Health (DNSP), which has a series of units including the Department of Environmental Health (DSA)	Environmental Health is assessed as facing limitations in trying to fulfil its role and in discharging its duties in a way that is compatible with its multisector mandate. Environmental Health should be positioned differently within institutions that manage health and environmental factors. It should focus on defining policies and norms, promotion and regulation/surveillance than on implementation (AFD, 2010)[15].

[13] 18% work for the private sector, 12% for NGOs (Gemo.2006).

[14] 48% of extension workers have completed vocational training at the medium level (pre-university), 29% basic education (junior secondary) and 20% higher education

[15] Sector Analysis Note on Environmental Health (AFD, 2010)

Sectors/Government Departments	Capacity and Strength
	In general de subsector is understaffed[16] and at the provincial and district levels it is faced with shortage of personnel and poor working conditions
Environmental Sector	
MITADER is the central entity responsible for the health of the environmental components such as water, soil, air, flora and fauna. It exercises its role through two main units:	
AQUA (environmental quality agency)	AQUA is a unity that is in the process of being established. For many years the Ministry of Environment (MICOA (1994-2015) fulfilled its role in the management of environmental components through the National Directory of Environmental Management (DGA). DNGA was assessed to be facing serious challenges to fulfil its role of cooperation and coordination with other environmental Ministries and civil society institutions, specifically to get its coordinating role defined and clarified. Its role in the definition of environmental standards was faced with many pre-conditions that the Ministry could not meet. Staff turnover is high and some positions are not filled with adequate staff (DANIDA, 2012)[17]. AQUA came to replace the DNGA but it is not yet fully operational.
DNAB, which is responsible for environmental licensing of activities through the Department of Environmental Licensing (DLA) as well as environmental education	The licensing of specific activities through the environmental impact assessment regulation (Decree 45/2004, which as from April 1 2016 will be replace by a new Decree (54/2015)) has been one of the most successful ways of exercising environmental management in Mozambique (DANIDA, 2012). Upstream the issuing of the license solid systems and procedures that bring together the different players (developers, engineers, consultants and the public) have been under consolidation. In what is a reflection of weaknesses in law enforcement, it is what happens after the issuing of the environmental license that is still in need of improvements.

[16] Mozambique has less than 1,800 doctors for population of close to 25.0 million people (MISAU, 2015)

[17] Institutional Performance Study (DANIDA, 2012)

Despite continuous efforts being made by the various government-led agriculture projects, particularly in terms of awareness raising, it still can be said that the capacity to for pesticide management remains relatively weak in Mozambique.

As can be seen from the table above the subsector is marked by a series of institutional constraints in the form of (i) poor coordination; (ii) dependency on external funding; (iii) poor law enforcement; (iv) inconsistency and discontinuity in program implementation; (v) under-staffing; and (vi) poor allocation of resources; (vii) inconsistent and discontinuity in applied and adaptive research and capacity building. All come as obstacles for a proper policy formulation, consistent implementation, monitoring and evaluation. For example, pesticide residues are not being monitored on export crops, nor on crops for the domestic market; poisoning statistics by pesticides are not available; and medical staff at rural clinics is not trained to recognize and adequately treat pesticide poisoning; and antidotes are not systematically available in rural areas, and in certain remote provincial and district urban centers.

Provincial officers report that from time to time the few random inspections that are conducted uncover non-compliance by different kinds of operators including large agricultural farmers with the regulations in place in the form of obsolete pesticides, inadequate labelling, use of pesticides without the adequate equipment, thus increasing the risk of contamination and use of empty pesticide's packages for domestic use, washed in rivers and posing water and soil contamination risks, etc.

The whole context talks of health risks to people and animals, which makes the WB approach to integrated pest management even more appealing.

All aspects combined paint a gloomy picture that makes the adoption of IPM for ANRLMP mandatory. Under the circumstances local actors concede that the IPM strategy in itself will be a serious challenge as it will be necessary to keep a number of factors under control to ensure that IPM essential elements are materialized. This is yet another reason to justify a well thought plan of action that includes mobilization and capacity building of people, institutions and resources.

