SFG3166

REPUBLIC OF MALAWI

Ministry of Agriculture, Irrigation and Water Development

Agricultural Commercialization Project

PEST MANAGEMENT PLAN

FINAL REPORT

Ministry of Agriculture and Food Security
Capital Hill
P O Box 30134
Capital City
Lilongwe 3
MALAWI

Second Draft March, 2017

CONTENTS

ACRONMYS AND ABBREVIATIONS

ADD	Agricultural Development Division
AEZ	Agricultural Ecological Zones
AGCOM	Agricultural Commercialization
APPSA	Agricultural Productivity Program for Southern Africa
ASWAP	Agriculture Sector Wide Approach
ATC	Agricultural Trading Company
BP	Bank Policy
CBO	Community Based Organisation
CERC	Contingent Emergency Response Component
CPM	Commission on Phytosanitary Measures
CSA	Climate Smart Agriculture
DCD	Department of Crop Development
DA	District Assembly
DAHLDO	Department of Animal Health and Livestock Development
DDC	District Development Committee
DDT	Dichlorodiphenyltrichloroethane
DEC	District Executive Committee
DADO	District Agriculture Development Officer
DARS	Department of Agricultural Research
DHO	District Health Officer
EAD	Environmental Affairs Department
EDO	Environmental District Officer
EMC	Executive Management Committee
EMP	Environmental Management Plan
ESIA	Environmental and Social Impact Assessment
ESCOM	Electricity Supply Corporation of Malawi
FAO	Food and Agriculture Organisation
FFS	Farmer Field School
GDP	Gross Domestic Product
GoM	Government of Malawi
GP	Good Practice
IPM	Integrated Pest Management
IPMP	Integrated Pest Management Plan
IPPC	International Plant Protection Convention
ISPM	International Standard for Phytosanitary Measures
LRCD	Land Resources Conservation Department
LRCO	Land Resources Conservation Officer
M&E	Monitoring and Evaluation
MoAIWD	Ministry of Agriculture, Irrigation and Water Development
MoITT	Ministry of Industry, Trade and Tourism
MoLGRD	Ministry of Local Government and Rural Development
MoLHUD	Ministry of Lands, Housing and Urban Development

MSV	Maize Streak Virus
MW	Megawatt
NGO	Non-Governmental Organisation
OIE	Office International Epizootie (World Animal Health Organization)
OP	Operational Policy
PA	Productive Alliance
PCB	Pesticide Control Board
PIU	Project Implementation Unit
PMP	Pest Management Plan
PO	Producer Organization
PPE	Personal Protective Clothing
PSC	Project Steering Committee
SADC	Southern African Development committee
TWG	Technical Working Group
WAHIS	World Animal Health Information System
WB	World Bank
WHO	World Health Organisation

EXECUTIVE SUMMARY

1.1 Project Background

The World Bank will support the Government of Malawi (GoM) in the implementation of the Agricultural Commercialization (AGCOM) Project with the objective of increasing commercialization of selected farm and agribusiness products for domestic and export markets. The project would also contribute to the higher level objectives of poverty reduction, improved gender and climate change mitigation and adaptation through supported Climate Smart Agriculture (CSA) initiatives.

The programme will be implemented by the Ministry of Agriculture, Irrigation and Water Development (MoAIWD) and the Ministry of Industry, Trade and Tourism (MoITT).

The proposed program would have four components:

1.1.1 Building Productive Alliance The objective of this component is to support small-scale[1], emerging farmers integrate into value chains by improving their capacity to finance and execute productivity-enhancing investments and respond to the requirements of the end-markets and buyers. To do so, it will implement the high impact 'Productive Alliances' (PAs) model. Project support to PAs will be complemented by 'last mile' infrastructure investments in targeted areas.

It will address the following constraints: (a) inefficiencies along value chains due to inadequate integration of actors, information asymmetries, and coordination failures among stakeholders; (b) unreliable access to quality raw material; (c) poor rural access roads to connect producers to markets; and (d) limited access to finance in agricultural value chains. Addressing these through PAs has the proven potential to increase incomes, productivity and commercial viability, prospects for employment generation, and integration of youth and women.

1.1.2 Support Investment Enabling Services The objective of the component is to support business enabling services by addressing some of the systemic gaps and challenges that constrain investment and trade in the agribusiness sector. Unless addressed, these constraints may impede the formation of Producer Organisations (POs) and prevent PAs from operating optimally. These include access to agricultural finance; access to land for commercial agriculture, policy dialogue on agribusiness; and removing some of the barriers to trade for agriculture business such as on standards and certification. The component will address processes in efficient access to finances, land and regulatory and operational business enabling services.

1.1.3 Contigent Emergency Response Component

[1] Defined by the project as those farmers who cultivate less than 5 ha of land.

This contingent emergency response component is included under the project in accordance with OP/BP 10.00, paragraphs 12 and 13, for situations of urgent need of assistance. This will allow for rapid reallocation of project proceeds in the event of future natural or man-made disaster or crisis that has caused or is likely to imminently cause a major adverse economic and/or social impact during the life of the project. This component will not have funding allocation initially. In the event of a future emergency, it can be used to draw resources from the unallocated expenditure category and/or allow the government to request the Bank to re-categorize and reallocate financing from other project components to cover emergency response and recovery costs, if approved by the Bank.

1.1.4 Project Coordination and Management

This component will finance activities of the Project Implementation Unit (PIU). The PIU will oversee the implementation of project activities, ensure sound fiduciary management in the project (both procurement and financial management), carry out monitoring and evaluation (M&E), ensure social and environmental safeguards compliance, and engage in communication and reporting. A main responsibility of the PIU will be to comply with the World Bank's fiduciary reporting requirements. This includes submitting a project implementation progress report on a semi-annual basis. In addition, the PIU would be responsible for implementing the calls for proposals and administrating the grants component under Component 1.1 and 1.2. Additional support will be provided under this component to support any relevant research and analysis[2] that can inform implementation of the project, as well as provide an opportunity for learning and informing future operations. An example would be some SME diagnostic.

1.1.2 Objectives of PMP

The activities proposed under AGCOM do trigger the World Bank safeguard policy on Pest Management (OP.4.09) and as such a standalone Pest Management Plan (PMP) has been prepared to meet the requirement. The objectives of the PMP include:

- Promote the use of environmentally friendly practices in pest control,
- Monitor pesticide use during implementation of AGCOM activities,
- Ensure that project activities comply with Malawi's laws and regulations on use of pesticides, and World Bank safeguard policy OP 4.09, and
- Provide an integrated pest management action plan which can be easily implemented in the event that pest management issues are encountered during implementation of proposed AGCOM activities.

1.3 Strategies to developing IPM

[2] Research and analysis will look at reviewing the value chains context, analyzing emerging opportunities/constraints for SME, drawing lessons from various experiences, analyzing market opportunities etc. Such evidence based analysis will inform current work, as well as future project operations.

This PMP outlines steps towards the establishment of IPM approaches in the AGCOM project impact locations as follows:

1. Identification of the implementation team;
2. Deciding on scale of implementation;
3. Setting goals and measurable objectives for the IPM program;
4. Analysis of current housekeeping, maintenance and pest control practices;
5. Establishing a systems for regular IPM inspections;
6. Defining treatment selection policy;
7. Establishing communication protocols;
8. Developing worker training plans and policies; and
9. Participatory monitoring and evaluation

This PMP investigates several alternatives, including biological treatment, mechanical and manual methods for pesticide control, which are recommended for use, with the ultimate objective of progressive reduction in the application of chemical pesticides, by replacing them with the more environmentally friendly options. The PMP discusses these opportunities and makes recommendations for implementation. For AGCOM a strong capacity building program will be required to manage and monitor the use of pesticides that may be used by farmers to scale up their production.)

CHAPTER ONE: INTRODUCTION AND BACKGROUND

1.1 PROJECT BACKGROUND

The World Bank will support the Government of Malawi (GoM) in the implementation of the Agricultural Commercialization (AGCOM) Project with the objective of increasing commercialization of selected farm and agribusiness products for domestic and export markets. The project would also contribute to the higher level objectives of poverty reduction, improved gender and climate change mitigation and adaptation through supported Climate Smart Agriculture (CSA) initiatives.

The programme will be implemented by the Ministry of Agriculture, Irrigation and Water Development (MoAIWD) and the Ministry of Industry, Trade and Tourism (MoITT).

1.2 OVERVIEW OF THE AGRICULTURE SECTOR

Agriculture remains the backbone of Malawi's economy. Agriculture accounts for 30% of Gross Domestic Product (GDP) and generates over 80% of national export earnings. Between 2005 and 2011, over 80% of the country's total exports were agricultural commodities, primarily tobacco, sugar and tea[3]. Tobacco alone however, represents on average 60% of Malawi´s total exports. Agriculture employs 64.1% of the country's workforce[4] comprising mostly the smallholder subsistence farmers. Agriculture also significantly contributes to the national and household food security and nutrition[5].

The agriculture sector in Malawi comprises of smallholder and the estate sub-sectors, with more than 99% of households involved in smallholder subsectors which contribute 80% of overall production and 70% of agricultural GDP[6]. The smallholder cultivates 6.5 million ha of land which constitutes 85% of the total land. These farmers mostly grow food crops (including maize, rice, cassava, sweet potatoes, Irish potatoes, and legumes), some cash crops such as tea, tobacco, sugarcane, coffee and rear livestock such as cattle, goats, poultry, pigs, sheep and some non-conventional livestock like rabbits, doves, guinea fowls. The estate subsector focuses primarily on the commercial production of high-value cash crops and livestock such as tobacco, tea, sugarcane, macadamia and beef cattle, dairy cattle, commercial laying chickens and broilers respectively. Recently, there has also been a growing emergence of medium-scale farmers[7].

[3] 2015 Annual Economic Report
[4] The 2013 Malawi Labour Force Survey
[5] National Agriculture Policy (2016)
[6] World Bank Support to Agriculture Strategy in Malawi
[7] Defined as farmers cultivating at least five hectares but less than 25 hectares of land.

Agricultural production and productivity remains low. For example, maize yields are still far below yield potentials of between five and ten mt per ha, implying a yield gap of three to eight mt per ha. In the case of oilseeds, average yields are approximately one mt per ha compared to the potential of about two mt per ha[8]. Although Malawi has allocated considerable resources to agriculture over years, production and productivity of the sector has generally been below the country's potential and not sufficient to match growing domestic demand and export markets. This has been because of both climatic and systematic factors. Most of the areas of the country have been exposed to climatic shocks of floods and prolonged dry spells with the occurrences of the La Nina and El Nino phenomena. In addition, the systematic factors such as low adoption of agricultural technologies, low access to farm inputs, low mechanization, low technical labour skills, poor access to finance, weak linkages to markets, and limited irrigation among smallholder farmers have been responsible for the low productivity. Furthermore, land for agriculture in Malawi is becoming limited. Smallholder farmers cultivate small and fragmented land holdings of less than one hectare (on average 0.61 ha) and produce lower crop yields than those in the estate subsector.

There is limited irrigation infrastructure in Malawi with only 4% of the crop land under irrigation, which makes the country to have a single cropping cycle. The total area of land under irrigation stood at 104,000 ha in 2014 of which about 46% was estates and 54% was smallholder. The irrigation schemes are predominantly smallholder schemes serving 56,600 household, which represents 3.3% of all rural households. The contribution of irrigation to agriculture GDP is between 7% and 12% and to the economy as a whole of between 2% and 4%.[9] However, the importance of the irrigation is greater than shown by its contribution to GDP as commodities produced under irrigation make up the bulk of Malawi's exports. Therefore, the smallholder irrigation is of particular significance to food and nutrition security, rural income generation and rural poverty reduction and thus should be expanded.

Trends in livestock production has not registered significant increase in the past ten or more years except for the poultry and pig industry. For example cattle population is estimated to have increased by 6%, poultry by over 50%, goat 10% and pigs by 31% from 2000 to 2014 (DAHLD 2014 annual report). 90% of the livestock farmers are from the small holder sector which is hampered by poor husbandry practices, rampant pests and diseases, limited access to quality veterinary services, expensive inputs, negative impacts of climate change on livestock production, farmers altitude towards livestock production as a business and disorganised market systems among others.

[8]National Agriculture Policy (2016)

[9] Malawi Irrigation Master Plan and Investment Framework (2015)

Agricultural commercialization is further constrained by poor market systems and unorganized farmers. Agricultural marketing systems in Malawi are still rudimentary, especially in rural areas. This is partly due to inadequate infrastructure for efficient agricultural marketing, limited access to and poor quality of marketing service provision, and policy incoherencies that negatively affect marketing. Malawi has made efforts to commercialize agriculture. In recent years, the Malawi Government has formulated coherent strategies to support agriculture growth and commercialization through increased liberalisation, development of rural marketing infrastructure and agricultural market information systems, and the establishment of commodity exchanges.

Malawi trade is highly concentrated on agricultural commodities. The top ten products account for 82% of total export and 42% of total imports, with tobacco, sugar and tea being the most dominant products. However, there have been emerging export trends in processed legumes and livestock products. The processed legumes (for example toor dhal) and livestock products (for example dairy) have been the focus sectors under the agro – processing area in the National Export Strategy. In addition, the increasing domestic demand of the horticulture products is making its production popular among the farmers. So much is the demand that the supermarkets in Malawi are investing a lot of resources in capacitating the farmers for horticulture production so as to import substitute the horticulture produce coming from neighbouring countries, mainly South Africa. Malawi Trade is concentrated on few destinations/origins, channelled through few sea route ports of Dar-es-Salaam in Tanzania, Nacala and Beira in Mozambique and Durban in South Africa. Largest trading partner remains South Africa, with China and Dubai coming up as emerging trading partners. Trade of agricultural commodities is dominated by a very small number of large firms with transportation of these commodities through the road network system.

Value addition in agricultural sector is limited by a weak business and investment climate. In 2014, the annual average capacity utilization of enterprises in Malawi has been only 69% and annual labour productivity growth has been negative (-34.2%)[16]. Malawi continues to perform poorly in critical areas of economic recovery and competitiveness such as trading across borders, access to electricity, starting a business, and others. Even though the country has shown improvement in the 2017 Malawi Doing Business Report compared to last year, it is still poorly ranked at 133 out of 189 in the world and a lot of improvement can be made in terms of getting electricity, getting credit and starting business areas.

Access to Finance comes out as the top most business obstacle in Malawi. The country was ranked 101 in the getting credit indicator according to Malawi Doing Business Report (Refrence). Despite the reduction of inflation rate from 38% in 2013, to 22.6% in 2016, interest rates are still very high-around 40% per annum in the formal banking system and ranging between 50 and 80% per annum in the microfinance and informal banking systems. The consequence of this high interest

rate has been that only 40.1% of the firms have line of credit, only 20.6% of the firms use banks to finance investments and 51% of the firms identify access to credit as a major constraint in Malawi[10]. Furthermore, the financial sector in Malawi is small and focuses on a narrow range of products which constrains the bank to lend to the agriculture sector which is perceived as high risk because of high default rate and exposure to the climatic shocks. In 2015, the average Non Performing Loans to Gross Loans percentage was 12.35%, which was much more than the benchmark of less than 5% set.

Malawi's national electrification rate stands at about 10% with electrification in the rural areas much lower at 2%.The main source of power is from hydro power along the Shire River, which accounts for 90% of installed generation capacity in Malawi. Malawi is not able to meet the electric power demand of the country. ESCOM has an installed generation capacity of 365 MW against forecasted demand of about 440 MW. The electric power deficit has been caused largely due to water constraints and wear and tear of generation machinery due to age. Due to the effects of climate change, the country has experienced prolonged drought over the last two years. As a result of this, water levels at the Lake Malawi and the Shire River have significantly dropped leading to much lower generation than the installed capacity. The cost of the electric power in Malawi is 8 cents/ unit which is much lower than the Sub- Saharan Africa average of 15 cents/ unit.[11] (Link to the subject at hand eg. Agro processing, storage, etc)

Weak institutional and regulatory framework poses a challenge to agricultural enterprise development. According to the 2014 Malawi Enterprise Survey, over 35% of business enterprises experienced losses in a year due to theft and vandalism. On the other hand, about 24.2 per cent of firms reported one bribe payment request in a year, and 16.6% were expected to give gifts to public officials to get business support such as getting operating license, construction permit, or getting water or electricity connected. Regulatory barriers, high transaction costs and non-transparent procedures hamper new entrants. Malawi generally face high costs of trade, coming from high tariffs and non-tariff barriers, regulatory costs, border challenges as well as high transportation costs.

The gender gaps in the agriculture sector in Malawi are as follows: a) On average, plots managed by women produce 25% less (in terms of gross value of output) per hectare than plots managed by men, b) Women use lower levels of agricultural inputs – including improved seeds, inorganic fertilizer and extension services – on their plots compared with men. This disparity accounts for more than 80% of Malawi's gender gap in agricultural productivity. Differences in the quality of these inputs and the returns they yield drive the remainder of the gap and c) The agricultural labour comprises of 70% of women, but only 32% of the land holders are women. To address these gaps, policy interventions aimed at

[10]Malawi Enterprise Surveys from World Bank

[11]Financial Viability of Electricity Sectors in Sub – Saharan Africa (Trimble et al)

alleviating the gender gap should focus on ensuring equal access to and use of agricultural inputs, and should take into consideration women's child-care responsibilities.The annual gender gap in Malawi is estimated to be $100 million[12].These estimates can help policy makers understand the scale of the gains that could be made from designing better policies to improve women's ability to use agriculture to lift themselves and their families out of poverty and contribute to economic growth.

