Democratic Socialist Republic of Sri Lanka

Pest Management Plan

Climate Smart Irrigated Agriculture Project

Adopted from Agriculture Sector Modernization Project

Ministry of National Policy & Economic Affairs
Ministry of Agriculture
Ministry of Irrigation & Water Resources Management
Ministry of Local Government & Provincial Councils
Ministry of Disaster Management
Ministry of Mahaweli Development & Environment
Ministry of Public Administration & Home Affairs

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List of Abbreviations

DOA	Department of Agriculture
DPMU	Deputy Project Management Unit
EAMF	Environmental Assessment and Management Framework
FFS	Farmer Field School
FAO	Food and Agriculture Organization
IPM	Intergraded Pest Management
MoA	Ministry of Agriculture
NGO	Non-Governmental Organizations
OPR	Office of Pesticide Registrar
OP/BP	Operational Policy/Bank Policy
PG	Producer Groups
PMP	Pest Management Plan
PMU	Project Management Unit
SCPPC	Seed Certification and Plant Protection Service (SCPPC)

Chapter 1: Introduction

1.1 Introduction to the proposed project

The Project Development Objective is to improve climate resilience of farming communities and productivity of irrigated agriculture in selected climatically vulnerable Hot-Spot Areas in Sri Lanka. This objective will be achieved through improved and modernized management of irrigation, drainage and flood protection systems, increased adaptation of climate-smart agricultural practices and technologies, improved agricultural diversification, better post-crop harvest management practices, and increased access to better prices and markets. The project design is structured along four components:

Component 1: Agriculture Production and Marketing (US$42 million). The objective of this component is to improve agriculture productivity and diversification through the adoption of CSA practices and improved on-farm water management.

Subcomponent 1.1: Climate Smart Agriculture and Water Technology (US$21 million). This subcomponent will support the adoption of CSA and will focus on (a) demonstrating the effectiveness of CSA practices in farmers' fields through Farmer Business Schools (FBSs) and leveraging information and communication technology (ICT) for peer-to-peer learning and (b) supporting the uptake of CSA practices by establishing Producer Groups (PGs). The key activities to be financed include

(a) Technical assistance (TA) to carry out detailed assessments to identify appropriate technologies relevant to each mini-watershed, including climate impacts and gender analysis;

(b) TA to develop and deliver training on climate-resilient practices and technologies to extension agents of the Government and the private sector, including on the requirements for adoption;

(c) The delivery of agronomic extension services to PGs through effective extension approaches (for example, field demonstrations and training events) including the use of proven water management technologies and ICTs to facilitate adoption of climate-resilient practices and technologies; and

(d) Capacity development for PGs and support to investments associated with technology transfer to PGs on a pilot basis.

Subcomponent 1.2: Marketing (US$21 million). This subcomponent aims to strengthen the links between PGs and the agriculture commodity markets by (a) upgrading and/or rehabilitating critical market infrastructure and (b) supporting farmers to access markets and develop sustainable links to agribusinesses. The key activities to be financed are

(a) Common infrastructure for agri-commodity marketing (markets, storage, and access roads) and the construction and/or upgrading of Common Service Centers (CSCs) and

(b) TA to support PGs to commercialize and link with agribusinesses in commodity value chains.

Component 2: Water for Agriculture (US$92 million). The objective of this component is to facilitate (a) planning for water and other infrastructure necessary to support climate-resilient irrigated agriculture, (b) construction of the planned infrastructure, and (c) co-management of this infrastructure by central/provincial governments and the local community.

Subcomponent 2.1: Rehabilitation of Irrigation Systems (US$86 million). This subcomponent will support the rehabilitation of irrigation systems based on plans derived from hydrologic modelling accounting for projected climate change in the project areas. The key activities to be financed include

(a) TA to support hydrology modelling and the preparation of Hot Spot Area Water Management Plans (HSAWMPs) at three levels: hot spots (about 25,000 ha); mini-watersheds within the hot spot areas (about 4,000 ha), including tank cascade systems, stand-alone irrigation systems, and rain-fed agriculture systems; and local administrative levels (Divisional Secretary [DS] Divisions and Grama Niladhari [GN] Divisions);

(b) Rehabilitation, modernization, and repair of existing cascade tanks and individual village tanks; construction of recharge wells in the tank beds; drainages and flood protection infrastructure; and

(c) Field implementation of watershed treatment and water harvesting works.

Subcomponent 2.2: Operation and Maintenance of Irrigation Systems (US$6 million). This subcomponent aims to ensure the sustainable operation and maintenance (O&M) of tank systems at the individual tank level and systemwide. The main activities to be financed are to

(a) Establish Cascade Management Committees (CMCs) for each of the cascades of minor irrigation tanks within the watershed-based boundary of the hot spot areas,

(b) Strengthen FOs that have been set up to manage each tank, and

(c) Design and implement a monitoring system for water use and availability.

Component 3: Project Management (US$6 million). The objective of this component is to ensure the quality of overall project management, while ensuring smooth coordination of activity implementation by various agencies and strategic partners at national and subnational levels. This component will finance

(a) The consultancy and operating costs of the Project Management Unit (PMU) and Deputy Project Director (DPD) Offices and of different project executing agencies, including for fiduciary and safeguard aspects;

(b) The monitoring and evaluation (M&E) of project activities at baseline, midterm, and end of project, including geotagging of the assets created; and

(c) Information, education, and communication campaigns to make all stakeholders aware of the project.

Component 4: Contingent Emergency Response (US$0.0 million). This emergency response component will allow for rapid reallocation of project proceeds in the event of a natural disaster or crisis that has caused or is likely to imminently cause a major adverse economic and/or social impact.

1.2 Pest and pesticide management implications of project activities

While the project is expected to bring positive environmental benefits to the project areas through the introduction and expansion of modern technology that promotes sustainable practice and applications that help improve current cropping patterns and farming methods, increase efficiency in the management of

water resources, protect agriculture soils, and roll out integrated pest management. The diversification and intensification of agricultural activities under the project could to lead to changes in the application of pesticides for pest and disease control. As per the World Bank safeguard policy Pest Management (OP 4.09, this standalone Pest Management Plans (PMP) has been prepared for the project based on Integrated Pest Management (IPM) principles. The PMP describes the relevant national regulatory framework, current status of pest and disease control, monitoring and supervision mechanism, major experience and problems, and lessons learnt from past projects. It specifies a means of assessing and documenting the range of non-chemical methods used for pest management in the form of IPM across the country, the preparation of a detailed action plan and a training and monitoring program to facilitate implementation. A list of all chemicals needed for the project that meet Bank requirements, which also comply with the World Health Organization's recommended categories, have been included in the PMP. The project will not partake in the procurement of pesticides or pesticide application devices.

The following Pest Management Plan (PMP) has been prepared in order to address the concerns related to the risks associated with the envisioned possible increase in the use of pesticides that will result from project as a whole and roll out Integrated Pest Management within the project in a strategic manner, while meeting safeguards requirements.

Component 2 is expected to support commercially viable business plans and there is probability of supporting a Matching Grant Program (MGP) and sub project specific pesticide management aspects will be captured via the environmental screening and management due diligence mechanisms outlined in the Environmental Assessment and Management Framework of the project.

The following PMP also identifies stakeholders and the institutional arrangements via which it is to be implemented.