5. PEST MANAGEMENT APPROACH

This section presents the current and anticipated pest problems relevant to the Project, relevant IPM experience within the project area, assessment of proposed or current pest and pesticide management approaches and recommendations, taking into consideration the fact that the Project will have a strong agricultural development component. As emphasized in the ESMF it is within this sector that the ability of the GOM to diversify the economy and deepen inclusion has been significantly weak. The current contribution of the agriculture sector to the country's GDP has been far below its real potential. This is what strategic and policy documents for the sector adopted lately such as PEDSA (Strategic Plan for Agricultural Development), PNISA (National Agriculture Investment Plan), PNI (National Irrigation Program), aim at reversing. These documents are endorsed by ANRLMP.

5.1 Current and anticipated pest problems

The potential use of pesticides will be associated with agricultural activities (plant production) for the control of pests, diseases, nematodes and weeds. Main crops targeted under IPMP in the project area and particularly the irrigated schemes to be established are maize, sesame, pigeon peas, cashew and soybeans, which, due to the expected intensification may involve the application of agrochemicals and inputs such as fertilizers, herbicides, insecticides, nematicides and fungicides.

In general pest attack is low in the Project targeted areas, but there is a range of pests, diseases and weeds reported by farmers, officials and in the literature. The current impact from these pests is not well unknown and/or mapped, except perhaps the red locust that attacks some of the areas. However, the expected pest incidence increase in the production of (i) agriculture-based (maize, poultry, sesame, pigeon peas, cashew, soybeans); (ii) Horticulture/Fruits will likely reverse that situation and some pests may become a major economic and environmental problem, especially for medium-scale subprojects and, thus an increase in pest control measures and rational use of chemical fertilizers may be needed for this project. There are control measures (chemical, cultural and biological) for most crops that can be used in case an outbreak is observed.

In most areas current pest occurrence and pesticide use is estimated by agricultural officers to be currently low, but an increase in crop area, especially of monoculture crops, may result in an increase of pest occurrence, especially birds (for cereal production areas grainivorous birds are an important pest), red locust and rats. These are currently reported to be the major pests in these areas. However, amongst the large majority of poor farmers, unless encouraged to do so by different forms of external forces, especially if private operators are given space to do so, pesticide use can be kept at a minimum level if the necessary efforts can be timely made. The prevailing lack of tradition of using pesticides, inadequate supply (the network of agricultural input suppliers, including pesticides is still relatively poor) and poor access to low priced and generic pesticides can be used to work in favor of a strategy to control the massive and indiscriminate use of agro-chemicals.

The development of agricultural activities by a series of farmers, including smallholder farmers and small and medium commercial producers may cause the following potential impacts:

- Stalk borers, brown plant hopper and armyworm could increase, but the result should not be an automatic increase in insecticide application than currently exists in the command area since less than half the farmers apply only one or more sprays per season;
- Irrigated agricultural production is not widespread in the project area at the moment. But with increased irrigation there is the possibility that irrigated cereals may become important and farmers will be more willing to apply a fungicide to protect their investment.
- Local informant are of the opinion that fungicide use is unlikely to be greater than presently very low levels that already exists in the area.
- The same consideration applies to weeds, diseases, as well as chemical fertilizer use.

5.2. Relevant IPM experience within the project area

In the same way as in other parts of Mozambique traditional farmers have their own knowledge in regard to the use of IPM principles in the Project command area. Different forms of intercropping and/or the use of remedies made from local plants are often adopted with the sole propose of keeping pest at by and/or increasing soil fertility.

But like in many other areas of traditional knowledge in Mozambique, the mix of it with modern information and practices and poor encouragement for people to use and expand such knowledge explain that it is slowly disappearing. On farm and on station research and extension should work hand in hand to develop a better understanding of such traditional knowledge and were it proves to be effective actively promote it.

This is because at times there, the belief is that chemicals are more efficient than any other cultural practices that could be adopted. However, farmers in a number of districts prefer crop rotation (summer (e.g. maize) and winter crops (horticulture and a number of beans) and intercropping (cereals and vegetables and legumes) as being efficient in controlling some pests, especially insects and fungus. It is to be expected that these techniques could also be applied in the large areas to be developed under the Project, as they are common practice in Mozambique. A specific set of interventions should be embraced by the project to reverse this and suggestions are made in this document on how best to go about them.