The climate of Malawi has been exposed to repetitive risks and shocks in the recent years which have necessitated increasing levels of humanitarian response. The country has experienced floods and prolonged dry spells in most of the areas because of the occurrences of the La Nina and El Nino phenomena. This has also resulted in having unstable and unreliable water balance, especially if population is factored into the climate change paradigm. Therefore, in order to break the cycles of disaster and food security for greater developmental impact, the government has launched the National Resilience Master Plan. The agriculture and food security strategy of the Plan will focus on developing new irrigation schemes, diversifying agricultural production, promoting integration of smallholder farmers into agricultural value chains and promoting small scale agro – processing.

1.3 MAIN GOAL OF THE AGRICULTURAL COMMERCIALIZATION PROJECT

The main goal of the Project is to increase commercialization of selected farm and agribusiness products for domestic and export markets.

1.3.1 AGCOM Project Components

The proposed program would have four components:

1.3.1.1 Building Productive Alliance The objective of this component is to support small-scale[13], emerging farmers integrate into value chains by improving their capacity to finance and execute productivity-enhancing investments and respond to the requirements of the end-markets and buyers. To do so, it will implement the high impact 'Productive Alliances' (PAs) model. Project support to PAs will be complemented by 'last mile' infrastructure investments in targeted areas.

It will address the following constraints: (a) inefficiencies along value chains due to inadequate integration of actors, information asymmetries, and coordination failures among stakeholders; (b) unreliable access to quality raw material; (c) poor rural access roads to connect producers to markets; and (d) limited access to finance in agricultural value chains. Addressing these through PAs has the proven

[12]The Cost of the Gender Gap in Agricultural Productivity

[13] Defined by the project as those farmers who cultivate less than 5 ha of land.

potential to increase incomes, productivity and commercial viability, prospects for employment generation, and integration of youth and women.

1.3.1.2 Support Investment Enabling Services The objective of the component is to support business enabling services by addressing some of the systemic gaps and challenges that constrain investment and trade in the agribusiness sector. Unless addressed, these constraints may impede the formation of POs and prevent PAs from operating optimally. These include access to agricultural finance; access to land for commercial agriculture, policy dialogue on agribusiness; and removing some of the barriers to trade for agriculture business such as on standards and certification. The component will address processes in efficient access to finances, land and regulatory and operational business enabling services.

1.3.1.3 Contingent Emergency Response Component

This contingent emergency response component is included under the project in accordance with OP/BP 10.00, paragraphs 12 and 13, for situations of urgent need of assistance. This will allow for rapid reallocation of project proceeds in the event of future natural or man-made disaster or crisis that has caused or is likely to imminently cause a major adverse economic and/or social impact during the life of the project. This component will not have funding allocation initially. In the event of a future emergency, it can be used to draw resources from the unallocated expenditure category and/or allow the government to request the Bank to re-categorize and reallocate financing from other project components to cover emergency response and recovery costs, if approved by the Bank.

1.3.1.4 Project Coordination and Management

This component will finance activities of the Project Implementation Unit (PIU). The PIU will oversee the implementation of project activities, ensure sound fiduciary management in the project (both procurement and financial management), carry out monitoring and evaluation (M&E), ensure social and environmental safeguards compliance, and engage in communication and reporting. A main responsibility of the PIU will be to comply with the World Bank's fiduciary reporting requirements. This includes submitting a project implementation progress report on a semi-annual basis. In addition, the PIU would be responsible for implementing the calls for proposals and administrating the grants component under Component 1.1 and 1.2. Additional support will be provided under this component to support any relevant research and analysis[14] that can inform implementation of the project, as well as provide an opportunity for learning and informing future operations. An example would be some SME diagnostic.

[14] Research and analysis will look at reviewing the value chains context, analyzing emerging opportunities/constraints for SME, drawing lessons from various experiences, analyzing market opportunities etc. Such evidence based analysis will inform current work, as well as future project operations.

1.4 PROJECT IMPLEMENTING AGENCY

Project Implementation will be led by the Ministry of Agriculture, Irrigation and Water Development (MoAIWD) since agriculture will be the major practice area for the project. Furthermore, implementation will be done in collaboration with the Ministry of Industry, Trade and Tourism (MoITT) and Ministry of Lands, Housing and Urban Development (MoLHUD).

A Project Steering Committee (PSC) will be established to provide overall guidance and will include the Ministries of Agriculture, Irrigation and Water Development (MoAIWD), Industry, Trade and Tourism (MoITT), and Lands, Housing and Urban Development (MoLHUD). Private sector representatives (producer organizations and investors) will also be part of the PSC.

Given the multi-sectoral nature of the Project, a Project Implementation Unit (PIU) will be established to handle day to day activities of the Project.

The lead Ministry's contact address is The Ministry of Agriculture, Irrigation and Water Development. Capital Hill Government Offices, P O Box 30134, Lilongwe 3, Malawi

1.5 PROJECT COST ESTIMATES

The total project cost is approximately US$95 million. The project financing plan is as provided in Table 1.1.

Table 1.1 AGCOM Components

Project Components		Project Cost	IBRD or IDA Financing	Trust Funds	Counterpart Funding
1	Building Productive Alliance	**65.00**	**65.00**	0.00	0.00
1.1	*Horizontal Alliances (PO Formation)*	*15.00*	*15.00*	0.00	0.00
1.2	*Productive Alliances*	*32.00*	*32.00*	0.00	0.00
1.3	*Last Mile Infrastructure for Productive Alliances*	*18.00*	*18.00*	0.00	0.00
2	Support Investment Enabling Services	**18.00**	**18.00**	0.00	0.00
2.1	*Access to Agricultural Financing*	*7.00*	*7.00*	0.00	0.00
2.2	*Access to Land for Commercial Agriculture*	*6.00*	*6.00*	0.00	0.00
2.3	*Support for business enabling services*	*5.00*	*5.00*	0.00	0.00
3	Contingent Emergency Response Component (CERC)	**0.00**	**0.00**	0.00	0.00
4	Project Coordination and Management	**9.00**	**9.00**	0.00	0.00
Total Costs					
	Total project Costs	**92.00**	**92.00**	0.00	0.00
	Physical Contingencies	**1.20**	**1.20**	0.00	0.00
	Price Contingencies	**1.80**	**1.80**	0.00	0.00
	Front End Fees	**0.00**	**0.00**	0.00	0.00
	Total Financing Required	**95.00**	**95.00**	0.00	0.00

1.6 INTEGRATED PEST MANAGEMENT

Definitions have been fronted over the years to describe Integrated Pest Management (IPM). Food and Agricultural Organisation (FAO) defined IPM as the careful condition of all available pest control techniques and subsequent integration of appropriate measures that discourage the development of pest populations and keep pesticides and other interventions t levels that are economically justified and reduce or minimize risks to human and animal health and/or the environment (FAO, 2014).

Key elements of an IPM program are:

(i) Use of available, suitable, and compatible methods which includes resistant varieties/species, cultural methods (planting time, intercropping and crop rotation); biological control, safe pesticides etc to maintain pests below levels that cause economic damage and loss;
(ii) Conservation of the ecosystem to enhance and support natural enemies and pollinators;
(iii) Integrating the pest management strategies in the farming system; and
(iv) Pests crop and livestock loss assessments

The following are key preconditions for an IPM approach:

(a) Understanding of the ecological relationships within a farming system (crop, livestock, plant, pests organisms and factors influencing their development;
(b) Understanding of economic factors within a production system (infestation: loss ratio, market potential and product prices);
(c) Understanding of socio-cultural decision-making behaviour of the farmers (traditional preferences, risk behaviour);
(d) Involvement of the farmers in the analysis of the pest problems and their management; and
(e) Successive creation of a legislative and agricultural policy framework conducive to a sustainable IPM strategy (plant and animal quarantine legislation, pesticides legislation, pesticide registration, price policy)

1.7 JUSTIFICATION OF THE INTEGRATED PEST MANAGEMENT PLAN

It is anticipated that during the implementation of AGCOM activities, use of pesticides and agrochemicals will increase to improve productivity, therefore an integrated pest management (IPM) that is centred on farmer needs and is sustainable, appropriate, environmentally safe and economic to use is needed. The requirement for adoption of IPM in farming systems is emphasized in the World Bank operational policy, WB OP 4.09, which supports safe, effective, and

environmentally sound pest management aspects, such as the use of biological and environmental friendly control methods.

1.8 METHODOLOGY FOR PREPARATION OF THE IPMP

1.8.1 Consultations and Literature Review

The IPMP was prepared by a number of experts from Department of Crop Development (DCD), Department of Agricultural Research (DARS), Pesticide Control Board (PCB), Land Resources Conservation Department (LRCD), Environmental Affairs Department (EAD), MoITT and Department of Animal Health and Livestock Development (DAHLD). Appendix 1 gives details of the experts.

Consultations with various communities in selected districts were conducted. Key informant and lead farmer interview questionnaires were specifically developed as data collection tools to gather the relevant primary data required for developing the IPMP. Structured, semi-structured and open-ended interviews with, farmers' organizations, /farmers clubs and agrochemical companies were also conducted. Appendix 2 provides a list of people and institutions consulted for the AGCOM Project.

Literature review was undertaken to identify priority concerns on pests/diseases, the legislation; and use of pesticides as well as IPM initiatives currently being undertaken or envisaged. Various project, legislative, and policy documents, including the following were reviewed:

a) The World Bank Safeguard Policy on Pest Management, O.P. 4.09;
b) Environment Management Act of 1996;
c) FAO International code of Conduct on the Distribution and Use of Pesticides, 2002;
d) FAO International code of Conduct on the Pesticide Management, 2014
e) Integrated Pest Management Framework for Kenya Agricultural Productivity and Agribusiness Project (IPMF-KAPAP), 2009; and Livestock Development and Animal Health Project - Pest Management Plan (Volume III); and
f) Bulletin of the World Health Organization, 66 (5): 545-551 (1988)
g) OIE Terrestrial Animal Health Code 2016.
h) DAHLD Annual Report 2014.

1.9 FORMAT OF THE INTEGRATED PEST MANAGEMENT PLAN

Chapter 1 provides a brief background of the project, highlighting the agricultural sector context and the Agricultural Commercialization Project (AGCOM). The Chapter narrates the three key components of the project namely support for agricultural productivity; strengthen market linkages and value addition; and

support investment enabling services. The Chapter also provides details of the project implementing agency, proposed project cost estimates and key elements of an IPM program and objectives as well as justification for preparing the IPMP are provided in this chapter.

Chapter 2 gives an insight of the pest management practices in Malawi. Problems and challenges of chemical pesticides are also presented in this Chapter.

Chapter 3 narrates the non-chemical plant protection approaches of biological control agents, cultural and crop management practices, mechanical control methods, physical control methods and legislative measures. The Chapter narrates how some of these controls are used in Malawi.

Chapter 4 presents the international and national legislation and policies for pesticides management. It also presents regulations for pesticides storage, distribution and disposal.

Chapter 5 highlights the key steps and elements of an Integrated Pest Management Plan. Key elements, among others, include good housekeeping, maintenance and pest control. The Chapter also emphasizes the establishment of a regular system of IPM inspections.

Chapter 6 presents impacts of pest management practices, which are broadly classified as chemical and non-chemical. The non-chemical practices are further grouped into biological, manual and mechanical. Positive and negative impacts, as well as their enhancement/mitigation measures are presented in this Chapter. The Chapter also presents common maize pest problems and the recommended IPM practices to deal with these problems. Principles of selecting pesticides and pesticides to be accepted for the AGCOM are described in this Chapter.

Chapter 7 focuses on the Integrated Pest Management and Monitoring Plan, providing the responsible persons or institutions to implement the mitigation measures and monitoring activities.

Chapter 8 presents an overview of the capacity needs, and the necessary training, in order to yield a successful implementation of the IPMP;

Finally, Chapter 9 gives the conclusions and recommendations.

CHAPTER TWO: CURRENT PEST MANAGEMENT PRACTICES IN MALAWI

2.1 AGRICULTURE AND PEST MANAGEMENT IN MALAWI

Production of both crops and livestock in Malawi is limited by a number of factors, which include aspects of weather, low soil fertility, poor agronomic practices and the incidence of insect pests and diseases. Outbreaks of insect pests and diseases in Malawi are currently on the increase as they are known to cause crop losses of up to 30% (Coffman *et al,* 1992).

Malawi, like most of the countries that depend on agriculture, uses considerable amounts of pesticides as one way of combating pest problems. Pesticides used in Malawi include insecticides, fungicides, herbicides, nematicides, Acaricides and rodenticides. Other products such as growth regulators, repellents, molluscicides and parasiticides are also used. In addition, some botanicals have been released.

In Malawi there exists some indigenous knowledge in plant protection. Some farmers have reported that they practice the use of botanical plants to control some insect pests and diseases. For example, leaves from the fish bean plant, *Tephrosia vogelli* have been used to control a number of pests in maize and beans. The neem leaves are used to prevent maize from weevils and dewormer for livestock. Some farmers use Aloe vera leaves as a remedy for some diseases.

Stemming from this knowledge, Malawian entomologists initiated various trials on using botanicals to control insect pests. A concoction of ash-50g; nicotine-50g; and 1/4bar soap-25g has been recommended for the control of red spider mite (*Tetranychus evance*) on tomatoes. The use of neem (*Azadirachta indica A. juss*), Fish beans (*Tephrosia vogelli Hook F.*), M'pungabwi (Sweet basil) have given promising results on the control of diamondback moth (*Plutella xylostella* (L) on crusiferus. *Azadirachta indica A. juss* is also used to control root knot nematodes *Meloidogyne* species on bananas.

Table 2.1 shows botanicals that are being used for the control of various pests.

Table 2.1: Botanicals being tested for the control of various pests

Scientific Name	Local Name	Pest on which it is used
Combretum ternifolium	Kadale	Storage pests
Elephantorrhiza goetzei	Chiteta	Storage pests
Cassia spp.	Muwawani	Storage pests
Mucuna spp.	Dema	Storage pests
Tephrosia vogelli	Wombwe	Storage pests / cabbage pests
Neem	Nimu	Storage pests / vegetable pest

Lasiosiphon kraussianus	Katupe	Storage pests
-	Katswatswata	Storage pests
-	Kangaluche	Storage pests
Dicoma spp.	Somphole	Storage pests

Other non-pesticide control methods being used in Malawi are mostly biological control. Examples include:

(a) *Apoanagyrus lopezzi* on cassava mealy bug;
(b) *Teretrius nigrescens* on Larger Grain Borer (*Prostephamus truncates (Horn)*;
(c) *Cofesia flaripe* on cereal stem borer (*Chilo partellus*);
(d) *Cales noack* on citrus woolly whitefly (*Aleurothixus floccosus*); and
(e) *Tiphlosromolus aripo* on cassava green mite (*Monorychelus tanajoa*)

The major crops grown in Malawi, for which pesticides are used, include tobacco, sugarcane, coffee, maize, cotton and tea. Pesticides are used for these crops to prevent and control various pests and diseases that attack them. Table 2.2 illustrates the estimated use of pesticides in Malawi by crop.

Table 2.2 Pesticides use in Malawi for the Major Crops and livestock

CROP	**USAGE IN 2017 (According to Pesticides Control Board)**	**CURRENT USAGE**
Tobacco	40-50%	Mostly uses pesticides
Tea	5%	Second position
Sugarcane	10-15%	Third Position
Coffee	15-20%	Fourth Position
Cotton	10%	Fifth Position
Maize	8%	Least used
Cattle	?	Mostly use acaricides

Malawi does not manufacture pesticides. This means that all pesticides used in the country are imported. There are some chemical companies that import pesticides into the country and in turn supply them to various stakeholders for both crops and livestock production. The most commonly used products are insecticides, followed by herbicides, fungicides and rodenticides. Herbicides are mostly used in sugar plantations, whereas fumigants are mostly dominant in the tobacco industries. Insecticides are mostly used in field crops, particularly maize.

The major importers of pesticides in Malawi are:

(a) Farmers Organizations Limited;
(b) Chemicals World;

(c) Export Trading Group
(d) Osho Chemicals
(e) Agricultural Trading Company (A.T.C); and
(f) Fordhan Limited.

2.2 PESTICIDE MANAGEMENT TECHNIQUES APPLIED IN SOME DISTRICTS

During consultations, pest management approaches and techniques in table (Table 2.3) were identified as being used. These approaches and techniques if properly coordinated and managed, would positively contribute to the implementation of IPM.

Table 2.3: Pesticides Management Application Techniques used in Malawi

Approach	Management techniques	Source of Information	Challenges	Recommendations
Cultural	Selection of early maturing plants are used; • Weeding and • Good crop storage (cement storage units are encouraged) • Intercropping • Closed seasons • Crop rotation • Mulching • Ploughing • Field sanitation • Recommended crop spacing • Timely harvesting	All ASWAp and APPSA districts	• A detailed oriented and meticulous process, which is not common sense information to all rural farmers. • An approach, which if practiced for a protracted period, can psychologically condition rural farmers' agricultural practices. Once rural farmers are accustomed to such practices, it is a formidable challenge to introduce new tested and proven farming techniques.	• Train Local farmers through example. • Supply farmers with simple but inexpensive equipment such as meteorological charts and rain gauges to facilitate forecasting.

