

BIOLOGY

Improvement in Food Resources

- Plants and animals are major food sources.
- We obtain food from agriculture and animal husbandry.
- Keeping in mind the population of India, it is necessary to increase India's production efficiency of crops and livestock.
- **Sustainable management** can be defined as the adoption of various farming and production management techniques to maximise yield in agriculture and animal husbandry.
- **Agriculture** is the art and science of cultivating soil, producing crops, rearing animals for food and useful products.

Improvement in Crop Yields

Plants which are grown by man on a large scale to obtain food, clothing and other useful products are called **crops**.

Crops	Nutrients we get from crops
Cereals (wheat, maize, millet, sorghum)	Carbohydrates
Pulses (gram, pea, black gram, green gram, pigeon pea, lentil)	Proteins
Oil seeds (ground nut, soya bean, mustard, sesame castor, sunflower, linseed)	Fats
Vegetables and fruits	Vitamins and minerals

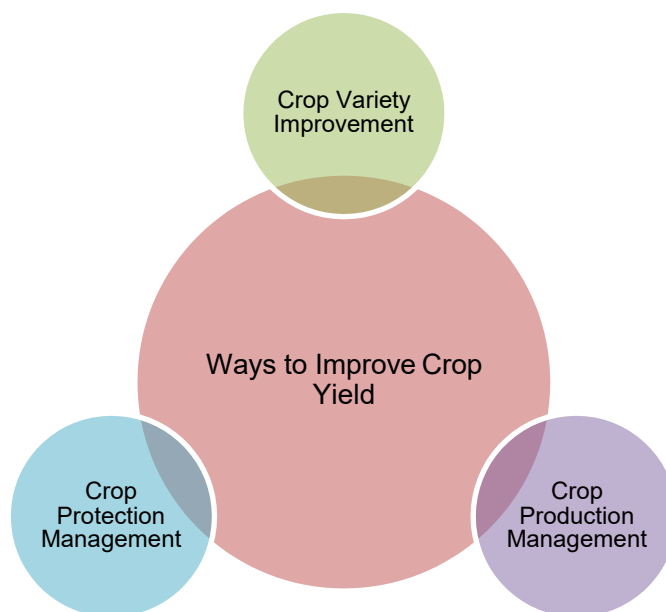
Based on the season of cultivation, crops are divided into two categories:

Kharif Crops

- They are grown in monsoon (June) and cultivated in autumn (October).
- Grown in hot and wet conditions.
- Examples: Rice, maize, tobacco, potato, onion, soyabean, millets (jowar and bajra), sugarcane, cotton, groundnut, pulses, pigeon pea

Rabi Crops

- They are grown in November and are harvested in April.
- Grown in cold and nearly dry conditions.
- Examples: Wheat, mustard, pea, barley, gram, linseed



Crop Variety Improvement

- It is the technique or the skill of selection of the best varieties of crops for various desirable characters and incorporating those characters into the crops of the next generation.

1. Hybridisation

It is the technique of crossing between two genetically dissimilar plants to produce a plant of a new variety. The variety produced by using this technique is called a **hybrid**.

Two ways of cross-breeding during hybridisation are

Inter-varietal cross-breeding

- A cross between two different varieties of crops

Inter-specific cross-breeding

- A cross between two different species of the same genus

The new varieties of crops obtained by hybridisation are called high-yielding varieties or **HYV seeds**. Production of HYV seeds has led to an increase in agricultural production, considerably reduced food shortage and generated more income in the agricultural sector. This is known as the Green Revolution.

Examples of hybrid varieties are

Wheat	Hira-moti, Kalyan sona, Sonora-64
Rice	Padma, Jaya, IR-8, Pusa-205, Basmati

2. Genetically Modified Crops

- A gene responsible for desirable characters is transferred from one crop variety to another crop variety. The crop into which the gene is introduced to obtain the desired result is called a genetically modified crop (GMO) or transgenic plant.
- Example: BT cotton

