ENVIRONMENT MANAGEMENT FRAMEWORK

EMF- Volume Two

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Project on Climate Resilient Agriculture (POCRA)

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SEPTEMBER 2017
(Revised November 2017)

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1.1 Background of the Project

The Government of Maharashtra (GoM) plans to undertake the 'Project on Climate Resilient Agriculture' (PoCRA), with support from the World Bank, to address the drought related vulnerability in the agriculture sector in the state. The project seeks to enhance the climate resilience of the farming community, especially of the poor and vulnerable farmers practicing rainfed farming, and contribute to livelihood security through

- Promoting Climate Resilient Agriculture Systems
- Climate Smart Post-Harvest Management and Value Chain Promotion
- Institutional Development, Knowledge and Policies for a Climate-resilient Agriculture

The project will support investments in (a) transfer of technologies for climate adaptation and mitigation at farm level and supports targeted interventions, and limited physical investments in the catchment area to promote a more efficient use of surface water, complemented where required with a more sustainable use of groundwater (b) activities aimed at linking organized smallholders with agri-food SMEs, facilitating farmers' access to new market opportunities, and enhancing their participation in commodity value chains. The project also supports investments in (a) on-farm water use efficiency; (b) soil moisture and fertility improvements; (d) sustainable intensification and diversification of farm production; (e) integrated crop farming systems.

An Environmental Management Framework (EMF) has been prepared for the project in order to describe the procedures and institutional arrangements for managing the potential environmental impacts from the project activities. The EMF is in line with the GoM's legal and regulatory framework and the World Bank's operational policies on environmental safeguards. The EMF will guide the project in implementing activities in line with the identified risk mitigation strategies and help in making the interventions environmentally sustainable.

This document describes the Integrated Pest Management Plan and Nutrient ManagementStrategy/Guidelines for the PoCRA and is part of the EMF.

1.2 Integrated Pest Management Approach

The World Bank Policy on Pest Management (OP 4.09) promotes the use of biological or environmental control methods and reduces reliance on synthetic chemical pesticides. This policy has been triggered for this project. The Integrated Pest Management Plan (IPMP) describes the strategy and activities to ensure compliance with this policy.

The state has gone through series of droughts since 1971. As reported, the current level of fertilizer and pesticide use are low in project areas as compared to the national average. While there is no evidence to suggest that the use of pesticide may increase due to the project interventions, yet the project would like to promote bio-pesticides and organic farming across the project areas. Hence, the IPMP has been proposed to minimize the environmental impacts of pesticides and nutrition deficiencies for the main crops (Sorghum, Pigeon Pea, Soya bean, Cotton, Gram, Safflower, and Sweet Lime) to mitigate adverse impacts arising from use of pesticides, mainstreaming biological control and use of bio-pesticides, and guidance on trainings and demonstrations, safe-handling, application and storage of pesticides.

The project is conscious of the fact that there could be several externalities (not necessarily related to project) may induce pesticide use with or without the project interventions. The project will document those externalities during the 2nd and 4th year of project implementation.

1.3 Objective of Integrated Pest Management

Integrated Pest Management is the approach now being adopted worldwide to address the issue of excessive use of chemical pesticides in agriculture The purpose of this document is to describe a Plan[1] by which the project can promote and support safe, effective, and environmentally sound pest management in agricultural interventions undertaken under PoCRA. . The World Bank's Operational Policy 4.09 defines integrated pest management as a mix of farmer-driven, ecologically based pest control practices that seeks to reduce reliance on synthetic chemical pesticides. It involves:

- Managing pests (keeping them below economically damaging levels) rather than seeking to eradicate them;
- Relying, to the extent possible, on non-chemical measures to keep pest populations low; and
- Selecting and applying pesticides, when they have to be used, in a way that minimizes adverse effects on beneficial organisms, humans, and the environment.
- IPM is a broad ecological approach of pest control (insects, diseases, weeds, rodents etc) employing all methods and techniques viz. cultural, mechanical, genetic, regulatory, biological and chemical in a compatible manner to keep pest population below economic threshold level (ETL).

2.0 Integrated Plant Nutrient Management

Integrated Plant Nutrient Management (IPNM) includes soil, nutrient, water, crop, and vegetation management practices, tailored to a cropping and farming system appropriate to Marathwada and Vidharbha regions of Maharashtra.

Integrated Plant Nutrient Management optimizes the condition of the soil, regarding its physical, chemical, biological and hydrological properties, for the purpose of enhancing farm productivity, while minimizing land degradation.

It not only provides tangible benefits in terms of higher yields, but also conserves the soil resource. The field level management practices considered under NM would include the use of farmyard manures, natural and mineral fertilizers, soil amendments, crop residues and farm wastes, agro-forestry (suitable cases) and tillage practices, green manures, cover crops, legumes, intercropping, crop rotations, irrigation, drainage, and a variety of other agronomic, vegetative and structural measures designed to conserve both water and soil. The underlying principles on how best to manage soils, nutrients, water, crops and vegetation to improve and sustain soil fertility and land productivity and their processes are derived from the essential soil functions necessary for plant growth.

The following are fundamental to the approach under the project is outlined in these guidelines**.**

1. **Soil Productivity**: Promotion of soil and plant nutrient management as an integral part of a productive farming system. Focus for IPNM would be on sustaining the productive potential of the soil resource.
2. **Rain Water Harvesting and Conservation**: Under rain-fed dry land farming, soil moisture availability is the primary limiting factor on crop yields. Hence IPNM strategy will adopt improved rainwater conservation and management practices, in-situ water conservation and improve water use efficiency.

[1] The IPMP draws upon the GoM's programs on IPM and on the World Bank Group's Environment, Health and Safety Guidelines for Annual Crop Production.

3. **Soil Organic Matter**: With declining soil, organic matter levels following cultivation, the adoption of improved organic matter management practices are a prerequisite for restoring and maintaining soil productivity (improved soil nutrient levels, soil moisture retention, soil structure and resistance to erosion). So, restoration and improvement of soil organic matter be the essential part of the IPNM strategy.
4. **Agricultural Practices for Nutrient Management**

Integrated plant nutrient management also contributes to pest management. Stressed crops are more susceptible to disease and to the effects of pest attacks. Crops growing in poorly structured soil, under low or unbalanced nutrient conditions or with inadequate water supply will be stressed. Responding to disease or pest attacks by applying pesticides is a costly symptomatic approach to a syndrome which is better addressed by improving the ecological conditions and systems within which the crops are cultivated. In addition, agricultural products with less pesticides residues are less risky to consume, and healthy plants with a properly balanced nutrient supply provide better quality feed and food, improving animal and human health.