Mechanical	• Hand-picking and crushing of pests • Netting • Bagging of fruits • Traps	All ASWAp and APPSA districts	• Expensive. • Limited target of intervention (soil).	Where applicable, the technique may still be used prior to use of chemicals.
Biological	Use of living organisms to control pests through predation such as parasitoids, predators, pathogens	All ASWAp and APPSA districts	• Pest specific. • Process takes a long time. • System requires expansive technical know-how. May be too complicated and expensive for most rural farmers. • Difficult to measure results with certainty.	• Train rural farmers on the general principles of biological control methods, and how to best maximize the benefit of biological methods of pest control when applied in the farmers' respective areas.
Botanical	Use of plant extracts to spray pests e.g. neem, mucuna, tephrosia vogelli, etc.	Pesticide Control Board (PCB)	• Cumbersome process.	• Train farmers on easier methods of obtaining extracts, such as boiling (where appropriate)
Chemical / Mechanical Composite	Pheromone traps	Bvumbwe Research Station	• Expensive	• Train farmers on methods of maximizing the potential of the process wherever the system is employed
Genetic	Use of pests and diseases resistant crop varieties	Bvumbwe Research Station	•	•

	and breeds of livestock			
Legislative or regulatory	Such as quarantine	PCB		

2.3 CHEMICAL PESTICIDE CHALLENGES IN MALAWI AND RECOMMENDATIONS

During consultations it was revealed that there is a disparity between the challenges as perceived by farmers and those expressed by officials from agricultural sector. Some of the general challenges are that Malawi does not manufacture pesticides and in addition, Malawi does not have ultimate pesticides disposal facilities (such as pesticide incinerators). Other observed challenges with their associated recommendations, are summarised as follows:

2.3.1 Use of Unregulated Pesticides

Malawi shares borders with Zambia, Mozambique and Tanzania and this geographical proximity to these countries facilitates both trade and accessibility to unregulated and illegal chemical pesticides especially for the districts close to these bordering countries. Negative effects of the prevalent supply of unscreened chemicals include:

- A threat of the introduction of highly toxic substances into the environment, putting human beings, plant and animals at risk.
- Development of pest resistance and economic loss on the part of the farmers for using substandard chemicals.
- Incessant expansion of Malawi government's regulatory duties and responsibilities; stretching its finances and resources too thin and seriously diluting its role and capacity of chemical pesticide regulation; and rendering it ineffective.

Recommendation(s):

i. Enhance capacity of regulatory institutions to facilitate thorough monitoring of unregulated pesticides, in relation to the demands due to the AGCOM.
ii. Educate/sensitise farmers on basic relationship between pesticides toxicity, exposure and hazard.
iii. Team up, delegate and collaborate with neighbouring countries and share responsibilities to curb sale of illegal pesticides.

2.3.2 ADDs Limited Role:

The ADDs have limited involvement in the assessment and regulation of pesticides. ADDs can check, report, but not impound any illegally used pesticides. With limited resources as discussed above, government does not have the capacity to fully regulate pesticides use in Malawi and therefore involvement of ADDs would complement government's efforts.

Recommendation(s):

i. Set up a team that consists of ADDs management staff and the government's pesticides inspection team so that inspections are jointly conducted; permitting instantaneous discovery of illicit pesticides, followed by immediate impounding and appropriate legal action;
ii. Institute illegal pesticides impounding capacity to ADD.

2.3.3 Use of expired pesticides:

During consultations, there were reports of indiscriminate use of expired chemical pesticides by farmers; a problem emanating from shared negligence between the farmers and chemical pesticide marketers. Both parties contribute to the situation partly due to ignorance. Unlicensed chemical pesticide marketers also contribute to the proliferation of expired chemicals.

Recommendation:

i. Train farmers in:

   a) Disadvantages of using expired pesticides, which includes compromised pesticides effectiveness;
   b) Identifying expired pesticide;
   c) Acquiring pesticide quantities that are likely to be needed to avoid the potential for creating obsolete stock; and
   d) The general environmental risks associated with the use of expired chemical pesticides.

ii. Use visual aids to communicate the negative implications of the application of chemical pesticides (e.g. show videos and documentaries to farmers, on dire consequences of use of unapproved and expired pesticides.
iii. Government must establish reliable systems to screen and monitor registration and business operations of pesticide marketers.

2.3.4 Lack of appropriate skills:

Implementation of an effective pest management plan requires an interdisciplinary approach, due to the breadth and depth of the subject. Junior officers usually lack appropriate training in pesticides management.

Recommendation:

i. Initiate or improve trainer, training programs.

2.3.5 Inadequate protective gear.

A combination of ignorance of the potential risks associated with chemical pesticides, with the lack of sufficient funding, imposes formidable strains on the safety methods of chemical pesticide application.

Recommendation:

i. Adopt a "safety is the number one priority" approach in IPM.
ii. "Safety packages" to be made available to farmers of AGCOM Project. Packages must include the minimum requirements for safe pesticide application (e.g. gloves and goggles, mouth mask).

iii. Sensitize farmers on the dangers of handling chemical pesticides and equipment without sufficient and appropriate protective gear.
iv. Encourage farmers to engage trained operators to reduce the risk of exposure to pesticides.

2.3.6 Out-dated Crop Policy, Plant Protection Act, Livestock Policy and Animal Disease Act

An outdated crop production policy (1987), plant protection act (1969), Control and Animal Diseases Act (1966) and DAHLD Livestock Policy (2006) are a deterrent to the adoption of progressive and contemporary agricultural methods. The policies aim at ensuring quality in crop and livestock production and that there is no risk of pesticides contamination as a result of any use of chemicals. The policy also mentions the need to ensure careful use of pesticides for tobacco, ground nuts, cotton, irish potato, vegetables and cattle. The crop production policy does not include information on the current trends in the agriculture sector such as changes in agricultural methods, introduction of new pesticides, and regulation on the use of the pesticides. The livestock production policy on the other hand does not address issues of emerging and re-emerging animal pests as a result of climate change and environmental degradation. It also emphasises control of catlle pests through use of acaricides and no emphasis on other livestock species. In addition, the plant protection act and Control and Animal Diseases Act would also negatively impact on the implementation of an IPMP because of low penalty fees stipulated in the Acts. Penalty fees in these acts are not adjusted to reflect inflation

and therefore are not a meaningful deterrent. This encourages non-compliance by farmers, since the punitive effects are inconsequential.

In response to the challenges currently being faced, the PCB and the Government, particularly the MoAIWD, are making diligent efforts to update the Pesticides Act (2000) and Livestock Policy (2006) to reflect the current position in relation to use and management of pesticides. The Registrar has consulted farming communities for necessary information to be included in the updated version of the Act.

The registrar alluded to the general challenges facing both the implementation of the Pesticides Act and IPMP. These include:

- Lack of capacity (urgent need to scale up)
- Lack of infrastructure (need for lab facilities and equipment for the PCB to conduct independent testing to confirm presence of unregulated pesticides

Recommendation:

Review and update Malawi's Crop and Livestock policy and adjust penalty fees appropriately.

2.3.7 Farmer's Attitude.

Consultations revealed a misinformed approach amongst farmers, where chemical remedies for pests are sought in the first instance.

Recommendation:

- Use visual aids in communicating the negative implications of overdependence on chemical pesticides.
- Advocate for IPM.

CHAPTER THREE: NON-CHEMICAL PLANT AND LIVESTOCK PROTECTION METHODS AND INTEGRATED PEST MANAGEMENT

3.1 NON- CHEMICAL PLANT AND LIVESTOCK PROTECTION

Some of the main features of Integrated Pest Management (IPM) involve the use of non-chemical methods of pest control which include the following:

3.1.1 Biological Control Agents

Biological control means use of living organisms to supress pest populations and damage. These living organisms can be parasitoids, predators and use of sterile males during breeding or pathogens. Environmentally friendly chemical interventions such as the use of semiochemicals (e.g.pheromones and parapheromones), biopesticides and relatively less toxic insecticides can be used together with biological control agents.

3.1.2 Cultural Control Practices

Cultural control means use of usual crop and livestock production practices to suppress pest population and damage in the field. These practices include ploughing to expose and kill soil pests, using pest and disease free seed, planting in time, intercropping, timely weeding, mulching, field sanitation, harvesting in time to minimise exposure of the crop to pests, practicing crop rotation, selection of breeding livestock with the desired traits, general khola hygiene for livestock and practising all in all out livestock production systems.

3.1.3 Mechanical control methods

Mechanical control means using manual devices to supress pest population and damage. This involves hand picking, netting and bagging of fruits and use of traps.

3.1.4 Physical control methods

Physical control means killing pests or suppressing their population by modifying physical factors of their environment to their detriment. This involves techniques such as irradiation, heat treatment, cold treatment, ultrasonic vibrations and drying.

3.1.5 Legislative measures

This involves setting up and effecting acts and regulations which help in pest management. Examples are quarantine services, seed certification, produce inspection, etc.

3.1.6 Genetic control measures

They involve production and use of crop varieties or animal breeds which are resistant to pests and/or diseases. These include insect and disease resistant varieties/breeds and rootstock.

3.2 INTEGRATED PEST MANAGEMENT AND ITS ADVANTAGES

IPM fundamentally differs from the traditional pest control programs in that IPM emphasizes the growth of a healthy crop and livestock with the least possible disruption to agro – ecosystems and encourages natural pest control mechanisms (FAO, 2014) while conventional pest management basically relies on chemical pesticides only.

The advantages of IPM are:

- Environmentally friendly
- Reduces human health risks (exposure to chemical pesticides)
- Relatively cheaper
- IPM is more effective in controlling pests over long periods.

IPM requires wider knowledge unlike traditional programs. Managing pests with less pesticide requires a strong working knowledge of pest biology and behaviour, current pest control technologies and practices, climate and its effects on pest proliferation, greenhouse and storage structural characteristics and staff behaviour. Without this knowledge, it will be difficult, if not impossible, to prevent infestations.

Investing in IPM programs may initially cost more than traditional methods but for the long-term; IPM is analogous to preventive health maintenance. IPM is more cost-effective in terms of time, personnel and materials to prevent pest problems than the practice of remediating the same problem again and again.

CHAPTER FOUR: INTERNATIONAL AND NATIONAL PESTICIDES LEGISLATION AND REGISTRATION

4.1 INTERNATIONAL LEGISLATION AND POLICIES

4.1.1 World Bank Operational Policy on Pest Management, OP 4.09 (1998)

The Bank uses various means to assess pest management in a country and support integrated pest management (IPM) and the safe use of agricultural pesticides. It also supports economic and sector work, sectoral or project-specific environmental assessments, participatory IPM assessments, and adjustment or investment projects and components aimed specifically at supporting the adoption and use of IPM.

In Bank-financed agriculture operations, the Bank advocates pest populations reduction through IPM approaches such as biological control, cultural practices, and the development and use of crop varieties that are resistant or tolerant to the pest.

According to the Bank, rural development and health sector projects have to avoid using harmful pesticides. A preferred solution is to use Integrated Pest Management (IPM) techniques and encourage their use in the sectors concerned.

If pesticides have to be used in crop protection or in the fight against vector-borne diseases, the Bank-funded projects 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 procurement of any pesticides 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. With respect to the classification of pesticides and their specific formulations, the Bank refers to the World Health Organization's Recommended Classification of Pesticides by Hazard and Guidelines to Classification (WHO 2009). The following criteria apply 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;
(d) The methods, timing, and frequency of pesticide application must aim to minimize damage to natural enemies; and
(e) Their use must take into account the need to prevent the development of resistance in pests.

At a minimum, pesticide production, use and management should comply with FAO's Guidelines for:

i. Packaging and storage;
ii. Good labelling practice; and
iii. Disposal of waste pesticide containers on the farm.

The Bank does not finance formulated products that fall in WHO classes Ia (extremely hazardous) and Ib (highly hazardous); or formulations of products in Class II (Moderately hazardous), if (a) the country lacks restrictions on their distribution and use; or (b) they are likely to be used by; or are accessible to lay personnel, farmers, or others without training, equipment, and facilities to handle, store, and apply these products properly.

The proposed project will trigger OP 4.09, since it will support post-harvest pest control, to minimise post-harvest pest damage from eroding crop productivity gained through the program's improved technology adoption by farmers. Demonstrations may require pesticides based on the IPM approach but it should be noted that APPSA will not procure pesticides to be supplied to farmers. However, during implementation, particularly demonstrations, maximum caution should be taken into consideration to ensure that local capacity exists to adequately manage their post-harvest environmental and social impacts from use of pesticides, in compliance with OP 4.09 as described above.

4.1.2 International Plant Protection Convention of FAO (1952)

The International Plant Protection Convention (IPPC) is an international treaty to secure action to prevent the spread and introduction of pests of plants and plant products, and to promote appropriate measures for their control. It is governed by the Commission on Phytosanitary Measures (CPM) which adopts International Standards for Phytosanitary Measures (ISPMs).

4.1.3 World Food Security and the Plan of Action of November 1996

This declaration seeks to secure effective prevention and progressive control of plant and animal pests and diseases, especially those which are of trans-boundary nature, such as rinderpest, cattle tick, foot-and-mouth disease and desert locust, where outbreaks can cause major food shortages, destabilize markets and trigger trade measures. It promotes regional collaboration in plant pests and animal disease control; and widespread development and use of integrated pest management practices.

4.1.4 OIE World Animal Health Organization

OIE World Animal Health Organization is an equivalent of World Health Organization in the human field which sets international standards for animal health and welfare, monitor world animal disease notification and strengthens

veterinary services when engaging in international trade which includes residue monitoring of which some of the residues emanate from animal pesticides.

When it comes to Standard setting, the OIE Specialist Commissions and Regional Representatives regularly commit time to and participate in sessions to raise Delegate's (OIE delegates are in most country directors of veterinary services who are veterinarians) awareness of when and how to participate effectively in the standard setting process. They also encourage dialogue between delegates and promote closer regional collaboration among them by sharing their individual national positions on standards being developed or reviewed.

In terms of Animal Disease Notification, the OIE has made extensive improvements to the World Animal Health Information System (WAHIS). It also continues to assist member in meeting their obligation to notify animal disease occurrences. OIE staff conduct regular training sessions, at regional level for designated national focal points for disease information. This has certainly significantly improved the quality of and responsiveness to notifications of disease outbreaks.

An effective and credible Veterinary Service is one of the most critical elements for fair and safe international trade in animals and animal products. Without a strong Veterinary Service and a robust international certification programme, member states will continue to experience trade restrictions. The OIE therefore places great emphasis on building the capacity and quality of Veterinary Services.

4.2 NATIONAL LEGISLATION AND POLICIES

Although the amount of pesticides used in Malawi is generally low, as compared with other countries, there has been considerable abuse of these toxic substances. In the absence of a regulatory body, pesticides were just imported by some organizations, as deemed necessary. As a result, there were more pesticides than actually required. This resulted in the build-up of pesticides products that became obsolete.

The MoAIWD conducted a survey in 1996/97 and subsequently in 1999/2000 crop seasons to take stock of pesticides. The survey revealed that some 127 tonnes and 112 tonnes of pesticides, for the two periods respectively, were of obsolete stocks.

4.2.1 The Pesticides Act, 2000

Upon realisation of the importance of having a regulatory body on the management of pesticides, the Pesticides Act, 2000 for Malawi was approved by Parliament. This Act enables Malawi to have control on the import, export, manufacture, distribution, storage, disposal and use of pesticides.

The establishment of the PCB was accomplished and the office of the registrar is now in place. The Pesticides Regulations were gazetted on 22 February 2002, and this resulted in the enforcement of the law on 1 May 2002, with a grace period of 2 years; and its launch took place on 21 November 2002.

The enforcement of the law facilitates the following outputs/results:

(a) Registration of all marketed pesticides in Malawi;
(b) Registration of all pesticides according to the crops and the target pests and diseases;
(c) Documentation of all import permits, export permits, pest control operators and licenses for selling and storage of pesticides;
(d) Conducting stakeholders' workshops to create awareness to the general public on the Pesticides Act;
(e) Encouragement on safe usage of pesticides;
(f) Carrying out quality control in collaboration with the Malawi Bureau of Standards;
(g) Harmonization of pesticides registration through international bodies such as SADC;
(h) Labelling of pesticides containers according to international standards; and
(i) Carrying out proper disposal of obsolete pesticides stock.

The general goal of having the PCB is that all pesticides used in Malawi should be registered and that all importers and dealers should be licensed. The benefits from this are:

1. Only safe and effective pesticides will be marketed;
2. There will be less risk for farmers, consumers and the environment;
3. There will be higher export opportunities for agricultural products.

4.2.2 Regulation of Pesticides Storage, Distribution and Disposal

The office of the Registrar is mandated to ensure that all registered and licensed pesticide dealers conform to the regulations for safe handling of the pesticides. Pesticides dealers should follow the "safety" guidelines on transportation, distribution, application, storage and disposal of pesticides.

The PCB must ensure that all stakeholders observe safe handling of pesticides. The Registrar is mandated to make frequent checks in all premises where pesticides are stored to ensure safety. The Registrar is also mandated to take stock of obsolete pesticides in all premises.

The PCB will advise the Malawi Government on how to dispose of obsolete stock. This will involve collecting obsolete stocks from all premises and arranging for disposal.

4.2.3 Control and Diseases of Animals Act (Cap 66:02)

The Control and Diseases of Animals Act is the main Act regulating animal health matters in Malawi .Its main purpose is to protect the national herd and the general public from transmissible disease considered to have (i) have potential for serious spread, (ii) socio-economic and /or public health importance and (iii) major importance in international trade of animals and animal products. Although the bulk of the provisions this Act remains valid law to-date there is a need to update it to reflect the demands of the recent 1994 Republic of Malawi Constitution and to conform with new societal expectations under the decentralised institutional arrangements and more importantly to be compliant with the current international standards and regulations.

The process of reviewing and amending this Act was initiated with some sections being amended, however not yet to be completed.

4.2.4 Meat and Meat Products Act (Cap 67:02)

This Act is responsible for the regulation of quality control and marketing of meat and meat products i.e it ensures that meat and meat products on the market are wholesome and fit for consumption by the general public. Most importantly, it protects the general public from zoonotic and food borne diseases of animal origin.

This Act also requires reviewing in line with the prevailing public health situation and this process was already initiated by the Department of Animal Health and Livestock Development and is yet to be finalised.