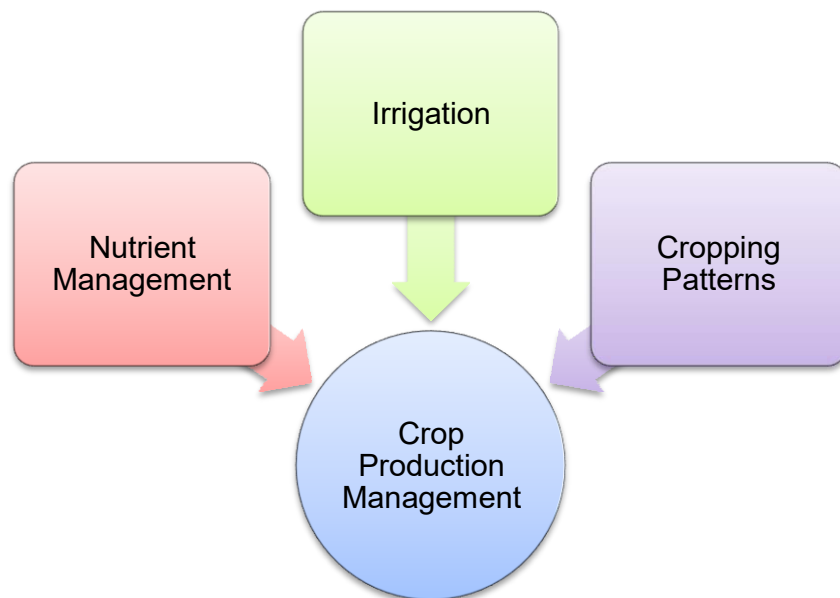
- ❖ American Scientist Norman Borlaug is known as the Father of the Green Revolution.
- ❖ M. S. Swaminathan, an Indian agricultural scientist, is known as the Father of the Green Revolution in India.

Need for Higher Crop Yield

- **Higher Yield** - Improves the commercial production of crops
- **Improved Quality** - Improvement in the quality of crops
- **Biotic and Abiotic Resistance** - Crop varieties resistant to diseases, pests, nematodes, floods, droughts
- **Change in Maturity Duration** - The shorter the duration of crop from sowing to harvesting, the more economical will be the variety of the crop
- **Wider Adaptability** - It ensures more sustenance under various environmental conditions
- **Desirable Agronomic Characteristics** - Developing crops with desired agronomic characters gives higher productivity

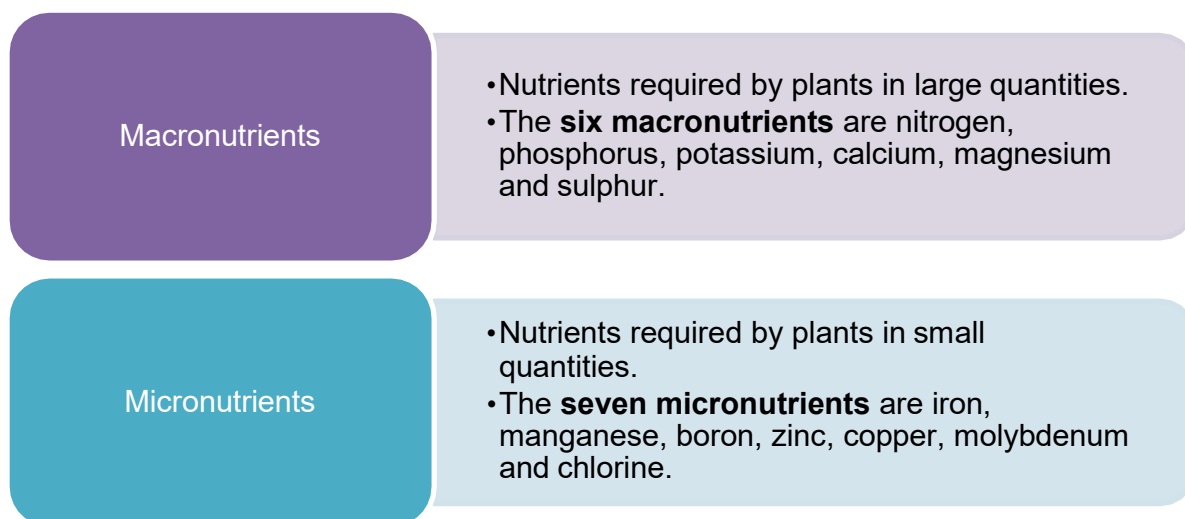
Crop Production Management

- Crop production management refers to controlling different aspects of crop production to obtain the maximum and best yield.



1. Nutrient Management

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



- Deficiency of these nutrients retards the growth of plants.

Manures and Fertilisers

- It is a natural substance obtained by the decomposition of dead and decaying vegetable matter, waste from farms, household waste and excreta of animals.