To achieve this, the project will promote Integrated Pest Management (IPM) approaches for the selected crops in the project locations. Crop wise IPM plans have been prepared and farmers will be oriented on such practices. This will help to minimize the environmental and social risk from pesticide residues and improving the cost-effectiveness of farming.

Attempt will be made to improve production efficiencies through integrated nutrient management practices promoting combined use of inorganic, organic and biological resources in a reasonable way to balance efficient use of limited resources and ensure ecosystem sustainability. Efficient fertilizer use will be promoted with application of appropriate quantities and method of application to minimizes losses. Rather than broadcasting, project will educate farmers to apply fertilizer into the soil directly. Plant nutrient status during the growing season will be monitored using leaf-colour charts and managing fertilizer application accordingly.

Nutrients are also linked to different other practices that are related to sustainable crop production and intensification. Management of nutrient cycling will be the main focus of “Conservation Agriculture” in which minimum soil disturbance, intercropping, crop rotations and a permanent soil cover will be promoted to minimize the need for chemical fertilizers. Promotion of such practices will help the crops to have required nutrients by which their susceptibility to pests will reduce and thus will be helpful to Integrated Pest Management. As it is expected that application of fertilizers may increase the occurrence of harmful weeds, project will promote “Integrated Weed Management” by improving the timing, dosing and application method of nutrients and thus minimizing the potential impact on weed growth. Application of nutrients is a regulated and scientific manner will contribute in maintaining the overall agricultural biodiversity and will be supportive to pollination. The project will also promote crop-livestock system, as a part of nutrient management.

2.1 Farm Level Strategy for Nutrient Management

Farmers can get higher benefit from the supply of additional plant nutrients, in the form of organic / inorganic fertilizer, only after they have made improvement in the biological, physical and hydrological properties of their soil. At the farm level, integrated and synergistic approach will be adopted under IPNM, involving the following.

1. Matching the land use requirements with the land qualities present in the area, i.e., the biological, chemical and physical properties of the soil, and the local climatic conditions (temperature, rainfall etc.);
2. Better plant management, i.e., (i) planting at the beginning of the rain to increase protective ground cover to enhance infiltration and biological activity and (ii) timely weeding to reduce crop yield losses;

3. Promotion of complementary crop, livestock and land husbandry practices in combination to maximize addition of organic materials and recycle farm wastes, so as to maintain and enhance soil organic matter levels;
4. Land management practices that ensure favorable soil moisture conditions for the proposed land use (e.g. moisture conservation in low rainfall areas, drainage in high rainfall areas);
5. The replenishment of soil nutrients through an integrated plant nutrition management approach like organic manuring, application of crop residues, rhizoidal N-fixation, Phosphorous and other nutrient uptake;
6. Combinations of crop, livestock and land husbandry practices that reduce rainfall impact, improve surface infiltration, and reduce the velocity of surface run-off thereby ensuring soil loss below the 'tolerable' level;
7. Conservation tillage, crop rotation, agro-forestry and soil restorative practices that maintain and enhance the soils physical properties thereby encouraging root development and rainfall infiltration;
8. Promotion of crop-livestock system in project clusters as a part of integrated nutrient management strategy;
9. Nutrient monitoring during growing stage by using colour chart and application of nutrients accordingly.

2.2 Integration of nutrient management into village/mini-watershed/cluster plans:

The soil nutrient status of the village/mini-watershed or cluster will be considered for developing the village/mini-watershed/cluster plans. The process manual and format for the village/mini-watershed/cluster plans will include the following:

- Soil nutrient status (based on representative soil testing)
- Key problems and issues with soil fertility
- Current nutrient management practices
- Proposed integrated nutrient management practices
- Monitoring of soil nutrient status

Strengthening the supply chain for nutrient management: The value chain promotion activities will include strengthening the supply chain for fertility management. For example, marketing of bio-fertilizers through FPCs.

Capacity building on nutrient management: Training programs for project staff will emphasize the strategy for nutrient management in the project. Capacity building programs for farmers will include coverage on sustainable nutrient management aspects.

Monitoring and Audit: The monitoring and audit of the implementation of the NMP will be undertaken as part of the Midterm impact assessment.

3.0 IPMP (Integrated Pest Management Plan):

IPMP combines different approach to control the pests, minimize the economic loss and protect the environment. The Appropriate strategy to be adopted for its promotion among the farmers like sensitization on environment, awareness on environmental impact of indiscriminate use of pesticides, educating farmers on restricted and banned pesticides, regular orientation training and follow up, providing hand holding / field guidance and monitoring the implementation of the IPMP.

The World Bank & IFC pesticide guidelines aim to ensure that;

1. It should have negligible adverse human health effects
2. Should be effective against target pests and minimal effect on non-target species
3. Development of pest resistance to be kept in view
4. Public health pesticides must be safe for inhabitants and animals
5. Integrated pesticide management specifically identifies the following as the key in pest control.
6. A categorical preference for bio control methods along with institutional and capacity building for the same.
7. Reducing reliance on synthetic chemical pesticides and only if approved by IPM approach.
8. Does not permit under any circumstance the use IA, and IB pesticides.
9. As WHO II classified pesticides has no restrictions on their distribution and use and will only be supported through the project with IPM training, equipment and facilities to handle, store and apply these products properly.
10. Recommends the use of Participatory IPM along with specific investment components for the same.
11. Permits category III type chemicals as a part of the IPM strategy.

3.1 Objectives of IPM Plan

The objective of IPMP is to promote and support safe, effective and environmentally sound pest management under the project. Along with regulating the use of synthetic pesticides (based on prescribed doses and type of pesticides to be used), the objective of IPM is to promote the use of biological and environmental control methods and the reduction in reliance on synthetic chemical pesticides. Promotion of IPMP is objectively driven to achieve the followings.

1. Minimize crop loss, augment farm production with scientific application of synthetic pesticides;
2. Reduce environmental pollution caused due to the application of synthetic pesticides;
3. Introduction and adoption of biological and cultural methods and managing pests below ETL;
4. Reduction in health hazards arising due to chemical pesticides during handling;
5. Minimizing pesticide residues through the application of appropriate doses;
6. Promotion of bio pesticides

3.2 Salient Features of the IPMP Approach:

All IPMP measures proposed in this project will be used after the second year of project implementation as most of the interventions pertaining to crop and production system will start after the first year of mobilization

1. Popularizing IPM approach among farming community through demonstration, awareness, training and exposure;
2. Organizing regular pest surveillance and monitoring to assess pest/disease situation and study agro-eco-system to advise timely IPM control measures;
3. Encourage farmers to rear biological control agents for their field use and conservation of naturally occurring biological control agents for control of crop pests;

4. Promoting use of bio-pesticides, neem based pesticides, bacillus based bio-pesticides, insect pathogen as alternative to chemical pesticides;
5. To play a catalytic role in transfer of innovative IPM skills/methods/ techniques to farmers through extension services and App based applications.
6. Human Resource Development in IPM by imparting training to master trainers, extension workers and farmers by conduct of trainings and establishment of Farmers' Field Schools (FFSs).
7. Issuing insect-pest and disease related information (app based / agri-watch / agri-met services) and control measures to farmers.