4.2.5 Milk and Milk Products Act (Cap 67:05)

The purpose of this Act is to ensure that milk and milk products on the market are wholesome and fit for human consumption. In essence it is to protect the general public from known Zoonotic diseases transmitted through milk and milk products.

Just like meat and meat products Act, this act has recently been reviewed in line with prevailing public health situation, the market structure and diversity of stakeholders in the dairy industry. The new bill is yet to be presented to the cabinet committee on legal affairs.

4.2.6 Protection of Animals Act (Cap 66:01)

The Protection of Animals Act Cap 66:01 is intended to protect the "welfare" of domestic and tame animals which are kept for use by man. The purpose is to protect animals against unnecessary pain and suffering. It provides for the

prevention of cruelty against animals and prescribes punishment against offenders.

In reality this Act has not been ably enforced, mostly probably due to lack of civic education on animal welfare.

There is a need to review this Act in line with the prevailing views and sensitivity of animal welfare issues globally.

4.2.7 Hide and Skin Trade Act (Cap 50:02)

This Act is to provide for the regulation of the trade in hides and skins. The provisions of this Ac t relate to dealing in hides and skins and to licences authorising such dealing extending to designated areas and such classes of hides and skins.

This is very important Act which also requires reviewing so as to include acceptable current standards and also improve on enforcement of imports and exports

4.2.8 Veterinary and Para-veterinary Practitioners Act 2001(Cap 53:04)

This Act has just been reviewed to address notable shortcomings in the old act ('the Veterinary Surgeons Act") and was enacted into law recently in 2001. The main purpose of this Act is to regulate the veterinary profession in the country.

CHAPTER FIVE: STEPS IN SETTING UP INTEGRATED PEST MANAGEMENT

5.1 IDENTIFY THE IMPLEMENTATION TEAM

Transition to an IPM program requires a diverse, action-oriented IPM Committee. This IPM Committee will be an environmentally conscious Committee and will be part of the District Development Committee (DDC) lead by the District Agricultural Development Officer (DADO) as a member of the DDC. A representative of the Farming Group will be a member of this Committee. The leader of this team should be familiar with pests, pesticides and pesticide regulations. This arrangement is appropriate, because implementation of an IPM program can be tracked as a performance indicator.

IPM leadership is guided by pest management principles and environmental issues. Leadership with such academic background and experience qualifies to serve as an authority to supervise IPM implementation. Other team members include Environmental District Officer (EDO), agronomists, crop protection experts (entomologists, pathologists) District Health Officer (DHO) and District Animal Health and Livestock Development Officers (DAHLDO).

5.2 DECIDE ON THE SCALE OF IMPLEMENTATION

To determine the scale of implementation, a strategic approach will be taken. IPM will be clearly defined and discussed by the DDC as is done for all other development projects. A representative of the EMC of the AGCOM must attend these meetings to help explain the IPM approach and give examples of similar documented success studies. Through these discussions comprehension will be achieved, and potential objections will be addressed with successful practical examples.

5.3 REVIEW AND SET MEASURABLE OBJECTIVES FOR THE IPMP

The IPM Committee will set measurable objectives and refine the IPM indicators to be relevant to their district; and determining factors such as:

- When the IPM program will start
- How much it will cost
- What will be accomplished by choosing IPM
- How success shall be monitored

The determination above must be done prior to IPM implementation. Additionally, measurable goals will be set, to track:

- Pest management costs;

- Monitoring of pest activity before and after implementation of the IPM program;
- Number of calls related to pest problems and toxic chemical use reduction.

Furthermore, the time when the shift to IPM will occur must be discussed and agreed upon prior to implementation. The initial step will be to establish an implementation timeline that includes time to execute all of the steps outlined in the implementation plan. It is imperative to include time to organize the administration of the IPM and conduct any farmer training as well as manage the IPM process.

The IPM Committee will gather information on previously implemented or currently being implemented IPM programs; the time it took to develop them and how successful they have been. They will obtain the budgetary and any technical information for the previously implemented IPM programs and analyse the elements to establish lessons to learn. Field visits to currently running programmes will be conducted to get a practical insight.

Reduced pesticide use is the substantive yardstick in measuring an IPM's ability to create a safer environment. Baseline study will be conducted and therefore an information database that includes annual quantities of pesticides used will be designed to enable comparative analysis to the previous years. The goal will be a downward trend over time or ideally, a specific reduction amount, ultimately leading to a scant usage of highly toxic pest control chemicals.

5.4 ANALYSE CURRENT HOUSEKEEPING, MAINTENANCE AND PEST CONTROL PRACTICES

While preparing to make a transition to IPM, the IPM Committee will familiarize itself with the organization's current policies and practices with respect to structural maintenance, sanitation and pest control. Occasionally, current practice may be consistent with IPM principles. Familiarization will provide the flexibility necessary to adapt to, and prepare for the necessary changes.

Structural maintenance is arguably the most efficient way to keep pests out of a facility because it physically stops pests from entering wherever possible. Structural maintenance will therefore be a regular part of the IPM. Cracks, crevices or other unnecessary openings in the building exterior that can be used by pests as harbourage areas or entry points regardless of size, will be sealed appropriately.

Sanitation deprives pests of food and water. A sanitation plan must therefore be accounted for in the development of an IPM. Staff must be provided with special sanitation training

5.5 ESTABLISH A SYSTEM OF REGULAR IPM INSPECTIONS

IPM's central focus is regular facility inspections. Such inspections are the "lifeblood" for a continuous cycle of IPM activities that may or may not include chemical treatments. Activities will include:

a) Routine Inspections
b) Pest Identification
c) Selection of Control Methods
d) Monitoring and Evaluation

IPM inspections must emphasize on the four "zones" of pest activity:

(1) Entry points
(2) Water sources
(3) Food sources
(4) Harbourage areas.

During inspections, all existing pest issues and potential problem areas, inside and outside, must be noted for follow-up.

For in-house IPM programs, the greatest inspection challenge will be establishing routine, proactive surveillance by trained specialists. To ensure this is done, the EMC or an independent consultant will conduct inspections and audits twice a year.

5.6 DEFINE THE TREATMENT POLICY SELECTION

A clear written policy on how the facility will respond to pests when they appear must be developed. Included in the policy will be definitions of both non-chemical and chemical treatment options and the sequence or prioritization in which they will be considered. It should be unequivocal on when and where chemical treatments are appropriate. Finally, it should include an "approved materials" list to ensure informed choices when chemical treatments are applied.

The key to an effective IPM is to correctly identify pests that have invaded the area before. Due to pest behaviour variations from one species to the other, the appropriate response will vary accordingly.

Once the pest is identified and the source of activity is pinpointed, the treatment policy will call for habitat modifications such as exclusion, repair or better sanitation. These counter measures can drastically minimize pest presence before chemical responses are considered. Additional treatment options—chemical and nonchemical—can then be tailored to the biology and behaviour of the target pest.

The final step in the pest response cycle is Monitoring. The information gained through on-going monitoring of the problem will facilitate determination of supplemental treatment options if required.

5.7 ESTABLISH COMMUNICATION PROTOCOLS

Communication protocols must be developed to assist environmental services, facility maintenance, facility management and service providers. IPM is a cooperative effort and therefore effective communication between various parties is essential for success. IPM Committee and farmers must document pest sightings. The IPM Committee will make recommendations and notify AGCOM of pesticide treatments. They will also communicate with the maintenance team to make the necessary repairs.

5.8 DEVELOP FARMER TRAINING PLANS AND POLICIES

The Farmer Groups will serve as a pool of "inspectors" charged with reporting pest sightings to expedite response times and help limit the scope of new infestations. Training sessions will be conducted to acquaint farmers with IPM principles and their responsibilities for the success of the IPM program.

5.9 TRACK PROGRESS AND REWARD SUCCESS

Measurable objectives set at the beginning, must be measured against the IPM program's performance at least once a year. Documentation to facilitate the evaluation process is as follows:

a. Detailed description of the parameters and service protocols of the IPM program, stating the ground rules;
b. Specific locations where pest management work was performed;
c. Dates of service;
d. Activity descriptions, e.g., baiting, crack-and crevice treatment, trapping, structural repair; hygiene and
e. Log of any pesticide applications, including:

- Target pest(s);
- The brand names and active ingredients of any pesticides applied;
- PCB registration numbers of pesticides applied;
- Percentages of mix used in dilution;
- Volume of pesticides used expressed in kilograms of active ingredient;
- Applicator's name(s) and certification identity (copy of original certification and recertification should be maintained);
- Facility floor plan on which all pest control devices mapped and numbered;

- Pest tracking logs (sightings and trap counts);
- Action plans, including structural and sanitation plans, to correct any pest problems;
- Pest sighting memos for IPM Committee to use in reporting pest presence to District Executive Committee (DEC); and
- Using these records, and the goals of the IPM program (increased efficacy, lower costs and reduced pesticide use), the IPM Committee must see:
    - Fewer pest sightings and farmer complaints;
    - Lower monitoring-station counts over time;
    - Lower costs after the first 12-18 months, once IPM's efficacy advantage has had time to take effect; and
    - Downward trend in volume or frequency of chemical pesticide usage
    - Reduced pest infestations on the livestock

IPM is a team effort. Therefore the IPM Committee will track and report the program's successes following each evaluation; and encourage good practices by recognizing farmers who played a role. Communicating the success of the program in reducing toxic chemical use and exposure, reducing pest complaints and lowering costs will help farmers to understand the purpose of the program and appreciate its success. The more they understand, the more likely they will participate willingly in helping expand and institutionalize the IPMP.

After the program has been in place for long enough to show significant results, it is recommended for the IPM Committee to work with AGCOM to publicize successes more broadly and to demonstrate the environmentally responsible approach to effective pest management and control. IPM Committee and AGCOM will lead by example by sharing success with other stakeholders.

CHAPTER SIX: IMPACTS OF PEST MANAGEMENT PRACTICES

IPM will play a key role in the agricultural productivity; leading to a wide range of socio-economic impacts and overall economic development of the country. Agricultural productivity in Malawi is closely related to reduction of poverty and malnutrition. Hence, small-scale farmers in particular, will play an important role in reducing poverty and malnutrition and creating widespread growth through the implementation of IPM for the AGCOM.

On the other hand pest management practices, if not implemented properly, will have negative impacts on the environment as well as harmful effects on human beings and animals. The following sections provide positive and negative impacts of pest management practices.

6.1 POSITIVE IMPACTS OF CHEMICAL PESTICIDES

Continued application of chemical pesticides results in long term negative impacts which are presented in Section 6.2. On the other hand, chemical pesticides may improve yields in the short term, although this is to the detriment of the soil quality in the long term. The short term positive impacts of chemical pesticides are as follows:

Increase in crop and livestock yields
Application of chemical pesticides will protect crops and livestock from damaging pests. This will lead to an increase in crop and livestock yields, for the short term.

Enhancement measures
Apply chemical pesticides in accordance with recommendations of the IPMP to sustain crop and livestock productivity. Adhere to the IPMP recommendations to progressively reduce the use of chemical pesticides.

Increase in economic growth
Increase in crop and livestock yields will lead to food self-sufficiency as well as surplus crop for sale; thereby contributing to the overall economic growth of the country, albeit for the short term.

Enhancement measures
Assist farmers in marketing produce and maintain access roads to markets. Train farmers in IPM practices to retain good soil quality and to progressively reduce use of chemical pesticides.

6.2 NEGATIVE IMPACTS OF CHEMICAL PESTICIDES

Soil degradation

Frequent and continuous application of chemical pesticides to agricultural fields will lower the soil potential for good crop yields. This would negatively affect crop growth and productivity in the long term.

Mitigation measures

- Apply soil conditioning measures which would also be part of IPM
- Train farmers in proper handling and application of chemical pesticides as recommended by the IPMP and AGCOM

Poisoning of non-target species

Poisoning of non-target flora and fauna species may occur due to negligence or lack of knowledge of chemical pesticide potency; equipment malfunction and use of wrong type of equipment; wrong time and method of application (spraying). Chemical pesticides and residues can be dangerous to non-target wild animals; fish and invertebrates as well as aquatic arthropods.

Mitigation Measures

- Supervise and control use of chemical pesticides to ensure that only approved and recommended ones are used;
- Use recommended equipment and approved methods of application;
- Use recommended rates of application
- Regularly maintain and clean the equipment as recommended in the IPMP
- Use recommended and appropriate protective clothing;
- Conduct training seminars in IPM; and
- Clean equipment and dispose old equipment as recommended by manufacturer.

Water, soil and environmental pollution

Water, soil and environmental pollution may occur due to spillage during loading and offloading of vessels and during storage. This can also result from farmers' carelessness as they use the pesticides e.g. washing sprayers in water streams, poor disposal of empty pesticide containers and expired pesticides.

Mitigation measures

- Provide suitable storage warehouse;
- Use bio-beds, draining channels and draining dams for waste pesticides treatment;
- Use chemical remains to re-spray crops;
- Clean equipment in one place designated for such activities;
- Take regular stock of pesticides for early tracking of leaks and waste;

- Provide farmers and other relevant authorities with information on appropriate remediation measures in case of spills and accidents,
- Apply Integrated Pesticide Management; and
- Train staff and farmers in proper handling and use of pesticides.

Health and safety risks

People around pesticides storage facilities, farmers handling pesticides and spray service providers may be exposed to hazardous pesticides. Lack of appropriate knowledge in handling of pesticides may also increase health and safety risks to humans due to misuse, underuse or overuse of these pesticides. Pesticides, if not stored correctly, will result in corroded containers, lost labels and release of the chemicals into the environment. Pesticide stockpiles pose a very serious health and safety risk of contaminating drinking water, food or the air.

Mitigation Measures

- Provide personal protective equipment to workers and ensure its good use
- Inspect pesticides handling and storage facilities regularly;
- Train staff and farmers in proper handling of chemical pesticides and conduct routine medical examination for workers; and
- Promote IPM to replace harmful pesticides
- Encourage farmers to only acquire pesticide quantities that are likely to be needed to avoid potential for creating obsolete stocks
- Pesticides whose handling and application require use of PPE that is uncomfortable, expensive or not readily available should be avoided.
- Washed and emptied containers that the pesticide supplier does not intend to reuse should be punctured or otherwise rendered unusable for any other purpose.
- Empty containers and pesticide-related waste should not be burnt, dumped or buried but returned to source
- Introduce pesticides in ready-to-use containers
- Discourage farmers from buying and using decanted pesticides
- Initiate education programmes that will be run by farmer cooperatives, Farmer Field Schools (FFS), Non Governmental Organisations (NGOs), extension services to raise awareness of the correct use of pesticides and disposal of the empty containers

Accidental or intentional poisoning

Improper labelling and storage of chemical pesticides may increase chances of accidental poisoning. Availability of pesticides and increased accessibility by staff and farmers may increase the risk of poisoning to kill intentionally or commit suicide due to social pressures and frustration.

Mitigation Measures

- Label and store chemicals in properly labelled shelves;
- Ensure responsible, mentally sound and mature persons are given charge and control of approved chemical pesticides;
- Restrict accessibility to chemical pesticides; and conduct regular spot checks to balance stock;
- Pesticides should be kept in secure place to which children, animals, or unauthorised personnel do not have access;
- Pesticides should never be transferred into containers other than those they were supplied; and
- Pesticides must be stored safely and securely away from food and water supplies.

Pest resistance

Lack of appropriate knowledge in pesticide may result in incorrect pesticide application. This may reduce effectiveness of the pesticides on pests through elimination of only weaker pests and leaving a generation of stronger pests, thereby promoting development of pest resistance.

Mitigation Measures

- Train staff and farmers in correct application of pesticides
- Initiate education programmes that will be run by farmer cooperatives, FFS, NGOs, extension services to raise awareness of the correct use of pesticides

6.3 POSITIVE IMPACTS OF NON CHEMICAL PEST CONTROL

Non chemical pest control which include biological control agents, physical measure, cultural measure, genetic, and mechanical methods of managing pests entails the use of environmentally and socially acceptable methods on the host, to eliminate pests or diseases.

6.3.1 Biological control agents

Reduced environmental and health risks

The use of natural enemies in controlling pests is more environmentally friendly in comparison with chemical control methods.

Enhancement Measures

- Establish demonstration plots to disseminate information on environmental and health benefits of biological control agents to the communities for them to appreciate the advantages.

Reduction in time spent on application of pesticides

Planting of pest resistant crops in a particular growing season guarantees the farmer of effective pest control for several growing seasons. This reduces the time spent by the farmer in applying pesticides to the same agricultural fields for a good number of growing seasons during which the biological control will be effective. Biological control methods can also be easily integrated in other IPM control methods.

Enhancement measures
Prepare an inventory of indigenous and established biological control methods and conduct community awareness seminars to enhance and exchange community knowledge base.

Increase in soil stability and reduction in soil erosion
The wider environmental benefits of increasing tree cover as biological control of pests will result in increase in soil stability and reduction of erosion.

Enhancement measures
Conduct awareness campaigns on the importance of using new and improved pest resistant seed varieties in controlling pests.

Resistance to pests through improved varieties
The use of resistant clones in the control of diseases; and adoption of fast methods of propagating plantings has environmental benefits as well as advantages of crop resistance to pests.

Tissue culture technology also has the potential to increase biodiversity by replacing the stocks of rare and endangered tree species. The wider environmental benefits of increasing biodiversity and tree cover include improving soil stability, reducing erosion, preventing desertification and stabilizing global climate.

Enhancement measures
Rural people have a tendency of resisting to introduction of new varieties and sticking to traditional seed varieties. Awareness campaigns on the benefits of new and improved seed varieties, which are resistant to pest will help reduce application of chemical pesticides.

6.3.2 Mechanical methods

Reduced pollution on the environment
Use of labour with simple implements/tools is environmentally friendly in the sense that it has no significant impacts on water or air pollution.