1.3 Common eenvironmental consequences of pesticide use in Sri Lanka

In all instances where pesticides- dependent pest control practices are adopted Island Wide, pesticide misuse is known to be common and results in a number of environmental consequences that can threaten the subsidence of agriculture and life itself in localities they are used. Some of the key consequences that have been eminent are listed below.

- Destruction of pollinators of crop plants leading to poor crop yields
- Elimination of the natural enemies of pests and consequent loss of natural pest control that keeps the population of crop pests very low.
- Development of pest resistance to pesticides, encouraging further increases in the use of chemical pesticides
- Contamination of the soil and water bodies
- Pesticide poisoning of farmers and deleterious effects on human health Loss of bio-diversity in the environment, particularly of aquatic species.

Considerable attention must therefore be paid to the environmental consequences of current pest management practices adopted within the agriculture sector . Key mitigation measures are therefore required to address those concerns , these are highlighted in **Table 1** below.

Table 1-Key Mitigation Measures to be Included in the proposed PMP to combat major issues identified

Major Issues	Actions required
1.Increased use and reliance on chemical pesticides	Promote adoption of IPM practices through farmer education and training via agriculture extension services Move farmers away from pesticide dependent pest control practices and promote use of botanical pesticides and biological controls.
2.Change current pest management practices	Allocate adequate resources to implement National Plant Protection policy, Increase IPM awareness among policy makers and farming community
3.IPM research and Extension	Strengthen IPM research at National level and strengthen IPM extension
4.Environmental hazards of pesticide misuse	Create public awareness of the hazards of pesticide misuse through public awareness campaigns Regular assessment of pesticide residuals in irrigated agricultural production systems and in harvested produce Monitoring of pesticide poisoning in farming and rural communities

1.4 IPM Strategies in Sri Lanka

IPM was introduced as the most appropriate strategy for pest control in the agriculture policy prepared by the Government of Sri Lanka in 1995. The DOA plays a vital role in the promotion and preparation of the country's IPM programs and are responsible for conducting research, training and transfer of technology via their existing extension services island wide. Local nongovernmental organizations such as the 'Sarvodaya Movement' also provide training on IPM practices to rural farming communities. In 1984, the DOA launched the Rice IPM Program, with the assistance of FAO. Termed the Integrated Pest Control (IPC) program, at its inception, it focused on applied research in the field and conventional approaches to extension. Demonstration plots were prepared and used to educate farmers on the various components of IPC. This included the use of resistant varieties of paddy and use of native biological controls against common pests. Over a 100,000 farmers were trained under the IPC program over a course of five years up to 1990. The IPC also used Strategic Extension Campaigns (SEC) via a national level multimedia campaign for rice IPC addressing specific issues identified during the field research stage, which was designed specifically to address. Even though the IPC program was successful at its inception subsequent evaluations on the impact of IPC on the farmers indicated that it was difficult for IPC trained farmers to arrive at correct

decisions on what action to take when they were faced with pest problems in the field. They depended on extension officers for these decisions, creating a setback in its adoption.

However, in 1994 the IPC program was renewed with a revised objective. It made an emphasis on improving the quality of training with the objective of making farmers independent decision-makers for their own cultivation practices. Farmer Field Schools were established and up until 1998 and, 76 master trainers and over 300 extension officers from the government sectors and 90 officers from the private sector NGOs along with about 10,000 farmers were exposed to this approach according to the FAO. Thus this program currently runs via the extension services that run island wide. A number of donor funded projects, such as the FARM project implemented pilot Programs for Food Security has included IPM in their program and FFS as the training approach. In 1998 The Ministry of Agriculture and Lands also launched a program to increase the production of rice through large tract demonstration. This program targeted to obtain a yield of over 6 tons/ha. The government provides seed and fertilizer on loan. IPM is taught through FFS, thereby making those farmers good managers of their crop. It was post 1998 that the DOA began extending IPM practices to other field crops, predominantly to high value crops such as Chilli. At present, Research Division of DOA has developed IPM technology packages for vegetables such as bitter gourd, snake gourd, luffa, okra, brinjal, capsicum, tomato and radish. These packages have been put into practice in farmer fields in Hambanthota district during the Yala Harvesting period from 1998- 2000 and yielded good results.

Support services for IPM does exists in Sri Lanka, even though a particularly planned strategy is yet not in place, Traditional IMP knowledge as well as via programs run by the DOA and other organizations farmers do use IPM practices in the field. However no studies have been conducted to deduced the extent to which IPM is practiced nationwide. The DOA documents that IPM is gaining increasing popularity among the local farming community since the adoption of experimental learning approach of FFS. The trained farmers are more knowledgeable about both the environment and agriculture. Pesticide use has changed with farmers adopting a more rational approach it its use. Follow-up studies in 1999 showed that the IPM-FFS program has created a clearly discernible impact with desirable consequences. This can be taken as a positive indicator that the DOAs attempts to implement IPM has succeeded to a certain degree and can be further strengthened.

1.5 The need to document and plan out current IPM activities

At present the DOA demonstrates some IPM practices only for paddy cultivation outside the project area, details on IPM activities and potential are discusses in the following sections. IPM was heavily promoted across the country via community driven development programs funded by doner agencies over the last decade. Extensive training Very little resources are currently invested for IPM research and development as well.

The project area spans across the country, where a range of agricultural practices are adopted based on a diverse array of agro-ecological conditions of each district. On the whole major crop species cultivated by farmers in Sri Lanka are paddy, tea, rubber coarse grains, vegetables, and fruits. Spices are included under the category of minor export crops. The main agricultural products produced, and volumes harvested annually over the last decade are presented in. Crops are grown in private plots, owned by local farmers and range between 1-2 acres.

A study conducted by the Department of Agriculture (DOA) in four major vegetable growing Districts in Sri Lanka showed that 85% of farmers in the Badulla district applied pesticides to their crops before the

appearance of any pests or symptoms. In the Nuwara Eliya this was recorded at 66%. This shows that even though chemical controls are used even before pest damage has exceeded economic threshold levels and the use of pesticides as a precautionary measure has become common.

While such small scale studies have been conducted via different projects and programs, there is a dire need for a national assessment of current pesticide use mechanisms. There is a large gap in considerable information assessing the current pest management practices as well as the success of the government's current IPM program in the country on a national scale, thus the first step in the implementation of the PMP under the project will be to fill all existing knowledge gaps and undertake priority planning to be executed during the project period.

Chapter 2: Pesticide Use and Management

2.1 Trends in pesticide use and pest control in Sri Lanka

Pesticides have been in use in agricultural practices in Sri Lanka since the 1950s, yet pesticides are not manufactured in Sri Lanka to date. Due to the positive trends observed via the scope and use of pesticides their import has grown over the years. All pesticides are imported as finished or formulated products or as technical grade materials for local formulation. There is very little solid statistical data available in the country to deduce the amounts and variations based on geography of pesticide use. Statistics on pesticide imports are among the few reliable indicators of quantities of pesticides used in agriculture. The DOA has conducted studies on pesticide use and attempt to monitor their use as well. In 1977, liberalized policies lead to an increase in the import of pesticides, favoring direct importation of finished products rather than intermediaries required for local formulations. According to the DOA, annual pesticide imports comprise mainly of herbicides, insecticides and fungicides and their use has shown a notable increase during the 1990s. It is clear that pesticide consumption has risen over time and continues to fluctuate with changes in planted acreage, infestation levels and other factors such as farm product prices. Herbicide consumption fluctuates around 2,300 tons per year. Insecticide consumption had increased by 25 per cent in 1999 (2,428 tons) compared to the previous year (1,942 tons), as per the data collected by the DOA. A list of banned pesticides is maintained by the DOA and made available to the public as well (Annex 1). However the DOA has not sorted and compiled different lists for herbicides.