5.3. Current pest management practices

At present pest and plant disease control is limited by a combination of lack of knowledge, equipment, supplies and finance. In general, smallholder farmers in the project area take various measures to minimize or avoid pest infestations such as weeding and application of insecticides and herbicides. 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. Comprehensive data on pesticides use are not available, but provincial officers in the subsector referred to Cypermethrin, Mancozeb, Cobox and Teodan, all under Class III (least toxic), as the main pesticides they use. These are also the pesticides mostly acquired and distributed by the public sector in critical moments.

Control of birds and wild animals (scarce in the targeted area) are mainly done by using the traditional way of scaring (the use of scarecrows is very common especially in cereal production areas), chasing and guarding of animals.

5.4. Pesticides management

Data on pesticides poisoning and environmental contamination are often not available or difficult to obtain, since no regular government system exists for regular monitoring of the risks. Additionally, medical personnel at rural clinics are not well trained to recognize and adequately treat pesticide poisoning, and antidotes are not systematically available in rural and in some remote provincial and district/municipal urban areas.

In summary, as related by provincial officers, the main pesticide management problems in the project targeted area and in Mozambique in general are:

- Unfounded use when applied, which may result in problems for human health and the environment, especially the contamination of soils and water. Signs of soil/water contamination/depletion have been observed in some areas, including soil salt accumulation;
- Use of out-of-date pesticides (observed in most of areas), including by large operators who would be expected to not do so;
- Use of non-authorized and/or non-labeled pesticides or the use of re-packaged pesticides;
- Application without the adequate equipment, with an increase of the risk of contamination;
- Use of empty pesticide's packages for domestic use, washed in rivers and leading to their contamination.
- Lack of adequate monitoring of pesticides use and handling is carried out.

However, there is a need to improve current pest and pesticide management practices within the country and more in particular, in the Project areas, especially given the fact that one of the objectives of the Project is to set the path to be followed in the future regarding the promotion of rural development on the basis of lessons learned. The plan of action under the PMP should contribute to reverse these negative tendencies.

The preliminary assessment indicates that each main area of operation in PM needs to contribute and coordinate with other areas in order to establish a new order that will be relevant for the project and to feed into to general PM and particularly IMP in the country.

6 TOWARDS THE ACTIVE ADOPTION OF THE IPM

6.1 Main Direction of the Plan

To mitigate the potential impacts associated with uncontrolled proliferation of pesticides the general approach of the ANRLMP should be to keep pesticide use at a minimum or avoid it and ensure that any necessary use is intelligent, coherent and considered part of an IPM approach in line with OP 4.09 and BP 4.01 (OP 4.09/BP 4.01). The preliminary discussions with the stakeholders and assessment of the situation on the ground indicates that the formulation of a concise plan of action will need to adopt a staged approach. Under this plan a general outline is presented, which will need to be endorsed by the project stakeholders and adjusted as more evidence is gathered. The final plan of action adopts the following essential stages:

Table 6: Indicative plan of action

Activity	Stakeholders	Objective/Action	Leading agency
Mobilization	DNAS, IIAM, DNEA, DPASA, SDAE Health and Environment Private sector, NGO, small, medium and large farmers	Formation of the Core IPM Team A national Workshop in the project area to identify agencies and individuals who will lead the formulation and implementation of the IPM for ANRLMP	ANRLMP assisted by DNAS
Diagnostic	DNAS, IIAM, DNEA, DPASA, SDAE Health and Environment Private sector, NGO, small, medium and large farmers	Take stock of the main issues affecting the subsector in the country and in the project area in particular Concise definition of the baseline Agree on the sequence of activities to formulate a plan of action and respective contents	ANRLMP as the convener DNAS as the leading technical department
Formulation of specific action plans	DNAS, IIAM, DNEA, DPASA, SDAE Health and Environment Private sector, NGO, small, medium and large farmers	Identification of specific issues and activities to be carried out in: ▪ IPM in general ▪ pesticide regulation per se, ▪ research, ▪ extension, and ▪ pesticide use	DNAS assisted by IIAM, DNEA
Implementation of action plans	DNAS, IIAM, DNEA, DPASA, SDAE Health and Environment Private sector, NGO, small, medium and large farmers	Separate and coordinated actions in: ▪ IPM in general ▪ pesticide regulation per se, ▪ research, ▪ extension, and	ANRLMP coordination In line with its role and responsibility each agency will work in its area, i.e. regulation, research, extension, IPM and pesticide use

