
On
Board!
BOOKS

On Board! BOOKS

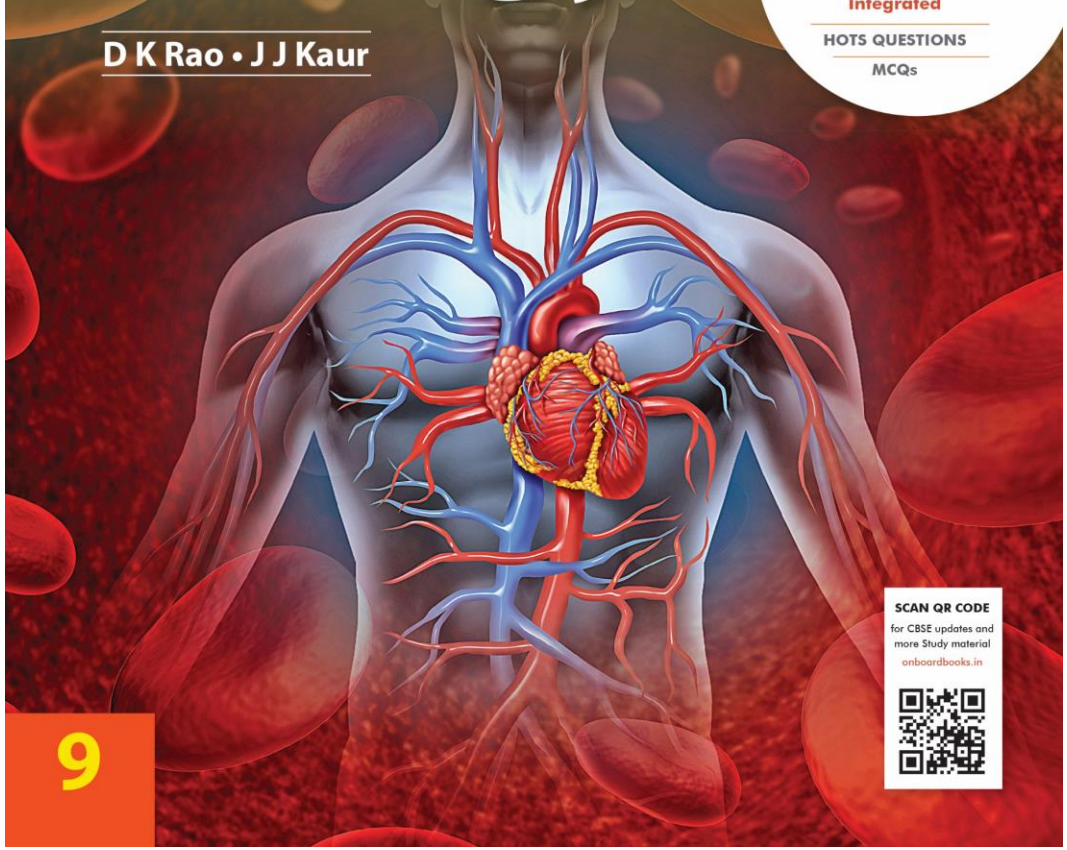
As per the guidelines of NEP 2020

Living Science
Biology

D K Rao • J J Kaur

Includes
COMPETENCY-BASED QUESTIONS (CBQs)
- ✓ Assertion-Reasoning
- ✓ Source-based/Case-based/ Passage-based/ Integrated

HOTS QUESTIONS
MCQs



SCAN QR CODE
for CBSE updates and more Study material
onboardbooks.in

9

CBSE
Living Science
Biology

Class 9

Chapter 6 Improvement in Food Resources

LEARNING OBJECTIVES

Improvement in Crop Yields

- Different types of crops
- Rabi Crops and Kharif Crops

Activities for Improving Crop Yield

- Crop Variety Improvement
- Crop Production Management
- Crop Nutrient Management

Manure and Fertilizers

- Organic Farming

Irrigation

- Rainwater Harvesting and Watershed Management

Cropping Patterns

- Crop Protection Management

Storage of Food grains

- Animal Husbandry

Cattle Farming

- Fish Production

Poultry Farming

- Bee-keeping

How is integrated agriculture related to both agriculture and animal husbandry?

Agriculture is the cultivation of food crops in the field for food requirements. On the other hand, rearing animals to obtain milk, eggs and meat and their management is called **animal husbandry**.

Combining agriculture with poultry farming, fish culture, bee-keeping, livestock production, etc. is known as **integrated agriculture**.

Improvement in Crop Yields

Different types of crops

Crops can be divided into two categories based on their utilization – **food crops** and **fodder crops**.