Compost (Vermicompost)	Green Manure
<ul style="list-style-type: none"> It is formed by the decomposition of vegetable and animal wastes, domestic waste and eradicated weeds. 	<ul style="list-style-type: none"> Farmers grow leguminous plants (e.g. groundnuts, soya beans, pulses) in between two crops.
<ul style="list-style-type: none"> The waste matter is decomposed in pits. This process is called composting. 	<ul style="list-style-type: none"> Leguminous plants help to replenish the nitrogen content in the soil.
<ul style="list-style-type: none"> Sometimes, organic substances are decomposed by earthworms and are converted into humus. This is called vermicompost. 	<ul style="list-style-type: none"> Sometimes, before sowing seeds, plants such as sun hemp or guar are grown and mulched by ploughing them into the soil.

Advantages of Manures:

- Increase the water-holding capacity of the soil
- Make the soil porous which facilitates the exchange of gases
- Improve the texture of the soil
- Replenish the general deficiency of nutrients

Fertilisers:

- Fertilisers are human-made substances.
- They contain inorganic salts or organic compounds.
- Fertilisers are nutrient-specific so that they can fulfil the specific requirement of nutrients.
- Fertilisers are costly and prepared in factories.
- Overuse of artificial fertilisers may reduce the fertility of soil. The soil may become infertile over a period of time.

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.
- Bio-agents such as blue-green algae are used in the preparation of biofertilisers.
- Neem leaves and turmeric are 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.

2. 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.
- **Irrigation** is the artificial method of supplying water to crops in a field.
- Different kinds of irrigation systems such as wells, canals, river lift system and tanks are adopted depending on the kinds of water resources available.
- Rainwater harvesting and watershed management are also used. Check dams are built to increase groundwater levels.

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

3. Cropping Patterns

Mixed Cropping	Inter-cropping	Crop Rotation
<ul style="list-style-type: none"> • Growing two or more crops simultaneously on the same piece of land • Minimises the risk of crop failure • Wheat + Gram • Wheat + Mustard • Groundnut + Sunflower 	<ul style="list-style-type: none"> • Growing two or more crops simultaneously in the same field in a definite pattern • Increases the productivity per unit area • Soyabean + Maize • Finger millet (Bajra) + Cowpea (lobia) 	<ul style="list-style-type: none"> • Growing of different crops on the same land in pre-planned succession • Allows soil to recover its lost nutrients • Maize-Mustard-Sugarcane-Fenugreek • Maize-Potato-Sugarcane-Pea

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* (gajar ghas) and *Cyperinus rotundus* (motha).
- 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 by cutting roots, sucking cell sap or damaging stems and fruits.
- Some pests are aphids, grasshoppers and borers.
- **Common diseases related to pests:** Late blight of potato, root rot, rust and smut of wheat, gall or tumour
- Pests can be controlled by spraying pesticides and insecticides such as Bordeaux mixture and BHC.
- Animals which control pests are reared and released in the farm.
- Example: Adults and larvae of ladybird beetles feed on aphids and their eggs.

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.

Sometimes, rodents, fungi, mites, bacteria and even moisture and temperature changes damage stored grains. To avoid this, special precautions are taken while storing grains.

- | |
|---|
| • Harvested grains contain a lot of moisture in them. Hence, grains are first dried. |
| • Dried grains are stored in granaries. |
| • Grains are also stored in gunny bags. |
| • The Government stores grains in large containers or storage towers called silos. |
| • Buffer stocks are stored in godowns to meet emergency needs such as natural calamities. |
| • Precautions to be taken while storing grains: |
| ○ Need to be stored in a room free from moisture. |
| ○ Tin boxes are preferred as they are mice-proof. |
| ○ In godowns, chemicals used to prevent rats and insects must be used carefully in such a way that grains are not contaminated. |
| ○ Storage places should be well-ventilated. |

Animal Husbandry

1. Cattle Farming

- The breeding of wild animals for specific purposes is called domestication, and such animals are called domestic animals.
- Animal husbandry is the branch of biology which deals with feeding, shelter, caring and breeding of domesticated animals.

DID YOU
KNOW



Dog was the first domesticated animal. It was domesticated to help in hunting and guarding.

