

# Protected Cultivation

- Although agriculture has been the backbone of India's economy since ages, yet our experience during last 50 years indicates a relationship between the agricultural practices, its growth vis-à-vis economic well-being.
- The demand for quality agricultural produce has increased over the last decade.
- This provides better opportunities for the Indian farmers to adopt protected cultivation technologies as per region and suitability of the crops.
- Protected cultivation is a process of growing crops in a controlled environment.
- This means that the temperature, humidity, light and such other factors can be regulated as per requirement of the crop.

- This assists in a healthier and a larger produce. There are various types of protected cultivation practices.

Some of the commonly used practices are —

- Forced ventilated greenhouse
- Naturally ventilated polyhouse,
- Insect proof net house,
- Shade net house,
- Plastic tunnel and mulching, raised beds,
- Trellising and Drip irrigation

- These practices can be used independently or in combination, to provide favourable environment to save plants from harsh climate and extend the duration of cultivation.
- Greenhouses are being commercially used for production of exotic (non-native) and off-season vegetables, export-quality cut flowers and also for raising quality seedlings.
- Economic returns from the high value agricultural produce can be increased substantially when grown under greenhouse conditions.
- For the crops under protected environment, the use of chemical pesticides and insecticides can be kept minimal to avoid their residues on the crop produce.
- Greenhouses are mostly used as rain shelters, particularly in high rainfall areas of India such as North-eastern states and coastal regions.

## **Advantages of Protected Cultivation**

- Protection of plants from abiotic stress (physical or by non-living organism) such as temperature, excess/deficit water, hot and cold waves, and biotic factors such as pest and disease incidences, etc.
- Efficient water use with minimum weed infestation.
- Enhancing productivity per unit area.
- Minimizing the use of pesticides in crop production.
- Promotion of high value, quality horticultural produce.
- Propagation of planting material to improve germination percentage; healthy, uniform, disease free planting material and better hardening.
- Year-round and off-season production of flower, vegetable or fruit crops.
- Production of disease-free and genetically better transplants.

At present in India, the small and medium farmers have started flower and vegetable cultivation under different types of modular protected structures depending upon their investment capacity and availability of market in their area.

Among all the protected cultivation practices, greenhouse cultivation provides maximum benefits.

- The major crops grown under protected structures include — floriculture crops like rose, gerbera, carnation, anthurium, liliun, orchids, chrysanthemum, etc., and the vegetable crops like tomato, yellow and red bell peppers (from the capsicum family), cucumber, leafy and exotic vegetables, etc.

# Limitations of Protected Cultivation

- High cost of initial infrastructure (capital cost).
- Non-availability of skilled human power and their replacement locally.
- Lack of technical knowledge of growing crops under protected structures.
- All the operations are very intensive and require constant effort.
- Requires close supervision and monitoring.
- A few pests and soil-borne pathogens are difficult to manage.
- Repair and maintenance are major hurdles.
- Requires assured marketing, since the investment of resources like time, effort and finances, is expected to be very high.

# **INTEGRATED NUTRIENT MANAGEMENT**

Integrated Nutrient Management (INM) refers to maintenance of soil fertility and plant nutrient supply to an optimum level for sustaining the desired crop productivity through optimization of the benefits from all possible sources of plant nutrients in an integrated manner.

- The aim of Integrated Nutrient Management (INM) is to integrate the use of natural and man-made soil nutrients to increase crop productivity and preserve soil productivity for future generations (FAO, 1995a).
- Rather than focusing nutrition management practices on one crop, INM aims at optimal use of nutrient sources on a cropping-system or crop-rotation basis. This encourages farmers to focus on long-term planning and make greater consideration for environmental impacts.

# Concepts of Integrated Nutrient Management

- The nutrients stored in the soil.
- The nutrients purchased from outside the farm.
- Plant nutrients present in crop residues, manures, and domestic wastes.
- Nutrient uptake by crops at harvest time.
- Plant nutrients lost from the field during crop harvest or through volatilization.

