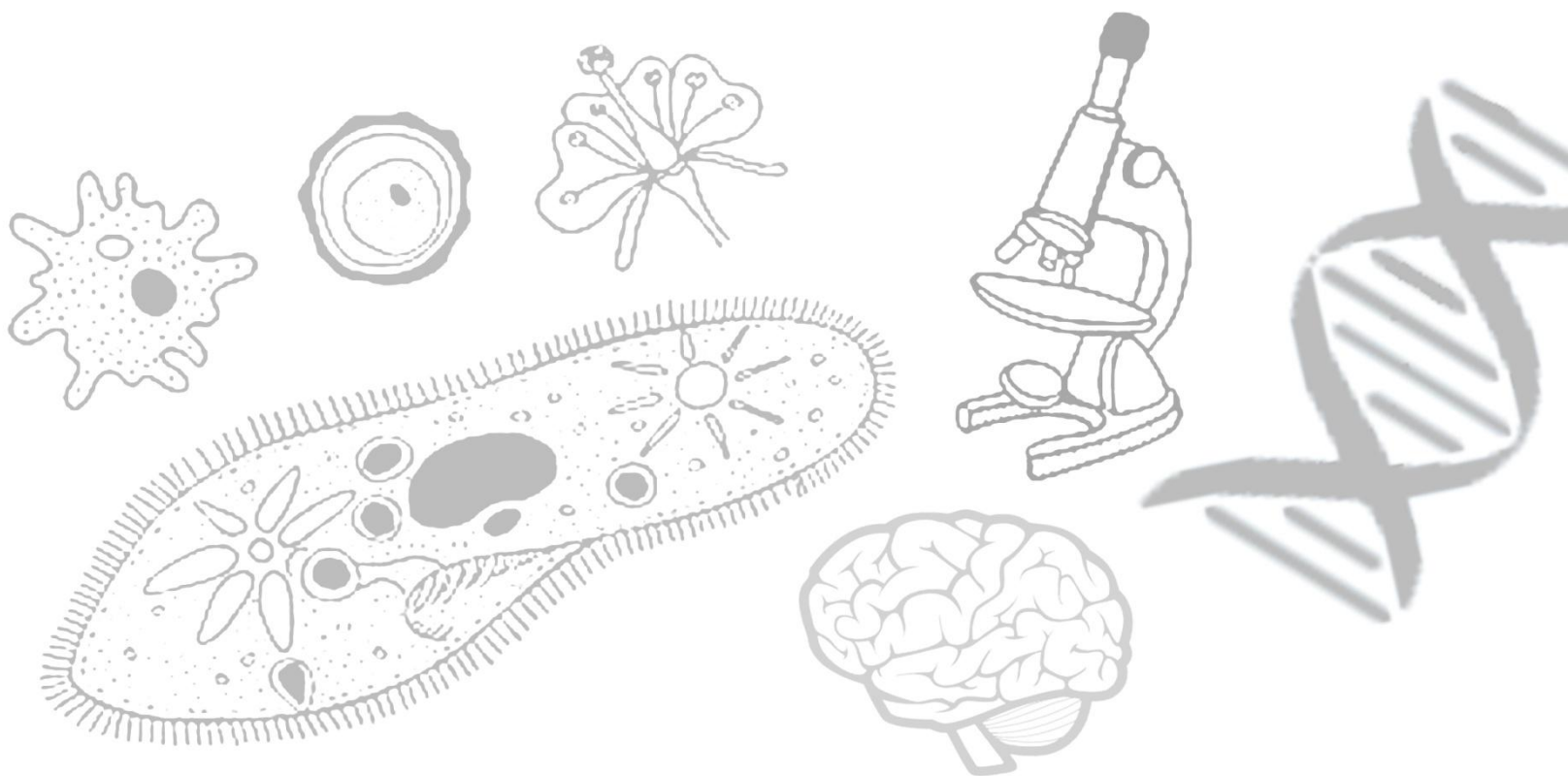
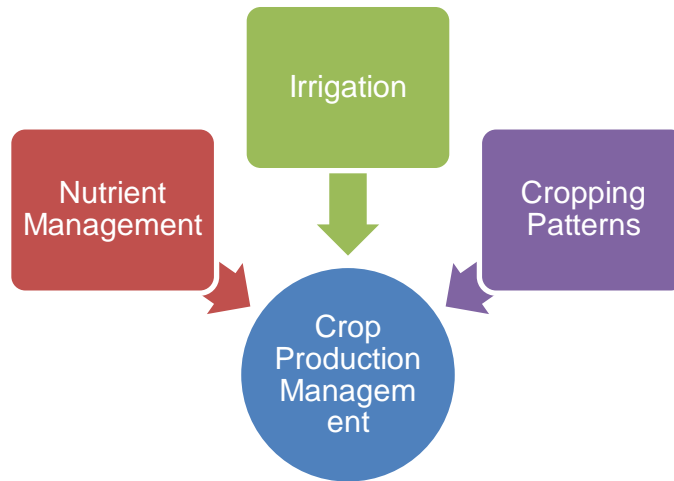