Enhancement measures

- Train farmers on the appropriate and efficient use of simple farm implements to significantly minimize environmental pollution; and

6.4 NEGATIVE IMPACTS OF NON CHEMICAL CONTROL METHODS

6.4.1 Mechanical methods

Human health risk

Hand picking of insect pests may be risky to the farmer since some pests may be injurious or zoonotic (affecting both animals and humans).

Presence of other injurious non pest organisms e.g. snakes in the field can pose as a health risk to the farmer

Mitigation measures

Encourage use of Personal Protective Clothing (PPE) when hand picking pests.

Poor crop development

Mechanical control of pests by fruit bagging may lead to poor development of the fruits due to shading from light for instance green bananas need to photosynthesise as they develop.

Mitigation measures

Encourage use of transparent bags to allow entry of light.

6.4.2 Physical methods

Human health risk

Accidental exposure to radiation in the process of treating planting materials against pests or sterilization of male tsetse flies by radiation may be a risk to human health.

Mitigation measure

Training in proper use of the technique

Damage to planting materials

Accidental overheating of planting materials during hot water treatment can render them unviable.

Mitigation measure

Training in proper use of the technique

6.5 POSITIVE IMPACTS OF IPM

Increase in agricultural yields

IPM practices will contribute to an increase in agricultural yields through prevention of crop damage and preservation of produce.

Enhancement measures
Train farmers in the use of appropriate IPM techniques to protect crops from pest damage.

Contribution to Food Security
Application of IPM will result in enhanced food security, yields and efficient preservation of produce, subsequently providing and contributing to the overall national goals on food security.

Enhancement measures

- Train pesticides marketers in selection and handling of IPM-compatible pesticides;
- Train farmers in appropriate application of the various IPM techniques; and
- Educate farmers on how to preserve natural enemies and timeframes of different integrated pest management options.

Saving in foreign exchange
Promotion and increased application of non-chemical pesticides will result in reduced importation of chemical pesticides thereby saving foreign exchange.

Enhancement measures

- Train suppliers in selection of appropriate pesticides to be eligible for supplying to AGCOM
- Train farmers in appropriate application of the various IPM practices to reduce application of chemical pesticides; and

Contribution to offsetting rural/ urban migration
Increase in farm income-generating opportunities due to better yields and availability of surplus produce for sale in the rural areas will help offset rural – urban migration.

Enhancement measures
Assist local communities to establish cooperatives and to market produce to potential markets for additional income.

Improved environmental protection
Increased application of IPM, through the use of biological controls, mechanical methods and indigenous control mechanisms will mean reduced application of polluting chemicals such as organochlorides, pyrethroids, triazines and amitraz which are harmful to the environment. It will also help reduce application of banned pesticides such as Dichlorodiphenyltrichloroethane (DDT) and dieldrin, which are sometimes smuggled across the borders.

Enhancement Measures

- Enforce regulation prohibiting importation of banned chemical pesticides;
- Sensitise pesticides users on the dangers of using prohibited pesticides; and
- Educate farmers on harmful consequences of banned chemical pesticides.

6.6 PRINCIPLES GOVERNING SELECTION OF PESTICIDES

Selection of pesticides, under the AGCOM project will be guided by the consideration of several pest management approaches for cultural, physical and biological measures before resorting to application of chemical pesticides.

The use of pesticides must be guided by the principles of cost efficiency, safety to humans, the bio-physical environment and effectiveness in controlling the pests. Pesticides selection will be made in accordance with the World Bank guidelines for the selection of pesticides (World Bank Operational Manual, Good Practice (GP) 4.03) as follows:

(i) Pesticides requiring special precautions should not be used if the requirements are not likely to be met;
(ii) Pesticides to be selected from approved list, taking into consideration of: toxicity, persistence, user experience, local regulatory capabilities, type of formulation, proposed use, and available alternatives;
(iii) Type and degree of hazard and availability of alternatives; and the following criteria will be used to restrict or disallow types of pesticides under Bank loans:

a. Toxicity: acute mammalian toxicity, chronic health effects, environmental persistence and toxicity to non-target organisms;
b. Registration status in the country and capability to evaluate long-term health and environmental impacts of pesticides.

6.7 PESTICIDES TO BE ACCEPTABLE TO AGCOM

The selection of pesticides to be acceptable under the project will be in line with (a) the World Bank Safeguard Policy OP 4.09 on pest management, and will depend on (b) the hazards and risks associated with pesticide use, and (c) the availability of newer and less hazardous products and techniques such as bio-pesticides.

In addition to the toxic characteristics of the pesticide, the hazards associated with pesticide use depend on how the pesticides are handled. Precautions to minimize environmental contamination and excess human exposure are needed at all stages from manufacture, packaging and labelling, transportation, and storage to actual use and final disposal of unused and contaminated containers. The guidelines in

Appendix 3 provide internationally accepted standards on pesticides to minimize the hazards associated with pesticide use.

The use of pesticides under the project will also be guided by the FAO Publication on International Code of Conduct, on the Distribution and Use of Pesticides 1991; *FAO Guidelines for the Packaging, Storage, Good Libelling Practice, Transportation and Disposal of Waste Pesticide and Pesticide Containers 1985.*

CHAPTER SEVEN: PEST MANAGEMENT AND MONITORING PLANS

7.1 PEST MANAGEMENT PLAN

The Integrated Pest Management and Monitoring Plan (IPMP) in Table 7.1 is developed from the impacts and mitigation measures identified in Chapter 6. The IPMP include impacts from application of chemical as well as non-chemical pesticides. The reason why chemical pesticides are included is that in the initial stages of implementation of the IPM, chemical pesticides will still be used but will be gradually phased out as the IPM gets established.

When coming up with the IPMP, the following steps should be considered and documented:

- Identify the main pests affecting crops in the region, assess the risks to the operation, and determine whether a strategy and capacity are in place to control them.
- Where possible, apply early-warning mechanisms for pests and diseases (i.e., pest and disease forecasting techniques).
- Select resistant varieties and use the cultural and biological control of pests, diseases, and weeds to minimize dependence on pesticide (chemical) control options. An effective IPM regime should:
    - Identify and assess pests, threshold levels, and control options (including those listed below), as well as risks associated with these control options.
    - Rotate crops to reduce the presence of insects, disease, or weeds in the soil or crop ecosystems.
    - Support beneficial bio-control organisms—such as insects, birds, mites, and microbial agents—to perform biological control of pests (e.g., by providing a favorable habitat, such as bushes for nesting sites and other original vegetation that can house pest predators and parasites).
    - Favor manual, mechanical weed control and/or selective weeding.
    - Consider using mechanical controls—such as traps, barriers, light, and sound—to kill, relocate, or repel pests.
    - Use pesticides to complement these approaches, not replace them.
    - Prior to procuring any pesticide, assess the nature and degree of associated risks and effectiveness, taking into account the proposed use and the intended users.

The purpose of the IPMP is to ensure that the identified impacts related to application of pesticides are mitigated, controlled or eliminated through planned activities to be implemented throughout the project life. The IPMP also provides opportunities for the enhancement of positive impacts. The IPMP gives details of the mitigation measures to be implemented for the impacts; and the responsible

institutions to implement them.

Implementation of the IPMP may be slightly modified to suit changes or emergencies that may occur on site at the time of project implementation. The plan therefore should be considered as the main framework that must be followed to ensure that the key potential negative impacts are kept minimal or under control. In this regard, flexibility should be allowed to optimize the implementation of the IPMP for the best results in pest management.

The IPMP consists of generic or typical environmental impacts that are derived from the site investigations, public consultations and professional judgment. This is because the specific and detailed impacts cannot be predicted without details for the project design and construction activities as well as the specific project locations. The IPMP will however, provide guidance in the development of more detailed IPMP's, once the project design and construction details are known.

Site specific Integrated Pest Management and monitoring plans will depend on the scope of identified major impacts to be addressed in the implementation of the project. Presented in Table 7.1 below is a generic or typical environmental management and monitoring plan, which would easily fit in the implementation of the AGCOM.

7.2 PEST MONITORING PLAN

Successful implementation of the AGCOM Integrated Pest Management Plan in the project locations will require regular monitoring and evaluation of activities undertaken by the farmers to be involved in the project. The focus of monitoring and evaluation will be to assess the build-up of IPM capacity among the farmers and the extent to which IPM techniques are being adopted in agricultural production, and the economic benefits that farmers derive by adopting IPM. It is also crucial to evaluate the prevailing trends in the benefits of reducing pesticide distribution, application and misuse.

Indicators that require regular monitoring and evaluation during the programme implementation include the following:

1 Number of farmers engaged in IPM capacity building in the project locations:
2 Number of farmers who have successfully received IPM training in IPM methods
3 Number of trainees practicing IPM according to the training instructions
4 Number of women as a percentage of total participating in IPM and successfully trained
5 Number of youth as a percentage of total participating in IPM and successfully trained
6 Number of farmers as a percentage of total applying IPM
7 Rate of IPM adoption (number of people as a percent of total) every year

8 Improvement in farm production due to adoption of IPM as a percent of production without IPM
9 Increase in farm revenue resulting from adoption of IPM practices, compared with revenue from conventional practices
10 Improvement in the health status of farmers
11 Extent to which crops and livestock are produced using chemical pesticides compared with total crop production
12 Efficiency of pesticide use and handling
13 Reduction in chemical pesticide poisoning and environmental contamination
14 Number of IPM participatory research project completed
15 Overall assessment of activities that are going according to IPMP; activities that need improvement; and remedial actions required

7.3 ESTIMATED COSTS FOR PEST MANAGEMENT AND MONITORING

Estimated costs for managing and monitoring some of the recommended enhancement and mitigation measures are provided in Table 7.1 and summarised in Table 7.2. As it can be noted for Table 7.1, not all the mitigation measures have been assigned costs. It is assumed that some of the mitigation measures will be part of the normal responsibility of the respective government ministries, agro-dealers, transporters, farmers and other relevant stakeholders, within their institutional mandates and budgets.

It is important to appreciate that some of the stakeholder institutions may not have sufficient capacity to manage environmental and social impacts of pesticides and to adequately monitor implementation of the enhancement and mitigation measures. Therefore, it is necessary to train them. The cost of training for the managing impacts has been provided for table 8.1. The table also includes costs for conducting awareness and sensitisation campaigns on pesticides application, management and adoption of IPM in the project areas. Costs for setting-up, adoption and use of IPM by farmers are provided in table 8.2. The costs for managing and monitoring various mitigation and enhancement measures provided in tables 7.1 and 7.2 are estimated for 1 year.

Table 7.1: Integrated Pest Management and Monitoring Plan

Item No	Potential Issues / Concerns	Cause of Concern	Control/Mitigation Measure	Responsible Person/Institution and Cost per year per district ($)	Standards/Regulation	Monitoring Institution and Cost per district per year	Monitoring Frequency
1. POSITIVE IMPACTS OF CHEMICAL PESTICIDES							
1.1	Increase in crop and livestock yield		Implement a long term IPM programme to sustain productivity and combat negative effects of chemical pesticides.	AGCOM, participating institutions and farmers **Cost included in the IPMP overall cost**	IPMP	MoAIWD	Semi annually
1.2	Increase in economic growth			AGCOM, participating institutions and farmers **Cost included in the IPMP overall cost**	IPMP	MoAIWD	Semi annually
2. NEGATIVE IMPACTS OF CHEMICAL PESTICIDES							
2.1	Soil degradation	Persistent use of chemical pesticides	• Apply soil conditioning measures which include IPM • Train farmers in proper	Farmers	IPMP	AGCOM EMC	Quarterly

Item No	Potential Issues / Concerns	Cause of Concern	Control/Mitigation Measure	Responsible Person/Institution and Cost per year per district ($)	Standards/Regulation	Monitoring Institution and Cost per district per year	Monitoring Frequency
			handling and application of pesticides				
2.2	Poisoning of non-target species including natural biological agents	• Lack of knowledge of chemical pesticide potency • Equipment malfunction • Use of wrong type of equipment • Wrong time and method of application (spraying)	• Supervise and control use of chemical pesticides so that only approved and recommended ones are used • Provide PM equipment • Regularly maintain and clean equipment as recommended by supplier • Dispose old equipment as recommended	AGCOM and participating farmers **21000.00** **30,000.00**	IPMP	MoAIWD AGCOM EMC PCB	Quarterly

Item No	Potential Issues / Concerns	Cause of Concern	Control/Mitigation Measure	Responsible Person/Institution and Cost per year per district ($)	Standards/Regulation	Monitoring Institution and Cost per district per year	Monitoring Frequency
			by manufacturer. • Provide recommended protective gear • Use recommended and appropriate protective gear • Conduct trainings in IPM				
2.3	Health and safety risks	Exposure to pesticides	• Provide protective clothing and ensure it is used. • Train farmers in proper	• Agro-dealers • Transporters • Farmers	• Labour regulations • PCB regulations	-Min. of Labour. -PCB -DA -AGCOM	Semi annually

Item No	Potential Issues / Concerns	Cause of Concern	Control/Mitigation Measure	Responsible Person/Institution and Cost per year per district ($)	Standards/Regulation	Monitoring Institution and Cost per district per year	Monitoring Frequency
			pesticides handling. • Routine medical examination	**Cost for five districts on farmer random sampling basis 10,000.00**		**5,000.00**	
2.4	Water, soil and environmental pollution	• Inappropriate building for storage of pesticides. • Cleaning of equipment, • Disposal of remains of pesticides • Disposal of containers and equipment	• Construct suitable warehouse • Construct bio-beds, draining channels and draining dams. • Use chemical remains to re-spray. • Clean equipment in one designated place.	• Pesticides Transporters and Suppliers • AGCOM EMC • Farmers **Cost for five district warehouses 150,000.00** **Cost for construction of bio-beds in five districts**	• Pesticides and equipment manufacturer's recommendations. • Water pollution standards.	• PCB • Environmental Affairs. • Water Resources Board	Quarterly

Item No	Potential Issues / Concerns	Cause of Concern	Control/Mitigation Measure	Responsible Person/Institution and Cost per year per district ($)	Standards/Regulation	Monitoring Institution and Cost per district per year	Monitoring Frequency
			• Take regular stock of pesticides • Use IPM • Train farmers not to spray toxic chemicals close to water sources • Train farmers to maintain spray equipment in safe operational order	**20,000.00**			
		Wrong shelving or stacking	Routine inspection and inventory checks	Agro-dealers	• PCB regulations, • Manufacturer's guidelines	• PCB • District Assembly (DA)	Semi annually

Item No	Potential Issues / Concerns	Cause of Concern	Control/Mitigation Measure	Responsible Person/Institution and Cost per year per district ($)	Standards/Regulation	Monitoring Institution and Cost per district per year	Monitoring Frequency
		• Inadequate storage space. • Bad housekeeping • Multipurpose use of warehouse	Provide adequate and separate storage space for pesticides	Agro-dealers	• PCB regulations, • Manufacturer's guidelines	• PCB	Semi annually
		Multi-purpose use of equipment or pesticides	Control use of equipment and pesticides • Thorough cleaning of equipment • Training • Integrated Pesticide Management	Farmers	Pesticides Act	• PCB • EMC • DA	Quarterly
		Illegal disposal of pesticides	Prohibit discharge of pesticides wastes to open dumps	Agro-dealers AGCOM	EMA Pesticides Act	EAD EMC **5,000.00**	Semi annually

Item No	Potential Issues / Concerns	Cause of Concern	Control/Mitigation Measure	Responsible Person/Institution and Cost per year per district ($)	Standards/Regulation	Monitoring Institution and Cost per district per year	Monitoring Frequency
			where children, domestic animals, rodents and some wildlife species scavenge				
		• Equipment malfunction • Wrong type of equipment. • Time and method of application (spraying)	• Regular maintenance of equipment. • Use recommended equipment. • Use approved methods of application. • Use recommended protective clothing. • Training seminars	Farmers AGCOM	• Manufacturer's recommendations. • Equipment maintenance policy	-PCB -EMC	Semi annually

Item No	Potential Issues / Concerns	Cause of Concern	Control/Mitigation Measure	Responsible Person/Institution and Cost per year per district ($)	Standards/Regulation	Monitoring Institution and Cost per district per year	Monitoring Frequency
			• Integrated Pesticide Management				
		• Improper cleaning of equipment. • Improper disposal of cleaning water and old equipment	• Clean equipment and dispose equipment as recommended by manufacturer. • Use bio-beds and draining dams to dispose cleaning and drainage waters. • Integrated Pesticide Management.	Farmers	• Manufacturer's recommendations. • PCB regulations. Water resources regulations	• PCB • EMC • DA	Annually
		Over-stocking	Buying the required and	Agro-dealers	Pesticides Act	PCB	Quarterly

Item No	Potential Issues / Concerns	Cause of Concern	Control/Mitigation Measure	Responsible Person/Institution and Cost per year per district ($)	Standards/Regulation	Monitoring Institution and Cost per district per year	Monitoring Frequency
			approved quantities only				
2.5	Air pollution and contamination	• Exposure of pesticides to air. • Disposal of pesticides remains in the open • Disposal of pesticides containers and equipment in the open	• Store pesticides in closed containers • Dispose chemical remains according to supplier recommendations. • Train farmers in appropriate spraying techniques to avoid chemicals being blown away by wind.	• Pesticides Suppliers • Farmers	• Pesticides and equipment manufacturer's recommendations. • Air pollution standards.	• PCB • Environmental Affairs.	Quarterly