The DOA also records that insecticide use in rice declined as a result of the Integrated Pest Management (IPM) Program, but increased on vegetables and other field crops like chili and onion. Vegetable growers most commonly depend on insecticides, typically used in heavy doses, followed by fungicides. Weedicide is not used to a great extent in vegetable production, except by farmers who cultivate onions. An array of insecticides is adopted and very little attention is paid to conforming to application frequencies, quantities and health and safety indications. Local farmers commonly misuse pesticides, mixing different varieties and striving to over application for better results, unaware that toxicity levels often increase and misuse facilitates greater environmental and health hazards. According to pesticide consumption data from 1995 to 2000, collected by the Food and Agriculture Organization (FAO), organophosphates were the highest used pesticide category within insecticides, amides in herbicides and dithiocarbamates in fungicides, within Sri Lanka.

Locally, pest control depends mostly on the use of synthetic pesticides. Ready-to-use products that can easily be procured from local vendors and applied when and where required. Abuse and misapplication of pesticides is a common phenomenon in Sri Lanka. Farmers often totally disregard recommendations and strive to indiscriminate use of pesticides based on their own experience. Some farmers do not have sufficient information and knowledge on the safe and efficient use of pesticides also. . Even though many farmers are aware of the detrimental effects of pesticide use, due to the economic gains involved it still remains the most popular method of pest control. Awareness on implications to human health, the environment and crop ecosystems have still not been able to drive a strong push towards alternatives to exclusive chemical pest control, like varietal resistance and IPM. Thus awareness and transfer of technical knowledge structured over the economic benefits of green/sustainable agriculture plays a key part in altering existing trends in pesticide use and pest control.

2.2 Control of pesticide use in Sri Lanka

According to the FAO continuous dependence on use of pesticides had brought a dramatic increase of imports since the enactment of the Pesticide 31 Law, from 2 309 metric tons in 1980 to 5 120 metric tons in 2003 A comprehensive pesticide control procedure is in existence within the country yet enforcement is low. The process includes; the registration of products, risk/benefit analysis, field monitoring and enforcement, laboratory testing, imports regulations and banning and restricting. Over the years, the use of 4 pesticides has been prohibited and these products have been banned. Only registered pesticides can be imported in to the country and they are also classified under the customs ordinances. A stringent process that allows only limited trial quantities of 10lites/kilograms and requirement of written approvals by relevant officials is in place. However even with controls and awareness facilitation programs are in place they are not exercised at the user level fully, the long term consequence of misuse are often overlooked.

2.3 Circumstances of pesticide use and competence to handle products in agricultural areas

Presently, farmers have been noted to use pesticides more as a precautionary and/or typical practice rather than as a requirement. Types of pesticides commonly used are; Admire, Imdacloprid, Thamethofam, Acetamiprip, Sulphur and Abamecgin. All these pesticides are systemic substances. The frequency of application recommended is 3 to 4 times depending on the crop period. However consultations with local farmers indicate that frequency of pesticide application in the area exceeds the times recommended. In the long run this can create pest resistance towards pesticides.

Even though awareness programs on the handling, proper attire and safe practice associated with pesticide use is conducted via training and media campaigns, it is observed less in the field. Protective gear is expensive and not worn in most cases due to the high cost. Thus pesticide users are not sufficiently protected during use. Proper storage of pesticides is also not conducted in a safe manner. Half full pesticide bottles are often disposed at the sites or with municipal solid waste, leading to contamination of water ways. 90% of farmers use knapsack sprayers while only 10% use power sprayers. The major issue in the project area encountered in terms of pesticide application is the nozzle used. The recommended nozzle is hollow cone and most of the farmers use flat fan nozzle where outflow is doubled when compared, according to the DOA. The cost incurred for this is doubled creating a lot of environmental issues as well as toxins are directly sprayed in to the air contaminating the surrounding environments as well.

Both local electronic and print media, in collaboration with Non-Governmental Organizations (NGOs) and/or the DOA conduct campaigns to inform the public and farmers if consequences of indiscriminate use of pesticides. Technical information if disseminated via extension services and district agriculture officers as well. Demonstration programs, agricultural radio/television programs on the detrimental effects of pesticide misuse and proper means of use are conducted. There is also an increasing lobby by the public and NGOs for stringent control of pesticide use and a growing market for organic produce.

The project will focus on strengthening awareness and education via comprehensive trainings and continuous support. The project expects via its PMP to train farmers on the safe handling of pesticides, proper storage ,selection of appropriate application equipment, enhance farmers knowledge and understanding the hazards and risks of pesticides and safe removal of containers etc. One of the main aims is to help strengthen the existing agricultural extension services in the project areas on pesticide

management to ensure the sustainability of the existing system and that farmers have support post the project activities.

2.4 Assessment of risks

Studies and data on pesticide poisoning and environmental contamination caused by pesticides are hard to come about in Sri Lanka. There are no systems in place that regularly monitor the risks associated with the use of pesticides. There are reports of health problems such a liver disorders, cancers often attributed to long term exposure to pesticides as well as lung disorders and skin disorders associated with short term exposure, recorded by local health clinics. However no validated and statistically analyzed data is available. The only quantified human health risk related data with regard to pesticides is on suicide rates. Studies have identified Sri Lanka as having one of the highest suicide rates in the world with 80% of this being attributed to Pesticides. Training that is to be provided to farming communities via this project will therefore focus some attention on risks associated with pesticide use and methods of minimizing and managing pesticide poisoning when they occur.

2.5 Promoting IPM in the context of current pest control practices

A small number of farmers also use IPM but along with nominal amounts of pesticides in poly tunnels and home gardens. The project already promotes IPM as part of its environmental management practices among communities in the project area. Activities such as awareness, training and technical guidance are provided to those who partake in agriculture. According to the project IPM has been able to reduce dependency on pesticides to a small extent. It was recorded that via IPM implementation farmers were able to benefit by 25-30 % saving/profit in an acre. The prevailing situation where pesticides are readily available at nominal prices affordable to farmers encourages “unreliable quick-fix pest control approach” which very apparent throughout Sri Lanka. This also creates a major disincentive for farmers to adopt integrated pest management practices which is the most sustainable and environmentally sound strategy for pest management. Even though the government promotes IPM within the paddy agriculture, neither the Department of Agriculture nor any other organization has focused implementing IPM as a national program in vegetable and other crop production. Some farmers do have an indigenous and traditional knowledge for pest control but rarely implement these strategies. There is a general awareness on the benefits of adopting IPM but farmers require much more awareness and education in this arena as well as technical support throughout to help them make the switch in a sustainable manner.

It is proposed to encourage and introduce bio-pesticides as a part of IPM. The project expects to work closely with Department of Agriculture and Registrar of Pesticides to strengthen IPM activities in a manner that will sustain. Over the last decade extensive training on IPM and the adverse effects of pest management have been conducted via projects and programs in the community driven development sector, yet the sustainability of these initiatives are still not known fully.

Chapter 3: Policy, Regulatory framework and institutional capacity

3.1 National Environment Act

Sri Lanka's National Environmental Act of 1980's controls the discharge and disposal of pesticides in to the environment. Based on the limits set by Australia, European Commission countries, India, Malaysia and the Codex Committee on Pesticide Residues, the maximum permitted residue levels of pesticides in food have been set by the Sri Lanka Standards Institution.