Alternative pest control strategies such as IPM that deploys a combination of different control measures such as cultural control, use of resistant genotype, physical and mechanical control, and rational use of pesticide would reduce the number and amount of pesticide applications. Sensitization, awareness and extension support would educate and encourage farmers to adopt the innovative IPM strategies that would be key to reduce the harmful impact of pesticides on life and environment.

Table 1: Insect Scouting Chart (Use it after the second year)

S. No.	Insect / Pest	June	July	Aug.	Sept.	Oct.	Nov	Dec.	Jan
1									
2									
3									
4									

The project, through its design would encourage farmers to take up better farm practices that are climate resilient without compromising farm-based productivity, it would be crucial to introduce IPM at the farmer end. Effective implementation of IPM practices will reduce the risk of water pollution through leaching of chemicals residues from farmlands to water sources, both surface and sub-surface. A detailed strategy for implementing IPM is presented below.

Table 2: Integrated Pest Management Approach

S. No.	Standard Pest Control Measures	Integrated Pest Management
1	Use of synthetic pesticides is common and widespread	More knowledge intensive
	Less emphasis on preventive approach	Emphasis on prevention of pest problems
	More reactive to pest outbreaks	Systematic approach for long-term pest control
2	Pesticide application is more chemical intensive	Change in field conditions that prevent pest attack
3	Use of synthetic pesticides focus more on killing pests directly	Regular inspection / monitor and taking recommended actions
4	Use of Higher Doses	Doses and type of pesticides use as per need

The project will adopt the suggested steps for IPM implementation. A baselinesurvey (benchmarking) will be undertaken after the first year of mobilisation phase of the project to assess knowledge, attitude and practice of farmers and identification of major pest problems by location. Specific IPM measures that the project will promote are;

- Deep summer ploughing (only in suitable cases).
- Recycling and appropriate disposal of crop residues, weeds etc.
- Seed treatment.

- Growing pest and disease resistant/tolerant varieties.
- Timely and synchronous sowing operation.
- Maintaining optimum plant spacing.
- Post-sowing cultural operations.
- Balanced use of fertilizers.
- Proper water management.
- Timely weed control.
- Use of light, yellow, sticky and pheromone traps for monitoring of pests.
- Regular monitoring on pests and their natural enemies.
- Conservation of crop defenders (parasites, predators and pathogens).
- Use of bio-pesticides against crop pests.
- Observation of pests and defenders ratio (2:1) before taking control action.
- Need based and judicious use of the pesticides on the basis of ETL (Economic Threshold Level) as a last resort.

Table 3: Risks and Mitigation Measures

Constraint/Risks	Mitigation
Availability of prescribed / selective pesticides, effective against pests but not against natural enemies of pests.	Making available selective bio-pesticides to farmers, as per their requirements through linkage and collaboration.
Determining the ETL for different crops taking location specific characteristics, pest species and pest density.	Support participatory research programs with farmers and research organizations to work out ETL for various pests within different project districts
Potential of bio-control agents to deal with different insects / pests / diseases.	Use of only duly approved bio-control agents.
Techniques of mass rearing of several bio-agents are still not well developed.	Fostering collaboration / convergence with different institutions / universities for timely supply of bio-agents to farmers.
Limited access to new technologies may result with non-adoption of technology.	Ensuring availability of technologies at village / farmer end as per the demonstrations conducted in FFS or their exposure to such technologies.
On field guidance and providing hand holding support to the farmers during different cropping seasons through extension services.	Project envisages developing a cadre at the cluster level who are trained in IPM for extending support. Apart from this, the existing extension mechanism of ATMA will be useful for supporting farmers in adopting IPM.

3.3 Activities under IPMP

Identification Process

Field monitoring helps to keep track of the pests and their potential damage, which forms the base of IPM. So, the process starts with monitoring, which includes inspection and identification, followed by the establishment of ETL (crop specific). This provides knowledge about the current pests and crop situation and is helpful in selecting the best possible combinations of the pest management methods. Identification of minor and major pests, diseases in the project areas will be conducted regularly for the purpose. Package of practices developed by the State Agriculture Universities can be adopted accordingly.

Assessment of Economic Threshold Level (ETL)

The ETL differs by pest and also by crop types. Pest population is expected to be maintained at levels below those causing economic loss. It is generally assumed that pest tolerant capacity of different crops is limited and when it exceeds or approaching the ETL, chemical control methods can be used. Different pest / disease control methods of IPM will be applied, based on the determination of ETL and pest density. A priority list of different control methods of IPM is presented below.

Table 3: Adoption of IPM Methods and its Priority

IPM Procedures	Methods of Executing	Priority in Application
Cultural	Avoidance of monoculture Improved disease resistant varieties. Summer ploughing. Optimum plant densities. Avoiding excessive irrigation. Avoiding high nitrogenous fertilization. Trap crops	To be given preference as preventive mechanism
Biological	Conservation / promotion of bio agents like birds, parasites & pathogens for biological control of pests.	Second Priority
Mechanical	Damage/Destroying all the eggs of the insect; Destroy any material infested by insect, pest and diseases.	Third Priority
Chemical	Chemical Control when the loss is beyond ETL Use of recommended chemicals only	Last Priority when crop loss is beyond ETL

Training and Capacity Building on IPMP

Under the promotion of IPM, it is important that farmers understand its importance and adopt it in their field, following the prescribed procedures. To improve the understanding of farmers, it is essential to develop their knowledge base through training, exposures, handholding and extension services. While the Farmer's Field School (FFS) will be a good place for exposure of farmers for practical learning (demonstration of IPM), classroom teaching and field level support is also essential. The Cluster Assistant will keep record of number of trainings given and attendance of trainees. He will also ensure the quality and record maintenance of trainings for IPM. The project will adopt a cascading approach for capacity building of farmers where resource farmers and farmer friends (*Krsihi Mitras*) will be developed through special training programme, and will be providing hand holding support to farmers as per the need arises through pest surveillance.

