BIOLOGY

Chapter 12: Improvement in Food Resources

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.

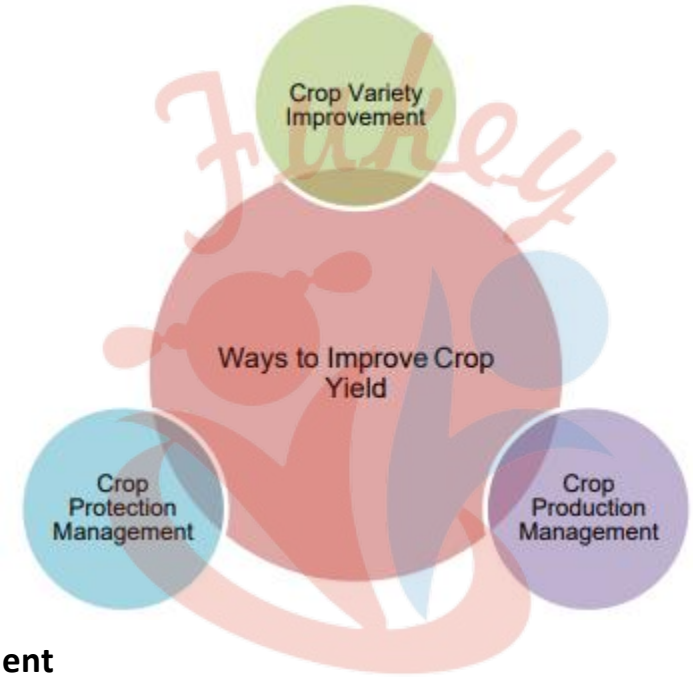
Improvement in Crop Yields

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	Rabi 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	•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.

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 varities 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

1. 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

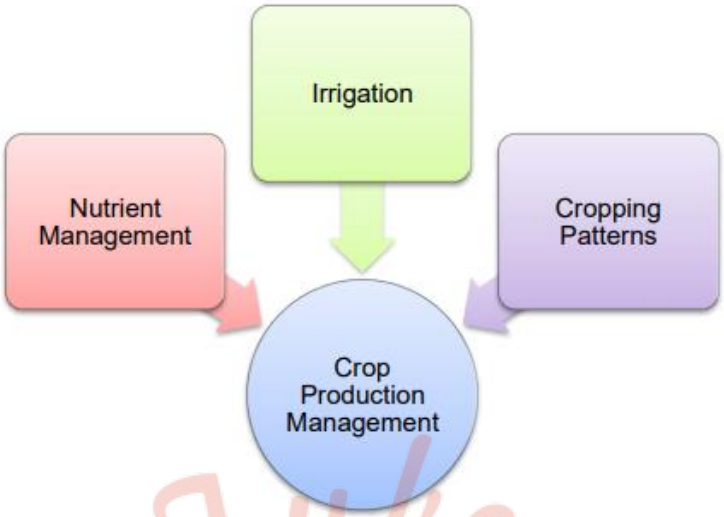
- American Scientist Norman Borlaug is known as the Father of the Green Revolution.
- M. S. Swaminathan, an Indian agricultural scientist, is known as the Father of the Green Revolution in India.

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.



Nutrient Management

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

Macronutrients	•Nutrients required by plants in large quantities. •The **six macronutrients** are nitrogen, phosphorus, potassium, calcium, magnesium and sulphur.
Micronutrients	•Nutrients required by plants in small quantities. •The **seven micronutrients** are iron, manganese, boron, zinc, copper, molybdenum and chlorine.

- 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
• It is formed by the decomposition of vegetable and animal wastes, domestic waste and eradicated weeds.	• Farmers grow leguminous plants (e.g. groundnuts, soya beans, pulses) in between two crops.
• The waste matter is decomposed in pits. This process is called composting.	• Leguminous plants help to replenish the nitrogen content in the soil.
• Sometimes, organic substances are decomposed by earthworms and are converted into humus. This is called vermicompost.	• 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
•Growing two or more crops simultaneously on the same piece of land •Minimises the risk of crop failure •Wheat + Gram •Wheat + Mustard •Groundnut + Sunflower	•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)	•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.