Activity	Stakeholders	Objective/Action	Leading agency
		▪ pesticide use	
Monitoring and evaluation and lessons learned to feed into the project and the subsector in general	DNAS, IIAM, DNEA, DPASA, SDAE Health and Environment Private sector, NGO, small, medium and large farmers	Continuous monitoring, introduction of corrective measures where needed, drawing of lessons learned and feeding back into the project and the IPM in general	ANRLMP assisted by DNAS

The Objectives and main action of an IPM approach are presented below in order of sequence:

Table 7: Objectives of an IPM

Main areas of and issues for intervention	Actions required	Responsibility
Change current pest management practices	(i) Allocate adequate resources to implement National Plant Protection Policy (ii) Increase IPM awareness amongst policy makers and farming community; (iii) Abolish free distribution of pesticides to farmers and promote safe handling and application of pesticides.	ANRLMP/DNAS
IPM mainstreaming	Embed IPM into the project key components of: (i) production and commercialization of smallholder agriculture; and (ii) make it a practical element affecting all aspects of extension and training	DNAS
IPM research and extension	(i) Strengthen IPM research at MASA/Relevant Research Institutions (ii) Strengthen IPM extension (iii) Strengthen collaboration between MITADER and MASA for field implementation of IPM (iv) Involve the Private Sector, NGOs and Communities in promoting IPM activities; (v) Implement participatory approaches in IPM for farmers to learn, test, select and implement IPM options to reduce losses due to pests and diseases	IIAM/UEM DNEA DNAS IIAM/UEM/DNEA
Increased use and reliance on chemical pesticides	(i) Promote adoption of IPM practices through farmer education and training (ii) Develop strategies to move farmers away from pesticide-dependent pest control practices and promote use of biological control	Extension services in coordination with research including applied research on traditional practices/on farm demonstrations

Main areas of and issues for intervention	Actions required	Responsibility
Enforcement of legislation	(i) Strengthen institutional capacity of MIC (to the extent needed) and MITADER to effectively supervise compliance with pesticide legislation	DNAS/ANRLMP
Environmental hazards of pesticide misuse	(i) Create public awareness of the hazards of pesticide misuse through public awareness campaigns (ii) Regular assessment of pesticide residues in irrigated agricultural production systems and in harvested produce. (iii) Monitoring of pesticide poisoning in the farming and rural communities.	DNAS/ANRLMP
Increase in vector populations and of vector borne diseases such as malaria	(i) Collaborate with other IPM programs in the region. (ii) Establish strong collaboration between Africa Stockpile Program and national malaria control project (iii) Conduct regular vector surveillance.	DNAS/ANRLMP
Monitoring	(i) Establish a participatory monitoring system that provides early warning on pest status, (ii) identify at what level economic losses will occur, (iii) identify main pest species, beneficial, regular and migratory species	DNAS/ANRLMP

A significant factor that can be expected to work as a constraint in the adoption of IPM practices is the attitude that pesticides are modern “medicines” that provide fast and effective cure for all problems affecting crops. Therefore, the success of any IPM strategy depends not only on the ability of the Project to define an IPM program and link it with strategic partners (private companies or NGOs), but also on the capacity of the different actors (government, extension service, farmers, private organizations, strategic partners) to fulfill their commitments in these areas. The latter requires considerable investment in training and capacity building in several topics of IPM and the implementation of this PMP as referred to in the main ESMF document (Chapter 11 – Training and capacity building requirements).

It is recommended The PMP and related IPM for the project will be managed and facilitated by the Hired Service Provider (HSP). The HSP will be responsible for

facilitating the main stages of the process, i.e. mobilization, participatory diagnostic, formulation of the detailed plan of action involving the main actors and main areas of intervention that have been identified, implementation, monitoring and evaluation and feedback to the system through lessons learned that are valid for the project and other similar interventions. The HSP will work in close collaboration with a focal point for IPM under ANRLMP stationed at the DNAS. All together should liaise with relevant agricultural operators and services including research and extension services in the fulfilment of their objectives.