3.3 Control of Pesticides Act

The Control of Pesticides Act No. 33 was enacted in 1980 for the licensing of pesticides, in order to impose controls on the pesticide industry. The regulatory framework looks at the import, packing, labeling, storage, formulation, transport, sale and use of pesticides. It also deals with the criteria for the appointment of a licensing authority for pesticides, for the establishment of a pesticide technical and advisory committee and for matters connected therewith or incidental thereto. All regulations with regard to pesticide products, including those used in agriculture, public health, domestic, industrial and veterinary etc. come under the purview of the Act.

3.4 Process of pesticides control

Sri Lanka has set up a comprehensive pesticide control process which includes the registration of produces, risk/benefit analysis, field monitoring and enforcement, laboratory testing, imports regulations, and banning and restricting of pesticides. Up to 41 pesticides have banned and their use prohibited and the use of 11 insecticides has also been restricted. Support is to be provided via extension services run by DOA as well.

3.5 Services Provided by Seed Certification and Plant Protection Service (SCPPC)

Currently the SCPPC of the MoA has been involved with work with regrade to the control of pesticide use and promotion of IPM services. Specific areas that the SCPPC works on have been presented below. Formal tasks under taken by the Office of Pesticide Registrar as outlined below are no handled by the SCPPC.

- Introduction of integrated pest management (IPM) program to leafy vegetables
- Registration of Pesticides
- Certification for Pesticides dealers
- Certification for seller
- Field compliant on pesticides
- Awareness/ Training on Safe & effective use/handling of Pesticides
- Pesticide Analysis

3.5 Services on Pesticide Registration

The former Office of Pesticide Registrar (OPR), which is now under the SCPPC was established in 1983, with the authority to set regulations and standards for pesticides in Sri Lanka. The OPR deals with a number of complicated issues when controlling pesticides, aspects such as the use of less toxic chemicals, and the economic implications-for the country and for individual farmers when imposing limits on the availability

of certain pesticides. The public health implications of the Registrar's decisions are obviously of great import. The office of the Registrar of Pesticide has the national responsibility to ensure that only pesticides of the highest quality and are least hazardous to human health and the environment are available in the local market. The following activities are those that are currently conducted by the OPR.

1. Registration of pesticides: A pesticide can be registered as valid for use for a period of 3 years. For re-registration, every pesticide is re-assessed based on new standards and information on safety and efficient use in relation to human health and environmental aspects.

2. Field enforcement: The pesticide dealer certification scheme is carried out in collaboration with the provincial field enforcement staff and the Mahaweli Authority of Sri Lanka. The certificate mandated to a particular pesticide dealer has a validation period of a year, unless otherwise cancelled for specific reasons.

3. Inventory of Persistent Organic Pollutants: To execute the National Implementation Plan under the Stockholm Convention, an inventory of POP was prepared in collaboration with the Ministry of Environment and Natural Resources. Although the nine pesticides designated under the convention have already been banned, adverse effects on human health and the environment could occur due to residues from past use as this group of pesticides is long persistent and bio-accumulated.

4. Pesticide quality: Quality of a pesticide is a major factor determining its efficacy and impact on the environment and human health. Quality pesticides should have the correct active ingredients, other adjutants and solvents with required physical and chemical standards as set out by the FAO and World Health Organization. The quality is also monitored and noted by the OPR.

3.6 Pesticides Technical and Advisory Committee

The Pesticides Technical and Advisory Committee is the statutory body of the Control of Pesticides Act that makes national policy related to pesticides and assists the Registrar of pesticides on technical issues related to enforcement of the Act. This committee consists of experts and ex-officio members of relevant institutes. These members include the General of Agriculture (Chairman), Registrar of Pesticides (Secretary), Director General of Health Services, Director General Sri Lanka Standards Institute, Director General Central Environmental Authority, Commissioner of Labor (Occupational Health), Government Analyst, Director of Tea Research Institute, Director of Rubber Research Institute, Director of Coconut Research Institute, a representative of the Attorney General, and five expertise in related discipline

3.7 Effectiveness of legislation

In spite of the legislations and institutional mechanisms in places, pesticides are heavily misused posing both environmental and health hazards. It is estimated that annually about 16,000 pesticides related poisonings are reported in Sri Lanka. . Approximately 700,000 kilograms of pesticides are imported annually. Almost every rural grocery store has shelves full of many brands of pesticides and over 100 chemicals, including Malathion in more than 200 formulations, are sold. Liquid preparations of pesticides can be lethal in minute doses. Enforcement of these regulations and strengthening of the existing institutional structure is essential to ensure pesticide management is conducted in a manner sustainable and the detrimental effected they have are controlled.

Chapter 4: Implementation of the Pest Management Plan

The activities proposed for implementation under the Pest Management Plan are based on the following objectives; to promote and support safe, effective, and environmentally sound pest management in agricultural interventions undertaken under the ASMP. The Plan further presents components to strengthen such capacity. The activities promotes the use of biological and environmental control methods and the reduction in reliance on synthetic chemical pesticides and they addresses pest management issues in the context of the project's key interventions.

4.1 Assessment of existing situation and preparation of action plan

There is a large gap in considerable information assessing the current pest management practices as well as the success of the government's current IPM program in the country on a national scale. Therefore, the PMP proposes that a detailed assessment of the pest management practices that are currently ongoing are conducted. The results of this assessment are then to be used in the preparation of an action plan to be implemented via the SCPPC focusing on the following actions. The action plan should outline and recommend measures with regard to the following areas.

- Strengthening pest forecasting.
- Promotion Agronomic Control
- Promotion Physical Control
- Promotion of Biological Controls
- Chemical Control

The general norm of the action plan should be once pest or disease occurs in cultivation areas, agricultural control measure should be firstly considered, physical and biological measures secondly considered. Chemical drugs shall be lastly adopted only when all other control measures have failed and the pest/disease damage exceeds the economic threshold. When chemical drugs are applied, attention shall be made to select pollution-free drugs to reduce the drug resistance of the pests and avoid pollution to the environment.

The main goal of the action plan is to carry out integrated pest and disease control which is targeted to control harmful creatures, improve safety level of agri-products, protect ecological environment, and improve farmers' quality, reduce the reliance on chemical pesticides and keep the pest damage under economic limit. Its core contents are (1) Control pests but not kill pests; (2) try to use non-chemical measures to keep the pest quantity at low level; (3) when chemical drugs are unavoidable, try to keep the impact of the pesticide to environment and human being at minimum level; (4) Establish standard IPM technical system based on the local conditions, combining agricultural, biological, ecological, physical control measures and pest trapping techniques to maximally substitute or reduce the use of chemical drugs and avoid killing pest predators and environment pollution so as to keep the pest/disease damage under durable level.

In addition the action plan will also identify knowledge gaps and outline mechanisms to strengthen these gaps, in building the capacity of the SCPPC in implementing the tasks mandated to them.

This exercise will be undertaken by the project PMU simultaneously to other activities such as technical capacity building and awareness programs which will be conducted in the field to strengthen existing initiatives in Pest Management.

Sectoral Guidelines Applicable to the Project

The World Bank group's industrial sector environmental health and safety guidelines developed for the agriculture sector, present detailed guidelines on the management of pesticides within agricultural activities. The following sub-sectoral guidelines need to be followed in detail during PMP implementation and the key guidance documents for best practices.