Item No	Potential Issues / Concerns	Cause of Concern	Control/Mitigation Measure	Responsible Person/Institution and Cost per year per district ($)	Standards/Regulation	Monitoring Institution and Cost per district per year	Monitoring Frequency
			• Train farmers to maintain spray equipment in efficient operational order				
		• Bad housekeeping	Provide adequate and enclosed storage space for pesticides	Agro-dealers	• PCB regulations, • Manufacturer's guidelines	PCB	Half yearly
		Illegal disposal of pesticides	Prohibit disposal of pesticides wastes into open dumps where they will be blown away by wind	Agro-dealers AGCOM	EMA Pesticides Act	EAD EMC City/District Councils	Half yearly
		• Equipment malfunction • Wrong type of equipment.	• Regular maintenance of equipment.	Farmers AGCOM	• Manufacturer's recommendations.	• PCB • EMC	Annually

Item No	Potential Issues / Concerns	Cause of Concern	Control/Mitigation Measure	Responsible Person/Institution and Cost per year per district ($)	Standards/Regulation	Monitoring Institution and Cost per district per year	Monitoring Frequency
		• Time and method of application (spraying)	• Use recommended equipment. • Use approved methods of application. • Training farmer in appropriate spraying methods		• Equipment maintenance policy		
2.6	Health risk from chemical pesticide misuse (over /under use)	Lack of appropriate knowledge	Training and awareness campaigns	AGCOM	Pesticide manufacturers regulations, IPMP	• PCB • EAD	Annually
2.7	Accidental or Intentional poisoning	Improper labelling or storage Frustration, Social pressures	• Label and store chemicals in properly labelled shelves	Farmers Agro-dealers	Pesticides Act	• PCB • Min of Labour • DA • AGCOM	Annually

Item No	Potential Issues / Concerns	Cause of Concern	Control/Mitigation Measure	Responsible Person/Institution and Cost per year per district ($)	Standards/Regulation	Monitoring Institution and Cost per district per year	Monitoring Frequency
			• Ensure responsible, mentally sound and mature persons are given charge and control of pesticides. • Restrict accessibility to pesticides. • Spot checking				
2.8	Pest resistance	Lack of appropriate knowledge in pesticides application	• Train farmers in correct application of pesticides • Initiate education programmes	Farmers AGCOM	Pesticides Act	PCB	Half yearly
3. POSITIVE IMPACTS OF BIOLOGICAL CONTROL AGENTS							

Item No	Potential Issues / Concerns	Cause of Concern	Control/Mitigation Measure	Responsible Person/Institution and Cost per year per district ($)	Standards/Regulation	Monitoring Institution and Cost per district per year	Monitoring Frequency
3.1	Reduced environmental and health risks		Establish demonstration plots to disseminate information on environmental and health benefits of biological control agents to the communities for them to appreciate the advantages	AGCOM	EMA	-EAD -MoAIWD	Quarterly
3.2	Reduction in time spent on application of chemical pesticides		Prepare an inventory of indigenous and established biological control methods and conduct community awareness seminars to	AGCOM	IPMP	Department of Land Resources	Annually

Item No	Potential Issues / Concerns	Cause of Concern	Control/Mitigation Measure	Responsible Person/Institution and Cost per year per district ($)	Standards/Regulation	Monitoring Institution and Cost per district per year	Monitoring Frequency
			enhance and spread knowledge base				
3.3	Resistance to pests through improved varieties/species	Rural people have a tendency of resisting to introduction of new varieties and sticking to traditional seed varieties.	Awareness campaigns on the benefits of new and improved seed varieties, which are resistant to pest will help reduce application of chemical pesticides	AGCOM	IPMP	MoAIWD	Annually
3.4	Increase in soil stability and reduction of soil erosion	Increasing tree cover as biological control of pests will result in increase in soil stability and	Conduct awareness campaigns on the importance of using new and improved and pest resistant seed varieties in controlling pests	AGCOM	IPMP	MoAIWD	Annually

Item No	Potential Issues / Concerns	Cause of Concern	Control/Mitigation Measure	Responsible Person/Institution and Cost per year per district ($)	Standards/Regulation	Monitoring Institution and Cost per district per year	Monitoring Frequency
		reduction of erosion					
4. NEGATIVE IMPACTS OF BIOLOGICAL CONTROL AGENTS							
4.1	Risk of damage to crops	The slowness of biological agents to act may frustrate IPM programmes as farmers are used to the rapid results of chemical pesticides	• Educate farmers on the long term benefits of the biological methods to facilitate their adoption; and • Phase transition from biological to IPM methods to ensure no appreciable loss of production during transition	AGCOM	IPMP	EMC MoAIWD	Annually
5.0 POSITIVE IMPACTS OF MECHANICAL METHODS							

Item No	Potential Issues / Concerns	Cause of Concern	Control/Mitigation Measure	Responsible Person/Institution and Cost per year per district ($)	Standards/Regulation	Monitoring Institution and Cost per district per year	Monitoring Frequency
5.1	Reduced pollution on the environment		Train farmers on the appropriate and efficient use of simple farm implements to significantly minimize environmental pollution	AGCOM	IPMP	MoAIWD	Annually
			6.0 NEGATIVE IMPACTS OF MANUAL METHODS				
6.1	Human health risks	Snake bites, hippo or crocodile attacks	• Provide protective clothing to workers and ensure it is properly used; • Train farmers in proper operations and handling of farm equipment; and	AGCOM	N/A	Department of Land Resources	Annually

Item No	Potential Issues / Concerns	Cause of Concern	Control/Mitigation Measure	Responsible Person/Institution and Cost per year per district ($)	Standards/Regulation	Monitoring Institution and Cost per district per year	Monitoring Frequency
			• Promote IPM to replace mechanical methods				
6.2	Poor crop development		Encourage use of transparent bagging to allow entry of light	AGCOM	N/A	MoAIWD	Annually
7.0 POSITIVE IMPACTS OF IPM							
7.1	Increase in agricultural yields	Non chemical methods are generally slow	Train farmers in timely and appropriate use of pest management techniques to protect maize from the great grain borer and other pests; and to protect other crops from pest damage	AGCOM	IPMP	MoAIWD	Annually

Item No	Potential Issues / Concerns	Cause of Concern	Control/Mitigation Measure	Responsible Person/Institution and Cost per year per district ($)	Standards/Regulation	Monitoring Institution and Cost per district per year	Monitoring Frequency
7.2	Contribution to Food Security	Non chemical methods are generally slow	• Train pesticides marketers in selection and handling of approved pesticides • Train farmers in the appropriate application of the various IPM practices • Educate farmers on preservation techniques and timeframes of different integrated pest management options.	AGCOM	IPMP	MoAIWD	Annually

Item No	Potential Issues / Concerns	Cause of Concern	Control/Mitigation Measure	Responsible Person/Institution and Cost per year per district ($)	Standards/Regulation	Monitoring Institution and Cost per district per year	Monitoring Frequency
7.3	Saving in foreign exchange	Banned chemicals	• Train pesticides suppliers in selection of appropriate pesticides to be eligible for supplying to ASWAp-SP; • Train farmers in the appropriate application of the various IPM practices to reduce application of chemical pesticides; and • Enforce regulation prohibiting importation of	AGCOM	Pesticides Act	PCB	Quarterly

Item No	Potential Issues / Concerns	Cause of Concern	Control/Mitigation Measure	Responsible Person/Institution and Cost per year per district ($)	Standards/Regulation	Monitoring Institution and Cost per district per year	Monitoring Frequency
			banned chemical pesticides				
7.4	Contribution to offsetting rural/ urban migration	Banned chemicals	• Enforce regulation prohibiting importation of banned chemical pesticides; • Educate farmers on harmful consequences of banned chemical pesticides; and • Assist local communities to establish cooperatives and to market produce to	Farmers AGCOM	Pesticides Act	PCB **5,000**	Quarterly

Item No	Potential Issues / Concerns	Cause of Concern	Control/Mitigation Measure	Responsible Person/Institution and Cost per year per district ($)	Standards/Regulation	Monitoring Institution and Cost per district per year	Monitoring Frequency
			potential markets for additional income.				
7.5	Improved environmental protection		• Enforce regulation prohibiting importation of banned chemical pesticides; and • Educate farmers on harmful consequences of banned chemical pesticides.	AGCOM	IPMP	AGCOM	Annually

Table 7.2 Summary of Management and Monitoring Costs for 1 Year

Impact	Management Costs (US$)	Monitoring Costs (US$)
Provide PM equipment (sprayers)	10,000.00	
Provide recommended protective gear	30,000.00	
Pesticide inspection, sampling and testing		10,000.00
Routine medical examination	10,000.00	5,000.00
Rehabilitation of laboratories	100,000.00	
Construct bio-beds, draining channels and draining dams.	20,000.00	
Disposal of chemical pesticides remains according to supplier recommendations		5,000.00
Enforce regulation prohibiting importation of banned chemical pesticides		4,000.00
Grand Total	**170,000.00**	**24,000.00**

CHAPTER EIGHT: CAPACITY, TRAINING NEEDS AND BUDGET FOR IMPLEMENTATION OF THE IPMP

8.1 CAPACITY NEEDS

IPMP is a knowledge intensive and interactive methodology. It calls for a precise identification and diagnosis of pests and pest problems. Comprehending ecosystem interplays equips farmers with biological and ecological control knowledge and assists them in making pragmatic pest control decisions.

The success of IPMP is largely dependent on developing and sustaining institutional and human capacity to facilitate experiential learning. Experiential learning is a prerequisite to making informed decisions in integrating scientific and indigenous knowledge. This assists in tackling district, ward and village specific problems.

Ineffective communication between farmers, extension agents and researchers from research institutes and universities has often translated into poorly-targeted research or to poor adoption of promising options generated by research. Essentially, the full potential of agricultural research is compromised.

Closer farmer-research investigator interaction, adaptive research and participatory learning approaches in capacity building efforts serves as a remedy to narrowing this gap, making research results more applicable to farmers. Farmers must at least be trained in:

(a) Biological and ecological processes underpinning IPM options;
(b) The practical application of newly acquired knowledge, to choose compatible methods to reduce production and post-harvest losses, through frequent field visits, meetings and demonstrations; and
(c) Adaptive research trails.

Capacity building will be achieved through farmer-based collaborative management mechanisms where all key stakeholders shall be regarded as equal partners. Beneficiary farmers shall be the principal actors facilitated by other actors from research institutes, academic institutions, sector ministries, NGOs, etc. as partners whose role will be to facilitate the process and provide technical direction and any other support necessary for the implementation of IPM. Pilot IPMP implementation must be built on and to some extent strengthen existing national capacities for the promotion and implementation of IPM.

The major actors and partners will include the following:

The programme beneficiary farmers: As the principal beneficiaries, they will be organized into Farmer Groups for training and adoption of IPM practices. The

farmers will receive assistance from Community IPM Action Committees, to coordinate IPM activities in their areas.

At the District level, the ***District Development Committees,*** through the District Agricultural Officers, will assist the farmers to form the Farmer Groups through whom IPM activities will be implemented. The District Agricultural Officer will provide the technical assistance to the Farmer Groups.

The ***Agricultural Development Divisions (ADD's)*** will backstop the District Development Committees and assist them with the technological advancements in IPM development. They will coordinate with research institutions and organise field days to disseminate the information.

The MoAIWD will provide logistical and technical support to the AGCOM EMC. They will thus provide capacity and policy guidance and oversight for implementation of the IPM at National level. MoAIWD will, through the AGCOM, provide the necessary budgetary support and overall monitoring of the IPM activities. ***The MoAIWD*** and the respective districts will provide staff for training local farmers and play a major role with NGOs/Community Based Organisations (CBOs) in the public awareness campaigns, production of extension materials, radio and television programs in the respective districts.

Agricultural sector departments have the national mandate in the implementation of crop and livestock protection and pest management research. They will provide technical support to AGCOM, through the respective Agricultural Development Divisions, in the implementation of IPM. EMC will exploit the sector department's experiences in the implementation of IPM and management of outbreak and migratory pests.

AGCOM will undertake to build the capacities of extension workers to train farmers and community leaders in promoting IPM activities. They will also facilitate information sharing with local farmers.

The Pesticides Control Board will provide the necessary information on pesticides and train the Farmer Groups in all aspects of pesticides including application rates, methods, storage and disposal of residues. They will also monitor pesticides stocks and potency at the dealers.

The Ministry of Health (MoH)*:* through the District Health Officers, will set up databases on incidence of poisoning, effect of pesticides on human health and environmental contamination. This data will then be used to measure and validate the ameliorating effects of IPM adoption and implementation that is expected to reduce risks to pesticides exposure.

Ministry of Justice and Constitutional Affairs: they have a national mandate to review laws They provide the legal advice on legal instruments that need to be reviewed.

The Environmental Affairs Department (EAD)*:* through the Environmental District Officers, will conduct environmental monitoring in relation to IPM. EAD will contribute towards training the beneficiary Farmer Groups in pesticides management.

Partners in capacity building and training will include ***Agriculture Services Providers and NGOs*** that are providing services to farmers and improving agricultural productivity, environmental management and rural health matters will be identified to provide services and technical support in the implementation of IPM.

8.2 TRAINING

8.2.1 Training Content

Training key role players and stakeholders in IPM is necessary to ensure that they possess appropriate skills for IPMP implementation. The IPMP training program is designed for four levels as presented in the following sections and the training areas for key role players and stakeholders of IPM are provided in Table 8.1.

National level workshop

A total of 30 participants including representatives from the institutions listed in table 8.1 will attend a one day training workshop in Lilongwe. Members from these key stakeholder institutions will prepare and make presentation on their specific areas of expertise and demonstrate how their technical know-how would be applied in the implementation of IPMP. The main focus of the training workshop will be to establish institutional coordination for implementation of the IPMP.

Training of trainers

25 people will participate in the 3-day training of trainers in IPM. The main objective of this training will be for the participants to acquire and share the necessary knowledge to be able to train district staff and extension workers in the AGCOM participating districts. Participants will be drawn from AGCOM and DEC of the project districts, selected IPM Trainers from MoAIWD and Development Service Providers and NGOs including pesticides marketers.

Training at district level

Training at the districts level will be targeted to district staff, extension workers, members of the Area Executive Committee (AEC) and community leaders. This group of participants, with the assistance of the trainers, will be responsible for imparting the IPM knowledge and practices to the farmers. 35 participants, with the extension workers being the majority (more than fifty percent of the participants) will be trained to assist the farmers in skills to implement the IPMP.

Community level (farmers)

Being beneficiaries, 50 farmers from each of the five districts, will be selected to participate farmer community training in IPM to be conducted in three strategic areas of the district. Areas of training focus will be to inform the farmers about the IPMP implementation and general discussions on indigenous as well as formal pest management practices currently in use.

Table 8.1: Training areas for key role players and stakeholders of IPM

Participants in the training	Roles of participants in IPMP	Training content	Cost US$ and Duration
National level institutions • DARS • LRCD • DAHLD • MoAIWD • AGCOM EMC • MoH • EAD • PCB • DCD • MBS • Trade • DAES	• Providing capacity and policy guidance and/or oversight for IPMP implementation • Monitoring and evaluation of IPMP implementation • Providing logistical and technical support for AGCOM training • Training IPM trainers. • Institutional coordination • Monitoring of IPM inputs supply by the dealers • Monitoring illegal stock of pesticides in boarder regions of Malawi	• General overview of the project • Roles of IPMP stakeholders • Institutional IPMP supportive roles in IPMP implementation • IPMP and environmental and social management • pesticide regulation on: imports, transportation, use, registration and disposal of residues	Cost for 1 day training workshop $16,354
Training of Trainers • AGCOM • PCB • DEC • IPM Trainers • MoAIWD, Service Providers and NGOs	• Supervising IPMP implementation • Preparation of IPM training materials • Training extension workers • To be fully abreast with AGCOMs IPMP and to conduct research in IPM.	• General overview of the project and the IPMP for the AGCOM • IPMP stakeholders and their roles • Pesticides (types, classification, labelling registration etc.)	Cost for a 3- day training: $9,784

Participants in the training	Roles of participants in IPMP	Training content	Cost US$ and Duration
• Pesticides marketers • PCB	• To engage farmers in participatory learning and knowledge sharing • To foster Farmer/trainer coordination • To maintain Databases on incidence of poisoning, effects of pesticides on human health and environmental contamination. • To conduct IPMP scientific study, data collection, analysis and storage	• Leadership and training for IPMP • Pesticides and environmental and social impacts; and mitigation measures • Safety and precautionary measures for handling pesticides • IPM tools, indigenous, contemporary and other pest management practices and methods • Management of outbreak and migratory pests. • Pesticide regulations on: imports, registration, transportation, use and disposal of residues • Farmer/Trainer coordination	
District level • District staff • Extension workers	• Supervision of farmers and provision of extension support • Preparation of farmer training materials, leaflets, demonstration	• General overview of the project and the IPMP for the AGCOM	Cost for a 3- day training $5,000

Participants in the training	Roles of participants in IPMP	Training content	Cost US$ and Duration
• Members of the AEC • Lead Farmers	material, radio and TV messages etc • Training farmers and community leaders in IPM and safety • Organising farmers for participatory learning and knowledge sharing events	• IPMP stakeholders and their roles • Pesticides (types, classification, labelling registration etc.) • Skills in preparing IPMP work plans and budgets. • Pesticides and environmental and social impacts; and mitigation measures • Indigenous and other pest management methods • Safety and precautionary measures while handling pesticides • Management of outbreak and migratory pests. • Pesticide regulation on: imports, transportation, use, registration and disposal of residues • Farmer/Trainer coordination	Cost for training in the 5 districts: $ 25,000

Participants in the training	Roles of participants in IPMP	Training content	Cost US$ and Duration
Community level (farmers)	• Attending IPM trainings and demonstrations • IPMP implementation	• General overview of the project and the IPMP for the AGCOM • IPMP stakeholders and their roles • Pesticides (types, classification, labelling registration etc.) • Pesticides and environmental and social impacts; and mitigation measures • Indigenous and other pest management methods • Safety and precautionary measures while handling pesticides • Management of outbreak and migratory pests. • pesticide regulation on: imports, transportation, use, registration and disposal of residues • Farmer/Trainer cooperation	Cost for a farmer community training in one district: $5,000 Cost for training in 5 districts: $25,000

Participants in the training	Roles of participants in IPMP	Training content	Cost US$ and Duration
Total			**76,138**

8.3 COSTS FOR SETTING UP THE IPMP

In line with the steps for establishing the IPM approaches as outlined in chapter five of this IPMP, table 8.2 presents one year's estimated budget for setting up the IPMP in each of the project districts.