Farmer Field School Approach:

- The Farmer Field School is a form of adult education, which evolved from the concept that farmers learn optimally from field observation and experimentation.
- It was developed to help farmers tailor their Integrated Pest Management (IPM) practices to diverse and dynamic ecological conditions.
- In regular sessions from planting till harvest, groups of neighboring farmers observe and discuss dynamics of the crop's ecosystem.
- Simple experimentation helps farmers further improve their understanding of functional relationships (e.g. pests-natural enemy population dynamics and crop damage-yield relationships).
- In this cyclical learning process, farmers develop the expertise that enables them to make their own crop management decisions.
- Special group activities encourage learning from peers, and strengthen communicative skills and group building.

Integration of integrated pest management into village/mini-watershed/cluster plans: The pest incidence and management status of the village/mini-watershed or cluster will be considered for developing the village/mini-watershed/cluster plans. The process manual and format for the mini-watershed/cluster plans will include the following:

- Key crops and pests
- Key problems and issues with pest management
- Current pest management practices
- Proposed integrated pest management practices
- Monitoring of integrated pest management practices

3.4 Institutional Arrangements for IPM

The project level implementation arrangement for IPM will include:

- As Department of Agriculture is the implementing agency for PoCRA, IPM strategy designed by department and project will be implemented in project area.
- Crop specific IPM package will be prepared with the technical consultations with SAU and KVKs.
- IPM package will be disseminated to the project farmers through FFS approach (sub component A2) and various other interventions at field level and all necessary arrangements to demonstrate IPM technology for respective crops will be made. The critical inputs required for IPM will be availed by the beneficiary and the cost of the inputs will be reimbursed by the project through Direct Benefit Transfer (DBT) mode.
- IPM as a part of FFS will be demonstrated in each project village for cotton, soybean, pigeon pea in Kharif season and for Gram and horticultural crop in Rabi season. The project is proposing IPM demonstrations on farmers' farms in dry land and saline conditions.
- Under component C. Institutional Development, Service delivery and Knowledge for Climate-resilient Agriculture, project incorporated contingency plan; development & testing of agricultural technologies and practices for climate adaptation; long term climate change model; on farm participatory action research and risk analysis framework; development of Climate Innovation Centres (CICs) etc. which will directly and indirectly strengthen the holistic IPM approach for climate resilient agriculture.
- At village level farmer's friends (male and female) will be responsible to work in close coordination with VCRMC and KVKs. These persons will be imparted knowledge and skills regarding IPM technology.

Table 4 Summary of key Roles and Responsibilities under IPMP

Level	*Role*	*Responsibilities for environmental management*
Village	Village Climate Resilient Agriculture Management Committees (VCRAMC) with support from Krishi Mitra	Identify and integrate the relevant activities on IPM into the village level watershed plans.
Cluster	Cluster Assistant	Identify and integrate the relevant activities on IPM into the mini-watershed/cluster plans.
FPC	FPC with support from District Technical Specialists and Division Level Multi-Disciplinary Team	Avoid procurement of hazardous pesticides that are excluded from the project. Support IPM through supply chain investments such as stocking of bio-pesticides, pheromone traps, etc.
Division	Division Level Multi-Disciplinary Team headed by Nodal Officer	Oversee and ensure quality control in integration of IPM into village/mini-watershed/cluster plans. Conduct periodic field visits to monitor implementation of IPM activities. Maintain database on implementation of trainings on IPM. Prepare periodic reports on implementation of PMP.
State	PMU – Environment Coordinator	Ensure effective implementation of the IPMP across the project. Organize training programs for project staff on the PMP. Make the PMP available to all relevant project staff in the local language. Conduct periodic field visits to monitor implementation of PMP across all districts. Maintain records and report on implementation of PMP including details on training on IPM.

3.5 Monitoring and Supervision

The IPM approaches adopted for different crops in project locations will be monitored on regular intervals by the executing entities and the farmers. The participatory monitoring system will help to understand the key challenges and emerging good practices. The challenges will be taken up for amicable solution at implementation level, with the support of technical institutions / SAUs whereas the learning will be replicated in different other clusters / villages. The project will also evaluate the impact of adopting IPM approaches (change in use of different IPM methods, incidence of pest attack, application of pesticide vis-a-vis pollination, economic damage, success of the package of practices including IPM, crop production and productivity etc.), with the support of technical institutions / SAUs. Key monitoring indicators covering both adoption as well as knowledge of IPM among the farmers will be assessed periodically as part of internal monitoring and periodic monitoring by third party. For surveillance purpose project will take help from the existing ICT tools used by DoA for e.g. M-crop.

Table 5: Monitoring of IPM

S. No.	Activity	Monitoring Areas	Responsibility	Time Frame
1	Development of IPM Related Learning Materials and its Distribution to Farmers / Farmer's Organisations	Learning materials cover crop specific IPM practices	District Project Management Unit	6 Months from project inception (printed materials)
		Availability of reading / reference materials with the farmers (distributed at village level)	Cluster Assistant at cluster level	• 1 month from printing of documents • Monitoring of adoption by farmers during field visits
2	Promotion of Cultural Procedures	Availability of resistant varieties of seeds, plant density maintenance etc.	Cluster Assistant at cluster level	Extending support (physical / technical) prior to sowing Regular monitoring
3	Promotion of Bio-Control Agents	Support to farmers in getting bio-control agents	SDAO at Sub-division level	During initial identification of pest / disease, within 7-10 days of such identification
		Application of bio-control agents by the farmers	Cluster Assistant at cluster level	Regular field visit and preparation of report
4	Use of Pesticides	Use of banned pesticides	SDAO at sub-division level	Periodic field visits
		Use of pesticides as per the crop specific prescription of doses.	Cluster Assistant at cluster level	Periodic field visits
5	Use of Bio-fertilizers and vermi-compost	• Awareness • Extension of Required Technical Support • Use of bio-fertiliser / pesticides / vermi-compost	Cluster Assistant at cluster level with the help of KVK/ SAU	Periodic field visits, physical observation and consultations
6	Training and awareness creation	• Organisation of Training on IPM; • Understanding of farmers on IPM • Organisation of awareness camps	SDAO at sub-division level with the help of KVK/ SAU	• Periodic field visits, consultation with farmers and their organisation • Review of training materials • Assessment of application of training inputs

Table 6: Major Activities – Training, Awareness and Monitoring under IPM Strategy