Food crops

Food crops include those crops that we eat to obtain nutrients. There are many types of food crops such as cereals, pulses, oil seeds, etc. In addition, there are vegetables, fruits and spices.

Fodder crops

Fodder crops are those crops which are raised as a food for the livestock. Fodder crops include berseem, oats or Sudan grass, etc.

Rabi Crops and Kharif Crops

Depending upon the season in which they are grown, there are mainly two types of crops – rabi and kharif crops.

Rabi crops

The winter season is from November to April and is known as **rabi season**. Wheat, gram, peas, linseed and mustard are important rabi crops.

Kharif crops

The rainy season is from the month of June to October and is known as **kharif season**. The chief kharif crops are the millets, known as *bajra* and *jowar*, paddy, maize, cotton, green gram and black gram.

Activities for Improving Crop Yield

There are broadly three stages of farming:

1. selection of seeds for planting, **2.** nurturing of crop plants, and **3.** protection of the growing crops and harvested crops from loss.

The major activities for improving crop yields are given below.

- Crop variety improvement
- Crop production management
- Crop protection management

Crop Variety Improvement

Need for crop variety improvement

A good variety of crop is one which gives better yield in minimum time, resources and land. Improvement in variety means to develop varieties with desired characters such as higher yields, better qualities, resistance to diseases and pests, etc.

It is mainly done by improving the genetic make-up of crop plants through plant breeding.
Plant breeding can be defined as the science of improving genetic make-up of plants in relation to their economic use.

Hybridization

Hybridization is the process of crossing two genetically dissimilar (different) plants to obtain a progeny with the desired traits. This crossing may be:
Intervarietal: Cross between two different varieties of same plant species. This helps in producing high-yielding varieties.
Interspecific: Cross between two different species of the same genus. This helps in producing plant varieties resistant to diseases.
Intergeneric: Cross between different genera.

Introducing a gene

In this technique, a gene that would provide the desired characteristics is introduced in the plant. As a result, **genetically modified crops** are produced.

Characteristics of a good plant variety

- The new varieties of crops should produce high yields under different climatic conditions found in different geographical areas.

- The seeds should be of good quality and all seeds should be of the same variety and germinate under same conditions.
- Varieties should be capable of growing in diverse climatic conditions since weather conditions are unpredictable. This is because cultivation practices and crop yields are related to weather, soil quality and water availability.
- The new varieties should also be tolerant to high soil salinity.

Crop Production Management

Crop production management includes the following components:
1. Crop nutrient management 2. Irrigation 3. Cropping patterns

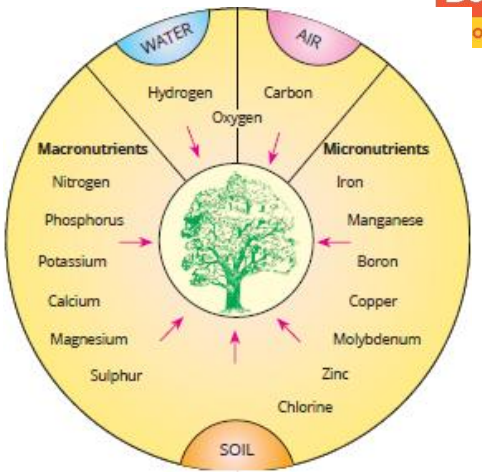
Crop Nutrient Management

Plants need certain chemical elements for their growth, development and metabolic activities. These chemical elements are called **plant nutrients**. There are about 30 to 40 elements found in plants, but only 16 of these are **essential** for their better growth and development. Other elements found in plant body are called **non-essential elements**.

The 16 elements found essential for growth and development of plants are – 1. Carbon, 2. Hydrogen, 3. Oxygen, 4. Nitrogen, 5. Phosphorus, 6. Magnesium, 7. Calcium, 8. Sulphur, 9. Potassium, 10. Manganese,

11. Iron, 12. Copper, 13. Zinc, 14. Boron, 15. Molybdenum and 16. Chlorine. All elements found in plants are derived from air, water and soil.

Air: Carbon and oxygen
Water: Hydrogen and oxygen essential nutrients to the plant.



Sources of essential plant nutrients

Soil: Soil provides maximum number (13) of essential nutrients to the plant. The essential elements provided by soil are nitrogen, phosphorus, potassium, magnesium, sulphur, calcium, iron, manganese, boron, zinc, copper, molybdenum and chlorine.

Macronutrients

Macronutrients are those elements which are utilized by plants in relatively large quantities. **Out of the 13 soil nutrients, only six are macronutrients.** These are nitrogen, phosphorus, potassium, calcium, magnesium and sulphur.