# BIOLOGY



## Crop Production Management

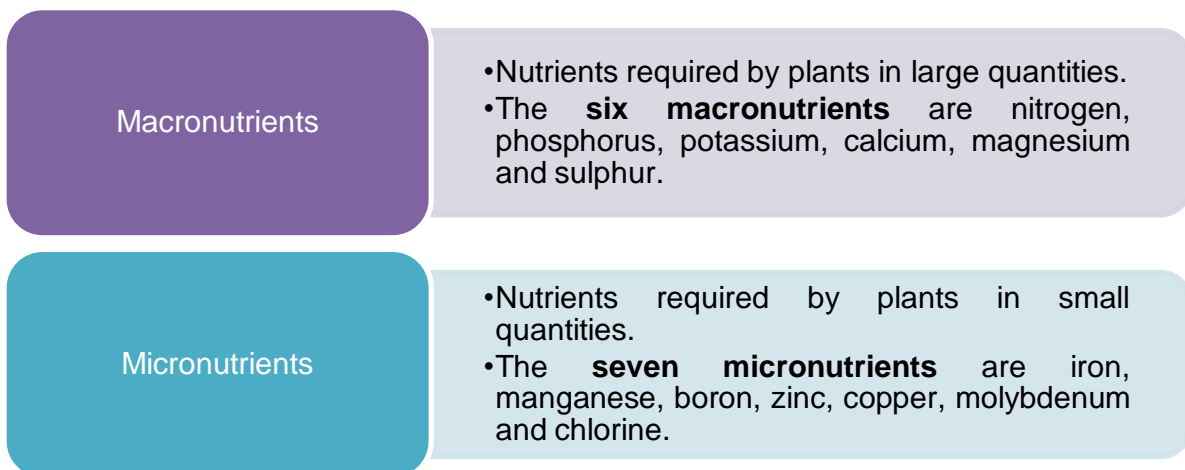
- India has a large area under cultivation.
- The production practices in India depend on land size, access to information and financial conditions of farmers.
- Crop production management refers to controlling different aspects of crop production to obtain maximum and best yield.



## Nutrient Management

- Plants require 16 different nutrients which are obtained by air, water and soil.

Air	Carbon, oxygen
Water	Hydrogen, oxygen
Soil	Nitrogen, phosphorus, potassium, calcium, magnesium, sulphur, iron, manganese, boron, zinc, copper, molybdenum, chlorine



- Deficiency of these nutrients retards the growth of plants.
- The soil is replenished by these nutrients by adding manures and fertilisers.

