



## Importance of Integrated Pest Management (IPM) in Agriculture Crops

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Integrated Pest Management (IPM) means a pest management system that in the context of the associated environment and the population dynamics of the pest species utilizes all suitable techniques and methods in a compatible manner as possible and maintains the pest populations at levels below those causing economically unacceptable damage or loss (FAO, 1967). Thus, IPM is the best combination of cultural, biological and chemical measures that provides the most cost effective, environment friendly and socially acceptable method of managing diseases, insects, weeds and other pests. [An "integrated approach" is the most effective for long-term, sustainable management programs].

### IPM and its role in crop production

- IPM is an **economical, environmental and eco-friendly** approach to **manage biotic and abiotic stresses** to crop plants in terms of insects, diseases, physiological disorders, weeds and rodents that cause economic yield loss and limit the agriculture production.
- IPM aims at **reducing farmer risks** from pesticide poisoning and consumer risks from residues in food chain at community level, **low production costs and greater yield savings** at farm level, and increased biodiversity especially of productive biota and improved quality of natural resources such as soil and water quality at agricultural ecosystem level.
- IPM aims to **reduce pest populations below the economic injury level**. IPM utilizes the various methods of pest suppression in a compatible manner towards sustainable crop production.

### Why follow integrated pest management for sustainable agriculture?

There are several reasons why following Integrated Pest Management (IPM) is beneficial for agriculture and the environment. These are following:

1. **Reduced reliance on pesticides:** IPM reduces the reliance on chemical pesticides, which can be harmful to the environment and human health. Instead, IPM uses a variety of methods to control pests, including cultural practices, biological control, and use of less toxic pesticides only when necessary.
2. **Improved pest control:** IPM can improve pest control by using a combination of methods that are targeted to the specific pest and its life cycle. By reducing the use of pesticides, IPM can also reduce the risk of developing pesticide-resistant pests.
3. **Protection of beneficial organisms:** IPM takes into consideration the impact of control measures on beneficial organisms, such as natural enemies, pollinators, and soil microorganisms. By preserving these organisms, IPM helps to maintain a healthy ecosystem.

4. Reduced environmental impact: IPM can reduce the environmental impact of agriculture by minimizing pesticide use, reducing water contamination and preserving soil health. This can help to maintain a sustainable agriculture system.
5. Cost-effective: IPM can be cost-effective in the long run, as it reduces the need for frequent pesticide applications and minimizes the risk of developing pesticide-resistant pests.
6. Compliance with regulations: IPM can help growers to comply with environmental regulations related to pesticide use and reduce the risk of fines and legal penalties.
7. Promotes sound structures and healthy plants and promotes sustainable bio-based pest management alternatives.
8. Reduces the need for pesticides by using several pest management methods
9. Reduces or eliminates re-entry interval restrictions
10. Maintains or increases the cost-effectiveness of a pest management program.

In principle, Integrated Pest Management for sustainable agriculture is finding the root of the pest problems in any facility and applying corrective and preventive measures to ensure pests elimination. This is achieved by, hygienic design of the facility, cleaning practices, exclusion or controlling access, modifying habitat, behavioural changes, removing infestations physically and applying pesticides where applicable. IPM must be continuous process improved continually by monitoring activities, documentation, employee training and effective communication.

### Tools of IPM

- 1) Different methods of IPM:
  - I. Cultural control
  - II. Mechanical control
  - III. Physical control
  - IV. Biological control
  - V. Legal control
  - VI. Chemical control
- 2) Recent trends in pest control:
  - I. Pheromones
  - II. Chemo-sterilents
  - III. Freezing/ irradiation
  - IV. Genetic manipulation
  - V. Insect attractants/ repellents

**Monitoring:** Keep tracks of the pests and their potential damage. This provides knowledge about the current pests and crop situation and is helpful in selecting the best possible combinations of the pest management methods. Pest resistant varieties: Breeding for pest resistance is a continuous process. These are bred and selected when available in order to protect against key pests.

**Cultural control:** IPM encourages use of cultural practices that enhance crop health and reduce pest pressure. Practices like proper irrigation management, weed control and sanitation eliminate pest breeding sites. The unfavorable environment for pests reduce their impact on crop growth. It includes crop production practices that make crop environment less susceptible to pests. Crop rotation, cover crop, row and plant spacing, planting and harvesting dates, destruction of old crop debris are a few examples. Cultural controls are based on pest biology and development.

**Mechanical control:** These are based on the knowledge of pest behaviour. Hand picking, installation of bird perches, mulching and installation of traps are a few examples.

**Biological control:** IPM promotes use of natural enemies like beneficial insects, parasites and predators to control pests. These include augmentation and conservation of natural enemies of pests such as insect predators, parasitoids, pathogens and weed feeders. In IPM programmes, native natural enemy populations are conserved and non-native agents are released with utmost caution.

**Chemical control:** IPM focuses on targeted applications of pesticide choosing less toxic options. Pest management materials should be used and applied in a way that minimizes human risks to health and is beneficial to the goal of the application. Non-targeted pests and the environment should not be harmed. Pesticides are used to keep the pest population below economically damaging levels when the pests cannot be controlled by other means. It is applied only when the pest's damaging capacity is nearing to the threshold.

Overall, the adoption of IPM practices is essential to ensure sustainable agriculture, protect the environment, and maintain a healthy balance between pests and beneficial organisms. With careful planning, implementation and evaluation, IPM can be an effective tool for growers to manage pest populations while preserving the integrity of the ecosystem.