Important training aspects could be done with lead farmers or involving experienced farmers. The use of lead farmers is part of the extension system in Mozambique already used in other areas of demonstration. This should be replicated accordingly to the IPM. The success of IPM will depend largely on developing and sustaining institutional and human capacity to facilitate experiential learning for making informed decisions in integrating scientific and indigenous knowledge to minimize potential detrimental impacts of the use of pesticides. Poor communication between farmers and extension workers and other agricultural and government officers could lead to poorly-targeted research or to poor adoption of promising options generated by research. Ideally some of the training should be led by farmers themselves targeted to other farmers. Additionally experience exchange among different farmers' communities could prove essential for the outcomes intended with this plan.

6.2 Possible Interventions in Integrated Pest and Pesticide Management

Based on issues that have been identified in previous chapters, this section provides a general outline of various types of pest control strategies known and applied in Mozambique and that can be further investigated and disseminated in wider areas, including the project area, on the basis of evidence. These include a brief review of techniques for biological control, cultural control, chemical control, quarantine and physical or mechanical control, chemical control and botanical control.

6.2.1 Strategy for Intervention and Pesticide Management Action Plan

6.2.1.1 Biological Control

Biological control involves the use of biological agents and predators to control pests and diseases. The method is usually successful in crops like cassava and involves conservation or optimization of the impact of living agents that already exist in the ecosystem, artificially increasing the number of natural enemies in the agro-ecosystem, introducing the new natural enemies'species where these were non-existent.

Evidence shows that every living organism has its natural enemies and diseases, which keep its population at balance. Natural enemies include predators, parasitoids, nematodes, fungi, bacteria, viruses etc. The use of predators, parasitoids, nematodes, fungi, bacteria and viruses to maintain the population density of pests at a lower level than would occur in their absence is a common methods under biological control or simply bio-control.

In the plant kingdom resistance to pests is the rule rather than the exception. In the coevolution of pests and hosts, plants have developed defense mechanisms. The mechanisms may be either physical (waxy surface, hairy leaves etc.) or chemical (production of secondary metabolites) in nature. Pest-resistant crop varieties either

suppress pest abundance or elevate the damage tolerance level of the plant. In other words, genetic resistance alters the relationship between pest and host. The inherent genetically based resistance of a plant can protect it against pests or diseases without recourse to pesticides.

In the project area and under ANRLMP research, extension, farmers of all classes, and particularly family, small and medium farmers will be encouraged to work together to make experiments and come up with combinations that are suitable for the area. The specific ways under which this will be done will be defined as set out in Table 6.

6.2.1.2 Cultural and Crop Sanitation Practices

Pests may also be controlled through the adoption of improved cultural and crop sanitation practices. Some of these include:

i. **Crop rotation**: this practice is used to depress weeds and/insect pests and diseases in some crops. For example, *Striga* in sorghum and millet can be controlled/reduced by planting a trap crop like groundnuts or cotton;
ii. **Intercropping**: the field is used to grow two or more crops at the same time, which among them interchange disease control elements;
iii. **Relay cropping**: where one crop is relayed with another to reduce the infestation of weevils, for example;
iv. **Fallow**: the field is not cultivated for some years in order to control various parasitic weeds;
v. **Cover crops**: these are leguminous crops, which are grown to suppress weeds in the field. They can be intercropped or not and they protect and cover the field e.g. pumpkins;
vi. **Trap crops**: these induce the germination of a pest. The trap crop can be intercropped or rotated with a susceptible host (e.g. groundnuts, cotton etc.).
vii. **Mulching**: this is covering of crop fields by dry grasses to control weeds and conserve soil moisture (e.g. in banana, tomato field etc.);
viii. **Hand pulling and hoes weeding**: these practices are the most common and being used by small-scale farmers. In moments of relative abundance of labor in rural areas this practice can be adopted easily;
ix. **Burning**: land clearing and destroying infected plants/crops. Although it is fundamental to ensure that burning is strictly controlled and limited to the areas and species being targeted and do not spread to other areas;
x. **Fertilizer/manure application**: the application of nutrients in the form of either inorganic fertilizer or farm-yard manure reduces both the infestation of fields by weeds (e.g. *Striga*) and losses in crop yield;
xi. **Use of disease free planting material**: e.g. cassava cuttings, sweet potato vines etc.;
xii. **Pruning**: done in tea, orange tree etc. to reduce insect pests and diseases that might infest the crop;
xiii. **Thinning**: done to reduce plant population in the field (e.g. in maize, rice, sorghum and cotton etc.).