Key Activities	Execution Strategy	Cropping Season (Kharif / Rabi)							
		K	R	K	R	K	R	K	R
Training of project officials on IPM (all levels)	Orientation training by crop type								
Training of Farmers and their organizations	Crop specific orientation on IPM in phased manner								
Developing IEC materials and distribution with list of banned pesticides	IEC materials (crop specific IPM) in local language with visual display; Using these materials in orientation								
Organising awareness camps at village level (crop specific during seasons)	Awareness camps covering IPM concept, safe use, handling and disposal of insecticides / pesticides, IPM methods, vermi-composting etc.								
Demonstration of IPM in demonstration plots / FFS (Crop Specific IPM Practices)	Involving farmers, irrespective of land holding size								
Extending technical inputs and support to farmers	Inputs support, i.e., bio-pesticides, bio-weedicides, bio-fungicides, bio-fertilizers, bio-control agents (predators) etc. on FFS host Farms and Converge with relevant departments and schemes								
Conduct study and preparing checklist of pests/pathogens by crop types	As part of pest surveillance for adopting appropriate INM by crop type								
Legume plantations (in farm bunds and fields), promoting use of mulch, setting up of vermi-compost units	Encouraging farmers for inter-cropping / planting of legume plants; technical support for vermi-compost establishment.								
Providing / supporting farmers with bio-control agents	Collaboration with other agencies / state bio-control labs.								
Process monitoring and documentation of learning cases / best practices	Periodic on-field assessment and documentation of economic gain.								

Note: K: Kharif, R: Rabi

3.6 Pest and Disease Surveillance

As part of IPM strategy, a pest and disease surveillance will be undertaken electronically. Pest surveillance is an effective tool as an information system, which renders all pest control methods more effective. It aims at monitoring and forewarning of likely build-up of pests in order to facilitate planning and adoption of suitable control strategy based on ETL. It acts as a guiding principle in determining the areas and time needing the pest control. The proposed pest and disease surveillance system in EMF is based on practices followed by the Government of Maharashtra and recommended by ICAR (Indian Council of Agriculture Research) for this project.

4.0 Code of Practice for Pesticide Handling, Storage, Transport and Disposal

Criteria for Pesticide Selection and Use

The criteria to be followed for the selection and use of pesticides are (1) they must have negligible adverse human health effects, (2) they must be shown to be effective against the target species and (3) they must have minimal effect on non-target species and the natural environment. Refer to Annex for guidelines on pesticides which are not permissible under the project.

Pesticide Storage, Handling and Disposal

The project will monitor (after 2 yearof implementation) the compliance of the dose response and safety measures prescribed on the pesticides packages (or recommended by the Government of Maharashtra).

Precautionary Measures

When administering the pesticides, general precautions to be taken are:

1. Wearing protective body cover by the operator;
2. While applying pesticide, restraining from taking food items, drink or smoke;
3. Washing hands, face and other body parts with soap after spraying;
4. Wash overalls and other protective clothing at the end of every working day in soap and water and keep them separate from the rest of the family's clothes.
5. In case if any part of the body is exposed and come in contact with the pesticide, it should be washed-off immediately;
6. Change clothes immediately after spray and cleaning body properly.
7. Visit to doctor in case of feeling unwell.

Handling

1. Operators (i.e., the person handling/applying the pesticide) must be trained and fully understand procedures for safe mixing, application and disposal.
2. Application rates must not exceed the manufacturer's recommendations.
3. Pesticides must not be directly applied to streams, ponds, lakes, or other surface bodies.
4. Maintain a buffer zone (area where pesticides will not be applied) around water bodies, residential areas, livestock housing areas and food storage areas.
5. Protective gloves, shoes, long-sleeved shirt and full trousers will always be worn by operators when mixing or applying pesticides.
6. Respiratory devises (nose mask) will be provided and used by all operators.
7. Avoid application of pesticides in wet and windy conditions.
8. Consumption of any food, drink and smoking while applying pesticide is prohibited.
9. Washing hands, face and other body parts with soap after spraying will be practiced.

10. Washing all protective clothing at the end of every working day in soap and water, and, keeping them separate from the rest of the family's clothes will be practiced.
11. In case if any exposure/body contact with the pesticide, it will be washed-off immediately and medical aid sought.
12. Any person who becomes ill during or within 24 hours of using pesticides will promptly seek medical assistance.

Storage

1. Pesticides will be stored in their original containers with clearly identifiable labels.
2. Pesticides will not be stored in premises used by human and livestock as living quarters.
3. *Pesticides will not be stored in premises used for* Storing food of humans or livestock.
4. Pesticides will be stored out of reach of children.
5. Pesticides will be stored away from water sources.
6. Pesticides will be stored at well-ventilated locations, but away from exposure to sunlight and moisture.
7. Stored pesticides will be stacked in such a way that spillage will be avoided.
8. Keep a register of all pesticides procured, recording when they were received, the amount used, the amount remaining in store, and their location.

Transportation

1. Pesticides will be transported in well-sealed and labelled containers.
2. Pesticides will be transported separately, i.e. not with any other consumable items, cloths, drugs etc.
3. Pesticides will be transported with proper stacking to prevent leakage.
4. The vehicle transporting pesticides will display warning notices (if transporting in bulk), with regular checking during transportation.

Disposal System

1. At the end of the day's work, the inside of the spray pump will be washed and any residual pesticides will be flushed out.
2. The rinsing water will be collected and carefully contained in clearly marked drums with a tightly fitted lid. This will be used to dilute the next day's tank loads.
3. Disposing left over pesticides directly or indirectly into surface water sources like streams, nalas, rivers, ponds, wells, etc., is strictly prohibited.
4. Containers will be decontaminated. For glass, plastic or metal containers this will be achieved by triple rinsing, i.e. part-filling the empty container with water three times and emptying into a bucket or sprayer for the next application.
5. All empty packaging will be kept away from common approach space and will be returned to the designated organisation / individual for safe disposal. Re-use of empty insecticide containers is prohibited. The used packages will not be left outside to prevent their re-use. Used packages will be broken and buried away from the habitation.
6. While purchasing pesticides, the date of manufacture and date of expiry will be reviewed, as per the print.
7. In case of any pesticide that remained unutilised and crossed the date of expiry, it will be returned to the supplier.

5.0 Major pests for important crops and IPM Strategy

Note 1: This IPM strategy may be changed based on location specific assessment.
Note 2: This IPM strategy does not include use of any chemical pesticides that are in WHO classes Ia and Ib as the use of such hazardous pesticides is not permissible in this project.