Micronutrients

Micronutrients are those elements which are required by plants in small quantities.

Though required in small quantities, these nutrients are as essential for the growth and development of plants as the macronutrients. There are seven micronutrients required by plants. These are iron, manganese, boron, copper, molybdenum, zinc and chlorine.

Manure and Fertilizers

Manure is an organic substance obtained from the decomposition of plant and animal wastes like cow dung and plant residues. Manure is the major source of organic matter, which supply nutrients in small quantities but organic matter in large quantities and increase the fertility of soil. Manure contains a mixture of various nutrients recycled from biomass wastes (plant waste and animal excreta).

Cow dung manure

Types of manure

On the basis of biological waste materials used, manure is classified into **farmyard manure (FYM)**, **compost**, **vermicompost** and **green manure**.

Note: Refer to Table 6.3 for the Differences between macronutrients and micronutrients

Farmyard manure (FYM)

It is called farmyard manure (brown manure) since it is prepared by using decomposed mixture of cattle excreta (dung) and urine along with the litter (generally straw) and leftover organic matter such as roughage or fodder.

Compost

Compost is prepared from farm and town refuse like vegetable waste, livestock excreta (cow dung), animal refuse, sewage waste, eradicated weeds, crop stubble and straw. This organic matter is decomposed by both aerobic and anaerobic microorganisms in pits. This process is called **composting**. Compost takes about 3 to 6 months for its formation. It is rich in organic matter and nutrients.

Compost pit

Vermicompost

Compost is also prepared with the help of earthworms. Composting by introducing earthworms in the pit of organic matter is called **vermicomposting**. In this process, earthworms are introduced to the pit containing plant and animal refuse. Earthworms hasten the process of decomposition of plant and animal refuse.

Green manure

Green manure is prepared from young, fast growing green leguminous crop plants, about two months old, by ploughing them back into the soil. This is a practice of growing green plants prior to sowing of crop seeds and then ploughing of green plants into soil.

Fertilizers

Manure cannot supply all the essential plant nutrients to the soil. Therefore, they are to be supplemented with some chemical fertilizers. **Fertilizers are the sources of plant nutrients manufactured commercially from chemicals.** Fertilizers make the soil fertile. They are generally inorganic materials or salt containing nitrogen, phosphorus or potassium in the form of soluble chemical compounds.

Disadvantages of using fertilizers

Important disadvantages of using chemical fertilizers are as follows:

- These chemicals get washed away due to excessive irrigation and are thus not fully absorbed by the plants. These fertilizers reach rivers, lakes and other waterbodies and pollutes them, disturbing the natural ecosystem.

Note: Refer to Table 6.4 for the Differences between fertilisers and manures

- The continuous use of chemical fertilizers can cause drastic alterations in soil chemistry and affect the crop yield. Fertilizers also harm the soil microorganisms and thus destroy soil fertility as the organic matter in the soil is not replenished.
- The excessive use of nitrogenous fertilizers makes underground water rich in nitrates, which makes the water unfit for drinking.
- The chemical fertilizers, specially nitrogenous, can increase the biological oxygen demand (BOD) of water. This causes harm to aquatic animals like fish and aquatic plants. This phenomenon is known as **eutrophication**.
- Thus, for maintaining soil fertility and optimum yields, short-term benefits of using fertilizers and long-term benefits of using manure should be considered.

Organic Farming

Excessive use of fertilizers affects soil salinity as well as causes water and soil pollution. This is affecting our health. Therefore, nowadays, there is new system of farming which is used to produce food and fibre with minimal or no use of chemicals and with the maximum use of bio-agents and organic manure, known as **organic farming**.

Advantages of organic farming

- **Toxin-free food:** Organic food is safe to consume. Organic produce contains no or significantly lower levels of pesticide residues (which are already available in soil and water) than conventional produce.
- **Controls pests and weeds:** The cropping systems are beneficial in insect, pest and weed control besides providing nutrients.
- **Environment friendly:** It is environment friendly and does not cause air, water or soil pollution.
- **Recycling of waste:** It helps in recycling of wastes produced in the farm.
- **Maintains fertility of soil:** It helps in maintaining the fertility of the soil and soil structure.

Irrigation

The process of supplying water to the crops by means of canals, reservoirs, ponds, lakes, wells, tube wells and tanks is known as irrigation.

Benefits of irrigation

- Water supplies two essential elements to the crop plants namely, hydrogen and oxygen.
- Seeds do not grow in dry soil. Irrigation provides moisture to the soil for the germination of seeds.