As with biological control existing knowledge and experiments in the project area should be used and/or carried out to identify the practices that are more suitable to local conditions. Based on evidence these should be disseminated.

6.2.1.3 Physical and Mechanical Control

These are measures that kill the insect pest, disrupt its physiology or adversely affect the environment of the pest. They are different from cultural measures as the devices or actions adopted are directed against the insect pest instead of modifying agricultural practices. The hand picking of cotton strainers from cotton plants, banana weevils from banana pseudo stems, killing American bollworm from tomato plants are forms of physical control while the use of a fly swatter against annoying flies is a form of mechanical control. Some of the mechanical measures are relatively easy to apply where and when there is abundance of manpower.

6.2.1.4 Chemical Control

These measures involve the use of herbicides, insecticides and fungicides to manage weeds, pests and diseases. As already explained throughout this document they should be used under certain conditions and when the other less intrusive and poisonous measures have proved to not be effective. All the aspects of capacity building of individuals and institutions should be used to ensure that the use of chemicals is not done to the detriment of the health of humans and other living organisms and consequently ensuring a healthy environment.

They can be applied as liquid spray, in the form of granules, powder or fumigation in stores. Registered pesticides (Annex 1) can be recommended as a component of IPM packages. These are registered under Pesticide Regulation (Ministerial Diploma 153/2002 of 11 September 2002) and as said updated on a yearly basis and Annex 1 is the list approved in December 2015 and currently.

The focus on monitoring and evaluation must be based on the assessment of the increase in IPM capacity, the extent to which IPM techniques are being adopted in crop production and the economic benefits that farmers derive from adopting IPM. Indicators for monitoring IPM adoption could be but not limited to:

Table 8: Monitoring indicators

Monitoring indicators	Number of farmers/percentages over time[18]	Institutional responsibility
Number of farmers who have adopted IPM practices		SDAE and extension workers
Number of farmers who have received training in IPM methods		SDAE and extension workers
Number of crops in which IPM is applied		SDAE and extension workers
Quantification of economic, health, environmental and social benefits		DPASA, SDAE and extension workers
Extent of area in which pesticides are used		DPASA, SDAE and extension workers (as part of normal monitoring and

[18] Targets to be defined after the diagnostic exercise a better definition of the baseline situation.

Monitoring indicators	Number of farmers/percentages over time[18]	Institutional responsibility
		evaluation of agricultural seasons)
Efficiency of pesticide use: type of pesticides used, rational use, handling, storage and disposal of pesticide residues and pesticide containers		DPASA, SDAE and extension workers (as part of normal monitoring and evaluation of agricultural seasons)
Level of reduction of pesticide purchase		DPASA, SDAE and extension workers (as part of normal monitoring and evaluation of agricultural seasons)

Monitoring will be a continuous function that will use a systematic collection of data on the above-mentioned indicators and other in order to measure progress over time. *Evaluation* on the other hand will be the periodic assessment of sustainability, relevance, impact, effectiveness and efficacy of an intervention in relation to stated objectives. Evaluation measures achievements in relation to institutional policies, project objectives, and the goals set for each operation. As can be seen monitoring and evaluation should, in as much as possible, be embedded in the existing data collection and processing done periodically by MASA at all levels, instead of being a separate and standalone process. The progress of IPM will be done taking into consideration the multiple areas in which the strategy will be rolled out notably regulation per se, research, and extension, adoption of IPM and pesticide use in a way that is in line with the strategy.

6.3. Authorized pesticides

Unless the project switches to and enforces an organic approach, it is inevitable that pesticides will be recommended for use on some sites and crops. In the territory defined by the Project the use of agro-chemicals, including pesticides is already a reality. Even if in general the use of pesticides in the project area is low there are pockets of farmers that do so. And as stated in the ESMF document, when compared with other areas in Mozambique the ten districts that define the project area rank high at the national level in the use of agro-chemicals. At present, this is mainly associated with the production of cotton and to some extent horticulture. As the area experiences guided inclusive agricultural and forest value chain development, development of small scale irrigation schemes, etc. the use of agro-chemicals might have to be intensified.