Granaries

- 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	• 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	• They are high-milk yielders. • Their males are poor draughts.
Dual Purpose Breeds	• They are good milk yielders. • The males are good for draught purposes. • Examples: Haryana, Dangi, Tharparkar

Cattle and Buffaloes

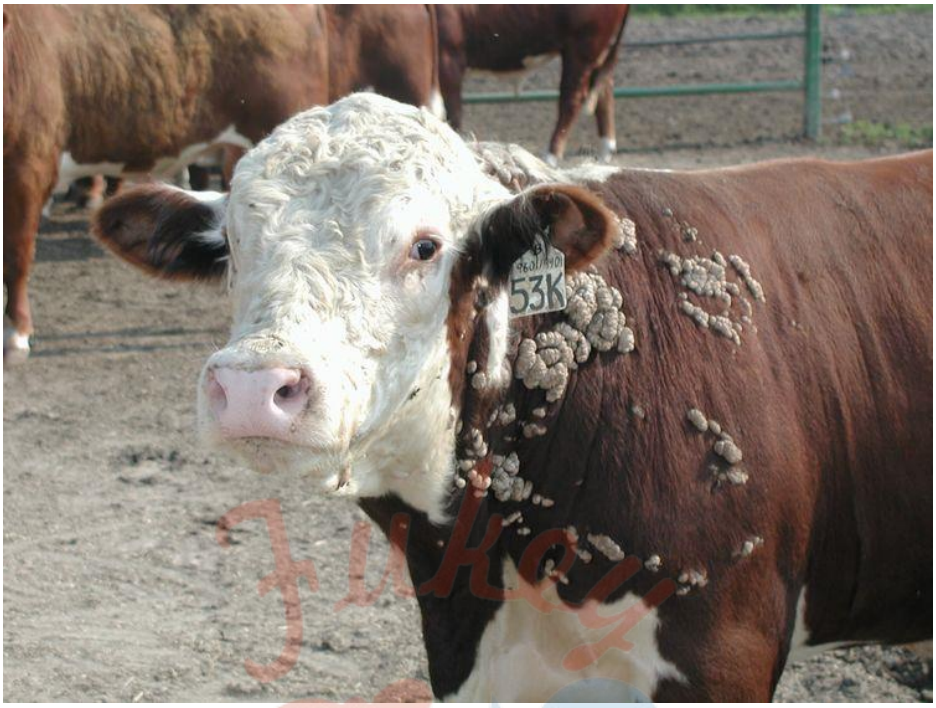
- There are 30 different breeds of cows in India.
- Examples of exotic or foreign breeds: Jersey, Holstein-Friesian, Brown Swiss
- Examples of indigenous breeds: Red Sindhi, Sahiwal, Gir

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	• 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	• They are rich in carbohydrates, proteins, fats, minerals and vitamins.
	▪ 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

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

Poultry

- **Poultry** is the raising of chickens, ducks, turkeys and geese for meat and eggs.
- The egg-laying chickens are called **eggers** 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.
• Dropping 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.

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.