# Manures and Fertilizers in Nutrient Management

## Manures

- Contains small quantities of nutrients and large quantities of organic matter
- Formed as a result of decomposition of plant wastes and animal excreta
- Enriches soil with nutrients and organic matter thereby increasing its fertility
- Bulk organic matter improves soil structure, which increases water-retaining capacity in sandy soil, helps in drainage and water clogging in clayey soil.
- Manure contains biological wastes obtained as a result of recycling and is preferred over the use of fertilizers.

- Manure can be classified into two types based on the kind of biological material used: Compost and vermicompost.
- Composting is carried out using farm wastes. Vermicompost is prepared using earthworms.
- Green manure: Some green plants are mulched into the soil while sowing seeds, which helps enrich the soil with nitrogen and phosphorous.

# Fertilizers

- These commercially produced plant nutrients provide macronutrients to ensure good vegetative growth. They yield more crops and results in high-cost farming.
- Use of fertilizers needs to be monitored properly as excessive fertilizer gets washed away without being absorbed by the soil, resulting in water getting polluted.
- Continuous use of fertilizers causes harm to microorganisms that live in the soil. These are beneficial in carrying out agricultural processes.
- To yield optimum crop production we have to minimize the use of fertilizers and maximize the use of manure.

# Importance of Nutrient Management

- Nutrient management helps to reduce contamination to waterways by plant nutrients.
- Improve soil fertility.
- Enhance plant productivity.
- Reduce the cost of chemical fertilizers.
- Providing balanced nutrition to crops.
- Promotes carbon sequestration and prevents the deterioration of soil, water, ecology, and also leaching of nutrients from the soil.

## Advantages of the INM System

- Soil health: INM help in improvement of the soil physical properties such as granulation, porosity, water holding and drainage capacity, aeration etc. It also leads to improvement in the organic matter content in the soil making soil healthy.
- Better yield: Balanced nutrition to the crops and better nutritional uptake lead to better plant growth and yield.
- Environmental benefits: INM minimizes the deterioration of soil, water and ecosystem by promoting carbon sequestration, reducing nutrient losses to ground and surface water bodies and to atmosphere.

- Fruitful utilization of farm wastes: INM promotes utilisation of farm wastes as a manure and a source of nutrients to crops.
- Cost reduction: Some organic sources are cheaply available hence they help in reducing the production cost.
- Judicious use: Overuse of chemical fertilisers is a big issue in Indian agriculture. INM encouragement of the judicious use of chemical fertilizers.

## Constraints in the Adoption of the INM System

**Lack of knowledge:** Farmers often have inadequate knowledge on use of fertilizers in balanced proportion.

**Funding:** Farmers lack access to credit especially in rural areas. They have insufficient funds to buy manure, fertilizer that are important for INM.

**Land degradation:** Degradation of lands due to intensive cropping and over-exploitation by the enormous pressure of the ever-increasing population is a big constraint to INM.

**Monsoon vagaries:** Indian agriculture is dependent on monsoon. Risk of water deficit during drought prone periods is considered the most important deterrent to fertilizer use.