- Animals domesticated for companionship at home are called pets.
- Animals domesticated to obtain food and other valuable products are called livestock.
- There are three types of animals:

Draught Breeds	<ul style="list-style-type: none">• They are primarily used for drawing bullock carts, ploughing land and transport of materials.• The milk yield is very low.• The meat is tough.
Dairy Breeds	<ul style="list-style-type: none">• They are high-milk yielders.• Their males are poor draughts.
Dual Purpose Breeds	<ul style="list-style-type: none">• They are good milk yielders.• The males are good for draught purposes.• Examples: Haryana, Dangi, Tharparkar

Cattle and Buffaloes

- There are 30 different breeds of cows in India.
- Examples of exotic or foreign breeds: Jersey, Holstein-Friesian, Brown Swiss
- Examples of indigenous breeds: Red Sindhi, Sahiwal, Gir

Shelter and Feeding

Shelter	
	• It must be well-lit and well-ventilated.
	• Cattle sheds must be properly covered to protect cattle from rain, heat and cold.
	• The floor should be sloping so that cleaning and keeping the place dry is easy.
	• The shelter must be spacious so that each animal is comfortable and overcrowding is avoided.
	• There should be an arrangement for fresh, clean drinking water.
	• A proper arrangement for the disposal of the animal's urine and excreta must be made.
	• Shelters should be located away from residential areas and waste disposal sites.

Feeding	
The animal food which contains essential components needed for the growth, development and general maintenance of the body is called feed.	
a) Roughage	<ul style="list-style-type: none"> • Roughage is a coarse, fibrous substance with low nutrient contents. • Animals get their roughage from substances in their feed such as hay, green fodder, silage, berseem, lucerne and cowpea.
b) Concentrates	<ul style="list-style-type: none"> • They are rich in carbohydrates, proteins, fats, minerals and vitamins.
	<ul style="list-style-type: none"> ▪ Grains and seeds of bajra, maize, rice, jowar and barley which are rich in carbohydrates. ▪ Oil cakes formed from cotton, mustard and groundnut. ▪ Rice bran, gram chaff, wheat bran and molasses.

Diseases in Cattle

Type of Disease	Name of Disease	Symptoms
Viral Disease	Foot and mouth disease	Blisters on feet and mouth Excessive salivation Reduced appetite Soreness of mouth Fever
	Cow pox	High fever Appearance of small nodules over the body
Bacterial Disease	Anthrax	High fever Swelling on the body, especially neck
	Rinderpest (cattle plague)	High fever Excessive salivation Redness of eyes Loss of appetite
	Salmonellosis	Diarrhoea with blood clot
Mad cow disease is a degenerative disease which affects the central nervous system.		

Symptoms of sick cattle**Cattle**

- Stop feeding
- Become inactive and dull
- Have drooping ears and lips
- Pass loose dung and coloured urine
- Produce less milk

2. Poultry

- **Poultry** is the raising of chickens, ducks, turkeys and geese for meat and eggs.
- The egg-laying chickens are called **egggers** or **layers**.
- Rhode Island leghorns and white leghorns are good layers.
- The chickens reared for obtaining meat are called **broilers**.
- The following breeds are found in Indian poultry:
 - Indigenous breed: Aseel
 - Exotic breeds: White Leghorn, Rhode Island Red

New varieties of fowls are developed for the following desirable traits:

Number and quality of chicks

Developing dwarf broiler parent for commercial chick production

Tolerance to high temperature

Small-sized egg-laying bird to use diets formed by using agriculture by-products

Low-maintenance requirements

Poultry Care

• Chickens are raised in wire cages.
• Birds should not be kept open or overcrowded.
• Feeding trays and egg trays are kept in front of the cage.
• The place should be well-ventilated.
• Clean drinking water must be provided.
• Droppings fall on the ground, so it must be cleaned at intervals.
• Bird dropping from poultry farms is an excellent source of nitrogen for plants.
• Egg production is related to day-length; artificial lighting is done to increase the day length in winter.
• The feed of poultry birds contains maize, soy, rice bran, cereals and groundnut cakes.
• For broilers, a thick layer of sawdust is provided in the sheds to absorb droppings.
• Feed and water are kept at regular intervals for easy access to all birds.
• After raising one batch, sawdust is cleared, the area is sterilised and again fresh sawdust is spread to raise another batch.

Poultry Diseases

Viral diseases	Fowl pox, Ranikhet
Bacterial diseases	Fowl cholera, salmonellosis, diarrhoea of chick, coryza
Fungal diseases	Aspergillosis

Timely vaccinations prevent chickens from these diseases.

3. Pisciculture (Fish Production)**Marine Fishery**

- India has a coastline of 7500 km and deep seas.
- Fish are caught by using fishing nets and other gear.
- Echosounders and satellites are used to locate a large population of fish under the sea.
- Some of the popular marine fish varieties are Pomfret, Bombay duck, mackerel, snapper and mullet.
- Fish reared in pisciculture are Catla, Mrigal, Tilapia and Singhi.
- Marine fish reared in pisciculture are Pomfret, Bombay duck, snapper and mackerel.