1. **Perennial Crop Production**
   These guidelines includes information relevant to large-scale plantation crops and out grower systems and focuses on the primary production and harvesting through farming and plantation forestry of major multi-year food, fiber, energy, ornamental, and pharmaceutical crops, located in both temperate and tropical regions. It includes tree crops (such as olives, citrus, coffee, rubber, eucalypts, and cacao) as well as banana, sugarcane, and palm oil. It does not include the processing of raw materials into semi-finished and finished products.

2. **Annual Crop production**
   These guidelines includes information relevant to large-scale production, harvesting, post harvesting processing and storage of major annual crops, including cereals, pulses, roots and tubers, oil-bearing crops, fiber crops, vegetables, and fodder crops, located in both temperate and tropical regions. It does not include the processing of raw materials into semi-finished and finished products.

All guidelines highlighted above may be downloaded via the following link:
http://www.ifc.org/wps/wcm/connect/topics_ext_content/ifc_external_corporate_site/ifc+sustainability/our+approach/risk+management/ehsguidelines

4.2 Awareness creation via the preparation of strategic communication materials

Awareness creation on the ill effects of pesticides there will be done targeting applicants of the Matching Grants Program and the project areas covered under Component 2. These programs will include along with project beneficiaries, various stakeholders residing in the project area, including the community, government officers, project staff and local politicians. Awareness materials include posters, flyers, brochures, etc. These will be made available via the SCPPC and Agriculture extension offices. The following key areas will be covered via the material prepared.

- Integrated Crop Management
- Integrated diseases management
- Integrated weed management
- Health issues of pesticide application
- Safe use of agrochemicals
- Steps in integrated pest management

Awareness material developed will be technically sound, comprehensive and made legible for layman in order to disseminate the message effectively. These will be prepared in the native languages, either Tamil/Sinhala, based on the project area.

4.3 Building technical capacity via training

Training of beneficiaries and relevant stakeholders on pesticide management and safe use of pesticides will be conducted with the following areas in mind. (Annex 3 presents Guidelines for Technical Training on PMP/IPM)

- Detrimental effects of pesticide use to human health/environment
- Decision making in use pesticides
- Transport, storage ,handling and distribution of pesticides
- Safe application of pesticides
- Risks on handling and use of pesticides
- Managing risks and pesticide poisoning via green mechanisms
- Intergraded Pest Management

Training programs will first be conducted among the project beneficiaries, successful applicants of the MGP, project/field staff and will also target local DOA officers, stationed in the project area. It is proposed that this program be conducted by reputed pest management specialists with experience working in Sri Lanka. This will thus provide the existing project staff with the capacity to conduct training programs in the field. Training material will be prepared comprehensively and cover the key areas highlighted prior, fashioned as a guidance book for long term use and support post training.

4.4 Research and Development

Research and innovations are important to test new IPM practices especially for vegetable and potatoes cultivations which are major crops cultivated in the project area. The DOA is yet to implement IPM practices for these crops. The project will support IPM research and development through Farmer participatory IPM research to be funded from competitive research grants that are available locally and internationally. Research opportunities can either be given to students from local universities studying agriculture or DOA staff members.

4.5 Field Demonstrations

Field demonstrations are the practical way of convincing farmers on IPM practices, establishment of a Farmer Field School (FFS). FSSs can actually show farmers the successful crop yields that can be expected by IPM implementation and demonstrate user friendly mechanisms. This will assist in changing set mindsets and educate farmers on the programs, driving them to implement them as well.

4.6 Proposed implementation action plan

Activity/Sub activity	Number	Timeframe	Estimated Budget (SLRs.)
Initial Assessment and preparation of national level pest management action plan	1 Report	Prior to 6months from the project effectiveness date.	500,000

1.Awareness creation and preparation of communication materials			
1.1National level program with participation of high level officials, including the Director General/Agriculture Department, Registrar of Pesticides, Project Director and other relevant institutional heads	2	Every 2 years	400,000
1.2 Awareness program for the field level project staff and field level MoA and DoA staff and	2	Beginning and Midterm of project	200,000
1.3 Preparation of communication materials on IPM, safe use of agrochemicals, risk and hazardous impacts of pesticides	1 Video 10,000 brochures		800,000
1.4 Preparation of guidance booklet on IPM practices	01		150,000
2.Training			
2.1 Training of project staff and MoA on IPM	4		400,000
2.2 General awareness programs for farmers of the project area and successful applicants of the Matching Grant Program environmental impacts of pesticide application and IPM	20	5 targeted programs per annum	1,000,000
3.Research and Development			
3.1 Study areas to be identified post the assessment	02		150,000.00
4.Field Demonstrations			
4.1 Field demonstration on Vegetable (Farmer Field Schools)	05		200,000
4.2 Field demonstration on Rice (Farmer Field Schools)	05		200,000

4.2 Proposed Institutional Arrangement

Project implementation will entail the creation of project management unit (PMU) at both the MoA and Deputy Project Management Units (DPMUs) in all other implementing agencies, except Ministries of

Disaster Management, Mahaweli Development and Environment and Public Administration and Home Affairs. The PMU of the MoA will take the lead in rolling out the pest management plan, due to the prior experience and mandate of the MoA of agriculture within this thematic area. The PMU and DPMUs will work in close collaboration in ensuring that all awareness program campaigns and technical trainings services are fully extended out to all relevant groups.

The Environmental Safeguard Specialist at the PMU in MoA; will be responsible for the implementation of all steps presented under the Pest Management Plan and will establish the following technical groups to facilitate the Initial Assessment and preparation of national level pest management action plan to be implemented via the SCPPC, under their current mandate as well as seek their technical guidance and concurrent in the preparation of a detailed training plan to roll out the technical training component of the PMP and on the preparation and dissemination mechanisms of awareness material.

- A Pest Management Committee (IPM Committee) will be appointed in order to monitor and implement the PMP via the PMU. The PMU IPM committee will be represented by the Environmental Safeguard Specialist of the PMU of the MoA, Environmental Safeguard Specialists of DPMUs, an Agriculture Instructor of the DOA, and key personal from the Plant protection Services of the MoA and other key MoA officials. This IPM Committee will meet once every month to review activities and make decisions with regard to PMP implementation under the sub-component 2.2. They will also review and clear documents produced for awareness, communication and

- National Level Strategic Committee - The National Level Strategic committee will be represented by the Additional secretary of the DOA, Project Director and Deputy Directors and Environmental Safeguard Specialists of both the PMU and DPMUs, Registrar of Pesticides, Assistant Directors. The main role of the National Level Strategic Committee is to convergence on the best practices on IPM among stakeholders and to develop policy guidelines that will strengthen nationwide pest management practices.

The Environmental Safeguard Specialist at the PMU will coordinate closely with the Agriculture Sector Modernization Project, Environment Officer at MOA to include the team under the National Level Strategic Committee and conduct joint awareness building and technical training as much as possible.

Chapter 5: Plan for Monitoring and Evaluation of PMP

Successful implementation of the PMP requires regular monitoring and evaluation of activities undertaken. The focus of monitoring and evaluation will be to assess the buildup of PMP/IPM capacity in the VOs and the extent to which IPM techniques are being adopted in crop production, and the economic benefits that farmers derive by adopting IPM in the villages.

The inclusion of an IPM specialist in project supervision missions is strongly recommended.