Table 7: IPM Strategy by Crop Type

Crop	**Major insect pest/diseases**	**IPM strategy**
Sorghum	Sorghum Shoot fly	• Remove dead hearts • Tall variety with yellow glossy stem less attacked • High seed rate 8 – 12 kg/ha • Application of chlorantraniliprole 5G or carbosulfan (yellow category) G • Use organic pesticides which are neem based or follow pesticide treatment prescribed on seed packages or follow Indian Council of Agricultural Research (ICAR) recommendations, Dimethoate 0.03% • Use resistant variety IS-2205, IS-3962, I-5469, IS-1054, s-386, SPV-102
	Stem borer	• Use organic pesticides which are neem based or follow pesticide treatment prescribed on seed packages or follow Indian Council of Agricultural Research (ICAR) recommendations. • egg parasite Trichogramma is effective. • Apply Quinalphos 5% G 6000 @ g/acre.
	Aphids	• Neem seed kernel suspension 0.04%+soap. • Usually natural enemies such as lady beetles, Chrysopa, hover fly larvae, parasitic wasps and others will control aphid infestations.
	Grain/Ear-head Midge	• Late sowing has less incidence • Spray Neem seed kernel extract 5% or Azadirachtin • Predator Anthocordbug,Orius,Ant(Tepino-maindicum) • Use organic pesticides which are neem based or follow pesticide treatment prescribed on seed packages or follow Indian Council of Agricultural Research (ICAR) recommendations. • Malathion 50% EC @ 400ml in 200-400 l of water/acre.
	Sorghum grain mould / charcoal rot/ ergot/ smuts	• Follow common cultural, mechanical and biological practices. • Plant varieties with good stalk strength. • Plant in fertile soil.
Pigeon pea	Pod borer Blister beetle Mealybug Plume moth	• Installation of bird perches @ 50/ha for rigorous feeding of insects. • Use H. armigera pheromone trap @ 12/ha.; • Hand collection and destruction of fully grown larvae. Mechanical collection of grown up larva and blister beetle is effective. • Practice crop rotation, planting non-leguminous crops every cropping season breaks the life cycle of bean pod borers • In presence of eggs and small larvae spray HaNPV@500 ml / ha with one tea spoon of liquid blue (neel) and sticking agents OR NSE 5%. • Spray Spinosad 45 SC @ 2.5 ml /10 lit of water OR Chlorantraniliprole 20

Crop	Major insect pest/diseases	IPM strategy
		SC @ 3 ml/10 lit of water when all stages of Helicoverpa armigera are found.
	Fusarium wilt Phytophthora Blight Powdery mildew Cercospora leaf spot Sterility Mosaic	• Long crop rotations for 3-4 year with non-host crop like tobacco, sorghum, pearl millet, cotton is recommended and has been found very effective for wilt and sterility mosaic disease management. • Selection of disease-free fields, soil solarization or summer ploughing and wide row interspacing are good agricultural cultural practices advocated for disease management. • Mixed cropping with sorghum, amendment of soil with oil cakes, appliances of trace elements such as boron, zinc and manganese and heavy dose of green leaf manure crops are remedial measures helps in checking the severity of wilt and blight diseases. • Cultivation of pigeonpea on ridges with proper drainage system and avoiding the sowing in heavy soil helpful in disease management. • Soil amendment with Trichoderma @ 1.0 kg + 100 kg FYM at the time of field preparation to reduce the incidence of wilt disease. • Treat the seeds with formulation of *Trichoderma viride* @ 4 g/kg of seed or *Pseudomonas fluorescens* @ 10 g/kg seed or Hexaconazole + Captan @ 2.5g/kg seed or Carbendazim@ 2 g/kg of seed 24 hours before sowing or for better management of diseases. • Preventive sprays of Mancozeb at 15-20 days interval starting from 15 days after germination reduces the incidences of diseases.
Soyabean	Girdle beetle Hairy caterpillar Stem fly Whiteflies Pod borer	• Use insect/disease tolerant varieties. • Use recommended seed rate (65-75 kg/ha) • N.P.K. and S should be applied as per soil health card recommendations • Seed treatment with Thiram 75% DS @ 3 g/kg seed followed by seed treatment with Bradyrhizobium japonicum and Phosphate Solubilizing Bacteria (PSB) @ 5+5 g/kg seed. • Rogue out collar rot affected seedlings. Crop should be maintained weed free initially for 4-6 weeks by resorting to timely inter-culture and hand picking. *For Girdle Beetle Management:* • Manual removal of infested plants or plant parts from below the girdles. If this practice is done two times in 15 days period from typical drying of leaf, it will substantially reduce damage by this insect. • Alternatively, spray Chlorantraniliprole 18.5 SC @ 150 ml/ha of water. Spray of these insecticides will be more effective if used within 7-10 days of girdling symptoms noticed. [water @ 500 lit/ha] *For Spodoptera Management:* • Install pheromone traps @ 10/ha containing Spodopteralitura (Sl) lure and observe for egg massesand gregarious larvae. • Do not handle Pheromonesepta with bare hands. Use clean cloth or cotton. Remove the egg masses and gregarious larvae.

Crop	Major insect pest/diseases	IPM strategy
		• Spray Spinetoram 11.7 SC @ 450 ml/ha. Same insecticide should not be repeated for second spray. *For Helicoverpa Armigera management:* • Install pheromone traps @ 10/ha containing Helicoverpa armigera (Ha) lure. • If 20-25 adult moths per trap are observed then spray HaNPV@ 100 LE/acre along with one tea spoon of indigoand sticker. • If big size larvae are noticed feeding on pods, spray Indoxacarb 15.8% EC @ 333 ml/ha.
	Foliar diseases and rust	• Plant disease-free seed. • Select resistant varieties. • Rotate crops with at least one year between soybean crops. • Use of a foliar fungicide is seldom warranted, except on high-value fields (e.g., seed production fields) or in years when weather is especially favorable for disease development • Two sprays of Hexaconazole 5% EC @ 100 ml/100 lit for the management of rust.
Gram	Pod borer/ cut worm / termites/ nematodes	• Apply well decomposed FYM or neem cake • Synchronized sowing of single recommended varieties in village/area. • Marigold plantation should be adopted as trap/indicator crop/ antagonistic crop for nematode. • Inter cropping with Linseed/ Coriander/ Mustard/ Wheat/ Sorghum (rabi) or 'sprinkle' cropof Sorghum/Sunflower as described under cultural practices. • Early planting i.e., mid-October to escape the peak activity of *H. armigera*. • Use tolerant/ resistance varieties. • Install pheromone traps at a distance of 50 m@ 5/ ha. Remove and destroy trapped moths • Install bird perches @ 50 /ha. • Monitor for the presence of eggs and small larvae. • Mechanical collection and destruction of big larvae in the early morning • Spray HaNPV@500 ml / ha with one tea spoon of liquid blue (neel) and sticking agents or NSE 5%. • Spray Chlorantraniliprole 18.5 SC@ 2.5 ml/10 litre of water
	Fusarium wilt Collar rot	• Use disease-free seed, avoid late sowing, Follow 4 years' crop rotations; • Use of organic amendments including neem and castor cake @ 1 ton/ha 10 days before sowing in infested field and their combination with seed treatment with Carbendazim @ 2 g/kg or Benomyl 3 g/kg and *Trichoderma viride* @ 4 g/kg seed
Cotton	Sucking pests (Jassids/Aphids /Thrips/	• Seed treatment with Imidacloprid 48%FS @5-9g/kg of seed. • For the eco-friendly management of Whiteflies Spray*Verticillium lacanni* @ 50 g (2X 108 CFU/g) in 10 lit of water • For sucking pests above ETL spray Acephate 50% + Imidacloprid 1.8%SP