Table 8.2 Budget for setting up integrated pest management and implementation

Activity	Methodology	Cost ($)
Identify the implementation team Decide on the scale of implementation Review and set measurable objectives for the IPMP Establish a system of regular IPM inspections Define the treatment policy selection Establish communication protocols Develop farmer training plans and policies	Three day workshop	10,000.00
Analyze current housekeeping, maintenance and pest control practices	Consultant	20,000.00
Provide protective gear		30,000.00
Track progress and reward success	Monitoring and evaluation	10,000.00
TOTAL COST PER DISTRICT		**40,000.00**
TOTAL COST FOR FIVE DISTRICTS PER YEAR		**200,000.00**

8.3 TOTAL COSTS FOR THE IPMP

The total cost for the IPMP comprises of pest management and monitoring costs, Training costs for IPM, and the Initial costs for setting up the IPMP. The total cost, which is $518,252, is summed from costs derived in the respective chapters of the IPMP

Activity	Cost ($)
Pest management and monitoring costs (Table 7.2)	195,000.00
Training for IPM (Table 8.1)	76,138.00
Cost for setting up IPMP	200,000.00
Contingency (10%)	47,114.00
GRAND TOTAL FOR THE IPMP	518,252.00

CHAPTER NINE: CONCLUSIONS AND RECOMMENDATIONS

Among other things, this IPMP has established that there are some initiatives in the use of indigenous knowledge and non-chemical practices for pest management. The IPMP has also proposed activities that need to be carried out to set up IPM practices in the AGCOM target districts.

It is noted that not all IPM practices would be applicable for the AGCOM in the short term. Specifically, mechanical methods may be difficult to implement in small scale farming communities where heavy machinery for weeding will be inappropriate. Biological methods are a possible option under the AGCOM but they take a long time and they need technical know-how as well as patience to adopt. Generally, IPM practices take some time to adopt and to bear the required results. However, IPM practices are highly recommended for long term and sustainable agricultural productivity. AGCOM should therefore:

i. Introduce the IPM in the AGCOM target districts by using the systematic approach presented in Chapter 5. This will ensure application of all appropriate alternatives prior to resorting to chemical pesticides as remedy for pests;
ii. Adopt a collective community effort and dissemination of appropriate tools and training. This will maximize IPMP implementation and accelerate progress towards reaching both measurable and tangible results in pest management;
iii. Adopt a use of chemicals as a last resort approach to prioritize IPM remedies, consistent with sound environmentally sustainable practices;
iv. Set up a team that incorporates ADD's management staff with the government's pesticides inspection team so that inspections are jointly conducted, permitting instantaneous discovery of illicit pesticides, followed by immediate impounding and appropriate legal action;
v. Train farmers in (a) identifying approved pesticide; (b) acceptable disposal practices for expired chemical pesticides; and (c) the general environmental risks associated with the use of expired chemical pesticides;
vi. Adopt a "safety is the number one priority" approach in IPM approach
vii. Equip ADDs with "safety packages" to be made available to farmers for free under AGCOM. Packages must include the minimum requirements for pesticide application such as gloves and eyewear, nose mask; and
viii. Thoroughly inform farmers on the dangers of handling chemical pesticides and equipment without sufficient and appropriate protective gear

As the process of pesticides registration in Malawi continues, it is proposed that the following factors, spearheaded by the PCB, must be implemented:

1. Priority list and importance of pesticides by crop and livestock must be supplied to government by farming organizations, to assist government in setting up quantity limits for importation;
2. The Malawi Bureau of Standards (MBS) must conduct pesticides residue and quality control tests in products; and
3. The programme should assist with the disposal of the farmers and household's pesticides related waste by establishing infrastructures for the collection and appropriate management of small quantities of pesticides and contaminated materials.

REFERENCES

1. David Dent (Ph. D.), N. C. Elliott (1995) **Integrated Pest Management** Chapman and Hall

2. Paul Horne and Jessica Page (2008) **Integrated Pest Management for Crops and Pastures** Land links Press Collingwood, Australia

3. Radcliffe E, Hutchison W, Cancelado R (2008)**Integrated Pest Management Concepts, Tactics, Strategies and Case Studies** Cambridge

4. Department of Research and Environmental Affairs (1994); **National Environmental Action Plan: Vol. 1: The Action Plan.** Lilongwe.

5. Government of Malawi (1969), **Water Resources Act;** Ministry of Water Development

6. Government of Malawi (1994**); National Environmental Action Plan Volume 1,**
   Department of Research and Environment Affairs

7. Government of Malawi (1995), **Constitution of the Republic Of Malawi**

8. Government of Malawi (1995), **Water Works Act,** Number 17. Ministry of Water Development

9. Government of Malawi (1996), **Environment Management Act,** Number 23. Department of Environmental Affairs

10. Government of Malawi (1996), **National Environmental Policy;** Ministry of Research and Environmental Affairs

11. Government of Malawi (1997); **Guidelines for Environmental Impact Assessment (EIA) In Malawi;** Department for Environmental Affairs

12. Government of Malawi (2002); **National Environmental Action Plan;** Department of Environmental Affairs, Lilongwe

13. Government of Malawi (2002); **State of Environment Report;** Department of Environmental Affairs, Lilongwe

14. Government of Malawi (2004); **State of Environment Report;** Department of Environmental Affairs, Lilongwe

15. Government of Malawi (1998), **National Land Use Strategy and Management;** Ministry of Agriculture and Irrigation

16. OIE Terestrial Animal Health Code (2016)

APPENDICES

APPENDIX 1 IPMP DEVELOPMENT TEAM

Id	Name	Post	Institution
1	John Mussa	Director	Land Resources Conservation Department
2	Gilbert Kupunda	Deputy Director	Land Resources Conservation Department
3	Joseph Kanyangalazi	Principal Land Resources Conservation Officer	Land Resources Conservation Department
4	Kefasi Kamoyo	Land Resources Conservation Officer	Land Resources Conservation Department
5	George Lungu	Principal Agricultural Officer (Crop Protection)	Department of Crop Development
6	Dr Donald Kachigamba	Entomologist	Department of Agricultural Research Services
7	Walunji Msiska	Environmental Officer	Environmental Affairs Department
8	Young Chakana		Pesticide Control Board
9	Cosmas Luwanda	Programme Coordinator	ASWAp Secretariat
10	Dr Gilson Njunga	Chief Pathologist	Department of Animal Health and Livestock Development
11	Donata Chitsonga	Principal Investment Promotion Officer	Ministry of Industry, Trade and Tourism

APPENDIX 2 PEOPLE AND INSTITUTIONS CONSULTED

ID	NAME	Gender	Designation	Duty Sation	District	Contact number	E-mail
1	Sarah Mbale	F	AEDO	Chitawale	Salima	0997173467	
2	George Chizungu	M	AEDO	Kalambe west	Salima	0999179075	
3	Prince Ngwira	M	AEDO	Chitala east	Salima	0888883794	
4	William Ngwira	M	LDO	Salima RDP	Salima	0888859674	wmngwira@yahoo.com
5	Matiya H. Phiri	M	Crops Officer	Salima RDP	Salima	0995580643	hmatiya@yahoo.com
6	Chimwemwe Mwambungu	F	LRCO	Salima RDP	Salima	0881936985	
7	Lughano Tomoka	M	PAO Horticulture	Salima RDP	Salima	0888728074	
8	AK Msosa	M	PLRCO	Kasungu ADD	Kasungu	0997204161	
9	Chipo Chinula	F	LDO	Kasungu ADD	Kasungu	0884100959	
10	DD Kalilangwe	M	PAO Tobacco	Kasungu ADD	Kasungu	0999645163	
11	P. Nkhono	F	AGRESSO	Kasungu ADD	Kasungu	0888743730	
12	Rhoda Lita	F	AEDC	Chipala EPA	Kasungu	0999683192	
13	B.P Lumwira	M	AEDO	Khuza	Kasungu	0995227444	
14	H.F.U Banda	M	AEDO	Chipange	Kasungu		
15	S. Aron	M	AEDO	Chipange	Kasungu	0999807625	
16			AEDO	Mwalawanyenje	Kasungu	0992009802	
17	Clara Chimgonda	F	AEDO	Kaswalipande North	Kasungu	0999480877	
18	D. Kuyankhula	M	AEDO	Chipala West	Kasungu	0992057172	
19	C.K. Chitowe	M	AEDO	Kaswalipande South	Kasungu	0999705049	
20	S.T Phiri	M	AEDO	Chipala east	Kasungu	0999910867	
21	Freson Banda	M	Crops Officer	Thyolo RDP	Thyolo	0888504407	fresonbanda@yahoo.com
22	Gladys Kaipsya	F	Crops Officer	Thyolo RDP	Thyolo	0888585533	gladys.chiwale@yahoo.com
23	Cathberity Naphiyo	F	AEDO	Nachipele SW	Thyolo	0999684282	cathynaphiyo@gmail.com
24	Gubuduza Mc Kinley	M	DAHLDO	Thyolo RDP	Thyolo	0888486845	
25	Chrissie Bandah	F	Field Assistant		Thyolo	0888907536	
26	Mwala Mbughi	M	AEDO	Nachipele South East	Thyolo	0882308991	

27	Odetta Kazembe	F	AEDO	Nansato	Thyolo	0884650239	
28	Zione K. Ngwilugwa	F	AEDO	Nachipele Central	Thyolo	0888519304	
29	Nani Lazaro	M	AEDO	Maonga	Thyolo	0888729954	lazaronani@yahoo.com
30	Lameck Monjeza	M	AEDO	Njale	Thyolo	0994865121	
31	Bennie Livala	M	AEDO	Mtambanyama	Thyolo	0888658065	blivula@gmail.com
32	Chrissy Likhutcha	F	AEDO	Namileme	Thyolo	0882701375	
33	Enock Chiwale	M	AEDO	Thyolo center	Thyolo		
34	Kenneth Chakuma	M	AHSA	Thyolo center	Thyolo	0999363270	
35	Sekanao Sitore	F	VS	Thyolo center	Thyolo	0999017364	
36	Martin Andrew	M	AEDO	Mianga	Thyolo	0884111510	
37	Flora Khumbo	F	AVO	Thyolo RDP	Thyolo	0994275146	
38	Philip Begue	M	DAHLDO	Chikwawa DAO	Chikwawa	0999236090	
39	L Y Lipenga	M	Crops Officer	Chikwawa DAO	Chikwawa	0992433084	
40	A. Dickson	M	LRCO	Chikwawa DAO	Chikwawa	0999604724	
41	R. Kanyimbiri	M	AEDO	Fombe	Chikwawa	0999146131	
42	C Singano	M	AEDO	Chiwale	Chikwawa	0999182933	
43	N Tentha	M	AHSA	Kanjedza D/Tank	Chikwawa	0881178466	
44	D.D Khembo	M	AEDO	Chilala	Chikwawa	0888529818	
45	Zex Kulema	M	AEDO	Dulansanje	Chikwawa	0995306511	
46	Chimwemwe Lomon	M	AVO	Mitole	Chikwawa	0995757195	
47	M. V . Berewu	M	AEDO	Mwasiya	Chikwawa	0993057048	
48	D. Chaola	M	AEDO	Mikolongo	Chikwawa	0995445003	
49	Patrick Makombola	M	SAVO	Chikwawa DAO	Chikwawa	0888641194	
50	Esther Fandika	F	AEDO	Mlomba	Chikwawa	0882706136	
51	Elsie Kalipa	F	AEDO	Mitole	Chikwawa	0888315497	
52	Getrude Kuchelekasa	F	AEDO	Mthumba B	Chikwawa	0995196956	
53	Tendai Kowera	F	AEDO	Phingo	Chikwawa	0881838287	
54	Emmanuel S Chiputula	M	AEDO	Mitole	Chikwawa	0888524245	
55	Lyson L. Bandawe	M	AHSA	Gumbwa	Chikwawa	0885457839	

56	Reuben Jekapu	M	AHSA	Chiwale	Chikwawa	0881349031	
57	Evance Mulivi	M	AEDO	Gumbwa	Chikwawa	0995754584	

APPENDIX 3 PEST MANAGEMENT

When coming up with the IPMP, the following steps should be considered and documented:

- Identify the main pests affecting crops in the region, assess the risks to the operation, and determine whether a strategy and capacity are in place to control them.
- Where possible, apply early-warning mechanisms for pests and diseases (i.e., pest and disease forecasting techniques).
- Select resistant varieties and use the cultural and biological control of pests, diseases, and weeds to minimize dependence on pesticide (chemical) control options. An effective IPM regime should:
    - Identify and assess pests, threshold levels, and control options (including those listed below), as well as risks associated with these control options.
    - Rotate crops to reduce the presence of insects, disease, or weeds in the soil or crop ecosystems.
    - Support beneficial bio-control organisms—such as insects, birds, mites, and microbial agents—to perform biological control of pests (e.g., by providing a favorable habitat, such as bushes for nesting sites and other original vegetation that can house pest predators and parasites).
    - Favor manual, mechanical weed control and/or selective weeding.
    - Consider using mechanical controls—such as traps, barriers, light, and sound—to kill, relocate, or repel pests.
    - Use pesticides to complement these approaches, not replace them.
    - Prior to procuring any pesticide, assess the nature and degree of associated risks and effectiveness, taking into account the proposed use and the intended users.

Pesticides Use and Management

Where pesticide use is warranted, in order to prevent, reduce, or control the potential contamination of soils, wildlife, groundwater, or surface water resources caused by accidental spills during the transfer, mixing, storage, and application of pesticides, they should be stored, handled, and applied in a manner consistent with the recommendations for hazardous materials management presented in the **General EHS Guidelines.**

A pesticide management plan (PMP) that includes procedures for the selection, procurement, storage, handling, and ultimate destruction of all out-of-date stocks should be prepared in accordance with FAO guidelines and should be consistent with country commitments under the Stockholm, Rotterdam, and Basel Conventions. The PMP prescribes the type of pesticides to be used, as well as the purpose of their use, and outlines best practice for the procurement and storage of all

pesticides. Personnel must have appropriate training—including certification, where relevant—to handle and apply pesticides safely. In particular:

- Ensure that any pesticides used are manufactured, formulated, packaged, labeled, handled, stored, disposed of, and applied according to the FAO's International Code of Conduct on Pesticide Management.
- Do not purchase, store, use, or trade pesticides that fall under the World Health Organization's (WHO) Recommended Classification of Pesticides by Hazard Classes 1a (extremely hazardous) and 1b (highly hazardous), or Annexes A and B of the Stockholm Convention.
- Do not use pesticides listed in WHO Hazard Class II (moderately hazardous), unless the project has appropriate controls established with respect to the manufacture, procurement, or distribution and/or use of these chemicals. These chemicals should not be accessible to personnel without proper training, equipment, and facilities in which to handle, store, apply, and dispose of these products properly.
- Preferentially, use selective pesticides with low environmental impact quotient (EIQ) where appropriate, rather than broad-spectrum products, to minimize impacts on non-target species.

Storage

Recommended pesticide storage practices include:

- Store all pesticides in a lockable, bunded container or store that has sufficient space in which to capture any spills without contaminating the environment. Stores should be set away from water sources, residential and built-up areas, as well as livestock and food storage areas.
- Procure spill kits and institute suitable control measures in case of accidental spillage.
- Store all pesticides in their original, labeled containers, and ensure that storage instructions are followed.
- Keep a register of all pesticides procured, recording when they were received, the amount used, the amount remaining in store, and their location.
- Keep SDS at appropriate locations in storage facilities.
- Warehouses must have appropriate ventilation, secondary containment, and emergency showers and kits.

Handling

- Operators must read, understand, and follow product label directions for safe mixing, application, and disposal; use trained personnel for critical operations (e.g., mixing, transfers, filling tanks, and application).
- Insist that correct PPE (e.g. gloves, overalls, eye protection) for each exposure route16 listed in the SDS be worn at all times when handling and applying pesticides.

- Mandate that any mixing and filling of pesticide tanks occur in a designated filling area.
    - This should be set away from watercourses and drains.
    - If on concrete, water should be collected in a separate sump and disposed of as a hazardous waste.
    - Ensure that spills are cleaned up immediately using appropriate spill kits; spills should not be washed away into watercourses or drains.

Application

- Give preference to the application method with the lowest EHS risk and ensure non target organisms are not affected.
- Select pesticide application technologies and practices designed to minimize off-site movement or runoff (e.g., low-drift nozzles, using the largest droplet size and lowest pressure that are suitable for the product).
- Establish buffer zones around watercourses, residential and built-up neighborhoods, as well as livestock and food storage areas.
- For the aerial application of pesticides, the boundaries of target areas should be clearly demarcated and all possible nearby communities, livestock, and rivers should be identified in the flight plan. The aerial application of pesticides should not be conducted where there is potential for contamination of organic or otherwise certifiable production.
- Ensure that all equipment is in good condition and properly calibrated to apply the correct dosage.
- Insist that applications occur under suitable weather conditions; avoid wet weather and windy conditions.