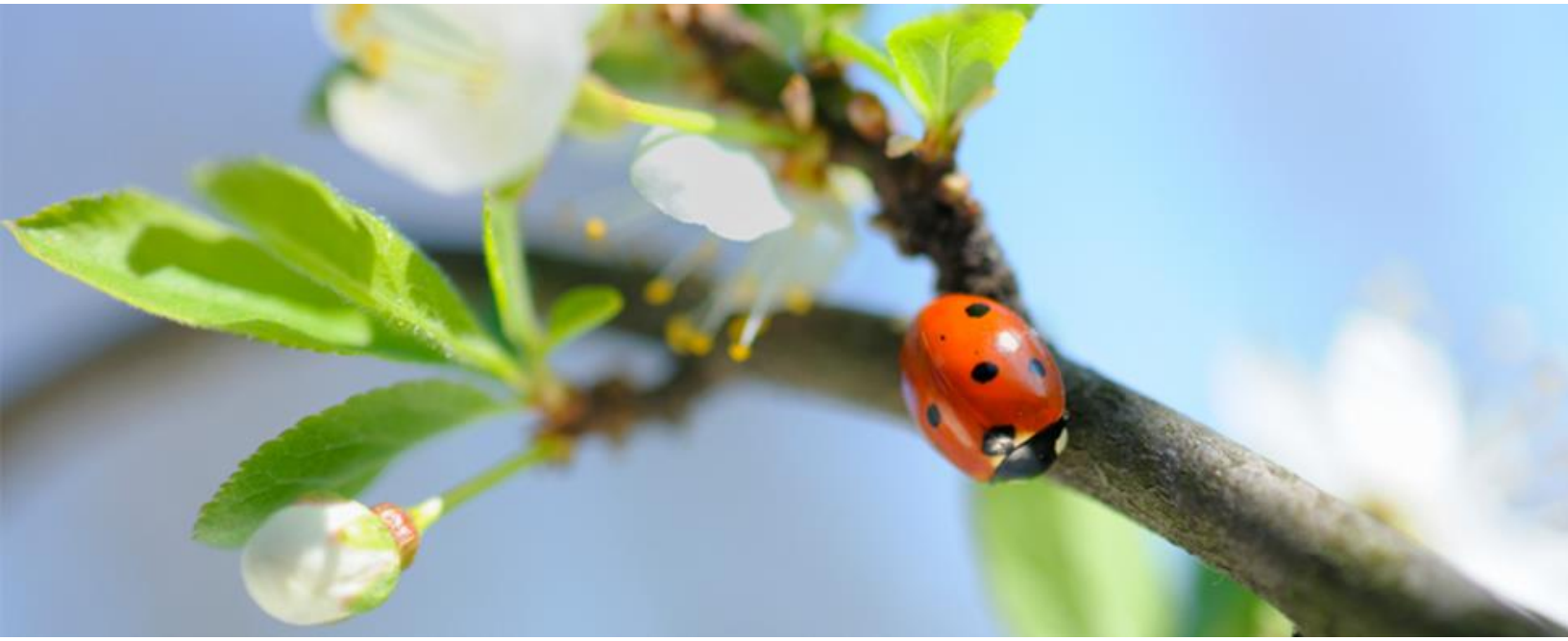
Activities that require regular monitoring, documentation and evaluation during project supervision include the following areas in order to note the success rates of awareness programs and technical capacity building programs:

- Numbers of farmers who have successfully received IPM training in IPM methods; evaluate the training content, methodology and trainee response to training through feedback.
- In how many crop production systems is IPM applied?
- Are the numbers increasing and at what rate?
- How has the adoption of IPM improved the production performance of farmers ?
- What are the major benefits that farmers derive by adopting IPM ?
- Extent to which pesticides are used for crop production ?
- Efficiency of pesticide use and handling
- Level of reduction of pesticide purchase and use by the PGs for crop production.
- Number of IPM sub-projects successfully funded from competitive grants
- Number of IPM participatory research projects have been completed.
- Influence of the results of IPM participatory research on implementation of IPM and crop production.
- Overall assessment of (i) activities that are going well (ii) activities that need improvements and (iii) remedial actions required.

Monitoring and supervision plan

During the first year of project implementation, the project Environmental Officer, based in the PMU at the MoA, will design the instruments to be used in evaluation of the activities described in the pest management plan. This will be done with the projects monitoring and evaluation team and in collaboration with World Bank environmental specialist.

Annexes



Annex 1: List of Banned Pesticides in Sri Lanka (Source-Department of Agriculture)

Active Ingredient		CAS Registry Number	Chemical Family	Chemical Name (IUPAC)
2,4,5-T		93-76-5	phenox	2,4,5-trichlorophenoxy acetic acid
arsenic (arsenites and arsenates)		7440-38-2	inorganic	arsenic
binapacryl		485-31-4	nitrophenol	2-sec-butyl-4,6-dinitrophynyl 3methylcrotonate
bromacil		314-40-9	uracil	5-bromo-3-sec-butyl-6-methyluracil
captafol		6/1/2425	thalimide	1,2,3,6-tetrahydro-N-(1,1,2,2tetrachloroethylthio)phthalimide
chlordane		57-74-9	organochlorine	1,2,4,5,6,7,8,8-octachloro-2,3,3alpha,4,7,7 alpha-hexahydro-4,7-methanoindene
chlorobenzilate		510-15-6	organochlorine	ethyl 4,4 -dichlorobenzilate
DDT		50-29-3	organochlorine	1,1,1-trichloro-2,2-bis (4chlorophenyl)ethane
dibromoethane (EDB)		106-93-4	-	1,2 dibromoethane
dichloropropane		542-75-6	-	1,3 dichloropropane

dieldrin		60-57-1	organochlorine	2,7,3,6-dimethanonaphth-2,3-b/oxirene, 3,4,5,6,9,9-hexachloro-1a,2,2a,3,6,6a,7,7a-
				octahydro-(1a.alpha,2.beta,2a.alpha,3.beta,
				6.beta,6a.alpha,7.beta,7a.alpha)

dinoseb/dinoseb salts	88-87-7	dinitrophenol	2-sec-butyl-4,6-dinitrophenol
ethyl parathion	56-38-2	organophosphate	O,O-diethyl O-4-nitrophenyl phosphorothioate
ethylene dichloride	107-06-2	-	1,2-dichloroethane
ethylene oxide	75-21-8	epoxide	dimethylene oxide
fluoroacetamide	640-19-7	luoroacetamide	2-fluoroacetamide
HCH (mixed isomers)	608-73-1	organochlorine	hexachlorocyclohexane
heptachlor	76-44-8	organochlorine	1,4,5,6,7,8,8-heptachloro-3alpha,4,7,7alpha-
			tetrahydro-4,7-methanoindene

hexachlorobenzene (HCB)	118-74-1	organochlorine	hexachlorobenzene
leptophos	21609-90-5	organophosphate	phosphonothioic acid phenyl-O- (4-bromo-2,5-dichlorophenyl) O-methyl ester
lindane	58-89-9	organochlorine	1alpha,2alpha,3,b4alpha,5alpha,6B- hexachlorocyclohexane
maleic hydrazide	123-33-1	pyridazine	6-hydroxy-2H-pyridazine-3-one
mercuric chloride	7487-94-7	inorganic	mercuric chloride
mercuric oxide	21908-53-2	inorganic	mercury(11) oxide
mercury	7439-97-6	inorganic	mercury
mercury chloride	7546-30-7	inorganic	mercury chloride
methamidophos	10265-92-6	organophosphate	O,S-dimethyl phosphoramidothioate

methyl parathion	298-00-0	organophosphate	O,O-dimethyl O-4-nitrophenyl phosphorothioate
pentachlorophenol	87-86-5	organochlorine	pentachlorophenol
hosphamidon	13171-21-6	organophosphate	2-chloro-2-diethylcarbamoyl-1-
			methylvinyldimethylphosphate
quintozene (PCNB)	82-68-8	organochlorine	pentachloronitrobenzene
endrin	72-20-8	organochlorine	2,7,3,6-dimethanonaphth-2,3-b/oxirene, 3,4,5,6,9,9-hexachloro- 1a,2,2a,3,6,6a,7,7a-
			octahydro- (1a.alpha,2.beta,2a.beta,3.alpha,6.
			alpha,6a.beta,7.beta,7a.alpha)
aldrin	309-00-2	organochlorine	1,4,5,8- dimethanonaphthalene,1,2,3,4,10,10-
			hexachloro-1,4,4a,5,8,8a-hexahydro-
			(1.alpha,4.alpha,4a.beta,5.alpha,