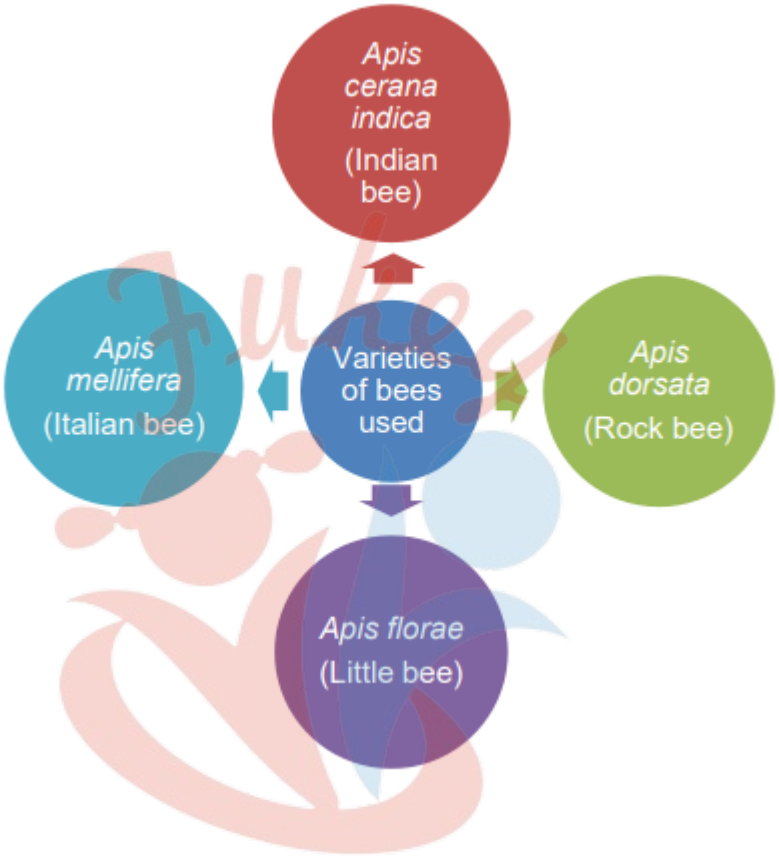
Purpose of Fish Production

- 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.

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.

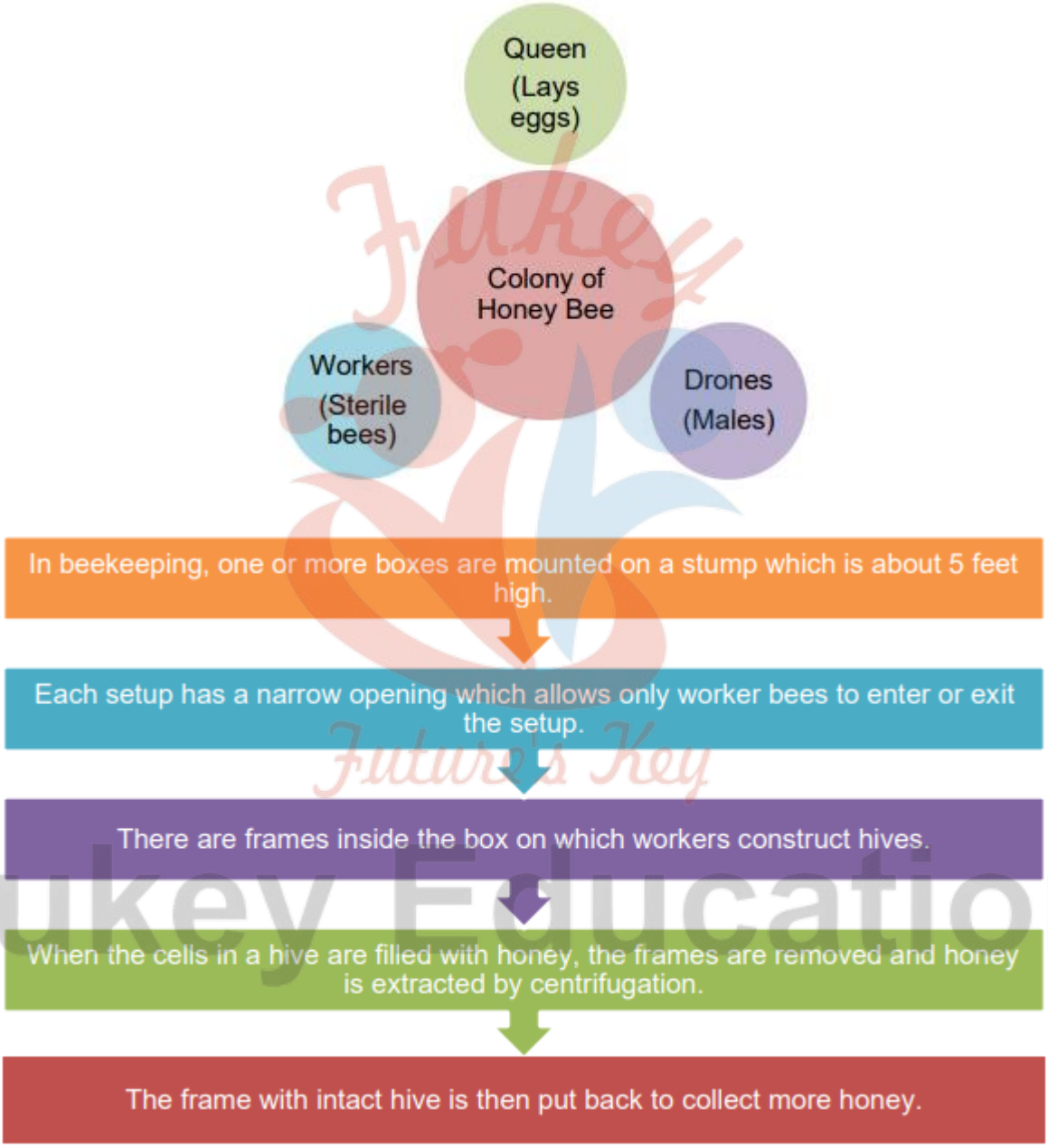
The place where bees are kept is called a **bee yard** or **apiary**.