Disposal

- Any unused dilute pesticide that cannot be applied to the crop—along with rinse water, and out-of-date or no-longer approved pesticides—should be disposed of as a hazardous waste, as per FAO guidelines.
- Empty pesticide containers, foil seals, and lids should be triple rinsed, and washings used in the pesticide tank should be sprayed back onto the field or disposed of as hazardous waste in a manner consistent with FAO guidelines and according to the manufacturer's directions. Containers should be stored safely and securely under cover prior to their safe disposal; they should not be used for other purposes.

Annex 4: PESTICIDES RELATED TO CROPS THAT WILL BE USED

REGISTRATION NO.	TRADE NAME	ACTIVE INGRIDIENT(S)	USES	QUANTITY
MW/PCB/2008/0001	**Shumba Super Dust**	***Fenitrothion 1.0% (organophosphorus) + Deltamethrin 0.13% (pyrethroid)***	**Non-systemic Insecticide with contact and stomach action for use as a grain protectant against stored grain insect pests like weevils, lesser grain borer, larger grain borer, moths and dried bean beetle. WHO CLASS ll**	10,000 litres
MW/PCB/R/2013/0003	**Super Guard Dust**	***Piriphos - Methyl (organophosphorus) + Permethrin (pyrethroid)***	**Insecticide for the control of stored maize and small grain cereals pests, including control of Larger Grain Borer.**	20,000 kgs
MW/PCB/R/2013/0004	**Super Guard Dust**	***Pirimiphos - Methyl 400 g/l (organophosphorous)+ Permethrin 100g/l(pyrethroid)***	**Insecticide for the control of stored product pests in stored maize, wheat, sorghum and bagged groundnuts and soya beans. Also controls Large Grain Borers.**	
MW/PCB/2008/0005	**Guardian 50 EC**	***Pirimiphos - Methyl 500 g/l(organophosphorous)***	**Broad -spectrum Insecticide with contact and respiratory action for the control of storage pests in stored grain, bulk stored grain, bagged grain and storage surfaces. Also for the control of insect pests in potatoes, vegetables, citrus, bananas and pineapples.**	
MW/PCB/R/2013/0010	**Gaucho 600 FS**	***Imidacloprid***	**A maize dressing systemic insecticide for the control of leaf hoppers, soil pests, snout beetle and dusty surface beetle and aphids on tobacco. WHO CLASS ll**	
MW/PCB/R/2013/0024	**Monceren GT 390 FS**	***Imidacloprid + Pencycuron + Thiram***	**Fungicide/Insecticide for the control of aphids, whitefly, leaf hoppers, thrips, jassids, termites, Rhizoctonia solani and damping off diseases on cotton.**	

MW/PCB/2008/0028	**Decistab 25% WD Tablets**	***Deltamethrin 250 g/kg***	**Insecticide used for the control of American bollworms and red bollworms on apples, pears, beans, groundnuts, grain, sorghum, cotton, grapes and lupins; and chilo stalk borer on maize.**	
MW/PCB/2008/0059	**Actellic Super Dust**	***Pirimiphos-methyl 16 g/kg+Permethrin 3g/kg***	**Insecticide for the control of larger grain borer, lesser grain borer, weevils, flour beetle and moths in stored grain.**	
MW/PCB/R/2014/0064	**Dual Magnum**	***S-metolachlor 96%(chloroacetanilide) EC***	**Selective herbicide for the control of annual grasses in cotton, kidney beans, soyabeans, groundnuts, sunflower, potatoes, sugarcane, tobacco and maize. WHO CLASS III**	
MW/PCB/R/2014/0072	**Karate 5EC**	***Lambda-cyhalothrin 50 g/l (pyrethroid)***	**Insecticide for the control of red, spiny and heliothis bollworms and certain other pests in cotton; cutworm in all crops excluding cotton and armyworm on pasture. WHO CLASS II**	
MW/PCB/2008/0074	**Polytrin C 440EC**	***Cypermethrin 40g/l+ Profenofos 400g/l***	**Insecticide for use in cotton, soyabeans and potatoes. Both components are especially active on lepidopterous larvae. In addition, profenofos provides good control of non-resistant aphids, spider mites and other sucking pests. Polytrin also has acaricidal properties when used on cotton.**	
MW/PCB/2008/0078	**Ronstar 250 EC**	***Oxadiazon250 g/l***	**Herbicide for the control of broadleaf weeds and certain annual grasses on coffee, onions, lawns, soybeans, tea and roses.**	
MW/PCB/R/2014/0079	**Score 250EC**	***Difenoconazole 250 g/l***	**Fungicide for the control of Cercospora in groundnuts; grey leafspot in maize; rust in soyabeans.**	
MW/PCB/2008/0090	**Dimethoate 400EC**	***Dimethoate 400g/l (organophosphate)***	**Insecticide/miticide for the control of aphids, psylla, red scale, fruit fly, bryobia mite, woolly aphid, mealy bug and black moth on**	

			various crops. WHO CLASS	
MW/PCB/2014/0100	**Atrazine 500SC**	***Atrazine 500 g/kg (triazine)***	**Herbicide for the control of annual broadleaf weeds and grasses in maize, sorghum and sugarcane. WHO CLASS II**	
MW/PCB/R/2013/0135	**Harness EC**	***Acetochlor 900g/l***	**Herbicide for pre-emergrnce control of grass and certain broadleaf weeds in maize, groundnuts, sugarcane, cotton, Eucalyptus and pine plantations and post-emergence weed control in plant and ratoon sugarcane and grain sorghum.**	20,000 litres
MW/PCB/R/2013/0138	**Round-Up**	***Glyphosate***	**Herbicide for post-emergence control of perennial and annual weeds in agricultural, non-crop and industrial areas. It can also be used as a growth regulator to increase sucrose content of sugarcane or reduce growth of weeds.**	20,000 litres
MW/PCB/R/2013/0139	**Lasso MT Capsule**	***Alachlor 480g/l+ Atrizine + Terbuthylazine***	**Herbicide for pe-emergence control of most annual grasses and certain broadleaf weeds in maize, groundnuts, soyabeans, sunflower, sorghum, potatoes, sugarcane and transplanted cabbage.**	
MW/PCB/R/2013/0140	**Bullet 700 SC**	***Acetochlor 700 g/l***	**Herbicide for pre- and early post emergence control of annual weeds in maize.**	
MW/PCB/2008/0156	**Cypermethrin 20EC**	***Cypermethrin 20%***	**Insecticide for the control of heliothis bollworm, spiny bollworm, stainers, jassids, whitefly and leafeating caterpillars on cotton; cutworms on tobacco and heliothis on tomatoes.**	

MW/PCB/R/2015/0225	**Deltamethrin 250 EC**	***Deltamethrin 25 g/l (pyrethroid)***	**Stomach and contact insecticide for the control of American, Red and spiny bollworm as well as stainers in cotton; cutworms in all crops; Diamond -back moth in crucifers and American bollworm in grain sorghum, groundnuts, beans, peas, maize, tomatoes and wheat . WHO CLASS II**	
MW/PCB/R/2013/0251	**Dithane M45 WP**	***Mancozeb 800g/Kg***	**Fungicide / Acaricide for the control of early and late blight in potatoes and tomatoes; cercospora and phyllosticta leaf spot in ground nuts; anthracnose and rust in beans; downy mildew in onions and peas.**	
MW/PCB/R/2013/0253	**Dursban 750 WG**	***Chlorpyrifos 750g/kg***	**Insecticide for the control of stalkborer, black maize beetle, sorghum, and dry beans; cutworm and lesser wireworm in tobacco; American bollworm and semi looper in tomatoes; Russian wheat aphid and green & blown aphids in wheat.**	
MW/PCB/2016R/0305	**Cypermethrin 200EC**	***Cypermethrin 200g/L (pyrethroid)***	**Insecticide with direct contact & stomach action for the control of bollworms in cotton; American bollworm in maize, groundnuts and sorghum and tomatoes and cutworms in all crops. WHO CLASS II**	
MW/PCB/2016R/0307	**Mancozeb 800WP**	***Mancozeb 800g/Kg (dithiocarbamate)***	**Fungicide to the prevention and control of early and late blight on tomatoes and potatoes, anthracnose and rust in beans & mangoes, downy mildew in onions, peas and cruciferae and cercospora leaf spot in groundnuts . WHO CLASS III**	
MW/PCB/2011/0345	**Acetamiprid 222SL**	***Acetamiprid 222g/l***	**Insecticide for the control of aphids and leafhoppers in cotton; whitefly and American leafminer in tomatoes.**	

MW/PCB/2011/0377	**Wivokil**	***Fenitrothion 50g/L + Deltamethrin 5g/L***	**Insecticide for use as a grain protectant against stored grain for insect pests- weevils, lesser grain borer, larger grain borer, moths and dried bean beetle.**	
MW/PCB/2012/0389	**Copper Oxychloride 860g/Kg WP**	***Copper Oxychloride 860g/Kg***	**Fungicide for the control of fungal diseases in beans, coffee, tobacco, tomatoes, potatoes and pepper.**	
MW/PCB/2012/0394	**Chlorpyrifos 480g/L EC**	***Chlorpyrifos 480g/L***	**Insecticide used for the control of cutworms, aphids, whiteflies, leafminer, borers, thrips, beetles, armyworm, Russian wheat aphids, moths, caterpillars, mealybugs and scale in vegetables, fruits, flowers, cotton, coffee, sunflower, tea and pineapples.**	
MW/PCB/2013/0413	**Carbarly 85 WP**	***Carbarly 850g/Kg***	**Insecticide for the control of various pests on crops, lawns, skins and hides and for thinning of certain apple varieties.**	
MW/PCB/2013/0414	**Imidacloprid 70%WG**	***Imidacloprid 700g/Kg***	**Insecticide to control aphids and whitefly nymphs on Roses; aphids, thrips, whiteflies, leaf miner on tomatoes; bean flower thrips on french beans; aphids, thrips, whiteflies, leaf beetles and weevils on tobacco.**	
MW/PCB/2013/0472	**Mancozeb 80% WP**	***Mancozeb 800g/Kg***	**Fungicide for the control of a wide range of fungal diseases on a variety of crops such as potatoes, tomatoes, vegetables, fruits, roses and other crops.**	
MW/PCB/2014/0491	**Lambda-Cyhalothrin 5% EC**	***Lambda-Cyhalothrin 50g/l***	**Insecticide for the control of chewing and sucking insects i.e. American bollworm, spiny bollworm, red**	

			bollworm and cotton stainers, aphids, in various crops.	
MW/PCB/2014/0518	**Abamectin 1.8% EC**	***Abamectin 18g/l,***	**Insecticide for the control of motile, mites, thrips, leafminer in roses, carnation, french beans and tomatoes.**	
MW/PCB/2014/0546	**Profenofos + Cypermethrin EC**	***Profenofos 500g/L + Cypermethrin 50g/L***	**Insecticide /Acaricide used for the control of foliar insects, sucking insects, beetles, caterpillars, mealybugs, grasshoppers, locusts and for public health.**	
MW/PCB/2015/0611	**Actellic Gold Dust**	***Pirimiphos-methyl 16g/Kg (organophosphorous) + Thiamethoxam 3.6g/Kg (neonicotinoid)***	**Insecticide for the conrol of weevils in grain cereals, beans, groundnuts and smaller grain borers.**	
MW/PCB/2015/0718	**Acetochlor 900 EC**	***Acetochlor 900 g/l EC (chloroacetanilide)***	**Herbicide for pre-emergrnce control of annual grasses and certain broadleaf weeds in maize, eucalyptus, potatoes, sugarcane and groundnuts. WHO CLASS III**	**15,000 litres**
MW/PCB/2015/0719	**Metolachlor 960 EC**	***Metolachlor 960 g/l EC (chloroacetanilide)***	**Herbicide for pre-emergence control of certain grasses and yellow nutsedge in sunflowers, soyabeans, dry beans, kidney beans, groundnuts, etc. WHO CLASS II**	**15,000 litres**
MW/PCB/2015/0720	**Fenamiphos 10 GR**	***Fenamiphos 100 g/kg (organophosphorous)***	**A systemic nematicide for the control of nematodes in bananas, tomatoes, citrus, papayas, cotton, guavas, tobacco and groundnuts. WHO CLASS 1b**	
	Fenitrothion 96%ULV	***Fenitrothion***	**Organophosphate insecticide used for control of Red locusts**	
	Green muscle	***Metarhizium***	**A biopesticide used for control of red locust hoppers**	

MW/PCB/2015/0641	**Chlorothalonil 750WP**	***Chlorothalonil 750g/Kg***	**Fungicide for the control of coffee berry disease in coffee; early and late blight in tomatoes and potatoes; leaf spot in groundnuts and leaf rust in beans.**	
MW/PCB/2015/0642	**Chlorban 48EC**	***Chlorpyrifos 480g/L***	**Insecticide used for the control of aphids, jassids, budworms and white flies in cotton, vegetables, tobacco and potatoes.**	
MW/PCB/2015/0624	**Velum Prime 500SC**	***Fluopyram 500g/l (Pyridinylethylbenzamide)***	**Nematicide for the control of nematodes in potatoes and tobacco.**	
MW/PCB/2015/0625	**Herbikill 200 SL**	***Paraquat 200g/L***	**Herbicide for the control of a wide spectrum of broad-leaved weeds and grasses in orchards, plantation, crops, forests, vegetable fields and pasture.**	
MW/PCB/2015/0613	**ZeroFly Storage Bag**	***Deltamethrin 3.0g/Kg (0.3% (318mg/m^2) ± 25%)***	**Insecticide for the control of post harvest pests such as borers, weevils, beetles and moths in stored seeds and grains such as maize, groundnuts and dry beans.**	
MW/PCB/2014/0588	**Atrazine 500SC**	***Atrazine 500g/L***	**Herbicide which kills annual broadleaf weeds and grasses at emergence, before and after emergence.**	
MW/PCB/2014/0578	**DDVP (Dichlorovos 500g/L**	***Dichlorovos 500g/L***	**Insecticide for the control of bollworms in cotton; semi loopers in groundnuts; semi loppers and borers in tomato; pyrilla in sugarcane; semi loopers, borers and diamond back moth in vegetables; household pests i.e. coachroaches, snails and weevils**	
MW/PCB/2014/0547	**Lambda-Cyhalothrin 5% EC**	***Lambda-Cyhalothrin 50g/l***	**Insecticide for the control of red, spiny and heliothis bollworms and certain other pests in cotton; cutworm in all crops excluding cotton and armyworm on pasture.**	
MW/PCB/2014/0548	**Profenofos 500EC**	***Profenofos 500g/L***	**Insecticide/ Acaricide for the control of American bollworm, loopers, aphids, thrips and red spider mites in cotton.**	

MW/PCB/2014/0537	**Atrazine 50% SL**	***Atrazine 500g/L***	**Herbicide for the control of annual broadleaved weeds and annual grasses pineapple, millet , yam, maize, sorghum and sugarcane.**	
MW/PCB/2014/0538	**Paraquat 20% SL**	***Paraquat Dichloride 276g/L***	**Herbicide for the pre-emergence control of annual and perennial weeds. Also useful in defoliation and desiccation of cotton.**	
MW/PCB/2014/0539	**Acephate 75%SP**	***Acephate 750g/Kg***	**Insecticides for the control of jassids and bollworms in cotton; and aphids in sunflower.**	
MW/PCB/2014/0510	**Mancozeb 64%+ Metalaxyl 8% WP**	***Mancozeb 640g/kg + Metalaxyl 80g/Kg***	**Fungicide for thje control of late blight and downy mildew in tomatoes and cucurbits; bluemould, brown spot, frog eye leafspot in tobacco seedbed/ field.**	
MW/PCB/2014/0511	**Copper Oxychloride 50%WP**	***Copper Oxychloride 500g/Kg***	**Fungicide for the control of early and late blight in vegetables and potatoes; dumping off, root rots, and stem rots in tobacco seedlings and vegetable seedlings.**	
MW/PCB/2014/0497	**Sulphur 800WDG**	***Sulphur 800g/Kg***	**Fungicide / Acaricide for the control of peanut lefspot; mildew on roses; mites on beans, carrots and tomatoes.**	
MW/PCB/2013/0427	**Pirimiphos Methyl 50% EC**	***Pirimiphos-methyl 500g/Kg***	**Insecticide for the control of grain storage pests (except larger or greater grain borer) in bulk stored grain, bagged grain, storage surfaces. Also for the Public Health use for the control of adult mosquitoes and cockroaches (on mud houses with grass thatch).**	
MW/PCB/2008/0154	**Renegade 50 Spray SC**	***Alpha Cypermethrin 50g/l***	**Insecticide/Acaricide for the control of ticks and face flies; protects against stable, horn and tsetse flies; it also kills lice and suppresses the incidence of Trypanosomiasis in livestock.**	
MW/PCB/2008/0155	**Crop Guard**	***Furfural***	**Adjuvant used to help herbicides penetrate the leaf structure.**	

MW/PCB/2008/0157	**Chlorothalonil 75WP**	***Chlorothalonil 25%***	**Fungicide for the control of Anthracnose, Gray mould and rust on beans;coffee berry disease;early and late blight on potatoes and groundnuts; cercospora, phoma and botryritis rot on groundnuts.**	

Note: For other crops quantities are not indicated because these will not be provided by the project. Farmers will buy on their own

Annex 5: Livestock medicines to be used in AGCOM

Name	Unit measure	Quantity
Piperazine	100 gms sachet	60
Trisul	100gms sachet	60
Keproceryl	100 gms sachet	100
Prococ	100 gms sachet	50
Kenflox oral	100mls	80
Vitaflash Injectable	100mls	48
Iron Injection	100 mls	48
Ivomec	100 mls	60
Ivomec	50mls	80
Needles	18 gauge (packets)	2
Bubaject	50mls	24
Powervit	100 gms sachet	60
Penstrep	100mls	24
Prococ	100 sachets	80