Inland Fisheries

- Fish reservoirs such as canals, ponds, rivers, estuaries and lagoons are used for fisheries.
- The fish yield is not so high.
- Fishing is also done in paddy fields.
- In this system, local and imported species of fish, usually 5–6, are used in a single pond.
- This is done to avoid any competition for food and space.
- Some of the fish cultured by using inland fishery techniques are Rohu, Catla, Mrigal and Tilapia.

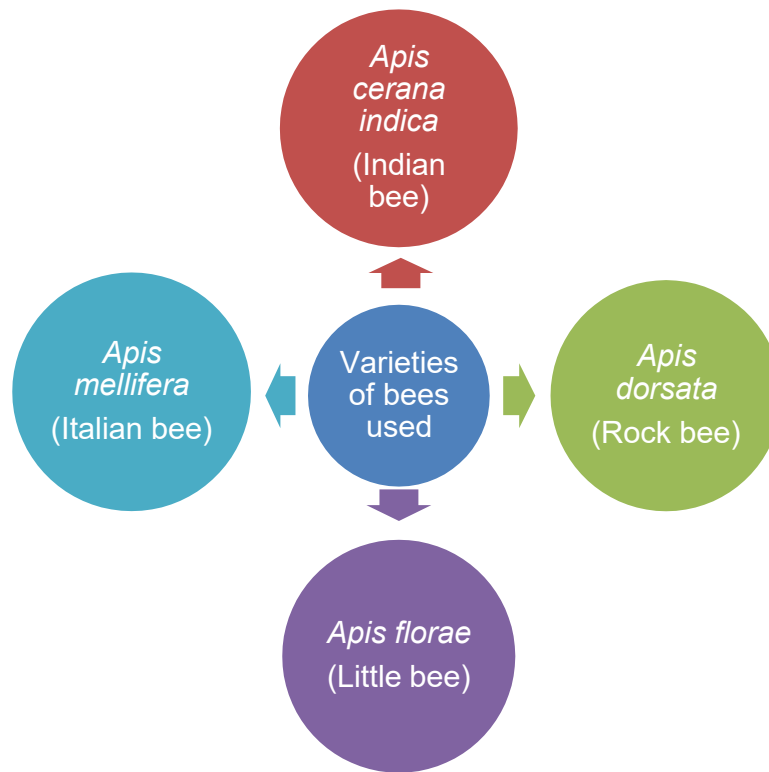
Purpose of Fish Production

- Fish is an important source of human food. It is highly proteinaceous.
- Shark liver oil and cod liver oil are rich in vitamins A and D.

4. Beekeeping

Beekeeping or apiculture is the artificial rearing of honey bees or the maintenance of colonies of honey bees by humans to obtain honey and other commercially important products.

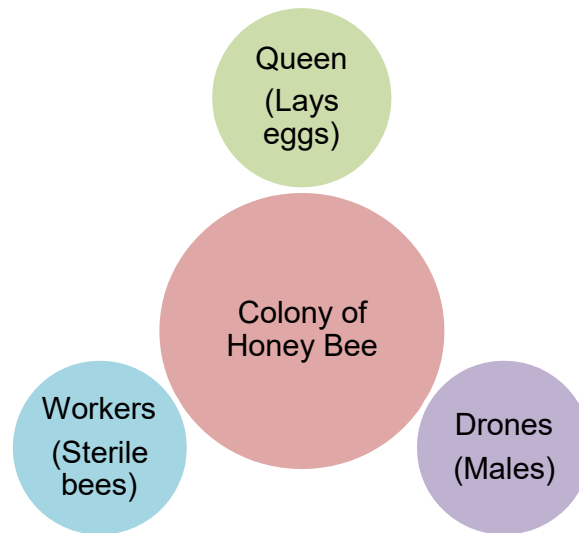
The place where bees are kept is called a **bee yard** or **apiary**.

**Italian bees**

- High honey collection capacity
- Stay in given bee hive for long periods

In nature, honey bees live in colonies in a beehive made of wax which they produce.

The three types of individuals found in a honey bee colony are drone, queen and worker.



In beekeeping, one or more boxes are mounted on a stump which is about 5 feet high.

Each setup has a narrow opening which allows only worker bees to enter or exit the setup.

There are frames inside the box on which workers construct hives.

When the cells in a hive are filled with honey, the frames are removed and honey is extracted by centrifugation.

The frame with intact hive is then put back to collect more honey.