- The roots of crop plants cannot grow well in dry soil. Irrigation loosens the soil and supports the growth and elongation of the roots.
- Water at the time of irrigation dissolves the nutrients present in the soil. These nutrients dissolved in water are easily absorbed by the roots of the plants

Irrigating fields by canals

Types of irrigation system

The design, equipment and technique of replenishing the soil water deficit by applying irrigation water is known as **irrigation system**. Depending upon the kind of water resources available, several irrigation systems are adopted in India to supply water to the agricultural land. These include the wells, canal system, river lift system and tanks.

Rainwater Harvesting and Watershed Management

Two fresh initiatives have been adopted for increasing the water availability for agriculture. These initiatives are:

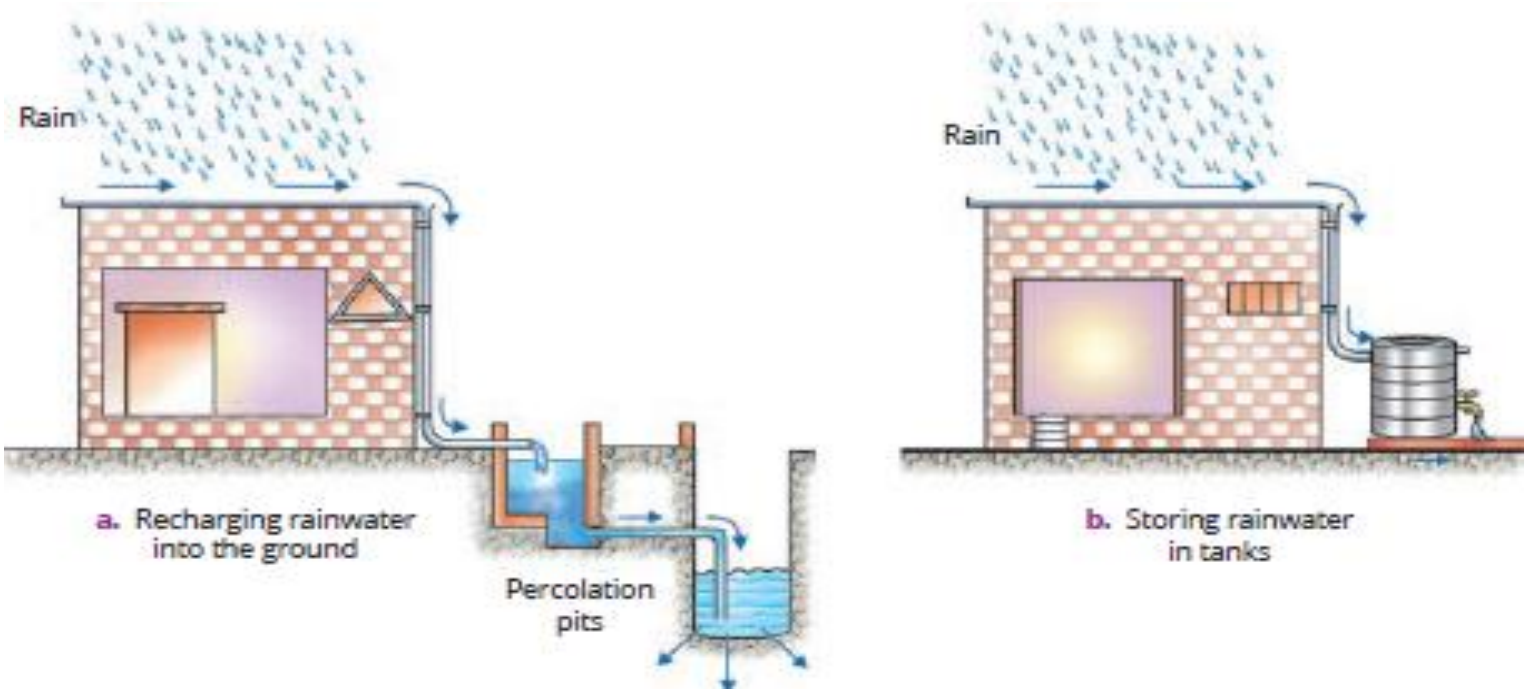
Rainwater harvesting

In rainwater harvesting, the rainwater that falls on the Irrigating fields by canals ground or rooftops of buildings is channelled by canals and recharged into the ground by digging tunnels .

This water percolates in the soil. Thus, the water table is maintained to a satisfactory level.