Crop	Major insect pest/diseases	IPM strategy
		@ 20g/10 litres of water
	Pink bollworm	• Control measures for pink bollworm will be advised based on pheromone trap catch • 60 to 90 days after sowing: Spraying of Thiodicarb 75 WP 20g/10 litres of water OR Quinalphos 20 % EC 25ml/10 litres of water • 90 to 120 days after sowing: Spray Fenvalerate 20 EC 8ml/10 litres of water • 120 days after sowing: Spray Thiodicarb 75 WP 20g OR Quinalphos 20 % EC 40ml/10 litres of water
	Leaf spots and Bacterial blight	*Alternaria leaf spot* • If symptoms are seen on mid and upper portion of plant: Field sanitation and spray Mancozeb M-45 @ 25g / 10 litres of water. *Myrotheciumleaf spot* • If symptoms are seen on mid and upper portion of plant: Spray Copper Oxychloride 50 WP@2.5 g or Captan 83 @10g *For bacterial blight* • If symptoms are seen on mid and upper portion of plant: Foliar spray with Streptocycline 0.1g + Copper Oxychloride 50WP @20g/10 litres of water
	Grey Mildew	• Destruction of infected plant debris. • Foliar spray of Carbendazim 50 WP @ 10g or Wettable Sulphur 70 % WP 20g or Sulphex 80 WP 25g/10 liters of water
	Root Rot	• Soil mulching after rains. • Mixed cropping with legumes and sorghum. • Soil disinfection with 0.1% Carbendazim helps in controlling the disease. • Seed treat with Carboxin 37.5% + Thiram 37.5%DS@ 3.5g/kg seed
	Boll Rot	• Spray Carbendazim 50WP @1g and/or Streptocycline 0.1g OR copper oxychloride 50WP @ 3g OR Carbendazim 2g OR Mancozeb 75 WP @2g OR Chlorothalonil 75WP @ 2g/ litres of water.
Sweet lime	Bark Borer	• The pest is satisfactorily controlled by removing the webbing followed by plugging the holes with cotton wool soaked in kerosene oil. The holes are then sealed with mud.
	Citrus Leaf miner	• Pruning of all the affected parts during winter should be done. • Foliar spray with Imidacloprid17.8% SL @ 50 ml and use spray volume depending on size of tree & protection equipment used • Foliar spray Permethrin 25% EC @160-240 ml in 400 l of water/acre
	White fly	• Drenching the trees with sufficient solution (preferably 8-10 litres for fully-grown tree) of Acephate (0.8 ml/litre of water) controls the pest effectively
	Aphids	• Spraying the plants with Quinalphos 25 EC 2ml/lit to control the pest and Malathion (0.03%) effectively controls this pest.
	Fruit Sucking Moths	• Elimination of alternate hosts plants from the vicinity of the orchards (especially *Tinospora cardifolia*) and collection and destruction of affected fruits reduce the pest population. • Uses of poison baits have proved useful.

Crop	Major insect pest/diseases	IPM strategy
		• Bagging of fruits at small scale is effective. • Creating smoke in the orchards after sunset. • Fallen fruits should be disposed-off as they attract the moths.
	Citrus Mite	• Application of Wettable Sulphur (3.0 g/litre of water) or Quinalphos EC25 (1.5 ml/litre of water)
	Mealybug	• Regularly monitor the infestation of trees by this insect. • Prune affected shoots during winter. • Destroy ant colonies. • Collect and destroy the damaged leaves, twigs and stems • Use sticky barrier (5cm length) on trunk • Use fish oil rosin soap 25 g/lit • Spray with Dimethoate 2 ml /l or Imidacloprid 200 SL @ 4 ml/ in 400 to 600 lit water per acre depending upon size of the trees
	Canker	• Cutting of affected twigs followed by spraying of 1% Bordeaux mixture or copper fungicide
	Gummosis	• Scrapping of the affected area and spraying with Bordeaux mixture or copper oxychloride
	Powdery mildew	• Cutting of affected twigs followed by spraying of WettableSulphur 2gm/ltr, copper oxychloride 3gm/ltr of water
	Anthracnose	• Cutting of affected twigs followed by spraying of copper oxychloride 3gm/ltr of water fortnightly

Note: This IPM strategy is suggestive and will be adopted based on location specific assessment by the diagnostic team including experts from SAU / KVKs and project implementing officers.

Source& Reference:

- http://niphm.gov.in/IPMPackages.html
- Crop Pest Surveillance and Advisory Project (CROPSAP) advisories by Department of Agriculture, Govt. of Maharashtra

Annex 1: List of Pesticides that are Not Permissible in the project[2]

Section 1: List of pesticides Banned by the Government of India

A.	Pesticides Banned for manufacture, import and use .	
	1.	Aldicarb (vide S.O. 682 (E) dated 17th July 2001)
	2.	Aldrin
	3.	Benzene Hexachloride
	4.	Calcium Cyanide
	5.	Chlorbenzilate (vide S.O. 682 (E) dated 17th July 2001)
	6.	Chlordane
	7.	Chlorofenvinphos
	8.	Copper Acetoarsenite
	9.	Dibromochloropropane (DBCP) (vide S.O. 569 (E) dated 25th July 1989)
	10.	Dieldrin (vide S.O. 682 (E) dated 17th July 2001)
	11.	Endrin
	12.	Ethyl Mercury Chloride
	13.	Ethyl Parathion
	14.	Ethylene Dibromide (EDB) (vide S.O. 682 (E) dated 17th July 2001)
	15.	Heptachlor
	16.	Lindane (Gamma-HCH)
	17.	Maleic Hydrazide (vide S.O. 682 (E) dated 17th July 2001)
	18.	Menazon
	19.	Metoxuron
	20.	Nitrofen
	21.	Paraquat Dimethyl Sulphate
	22.	Pentachloro Nitrobenzene (PCNB) (vide S.O. 569 (E) dated 25th July 1989)
	23.	Pentachlorophenol
	24.	Phenyl Mercury Acetate
	25.	Sodium Methane Arsonate
	26.	Tetradifon
	27.	Toxaphene(Camphechlor) (vide S.O. 569 (E) dated 25th July 1989)
	28.	Trichloro acetic acid (TCA) (vide S.O. 682 (E) dated 17th July 2001)
B.	Pesticide formulations banned for import, manufacture and use	
	1.	Carbofuron 50% SP (vide S.O. 678 (E) dated 17th July 2001)
	2.	Methomyl 12.5% L
	3.	Methomyl 24% formulation
	4.	Phosphamidon 85% SL
C.	Pesticide / Pesticide formulations banned for use but continued to manufacture for export	
	1.	Captafol 80% Powder (vide S.O. 679 (E) dated 17th July 2001)
	2.	Nicotin Sulfate
D.	Pesticides Withdrawn (Withdrawal may become inoperative as soon as required complete data as per the guidelines is generated and submitted by the Pesticides Industry to the Government and accepted by the Registration Committee. (S.O 915(E) dated 15th Jun,2006)	