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.



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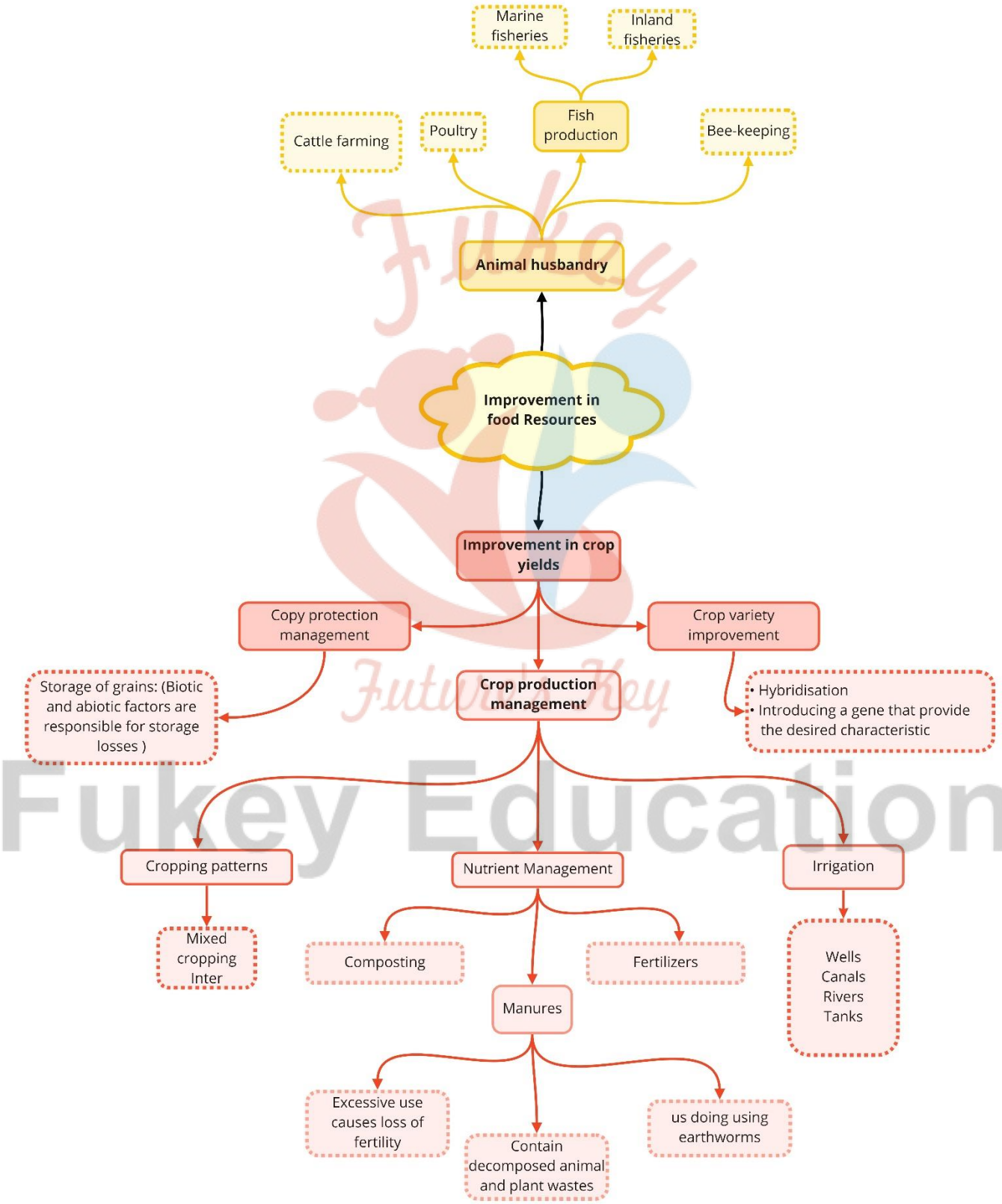