Under the World Bank funding for the Project, no funding for pesticide acquisition will be provided for farmers. However, it would be recommended to elaborate a provisional list of less harmful pesticides that can be used. A list of registered pesticides in Mozambique is provided as an Annex of the Pesticide Regulation (Ministerial Diploma 153/2002 of 11 September 2002) and includes among others: cypermethrin, deltamethrin, mancozeb and dimethoate. The list is updated on a regular basis and Annex 1 of this document presents the latest version updated in December 2015. Annex 2 of this document presents the WHO Pesticide Classification List by level of hazardousness. The list could guide the classification of pesticides eventually to be used.

7 INSTITUTIONAL STRENGTHENING, TRAINING AND CAPACITY BUILDING

A series of measures are being proposed to mitigate the potential adverse impacts likely to occur as a result of pesticide use in the project areas. The primary mitigation measure include institutional strengthening and the second training of the various categories of stakeholders in the pesticide chain in safe and thoughtful pesticide use and management. The later includes the delivery of a mix of Information Education and Communication approaches targeting farmers, pesticide operators and teams; provision of Personal Protective Equipment (PPE); training to farmers, and thorough and consistent supervision and monitoring. Specific aspects and numbers of people to be involved will be defined after the diagnostic of the situation and preparation of the final version of the plan of action foreseen in Table 6.

7.1 Institutional Strengthening

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 workers has often led to poorly-targeted research or to poor adoption of promising options generated or that could be generated by research.

A sound IPM in Mozambique can only be achieved through a good and practical combination of scientific and applied/participatory research involving farmers (including women), extension workers, and researchers. For this specific project stakeholders need to get together and in a process with multiple stages agree on issues to be addressed and define a plan of action, implement and monitor it. During the formulation of this plan it was not possible to bring all of them together and the information obtained from each of the few that were directly contacted cannot substitute this process of formulation of an agreed plan of action. The issues to be addressed are assessed to be complex and requiring a good combination of plan and action.

In other words the DNAS through its Plant and Animal Health Services, are required to work hand-in-hand with the IIAM (research stations in the project area (e.g. Nampula)) and other related sectors (health and environment) to institute research programs that respond to local needs. In order for the programs to be adequately responsive they should involve local farmers (including women) and extension workers in the identification of issues to be worked on and subsequent delivery of responses and ways of putting them into practice, including the training, capacity building and skills and attitude development. The “on farm” and “on station” research programs embraced by IIAM should be creatively used to work for this objective. The private sector and local relevant NGOs should also be involved. The program should also include initiatives such as Farmer Field Schools, Training of Trainers, and regional meetings etc., which could bring together actors from different projects (e.g. PROIRRI) but with similar objectives in this particular regard.

As said PROIRRI is already using the above-described structure to build capacity on irrigation. Stakeholders are suggesting that although on a minor scale ANRLMP should adopt a similar approach for IPM and contribute to creating models of best practice that it is felt are not adequately applied for this subsector.

7.2 Training and Capacity Building

It is not always a straight forward perception but in general farmers are aware that pesticides are poisonous and represent a serious occupational health and environmental risk. Additionally, the cost of pesticides is discouraging for most poor farmers to embark in respective massive use. In order to boost this conducive situation 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.

Capacity building will be achieved through farmer-based collaborative management mechanisms under which all key stakeholders have to be regarded as equal partners whose role will be to facilitate the process and provide technical direction and any other support necessary for the implementation of the activities

The HSP backed by DNAS Focal Point will take the necessary steps to prepare comprehensive training manuals, brochures and leaflets on pesticide use and management, targeting different actors within the program, ranging from extension service providers, farmers, loaders, mixers, transporters, government staff among others. The training manual or guides to be developed for use must be simplified and easy to understand and participatory in nature with in-built and demonstration/ practical sessions as much as possible.

More specifically training on IPM, targeting lead farmers, extension workers, local leaders, etc. will include but not be limited to:

- **Learning-by-doing/discovery training programs**: 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.
- **Focus groups discussions**: regular meetings among women, men, the youth to discuss production problems including pests and related problems can assist in the success of various control methods. These meetings should be promoted using all forms of local incentives.
- **Demonstration projects**: farmer-field schools can be very effective at promoting IPM within the local community. These pilot sessions 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 about 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.