## Manures and Fertilisers

Manure	
<ul style="list-style-type: none"> <li>• It is a natural substance obtained by the decomposition of dead and decaying vegetable matter, waste from farms, household waste and excreta of animals.</li> <li>• Contains large quantities of organic compounds.</li> <li>• Contains small quantities of nutrients.</li> <li>• It is cheap and can be prepared in home or fields.</li> </ul>	
<b>Compost (Vermicompost)</b>	<ul style="list-style-type: none"> <li>• It is formed by the decomposition of vegetable and animal wastes, domestic waste and eradicated weeds.</li> <li>• The waste matter is decomposed in pits. This process is called composting.</li> <li>• Sometimes, organic substances are decomposed by earthworms and are converted into humus. This is called vermicompost.</li> </ul>
<b>Green Manure</b>	<ul style="list-style-type: none"> <li>• Farmers grow leguminous plants (e.g. groundnuts, soya beans, pulses) in between two crops.</li> <li>• Leguminous plants help to replenish the nitrogen content in the soil.</li> <li>• Sometimes, before sowing seeds, plants such as sun hemp or guar are grown and mulched by ploughing them into the soil.</li> </ul>
<b>Advantages of Manures</b>	
<ul style="list-style-type: none"> <li>• Increase the water-holding capacity of the soil.</li> <li>• Make the soil porous which facilitates the exchange of gases.</li> <li>• Improve the texture of the soil.</li> <li>• Replenish the general deficiency of nutrients.</li> </ul>	
<b>Disadvantages of Manures</b>	
<ul style="list-style-type: none"> <li>• It is not nutrient-specific, thus it removes general deficiency of the soil.</li> <li>• It is inconvenient to transport or store the manure.</li> <li>• Nutrients are released into the soil slowly. Thus, they are unable to suffice the urgent demand of nutrients by plants.</li> </ul>	
Fertilisers	
<ul style="list-style-type: none"> <li>• Fertilisers are human-made substances.</li> <li>• They contain inorganic salts or organic compounds.</li> <li>• They are used to fertilise a larger area at a time.</li> <li>• Fertilisers are nutrient-specific so that they can fulfil the specific requirement of nutrients.</li> <li>• They are soluble in water; thus, they are readily absorbed by plants.</li> <li>• They are easy to store, transport and apply to crops.</li> <li>• Fertilisers are costly and prepared in factories.</li> <li>• Overuse of artificial fertilisers may reduce the fertility of soil. The soil may become infertile over a period of time.</li> </ul>	

### Organic Farming

- Organic farming is the kind of farming in which crops are grown without using chemical fertilisers and pesticides.
- There is a maximum input of organic manure or recycled farm wastes.
- Different cropping systems such as mixed cropping, inter-cropping and crop rotation are used to maintain the composition of nutrients in the soil.
- Bio-agents such as blue-green algae are used in the preparation of biofertilisers.
- Neem leaves or turmeric is used as pesticides in grain storage.
- Food grown by organic farming is called **organic food**.
- In recent years, organic farming has increased. This is because of the increased awareness in people about the safety related to the environment and food.

### Irrigation

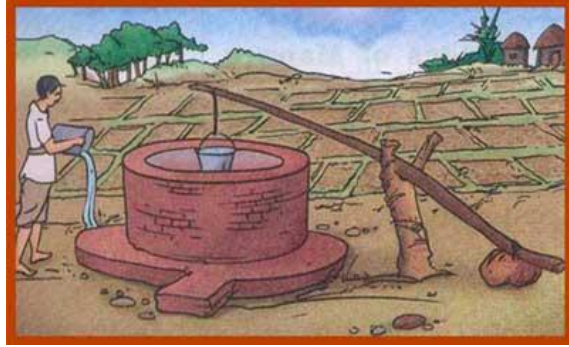
- In most parts of India, the success of crop yield depends on monsoons and sufficient rainfall during the growing season. Hence, a poor monsoon causes crop failure.
- It is the artificial method of supplying water to crops in a field.
- Different kinds of irrigation systems are adopted depending on the kinds of water resources available.

1. Wells	<ul style="list-style-type: none"> <li>• The two types of wells are dug well and tube well.</li> <li>• In a dug well, water is collected from water-bearing strata.</li> <li>• Tube wells trap water present in deeper strata.</li> <li>• Water is lifted from wells by using a pump.</li> </ul>
2. Canals	<ul style="list-style-type: none"> <li>• Canals receive water from water reservoirs especially from rivers.</li> <li>• The main canal is divided into several branches which irrigate the field.</li> </ul>
3. River Lift System	<ul style="list-style-type: none"> <li>• This type of irrigation is used in areas where canal flow is insufficient.</li> <li>• Water is directly drawn from the rivers to provide irrigation for fields which are close to rivers.</li> </ul>
4. Tanks	<ul style="list-style-type: none"> <li>• They are small storage reservoirs.</li> <li>• Tanks store runoff water in smaller catchment areas.</li> </ul>
5. Rain water harvesting and watershed management are also used. Check dams are built to increase groundwater levels.	