			8.alpha,8a.beta)
mirex	2385-85-5	-	-
toxaphene	8001-35-2	organochlorine	toxaphene
aldicarb	116-06-3	carbamate	2-methyl-2-(methylthio)propionaldehyde O-methylcarbamoyloxime
chlordimeform	6164-98-3	organochlorine	N -(4-chloro-2-methylphenyl)-N,Ndimethyl-
			methanimidamide
dibromochloropropane (DBCP)	96-12-8	-	1,2-dibromo-3-chloropropane
thalium sulphate	7446-18-6	inorganic	thalium sulphate

Annex 2: Pesticide Classification List – World Health Organization

Table 1. Extremely hazardous (Class Ia) technical grade active ingredients of pesticides (common name) – not permissible in the project

Aldicarb	Difethialone	Parathion-methyl
Brodifacoum	Diphacinone	Phenylmercury acetate
Bromadiolone	Disulfoton	Phorate
Bromethalin	Ethoprophos	Phosphamidon
Calcium cyanide	Flocoumafen	Sodium fluoroacetate
Captafol	Fonofos	Sulfotep
Chlorethoxyfos	Hexachlorobenzene	Tebupirimfos
Chlormephos	Mercuric chloride	Terbufos
Chlorophacinone	Mevinphos	
Difenacoum	Parathion	

Table 2. Highly hazardous (Class Ib) technical grade active ingredients of pesticides (Common name) – not permissible in the project

Acrolein	*Ethiofencarb*	Omethoate
Allyl alcohol	Famphur	Oxamyl
Azinphos-ethyl	*Fenamiphos*	Oxydemeton-methyl
Azinphos-methyl	Flucythrinate	Paris green [C]
Blasticidin-S	Fluoroacetamide	Pentachlorophenol
Butocarboxim	Formetanate	*Pindone*
Butoxycarboxim	Furathiocarb	Pirimiphos-ethyl
Cadusafos	Heptenophos	Propaphos
Calcium arsenate	Isazofos	Propetamphos
Carbofuran	Isofenphos	Sodium arsenite
Chlorfenvinphos	Isoxathion	Sodium cyanide
3-Chloro-1,2-propanediol	Lead arsenate	Strychnine
Coumaphos	Mecarbam	Tefluthrin
Coumatetralyl	Mercuric oxide	Thallium sulfate
Zeta-cypermethrin	Methamidophos	Thiofanox
Demeton-S-methyl	Methidathion	Thiometon
Dichlorvos	*Methiocarb*	Triazophos
Dicrotophos	Methomyl	Vamidothion
Dinoterb	Monocrotophos	Warfarin
Edifenphos	Nicotine	Zinc phosphide

Table 3. Moderately hazardous (Class II) technical grade active ingredients of pesticides (Common name) – not permissible in the project

Alanycarb	Bioallethrin	Chloralose
Anilofos	Bromoxynil	Chlordane
Azaconazole	Bromuconazole	Chlorfenapyr
Azocyclotin	Bronopol	Chlorphonium chloride
Bendiocarb	Butamifos	Chlorpyrifos
Benfuracarb	Butylamine	Clomazone
Bensulide	Carbaryl	Copper sulfate
Bifenthrin	Carbosulfan	Cuprous oxide
Bilanafos	Cartap	Cyanazine
Cyanophos	Gamma-HCH	Prallethrin
Cyfluthrin	Guazatine	Profenofos
Beta-cyfluthrin	Haloxyfop	Propiconazole
Cyhalothrin	Heptachlor	Propoxur
Cypermethrin	Imazalil	Prosulfocarb
Alpha-cypermethrin	Imidacloprid	Prothiofos
Cyphenothrin	Iminoctadine	Pyraclofos
Deltamethrin	Ioxynil	Pyrazophos
Diazinon	Ioxynil octanoate	Pyrethrins
Difenzoquat	Isoprocarb	Pyroquilon
Dimethoate	Lambda-cyhalothrin	Quinalphos
Dinobuton	Mercurous chloride	Quizalofop-p-tefuryl
Diquat	Metaldehyde	Rotenone
Endosulfan	Metam-sodium	Sodium fluoride
Endothal-sodium	Methacrifos	Sodium hexafluorosilicate
Esfenvalerate	Methasulfocarb	Spiroxamine
Ethion	Methyl isothiocyanate	Sulprofos
Etrimfos	Metolcarb	Terbumeton
Fenazaquin	*Metribuzin*	Tetraconazole
Fenitrothion	Molinate	Thiacloprid
Fenobucarb	Nabam	Thiobencarb
Fenpropidin	Naled	Thiocyclam
Fenpropathrin	Paraquat	Thiodicarb
Fenthion	Pebulate	Triazamate
Fentin acetate	Permethrin	Trichlorfon
Fentin hydroxide	Phenthoate	Tricyclazole
Fenvalerate	Phosalone	Tridemorph
Fipronil	Phosmet	Vernolate
Fluxofenim	Phoxim	Xylylcarb
Formothion	Piperophos	
Fuberidazole	Pirimicarb	

Table 4. Slightly hazardous (Class III) technical grade ingredients of pesticides (Common name) – permissible under IPM

Acephate	Copper oxychloride	Dimethachlor
Acetochlor	Cycloate	Dimethametryn
Acifluorfen	Cyhexatin	Dimethipin
Alachlor	Cymoxanil	Dimethylarsinic acid
Allethrin	Cyproconazole	Diniconazole
Ametryn	Dazomet	Dinocap
Amitraz	Desmetryn	Diphenamid
Azamethiphos	Dicamba	Dithianon
Bensultap	Dichlormid	Dodine
Bentazone	Dichlorobenzene	Empenthrin
Bromofenoxim	Dichlorophen	Esprocarb
Butroxydim	Dichlorprop	Etridiazole
Chinomethionat	Diclofop	Fenothiocarb
Chlormequat (chloride)	Dienochlor	Ferimzone
Chloroacetic acid	Diethyltoluamide	Fluazifop-p-butyl
Chlorthiamid	Difenoconazole	Fluchloralin
Copper hydroxide	Dimepiperate	Flufenacet