[2] Central Insecticides Board and Registration Committee http://cibrc.nic.in/#

	1.	Dalapon
	2.	Ferbam
	3.	Formothion
	4.	Nickel Chloride
	5.	Paradichlorobenzene (PDCB)
	6.	Simazine
	7.	Sirmate (S.O. 2485 (E) dated 24th September 2014)
	8.	Warfarin (vide S.O. 915 (E) dated 15th June 2006)

Section 2: List of pesticides Restricted by the Government of India

S. No.	***Name of Pesticides***	***Details of Restrictions***
1.	Aluminum Phosphide	The Pest Control Operations with Aluminum Phosphide may be undertaken only by Govt./Govt. undertakings / Govt. Organizations / pest control operators under the strict supervision of Govt. Experts or experts whose expertise is approved by the Plant Protection Advisor to Govt. of India except 1Aluminium Phosphide 15 % 12 g tablet and 2Aluminum Phosphide 6 % tablet. [RC decision circular F No. 14-11(2)-CIR-II (Vol. II) dated 21-09-1984 and G.S.R. 371(E) dated 20th may 1999]. 1Decision of 282nd RC held on 02-11-2007 and, 2Decision of 326th RC held on 15-02-2012. The production, marketing and use of Aluminum Phosphide tube packs with a capacity of 10 and 20 tablets of 3 g each of Aluminum Phosphide are banned completely. (S.O.677 (E) dated 17thJuly, 2001)
2.	Captafol	The use of Captafol as foliar spray is banned. Captafol shall be used only as seed dresser. (S.O.569 (E) dated 25thJuly, 1989) The manufacture of Captafol 80 % powder for dry seed treatment (DS) is banned for use in the country except manufacture for export. (S.O.679 (E) dated 17thJuly, 2001)
3.	Cypermethrin	Cypermethrin 3 % Smoke Generator, is to be used only through Pest Control Operators and not allowed to be used by the General Public. [Order of Hon'ble High Court of Delhi in WP(C) 10052 of 2009 dated 14-07-2009 and LPA-429/2009 dated 08-09-2009]
4.	Dazomet	The use of Dazomet is not permitted on Tea. (S.O.3006 (E) dated 31st Dec, 2008)
5.	Diazinon	Diazinon is banned for use in agriculture except for household use.(S.O.45 (E) dated 08th Jan, 2008)
6.	Dichloro Diphenyl Trichloroethane (DDT)	The use of DDT for the domestic Public Health Programme is restricted up to 10,000 Metric Tonnes per annum, except in case of any major outbreak of epidemic. M/s Hindustan Insecticides Ltd., the sole manufacturer of DDT in the country may manufacture DDT for export to other countries for use in vector control for public health purpose. The export of DDT to Parties and State non-Parties

		shall be strictly in accordance with the paragraph 2(b) article 3 of the Stockholm Convention on Persistent Organic Pollutants (POPs). (S.O.295 (E) dated 8th March, 2006) Use of DDT in agriculture is withdrawn. In very special circumstances warranting the use of DDT for plant protection work, the state or central Govt. may purchase it directly from M/s Hindustan Insecticides Ltd. to be used under expert Governmental supervision. (S.O.378 (E) dated 26thMay, 1989)
7.	Fenitrothion	The use of Fenitrothion is banned in Agriculture except for locust control in scheduled desert area and public health. (S.O.706 (E) dated 03rdMay, 2007)
8.	Fenthion	The use of Fenthion is banned in Agriculture except for locust control, household and public health. (S.O.46 (E) dated 08th Jan, 2008)
9.	Methoxy Ethyl Mercuric Chloride (MEMC)	The use of MEMC is banned completely except for seed treatment of potato and sugarcane. (S.O.681 (E) dated 17thJuly, 2001)
10.	Methyl Bromide	Methyl Bromide may be used only by Govt./Govt. undertakings/Govt. Organizations / Pest control operators under the strict supervision of Govt. Experts or Experts whose expertise is approved by the Plant Protection Advisor to Govt. of India. [G.S.R.371 (E) dated 20thMay, 1999 and earlier RC decision]
11.	Methyl Parathion	Methyl Parathion 50 % EC and 2% DP formulations are banned for use on fruits and vegetables. (S.O.680 (E) dated 17thJuly, 2001) The use of Methyl Parathion is permitted only on those crops approved by the Registration Committee where honeybees are not acting as a pollinator. (S.O.658 (E) dated 04th Sep., 1992.)
12.	Monocrotophos	Monocrotophos is banned for use on vegetables. (S.O.1482 (E) dated 10thOct, 2005)
13.	Sodium Cyanide	The use of Sodium Cyanide shall be restricted for Fumigation of Cotton bales under expert supervision approved by the Plant Protection Advisor to Govt. of India. (S.O.569(E) dated 25thJuly, 1989)

Section 3: List of pesticides classified by the World Health Organization as Class 1a-EXTREMLY HAZARDOUS and Class 1b-HIGHLY HAZARDOUS

Please refer to the document 'The WHO Recommended Classification of Pesticides by Hazard and Guidelines to Classification 2009' available online at:
http://www.who.int/ipcs/publications/pesticides_hazard_2009.pdf?ua=1.

- The Table 1 in the above document has the Class 1a-EXTREMLY HAZARDOUS pesticides.
- The Table 2 in the above document has the Class 1b-HIGHLY HAZARDOUS pesticides.
- The Table 6 in the above document has the list of OBSOLETE OR DISCONTINUED pesticides.