Rainwater can be stored in tanks

This is done by collecting water from cemented surfaces, such as rooftops in tanks or big containers . This water can be filtered and used in gardens to water plants, in fields for irrigation purposes, at home for cleaning vehicles, floor, clothes, dishes, etc. This water, when strained through a fine cloth, can be used as distilled water in batteries of vehicles.



Rainwater harvesting

Watershed management

It involves building of small check dams to increase percolation of water into the ground. It prevents rainwater from flowing away and also reduces soil erosion.

Cropping Patterns

In order to get maximum benefit, crops can be grown in different ways. Some of these ways have been described here.

Mixed cropping

Growing two or more crops simultaneously on the same piece of land is known as mixed cropping.

Some of the commonly used mixed crops are:

1. Soya bean + Pigeon pea **2.** Sorghum + Pigeon pea

3. Groundnut + Sunflower **4.** Maize + Urad bean

5. Cotton + Mung bean **6.** Wheat + Gram **7.** Wheat + Mustard

Intercropping

It can be defined as growing two or more crops simultaneously in the same field in a definite row pattern or tier system. In intercropping, the crops selected are those that have different nutrient requirements so that there is maximum utilization of nutrients available in the soil. In intercropping, a few rows of one crop alternates with a few rows of a second crop.

Advantages of intercropping

- Intercropping has several advantages over sole cropping:
- It makes optimum utilization of natural resources such as sunlight, land and water.
- Intercropping also helps to prevent spread of pests and diseases to all the plants belonging to one crop in the field.
- It helps to maintain soil fertility.
- It economises space and time of cultivation of two or more crops.

Intercropping of soya bean with maize

Crop rotation

When the same crop is grown in the same field, year after year, it removes particular nutrients from the soil and reduces its fertility. The fertility of the soil can be restored by crop rotation. Growing different crops on the same piece of land in a pre-planned succession is known as crop rotation. In the rotation of crops, the leguminous crops like pulses, peas, beans, groundnut and Bengal gram are sown in-between the seasons of cereal crops like wheat, maize and pearl millet (*bajra*).

Note: Refer to Table 6.5 for Comparison between mixed cropping and intercropping

Characteristics of crop rotation

- Legumes are grown in between cereal crops.
- Crops requiring high fertility level are grown after growing legumes.
- High input crops like wheat, rice, maize, sugar cane and potato may be grown before crops requiring low input.
- Generally, crops of the same family should not be grown repeatedly in the same piece of land as this will encourage growth of insects, pests and disease-causing organisms.

Crop Protection Management

There are a large number of weeds, insect pests and diseases, which attack the food crops and damage them. If these weeds, insect pests and diseases are not controlled at appropriate time, then they can damage the crop leading to a loss of more than 50 to 60% of its economic value.

Weed control

Unwanted wild plants, which grow with crop plants in the cultivated field are called weeds. Weeds are very harmful because of the following reasons:

- Weeds grow in the crop field and compete with the main crop. They consume a lot of soil nutrients, water, fertilizers, sunlight and space, which are meant for the crop plants.

- Weeds may sometimes act as an alternate host for microorganisms and different insects, which feed on weeds and attack the crop plants, finally destroying them.

Methods of weed control

Weeds can be controlled by many methods, such as mechanical, cultural, biological and chemical.

Mechanical methods: Weeds are removed manually by uprooting them using hands, harrow (*khurpi*), hand hoeing, ploughing, land tilling, mowing (cutting with machines) and flooding.

Cultural methods: The cultural methods of weed control involve preparation of proper seed bed, timely sowing of crops, intercropping and crop rotation.

Biological methods: Biological methods of weed control involve the use of insects, which feed selectively on a particular weed. Certain microorganisms that cause diseases in the weed plants and eliminate them are also used in this method.

Chemical methods: There are certain chemicals that kill weeds. These chemicals are called weedicides. They are also known as **herbicides**. Some weedicides used to control different weeds are 2,4-D (2,4-Dichlorophenoxy acetic acid), Atrazines, Deltron, etc.

Insect pests

Any organism, which damages or destroys a crop plant is called a pest.
Almost all crops are attacked by insect pests.

Control of insect pests

Insects infesting a food crop and other crop diseases can be controlled by various methods. The use of pesticides is one of the most common and effective methods of controlling insect pests and crop diseases. These pesticides are the chemicals used to control pests like insects, mites, rodents and fungi. There are following types of pesticides:

Weedicides: Chemicals used to control unwanted wild plants (weeds) in the crop field.

Insecticides: Chemicals used to kill insects.

Miticides: Chemicals used to kill mites.