Fluoroglycofen
Flurprimidol
Flusilazole
Flutriafol
Fomesafen
Furalaxyl
Glufosinate
Hexazinone
Hydramethylnon
Iprobenfos
Isoprothiolane
Isoproturon
Isouron
Malathion
MCPA-thioethyl
Mecoprop
Mecoprop-P
Mefluidide
Mepiquat
Metalaxyl
Metamitron
Metconazole
Methylarsonic acid
Metolachlor
Myclobutanil
2-Napthyloxyacetic acid
Nitrapyrin
Nuarimol
Octhilinone
N-octylbicycloheptene
dicarboximide
Oxadixyl
Paclobutrazol
Pendimethalin
Pimaricin
Pirimiphos-methyl
Prochloraz
Propachlor
Propanil
Propargite
Pyrazoxyfen
Pyridaben
Pyridaphenthion
Pyridate
Pyrifenox
Quinoclamine
Quizalofop
Resmethrin
Sethoxydim
Simetryn
Sodium chlorate
Sulfluramid
Tebuconazole
Tebufenpyrad
Tebuthiuron
Thiram
Tralkoxydim
Triadimefon
Triadimenol
Tri-allate
Triclopyr
Triflumizole
Undecan-2-one
Uniconazole
Ziram

Table 5. Technical grade active ingredients of pesticides unlikely to present acute hazard in normal use (Common name) - permissible

Aclonifen
Acrinathrin
Alloxydim
Amitrole
Ammonium sulfamate
Ancymidol
Anthraquinone
Asulam
Atrazine
Azimsulfuron
Azoxystrobine
Benalaxyl
Benazolin
Benfluralin
Benfuresate
Benomyl
Benoxacor
Bensulfuron-methyl
Bifenox
Bioresmethrin
Biphenyl
Bispyribac
Bitertanol
Borax
Bromacil
Bromobutide
Bromopropylate
Bupirimate
Buprofezin
Butachlor
Butralin
Butylate
Captan
Carbendazim
Carbetamide
Carboxin
Carpropamid
Chlomethoxyfen
Chloramben
Chloransulam methyl
Chlorbromuron
Chlorfluazuron
Chloridazon
Chlorimuron
Chlorothalonil
Chlorotoluron
Chlorpropham
Chlorpyrifos methyl
Chlorsulfuron
Chlorthal-dimethyl
Chlozolinate
Cinmethylin
Cinosulfuron
Clofentezine
Clomeprop
Clopyralid
Cloxyfonac
Cryolite [C]
Cycloprothrin
Cyclosulfamuron
Cycloxydim
Cyhalofop
Cyromazine
Daimuron
Dalapon
Daminozide
Desmedipham
Diafenthiuron
Dichlobenil
Dichlofluanid
Diclomezine
Dicloran
Diclosulam
Diethofencarb
Diflubenzuron
Diflufenican
Dikegulac
Dimefuron
Dimethirimol
Dimethomorph
Dimethyl phthalate
Dinitramine
Dipropyl isocinchomerate
Dithiopyr
Diuron
Dodemorph
Ethalfluralin
Ethephon
Ethirimol
Ethofumesate
Etofenprox
Famoxadone
Fenarimol
Fenbutatin oxide
Fenchlorazole
Fenclorim
Fenfuram
Fenhexamid
Fenoxycarb
Fenpiclonil
Fenpropimorph
Fenuron
Fenuron-TCA
Ferbam
Flamprop
Flucarbazone-sodium
Flucycloxuron
Flufenoxuron
Flumetralin
Flumetsulam
Fluometuron
Flupropanate
Flupyrsulfuron
Flurenol
Fluridone
Flurochloridone
Fluroxypyr
Fluthiacet
Flutolanil
tau-Fluvalinate
Folpet
Fosamine
Fosetyl
Gibberellic acid
Glyphosate
Hexaconazole
Hexaflumuron
Hexythiazox
Hydroprene
Hymexazol
Trietazine
Triflumuron
Trifluralin
Imazamethabenzmethyl
Imazapyr
Imazaquin
Imazethapyr
Imibenconazole
Inabenfide
Iprodione
Iprovalicarb
Isoxaben
Kasugamycin
Lenacil
Linuron
Maleic hydrazide
Mancozeb
Maneb
Mefenacet
Mepanipyrim
Mepronil
Metazachlor
Methabenzthiazuron
Methoprene
Methoxychlor
Methyldymron
Metiram
Metobromuron
Metosulam
Metoxuron
Metsulfuron methyl
Monolinuron
2-(1-Naphthyl) acetamide
1-Naphthylacetic acid
Napropamide
Naptalam
Neburon
Niclosamide
Nicosulfuron
Nitrothal-isopropyl
Norflurazon
Ofurace
Oryzalin
Oxabetrinil
Oxadiazon
Oxine-copper
Oxycarboxin
Oxyfluorfen
Penconazole
Pencycuron
Pentanochlor
Phenmedipham
Phenothrin
Phenylphenol
Phosphorus acid
Triflusulfuron-methyl
Triforine
Triticonazole
Phthalide
Picloram
Piperonyl butoxide
Pretilachlor
Primisulfuron
Probenazole
Procymidone
Prodiamine
Prometon
Prometryn
Propamocarb
Propaquizafop
Propazine
Propham
Propineb
Propyzamide
Pyrazolynate
Pyrazosulfuron
Pyrimethanil
Pyriminobac
Pyriproxyfen
Pyrithiobac sodium
Quinclorac
Quinmerac
Quinoxyfen
Quintozene
Rimsulfuron
Siduron
Simazine
Spinosad
Sulfometuron
Sulphur
Tebutam
Tecnazene
Teflubenzuron
Temephos
Terbacil
Terbuthylazine
Terbutryn
Tetrachlorvinphos
Tetradifon
Tetramethrin
Thiabendazole
Thidiazuron
Thifensulfuron-methyl
Thiophanate-methyl
Tiocarbazil
Tolclofos-methyl
Tolylfluanid
Transfluthrin
Triasulfuron
Tribenuron
Validamycin
Vinclozolin
Zine

Annex 3: Guidelines for Technical Training on PMP/IPM

Training is an important approach to strengthen pest/disease management capability via IPM. According to the job division and levels of the people involved from various departments, training will be given to the technicians at provincial, city, county and township level under the training scheme. The pest/disease management training will include the following aspects:

- Periodical pest and disease control training to the technicians at county and township level, including PMP method against specific crop/pest and disease to ensure the effective implementation of pesticide management regulations.

- PMP training to farmer on pest/disease control new methods for specific crops through field school on time and on regular basis.

- Compile and distribute PMP training material. It should be written with simple words and supported by audio/video materials.

- Encourage women to participate in PMP activities

Training to farmers aims to enhance their capability of mastering the biological control skills for common pests and controlling pests and diseases in cost-effective way. The training covers how to identify the pest and diseases, how to make correct control decision and how to take appropriate preventive and control measures.

Farmers will be given training for 3-4 times during the pest control period (each time for one day and train 30-40 households at a time

Training should ideally covers the following area:

- morphological characteristics and identification of pests and diseases
- damage and loss from different pests and diseases
- identification of major natural enemies to the pests
- occurrence of major pests and diseases;
- field sampling and outbreak density estimation of pests;
- pest control threshold;
- pest and disease control measures, including agricultural, physical, biological and chemical control methods;
- pesticide selection and use safety skills;
- safe storage of agricultural chemicals and disposal of their packaging waste
- field survey method
- control specifications

- integrated control measures combining agricultural, physical, biological and chemical control methods, safe storage and management of pesticide and disposal of pesticide waste and packaging container
- Chemical drug application method and protection requirements during application

Trainers should be comprised of:

- Trained agricultural technology promotion personnel
- Trained experts on Integrated pest management practices
- Demonstrators of IPM practices in the field