Important Questions

➢ Multiple Choice Questions:

1. How much increase in cultivable land occurred in India from 1952 to 2010?

(a) 20%

(b) 25%

(c) 35%

(d) 40%

2. How many nutrients are essential for plants?

(a) 16

(b) 20

(c) 26

(d) 36

3. Which one of the following species of the honey bee is an Italian species?

(a) Apis cerana indica

(b) Apis dorsata

(c) Apis florae

(d) Apis mellifera

4. How many micronutrients are required by plants?

(a) 6

(b) 10

(c) 7

(d) 12

5. Which of the following are Indian cattle?

(i) Bos indicus

(ii) Bos domestica

(iii) Bos bubalis

(a) (i) and (iii)

(b) (i) and (ii)

(c) (ii) and (iii)

(d) (iii) and (iv)

6. The hybrid breed of buffalo yielding maximum milk is:

(a) Jamunapari

(b) Murrah

(c) Sahiwal

(d) Barbary

7. This breed of cow gives more milk:

(a) Bhadawari

(b) Jaffrabadi

(c) Murrah

(d) Sahiwal

8. This hybrid breed of the hen has the world record of laying maximum eggs:

(a) White leghorn

(b) Minorca

(c) Karaknath

(d) Vasra

9. Which goat is known as the queen of milk?

(a) Barbary

(b) Jamunapari

(c) Sannen

(d) Bikaneri

10. Which one of the following nutrients is not available in common fertilizers?

(a) Nitrogen

(b) Phosphorus

(c) Iron

(d) Potassium

➢ Very Short Question:

1. What is the advantage of selecting seeds of crops with wider adaptability for agriculture?

2. Name the type of nutrient that we get from mustard seeds and linseed.

3. Mention any two abiotic factors that affect crop production.

4. Students were asked to select one that is not a source of starch amongst the following rice, wheat, sunflower seeds, and potato tuber.

5. Improved varieties can be produced in both animals and plants. How?

6. Name two protein-containing Rabi crops.

7. Identify two crops from the following which provide us carbohydrates for energy requirement. Black gram, wheat, lentil, and rice.

8. Name two plants which are used as biopesticide in organic farming.

9. Name the two vitamins which are added in the poultry feed.

10. Name the major nutrient which we get from fish.

➢ Short Questions:

1. Mention the names of four marine fish of high economic value.

2. Give two examples of shellfishes.

3. Name two desirable traits for variety improvement in poultry farming.

4. Which method is commonly used for improving cattle breeds and why?

5. What are 'Sahiwal' and 'Jersey' breeds?

6. State the food requirements of dairy animals.

7. What is mixed cropping? How does it help a farmer?

8. State two advantages of fertilizers over manure.

➢ Long Questions:

1. Mention the modern initiatives undertaken in India to supply water to the fields.

2. What do you understand by composite fish culture? Describe in detail with advantages and disadvantages. What are the advantages of composite fish culture?

3. How do plants get their nutrients?

OR

List the nutrients supplied by air, water, and soil.

➢ Assertion Reason Questions:

1. For two statements are given- one labelled Assertion (A) and the other labelled Reason (R). Select the correct answer to these questions from the codes (a), (b), (c) and (d) as given below:

   a. Both Assertion and Reason are correct, and reason is the correct explanation for assertion.

   b. Both Assertion and Reason are correct, and Reason is not the correct explanation for Assertion.

   c. Assertion is true but Reason is false.

   d. Both Assertion and Reason are false.

Assertion: Our natural resources are damaged due to human activities.

Reason: due to the revolution natural resources are getting used more intensively.

2. For two statements are given- one labelled Assertion (A) and the other labelled Reason (R). Select the correct answer to these questions from the codes (a), (b), (c) and (d) as given below:

   a. Both Assertion and Reason are correct, and reason is the correct explanation for assertion.

   b. Both Assertion and Reason are correct, and Reason is not the correct explanation for Assertion.

   c. Assertion is true but Reason is false.

   d. Both Assertion and Reason are false.

   Assertion: Our natural resources are damaged due to human activities.

   Reason: Our natural resources damaged by global warming.