**Traditional Methods of Irrigation**

**Moat**

Water is directly taken out of the wells and used to irrigate fields.



**Rahat**

Water is drawn out by using the single wheel moved by animals.



**Canals**



**Tube wells**



**Rain water harvest reservoirs**



**Modern Methods of Irrigation**

**Basin Irrigation**

- It is a kind of surface irrigation.
- The land is surrounded with embankments in the form of a basin.
- Basins are flooded with water.
- It is used for crops which require large amounts of water for growth.



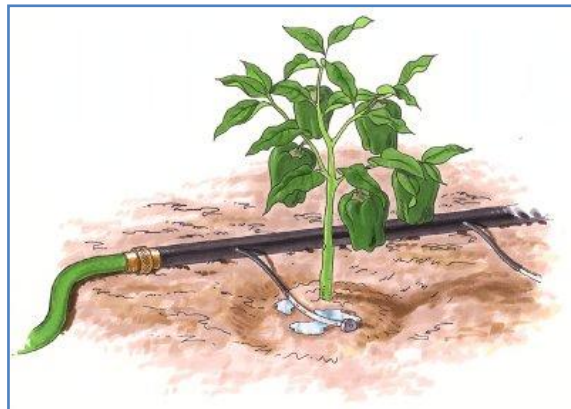
**Furrow Irrigation**

- It is a kind of surface irrigation.
- Small channels or furrows are created along the field length between crop rows.
- It used for crops which do not require much water.



**Drip Irrigation**

- Water is supplied through pipes with drippers.
- Pipes are placed in rows between the plants, close to the roots.
- Water is saved.
- It is the best method in water scarce regions.
- It is used for fruit orchards, gardens and trees.



**Sprinkle Irrigation**

- Spray guns are attached to a large hosepipe at regular intervals to spray water.
- It is suitable for all types of crops.



***Advantages of Irrigation***

Provides moisture to germinating seeds.

Facilitates the absorption of nutrients by minerals.

***Disadvantages of Irrigation***

Excess of water in the soil leads to water logging.

Sometimes, it inhibits the process of germination.

Roots do not grow properly in a standing water field.

Excess irrigation destroys standing crops.

It increases the amount of salt on the surface soil as water gets evaporated.



## Cropping Patterns



Mixed Cropping

- Growing two or more crops simultaneously on the same piece of land.
- Minimises the risk of crop failure.
- Seeds of two crops are mixed before sowing.
- Pest control of individual crop is difficult.
- Separate harvesting and threshing of individual crops is not possible.
- Crops yield can be increased.
- Wheat + Gram
- Wheat + Mustard
- Groundnut + Sunflower



Inter-cropping

- Growing two or more crops simultaneously in the same field in a definite pattern.
- increases the productivity per unit area.
- Pesticides can be easily applied to individual crop.
- Both crops can be easily harvested and threshed.
- Soil erosion is reduced.
- Allows better use of natural resources such as light, soil air and water.
- Soyabean + Maize
- Finger millet (Bajra) + Cowpea (lobia)



Crop Rotation

- Growing of different crops on the same land in pre-planned succession.
- Allows soil to recover its lost nutrients.
- Helps to control pests, weeds and diseases.
- Helps to reduce the use of chemical fertilisers.
- Maize-Mustard
- Rice-Wheat
- Maize-Mustard-Sugarcane-Fenugreek
- Maize-Potato-Sugarcane-Peas

## Crop Protection Management

### 1. Weeding

- Wild and undesirable plants which grow in crop fields and compete with the crops for space, soil, nutrients, water and sunlight are called **weeds**.
- Some examples of weeds are Xanthium (gokhroo), Parthenium (gaja ghas) and *Cyperinus rotundus* (motha).