Training in the use of pesticides, targeting lead farmers, extension workers, local leaders, etc., will include but not be limited to:

- **Pesticide selection**: indicating the list of authorized pesticides per target pests, indicating their level of toxicity and hazardous, possible harmful effects and past experience of using those pesticides for the pest and the crop.
- **Understanding the pesticide label**: explaining 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 pesticides**: explain the importance of ensuring the proper dilution of the concentrated pesticide and the need to use protective clothing.
- **Pesticide storage**: give indications on how to storage pesticides (i.e. site location (not allowed in flood areas), security (against illegal entries, as well as children and livestock), isolated from housing, well ventilated, waterproof roof, have a current inventory list of pesticide stock.
- **Container disposal**: giving indications on how to destroy/dispose used pesticide containers
- **Obsolete pesticides**: explain the risks associated with obsolete pesticides and procedures to be followed.
- **Calibration, product quantity and pesticide application**: explaining the importance of application equipment calibration and how to do it.
- **Determining the amount of chemicals to use**: giving explanations on methods to find out the amount of chemicals to apply per hectare and levels of dilution
- **Precautions related to the application of pesticides**: giving indications on important precautions for safe use of pesticide
- **Toxicity, human protection and first aid**: explaining the possible effects of pesticide on human health, ways of pesticides entering in the body, importance of protective clothing and other protective equipment, basic first aid for pesticide exposure (with skin, mouth, eye or respiratory system).

Under ANRLMP the distribution and use of pesticides to or by people who have not received training should be prevented.

All the details on institutional strengthening and training and capacity building should be revisited at the start of the program as suggested in Chapter 6.

8. INDICATIVE BUDGET

The costs of PMP implementation will depend on the scale and details of the program to be agreed upon. A preliminary budget estimate for the implementation of this PMP puts it at **USD$ 200,000.00** (**two hundred thousand American Dollars**), which is equivalent to 1% of the total budget for **Agribusiness finance to value chain actors (US$20M IDA). SECFs, Agribusiness, Weather based insurance**, i.e. the component that will have the bulk of the farming activities and close relations with IPM. This is slightly higher than the proportion used for MOZBIO project for the same plan (close to double in terms of proportion to the total budget) and considered adequate as a first estimate for this project as it is suggested that its PMP will be more encompassing. The details of the distribution of the budget will be worked out after project start up and will be itemized as follows:

Table 9: Estimated total budget and budget distribution items

Item	Total Amount in US$ 1,000
PMP Implementation	
Kick-off meeting	
Orientation workshops	
Research and extension	
Training of trainers	
Training of farmers/demonstrations	
Technical Assistance	
Monitoring and evaluation	
Total	**$200.0**

Annexes

Annex 1: World Bank OP 4.09 Pest Management

OP 4.09 Pest Management.pdf

Annex 2: BP 4.01, Annex B - Application of EA to Projects Involving Pest Management


OP4.01 Annex B.pdf

Annex 3: Registered Pesticides in Mozambique (June 2015)

lista de pesticidas - Dezembro -2015 (1).:

Annex 4: List of People Consulted (Detailed consultation to be included in the ESMF)

Nr	Name	Institution	Position
1	Tânia Paco	MITADER-UMFI	Environmental and Social Safeguards Specialist
2	Zalijate da Graça	MITADER-UMFI	Procurement Specialist
3	Roberto Zolho	MITADER-UMFI	Natural Resources Management Specialist
4	Yunassy Tonela	MITADER-UMFI	Communication Specialist
5	Arlindo Dgedge	MITADER-DNOTER	Director
6	André Rodrigues Aquino	World Bank	Sr. Natural Resources Management Specialist and Co-Task Team Leader
7	Paulo Sithoe	World Bank	Environmental Specialist
8	Éden Dava	World Bank	Social Specialist
9	Alfredo Zunguze	World Bank	
10	Bruno Alcantara Cardoso	World Bank	Safeguard
11	João Moura	World Bank	Natural Resources
12	Paiva Munguambe	INIR – Irrigation Institute	Director
13	Eugenio Nhone	PROIRRI	Project Manager
14	Nelson Melo	INIR/PROIRRI	Technical Adviser
15	Aurelio Nhabetse	INIR – Irrigation Institute	Head of Department
16	Manuel Gouveia	DPASA Sofala	Plant Health
17	Manuel Magombe	PROIRRI Sofala	Provincial Coordinator
18	Serafina Mangane	DNAS	Head of Department/Plant Health