➢ Case Study Questions:

1. Different crops require different climatic conditions, temperature and photoperiods for their growth and completion of their life cycle. Photoperiods are related to the duration of sunlight. Growth of plants and flowering are dependent on sunlight. As we all know, plants manufacture their food in sunlight by the process of photosynthesis. There are some crops, which are grown in rainy season, called the kharif season from the month of June to October, and some of the crops are grown in the winter season, called the Rabi season from November to April. Paddy, soyabean, pigeon pea, maize, cotton, green gram and black gram are kharif crops, whereas wheat, gram, peas, mustard, linseed are Rabi crops.

In India there has been a four times increase in the production of food grains from 1952 to 2010 with only 25% increase in the cultivable land area. This increase in production been achieved through the practices involved in farming, we can divide it into three stages. The first is the choice of seeds for planting. The second is the nurturing of the crop plants. The third is the protection of the growing and harvested crops from loss. Thus, the major groups of activities for improving crop yields can be classified as:

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

(i) What is kharif season period?

(a) June to July

(b) June to October

(c) June to November

(d) June to December

(ii) What is Rabi season period?

(a) November to April

(b) November to March

(c) November to February

(d) November to January

(iii) Plants manufacture their food in sunlight by the process called _____.

(a) Photosynthesis

(b) Photoperiod

(c) Photolysis

(d) None of the above

(iv) Enlist the names of Kharif crops.

(v) Enlist the names of Rabi crops.

2. Cattle husbandry is done for two purposes— milk and draught labour for agricultural work such as tilling, irrigation and carting. Indian cattle belong to two different species, Bosindicus, cows, and Bosbubalis, buffaloes. Milk-producing females are called milch animals (dairy animals), while the ones used for farm labour are called draught animals.

Milk production depends on the duration of the lactation period, meaning the period of milk production after the birth of a calf. So, milk production can be increased by increasing the lactation period. Exotic or foreign breeds (for example, Jersey, Brown Swiss) are selected for long lactation periods, while local breeds (for example, Red Sindhi, Sahiwal) show excellent resistance to diseases. The two can be cross-bred to get animals with both the desired qualities.

Proper cleaning and shelter facilities for cows and buffaloes are required for humane farming, for the health of the animals and for production of clean milk as well. The food requirements of dairy animals are of two types: (a) maintenance requirement, which is the food required to support the animal to live a healthy life, and (b) milk producing requirement, which is the type of food required during the lactation period.

Cattle suffer from a number of diseases. The diseases, besides causing death, reduce milk production. The external parasites live on the skin and mainly cause skin diseases. The internal parasites like worms, affect stomach and intestine while flukes damage the liver.

(i) Identify the exotic breed of cow:

(a) Red Sindhi

(b) Sahiwal

(c) Brown Swiss

(d) All of the above

(ii) Identify the correct statements:

Statement 1 – Milk production depends on the duration of the lactation period.

Statement 2 – Exotic or foreign breeds are selected for long lactation periods.

Statement 3 – Local breeds show excellent resistance to diseases.

Statement 4 – Animals used for farm labour are called draught animals.

(a) Both 1 & 2

(b) Only 3

(c) Both 3 & 4

(d) All of the above

(iii) Milk-producing females are termed as

(a) Milch animals

(b) Dairy animals

(c) Draught animals

(d) Both a & b

(iv) Enlist any two Indian cattle species.

(v) What are the food requirements of dairy animals?

✓ Answer Key-

➢ Multiple Choice Answers:

1. (b) 25%
2. (a) 16
3. (d) Apis mellifera
4. (c) 7
5. (a) (i) and (iii)
6. (b) Murrah
7. (d) Sahiwal
8. (a) White leghorn
9. (c) Sannen
10. (c) Iron

➢ Very Short Answers:

1. Answer: Wider adaptability helps in stabilizing crop production under different

environmental conditions.

2. Answer: Mustard seeds and linseed are oilseed crops that provide fats.
3. Answer: Drought, salinity, waterlogging, heat, cold and frost are the abiotic factors that affect crop production.
4. Answer: Sunflower seeds are not a source of starch. They are a source of fats.
5. Answer: Improved varieties can be produced in both animals and plants by hybridization and genetic modification.
6. Answer: Protein containing Rabi crops are gram and peas.
7. Answer: Wheat and rice provide energy.
8. Answer: Turmeric and leaves of Neem plant are used as biopesticide in organic farming.
9. Answer: Vitamin A and K are the vitamins that are added in the poultry feed.
10. Answer: The major nutrient which we get from fish is protein.