**Xanthium**



**Parthenium**



***Cyperinus rotundus***

- Weeding is the process of removal of weeds.
- Weeds are removed by various methods:

- |  |
|--|
| • Weeds can be pulled out by hand.   |
| • A trowel or small arrow can be used to remove weeds.                                   |
| • Chemicals generally called weedicides can be used to kill weeds. Examples: 2,4-D, MCPA |
| • Releasing certain insects which destroy weeds. Example: Cochineal insect               |

### *Disadvantages of Weeds*

- |  |
|--|
| • Compete with crops for all the possible resources. |
| • Can be responsible for spreading diseases.         |
| • Provide hideouts for rats and snakes.              |

**2. Pest Control**

- Almost all crops are affected by insects, mites, small animals, birds and rats. Such harmful organisms are called **pests**.
- Pests reduce crop production.
- Some pests are

<b>Worms and insects</b>	Aphids, larvae of weevil, earworms, bollworms, borers, mites
<b>Locusts</b>	Grasshopper
<b>Microorganisms</b>	Bacteria, fungi, virus

**Common diseases related to pests**

Late blight of potato
Rust and smut of wheat
Blast of rice
Root rot
Canker
Gall or tumour
Mildew

**Ways to Control Pests**

<b>Chemical Control</b>	<ul style="list-style-type: none"> <li>• Chemicals which control pests such as insects and mites are called pesticides.</li> <li>• Pesticides used to kill insects are called insecticides.</li> <li>• They may be stomach poisons. Examples: Lead arsenate, sodium arsenate</li> <li>• They may be contact poisons. Examples: DDT (dichloro-diphenyl trichloro ethane), BHC (benzene hexachloride)</li> <li>• Bordeaux mixture can be spread on plants to kill fungal diseases.</li> <li>• Bordeaux mixture is a mixture of copper sulphate and lime dissolved separately in water and then mixed together in equal proportions.</li> <li>• A natural insecticide extracted from neem is useful in controlling pests without any harm to crops and soil.</li> </ul>
<b>Biological Control</b>	<ul style="list-style-type: none"> <li>• Animals which control pests are reared and released in the farm.</li> <li>• Adults and larvae of ladybird beetles feed on aphids and their eggs.</li> <li>• Syrphid fly larvae feed on aphids.</li> <li>• Ground beetle larvae feed on caterpillars of gypsy moth.</li> <li>• Adult ground beetles feed on the pupae of gypsy moth.</li> </ul>

**Disadvantages of Pesticides**

- Destroy friendly insects along with pests.
- Causes environmental pollution.
- Affects nutritional quality of crops.
- Animals eating such crops also get affected.

## Storage of Grain

- Harvested crops are stored until they are sold in the market.

- |   |
|---|
| <ul style="list-style-type: none"><li>• Harvested grains contain a lot of moisture in them. Hence, grains are first dried.</li></ul>  |
| <ul style="list-style-type: none"><li>• Dried grains are stored in granaries. Granaries are large metal or earthen pots.</li></ul>  |
| <ul style="list-style-type: none"><li>• Grains are also stored in gunny bags.</li></ul>   |
| <ul style="list-style-type: none"><li>• Government stores grains in large containers or storage towers called silos.</li></ul>  |
| <ul style="list-style-type: none"><li>• Buffer stocks are stored in godowns to meet emergency needs such as natural calamities.</li></ul>   |
| <ul style="list-style-type: none"><li>• Precautions to be taken while storing grains</li></ul>  |
| <ul style="list-style-type: none"><li>○ Grains must be dried thoroughly; otherwise, there are chances of rotting.</li><li>○ Need to be stored in a room free from moisture.</li><li>○ Tin boxes should be preferred as they are mice-proof.</li><li>○ In godowns, chemicals used to prevent rats and insects must be used carefully in such a way that grains are not contaminated.</li><li>○ Old gunny bags should be sun-dried.</li><li>○ Storage places should be well-ventilated.</li><li>○ During transportation of grains, gunny bags must be covered properly so that no wastage occurs.</li></ul> |