Rodenticides: Chemicals used to kill rodents

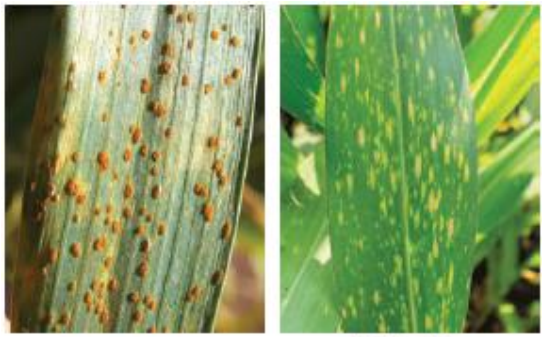
Fungicides: Chemicals used to kill fungi.

Spraying pesticides

Crop diseases

A number of diseases attack crop plants. A plant disease is a structural or physiological abnormality which is injurious to the plant and reduces its economic value.

Depending upon the mode of occurrence and transmission, plant diseases are classified into following three categories.



a. Rust of wheat b. Blight of rice

Some crop diseases

Soil-borne diseases: The diseases, which get transmitted through the soil are called soil-borne diseases. For example, smut of *bajra*, tikka of groundnut and wilting of chick pea are some soil-borne diseases caused by fungi.

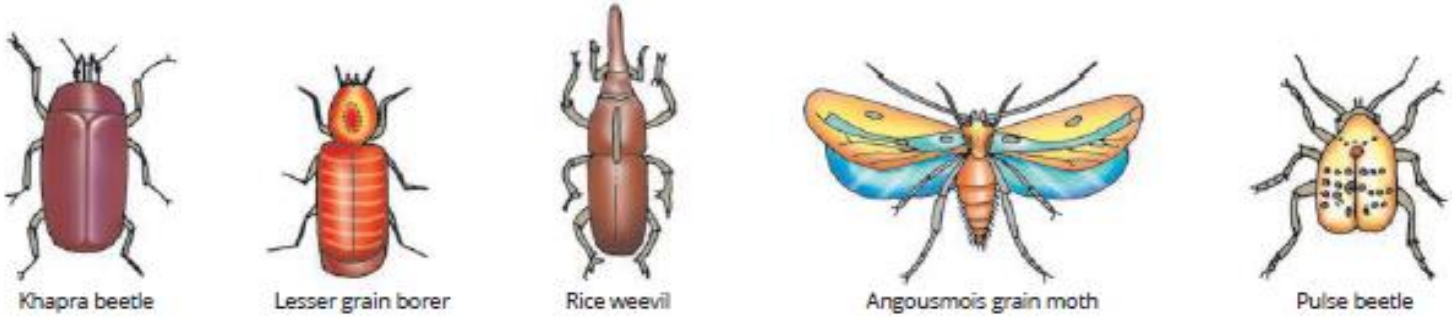
Air-borne diseases: The air also transmits many diseases. These diseases which are transmitted through air are called air-borne diseases. For example, rust of wheat is an air-borne disease caused by fungi.

Water-borne diseases: The diseases which are transmitted through water are called water-borne diseases. For example, blight of rice is a water-borne disease caused by bacteria.

Storage of Foodgrains

The foodgrains such as cereals and legumes are preserved for several months and sometimes even for a number of years. Therefore, it is necessary to keep them in safe storage to ensure their availability during all the seasons.

Safe storage facilitates the distribution of food materials to distant places in the country. It also protects the foodgrains and other food materials from pests, rodents and other microorganisms.



Some insect pests of foodgrains

Methods of foodgrain storage

There are two different methods of food storage:

1. Dry storage: The storage of food materials at room temperature is called dry storage. In this method, all the non-perishable materials like foodgrains are stored.

2. Cold storage: The storage of food materials at low temperature is called cold storage. The perishable food materials are stored in cold storage. The low temperature of cold storage reduces the losses from spoilage of food materials, and the nutritive value of the food materials is also retained for longer duration.

Animal Husbandry

Rearing animals (livestock) to obtain milk, eggs and meat and their management is called animal husbandry. In other words, the branch of agriculture related to the scientific management of animal livestock is known as animal husbandry. It includes breeding, feeding and disease control of domestic animals.

The various elements of animal husbandry are :

- Proper feeding of animals
- Proper shelter for animals
- Proper care of animals against diseases
- Proper breeding of animals

Cattle Farming

We do cattle husbandry for two purposes:

- For getting milk as a food, and
- For agricultural tasks such as tillage, irrigation and carting.