➢ Short Answer:

1. Answer: Fishes like mullets, bhetki, pearl spots and prawns are of high economic value.
2. Answer: Shellfish include prawns, mussels and oysters.
3. Answer: The two desirable traits for variety improvement in poultry farming are:
   - number and quality of chicks;
   - dwarf broiler parent for commercial chick production.
4. Answer: Crossbreeding between the indigenous and exotic breeds is commonly used for improving cattle breeds. This is done as it helps to incorporate the desirable qualities like a long lactation period of exotic breeds with the disease resistance of indigenous breeds in the progeny.
5. Answer: Sahiwal is an indigenous breed of cow whereas Jersey is the exotic breed of cow.
6. Answer: The food requirements of dairy animals are of two types:
   - Maintenance requirement, which is the food required to support the animal to live a healthy life.
   - Milk producing a requirement, which is the type of food required during the lactation period.
7. Answer: Mixed cropping is the practice of growing two or more crops simultaneously on the same piece of land. For example, wheat and gram, or wheat and mustard, or groundnut and sunflower. It helps the farmer as it reduces the risk and gives some insurance against the failure of one of the crops.
8. Answer: Fertilizers are more advantageous than manure as:

- Fertilizers are nutrient specific and provide the specific nutrients like N, P, K to the soil.
- They are not bulky, so are easier to transport.

➢ Long Answer:

1. Answer: Indian agriculture is mainly dependent on the monsoons. The irregular or scarcity of rainfall often results in crop failure. To overcome the problem, different types of irrigation systems are in practice in India for the supply of water in agricultural fields. Wells, canals, river lift systems, tanks, etc. are used for irrigation. Some new initiatives like rainwater harvesting and watershed management are being used.

   For this small check-dams are constructed to stop the rainwater from flowing and lead to an increase in groundwater levels. The different types of irrigation systems are:

   - Wells: There are two types of wells – dug wells and tube wells. In a dug well, water is collected from water-bearing strata. Tube wells can tap water from the deeper strata. From these wells, water is lifted by pumps for irrigation.
   - Canals: In this system canals receive water from one or more reservoirs or from rivers. The main canal is divided into branch canals having further distributed to irrigate fields.
   - River Lift Systems: In this system, water is directly drawn from the rivers for supplementing irrigation in areas close to rivers.
   - Tanks: These are small storage reservoirs, which intercept and store the run-off of smaller catchment areas.

2. Answer:

   A combination of five or six fish species is used in a single fish pond in the composite fish culture system. The selected species do not compete for food among them as they have different types of food habits.

   The types of fishes used are:

   Callas are surface feeders, Rohus feed in the middle-zone of the pond, Mrigals, and Common Carps are bottom feeders, and Grass Carps feed on the weeds. As a result, the food available in all the parts of the pond is used.

   Advantages of Composite fish culture:

   - The species of fishes in the pond utilize all the food available in the pond.
   - The species do not compete with each other for food as they have different food habits.
   - The yield of fish is increased by such a culture system.

   The disadvantage of Composite fish culture:

   A major problem in fish farming is the lack of availability of good quality fish seeds.

3. Answer:

Nutrients supplied by air, water and soil	
Source	**Nutrients**
Air	Carbon, oxygen
Water	Hydrogen, oxygen
Soil	(*i*) Macronutrients: nitrogen, phosphorus, potassium, calcium, magnesium, sulphur.
	(*ii*) Micronutrients: iron, manganese, boron, zinc, copper, molybdenum, chlorine

➢ Assertion Reason Answer:

1. (a) Both Assertion and Reason are correct, and reason is the correct explanation for assertion.
2. (c) Assertion is true but Reason is false.

➢ Case Study Answers:

1.

(i) (b) June to October

(ii) (a) November to April

(iii) (a) Photosynthesis

(iv) Kharif crops

Paddy, soyabean, pigeon pea, maize, cotton, green gram and black gram

(v) Rabi crops

Wheat, gram, peas, mustard, linseed are.

2.

(i) (c) Brown Swiss

(ii) (d) All of the above

(iii) (d) Both a & b

(iv) Indian cattle belong to two different species

- Bosindicus – cows.
- Bosbubalis – buffaloes

(v) The food requirements of dairy animals are of two types

- Maintenance requirement – which is the food required to support the animal to live a healthy life.
- Milk producing requirement -which is the type of food required during the lactation period.