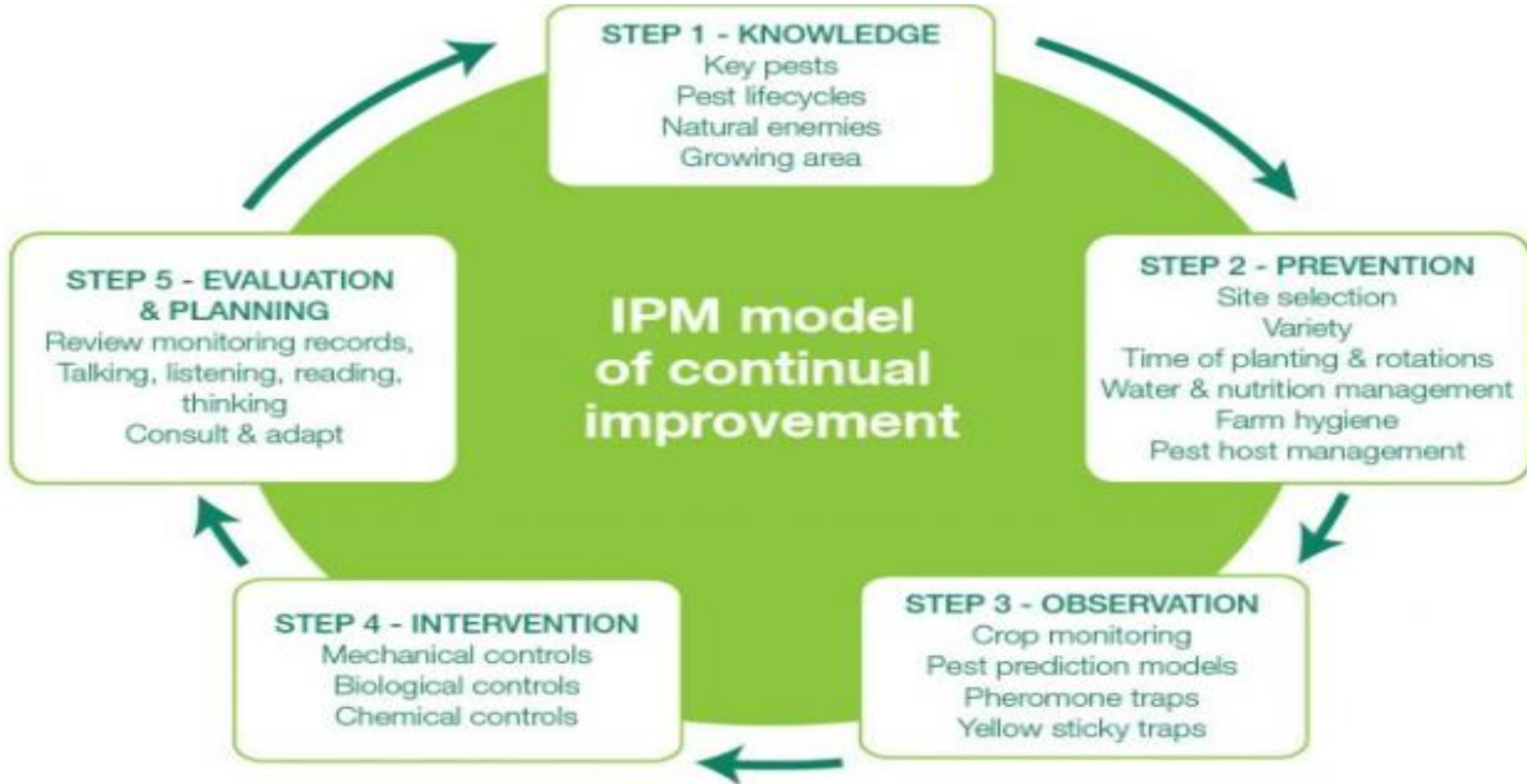
During monsoon, water erosion is a serious threat on soil fertility and productivity.

- Limitation of small holdings: Land is fragmented in India and most of the farmers hold small holdings. This prevents the application of INM at commercial level.
- Limitation of biofertilizer: There are several constraints to effectively utilize and popularize the use of biofertilizer e.g. use of the biofertilizer is crop and location specific, low shelf life of the microorganisms, need for careful handling etc. Moreover, poor-quality bio-fertilizers that reach the farmers are ineffective and their marketing becomes difficult because the products contain living or latent organisms.

# Integrated Pest Management

- The concept of 'pest management' was proposed in 1961 (Geier and Clark, 1961)
- - In 1967 the term **IPM** was introduced by **R.F. Smith** and **R.vanden Bosch**.
- Integrated pest management (IPM) combines the use of biological, cultural and chemical practices to control insect pests in agricultural production.
- It seeks to use natural predators or parasites to control pests, using selective pesticides for backup only when pests are unable to be controlled by natural means.
- IPM should not be confused with organic practices.
- It does not discourage spraying chemicals; it promotes spraying with selective pesticides only when the crop needs it, which generally means that less pesticide is used.

# Steps for implementing and evaluating IPM practices



# Advantages of IPM

- Long -term answers to pest problems
- Protecting environmental and human health by reducing pesticide use
- Reducing harm to beneficial organisms
- Preventing creation of pesticide resistant pests
- Providing a way to manage pests when pesticides cannot be used