On the basis of the above mentioned criteria, the animals can be divided into the following two categories:

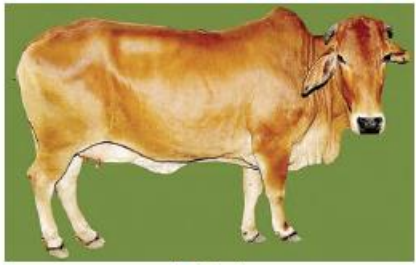
- **Milk-yielding animals:** These animals are also known as **milch animals** (dairy animals).
- **Draught animals:** These animals are used for farm labour.

The female cattle provide milk, which in turn contribute animal protein to the diet of people. The production of milk depends upon the duration of lactation period. **Lactation period is the period of milk production after the birth of a calf.** The milk production can be increased by increasing the lactation period. There are many important breeds of cows and buffaloes available in our country, which provide us good quality milk. The exotic or foreign breeds have long lactation period and provide us good quantity of milk.

Indigenous or local breeds of cattle: Sahiwal, Gir, Red Sindhi and Tharparkar are some of the indigenous breeds of cattle.

Exotic breeds of cattle: The exotic breeds mean those breeds which have been imported from abroad and are reared in India. The exotic breeds of cattle are Holstein-Friesian, Jersey, Brown Swiss, etc.

a. Red Sindhi



b. Sahiwal

Indigenous milch breeds of cattle

a. Jersey

b. Holstein-Friesian

Different exotic breeds of cow

Improved breeds of cattle: In India, certain improved breeds of Indian cattle have been developed by making a cross between indigenous (local) cows with high milk-yielding exotic breeds of bull. The improved, high milk-yielding breeds of cows developed in India are: Frieswal , Karan Swiss and Karan Fries

Fish Production

Fish forms an important part of our diet. Fish is a valuable and cheap source of food rich in animal protein. Fish proteins are easily digestible. In addition, fish is useful for us in the following ways:

- **Medicinal use:** Fish liver oil (Cod liver oil) is an important source of vitamin A and D.
- **Industrial use:** Body oil of some fish like herrings and sardines are used for the manufacturing of edible oil and margarine.
- **Agricultural use:** They are used as organic manure in the field.
- **Feed for farm animals:** Dried fish are used to provide proteins to farm animals.
- **Adhesive:** Skins and bones of fish are used to make high quality glues and adhesives.

There are two ways of procuring fish:

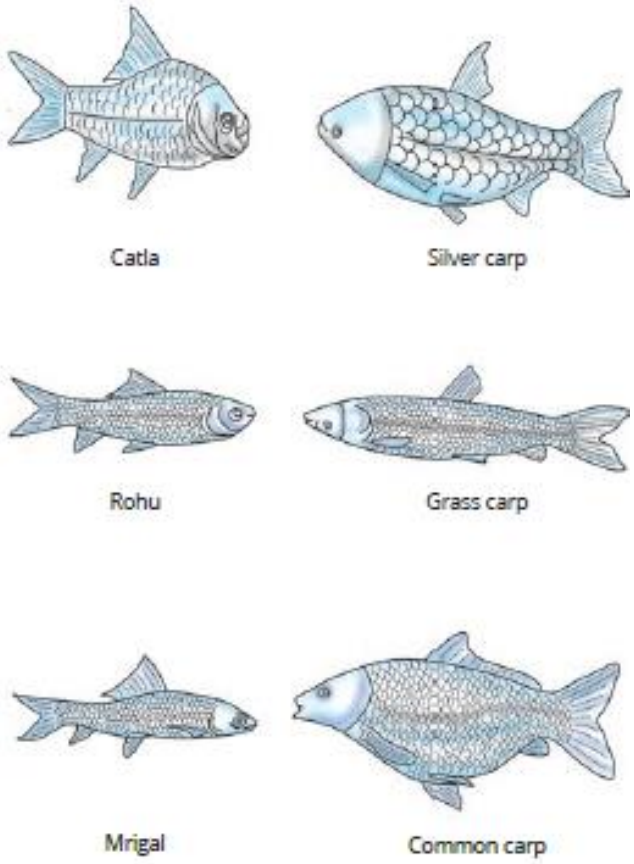
- From natural resources, called **capture fishery**.
- By fish farming, called **culture fishery**.

Fisheries are of following three types:

Marine fisheries: This includes capturing fish of oceans and seas. Pomphret, tuna, sardine and mackerel are some marine fish.

Freshwater fisheries: This includes capturing and doing culture of fish in freshwater system such as lakes, ponds, paddy fields, rivers, etc. For example, rohu, catla, *Mystus* and *Gambusia* are some varieties of freshwater fish.

Brackish water fisheries: This includes fishing activities in brackish water (slightly salty water where sea water mixes with fresh water) such as lagoons, estuaries and mangrove swamps, etc. For example, pearl, spot and mullet are some brackish water fish.



Some fish

Poultry Farming

Poultry includes birds such as chicken (hen), duck, geese and turkey. However, it is mostly chicken that is domesticated on a large scale. **Poultry farming is defined as the rearing and keeping of poultry birds such as fowl for eggs and meat**.

Poultry farming is done to raise domestic fowl for the production of eggs and chicken meat. Eggs and meat obtained from birds are a good source of nutrients. Therefore, improved poultry birds are developed and reared in farms to produce layers for eggs and broilers for meat.


Aseel


White leghorn

Some breeds of poultry birds

The egg-laying poultry birds are called **hen** (egg layer) while the one groomed for obtaining meat is called **chicken** or **broiler.**

Egg and broiler production

Poultry farming involves taking good care of birds for food, shelter and disease control. In order to obtain good quality chicken for meat, broiler chickens are fed on vitamin-rich food for good growth rate and better feed efficiency. Special care is taken to avoid any mortality and maintain superior quality. Broiler chickens are produced as broilers and then sent to market for meat purposes.

Disease control

Since they live in crowded conditions, the poultry birds suffer from a number of diseases. These diseases are caused by bacteria, viruses, fungi, parasites and also from nutritional deficiencies.

These diseases can be controlled by taking preventive measures like proper cleaning, sanitation, spraying of disinfectants at regular intervals, proper feed and vaccination. Appropriate vaccination is required to prevent any occurrence of diseases and loss of poultry birds in case of an outbreak.

Bee-keeping

Bee-keeping is the practice of rearing and taking care of honey bees on a large scale to obtain honey from them. It is also known as apiculture.

There are many advantages of bee-keeping:

- It provides honey, which is a nutritive food and has many other uses.
- It provides bees-wax, which is used in various medicinal preparations.
- Honey bees are excellent pollinating agents. Thus, they help in getting good agricultural yields.

Honey comb

Varieties of honey bees

There are four common varieties of honey bees. Out of these, three are local varieties while one is an exotic variety.

Indigenous (local) varieties

The indigenous (local) varieties of honey bees used for commercial honey production are:

- *Apis cerana indica* – commonly known as the Indian bee.
- *Apis dorsata* – commonly known as the rock bee.
- *Apis florea* – commonly known as the little bee.

Artificial beehive

Exotic variety reared in India

Apis mellifera (the Italian bee): This variety has been brought in India to increase yield of honey.

a. An apiary frame

b. A honey extractor

Quality and taste of honey

The quality or value of honey depends upon pasturage or flowers available to the honey bees for nectar and pollen collection.

The taste of honey depends upon the quantity of pasturage and kind of flowers available.

SUMMARY...

- Cultivation of food crops in field for food requirements is known as agriculture.
- There are about 30 to 40 elements found in plants. Out of these, only 16 nutrients are essential for plant nutrition.
- The nutrients required by plants in large quantities are known as macronutrients whereas nutrients needed in small amounts are known as micronutrients.
- Soil provides nitrogen, phosphorus, potassium, manganese, magnesium, boron, iron, sulphur, copper, calcium and molybdenum to plants.
- Manure is an organic substance obtained from the decomposition of vegetable and animal waste, which supply essential elements and humus to the soil and make it fertile.
- There are three types of manure namely, farmyard manure (FYM), compost and green manure. Fertilizers are the plant nutrients manufactured commercially from chemicals.
- Fertilizers can be applied before sowing, during irrigation or spraying on the standing crops.
- A farming system with no or minimal use of chemicals and with maximum use of organic manures, etc. with healthy cropping system is known as organic farming.

- The various systems of irrigation used in India are: canal system, tanks, wells, river valley system and river lift system.
- Mixed cropping is growing two or more crops simultaneously on the same piece of land.
- Growing different crops on the same piece of land in a pre-planned succession is known as crop rotation. Crop rotation restores soil fertility.
- Insects, pests and weeds can be controlled by using pesticides and weedicides.
- The diseases of crop plants can be classified into soil-borne diseases, air-borne diseases and water-borne diseases.
- The stored grain pests can be controlled by chemicals, fumigation and plant products.
- The branch of agriculture related with scientific management of animal livestock is known as animal husbandry..
- Fish production includes capture, management and exploitation of fin and shell fisheries.
- Poultry farming is rearing and keeping of poultry birds for eggs and meat.
- Bee-keeping is the practice of rearing and taking care of honey bees on a large scale to obtain honey from them.

THANK YOU