### Improvement in food resources



#### Improvement in Food Resource

Food is the basic necessity of all living organisms. Without food, life is just not possible. All the living organisms, therefore, must get a regular supply of food. Our body requires food for its growth, development, repair and maintenance and also to carry out various tasks in our day to day life. It also protects the body from diseases. The main constituents of our food are proteins, carbohydrates, fats, vitamins and minerals.

#### SOURCES OF FOOD

To us, both plants and animals are the major sources of food. It is on this account, man has been searching better methods of food production from plants and animals all the time. He grows suitable plants and rears animals for his needs and liking. The process of growing of plants (cultivation) in an organized way for obtaining food is called **agriculture.** 

To feed the ever growing population more food is required to be produced. Over the years food production in our country has increased considerably. The period between 1960 to 1980 is considered a golden period in our agriculture. The sincere efforts and breakthrough of our agricultural scientists of the country saw a great increase in food production in all the fields. This period ushered in many revolutions i.e.

- Green revolution (production of food grains)
- Blue revolution (production of fishes)
- White revolution (production of milk)
- Yellow revolution (production of oil).

All these made India self-reliant in food to certain extent. Now golden revolution is expected in the production of pulses.

#### SUSTAINABLE AGRICULTURE

Continuous increase in population and the fast rate of development in other fields of human activity have overexploited the natural resources. As a result of this, the limited natural resources are exhausting at a much faster rate. Attention is now given to find out ways and means to get more food to meet the needs of growing population without further depleting, degrading our environment and disturbing natural balance. Thus, it is felt, it would be possible only if a system of sustainable agriculture is developed. Sustainable agriculture can be defined as "successful management of resources and development of new techniques of agriculture to meet the changing human needs, at the same time maintaining and improving the quality of environment and conserving natural resources".

Sustainable agriculture would help the country and its people in two ways:

- (i) It would increase the food production considerably without further degrading the environment. It would make the country selfsufficient in the availability of food and there would be enough to tide over unforeseen circumstances of crop failure in any part of the country.
- (ii) The farmers would get more production from the available land, this would help them to earn more money for their livelihood.



1. On what factors does the growth of plant and flowers depend?

Ans. Temperature and photoperiod (duration of sunlight.) (NCERT)

#### **CROP PRODUCTION**

Plants provide us food in the form of cereals, vegetables, fruits, pulses and oils. Crop plants are sources of different nutrients required by our bodies so as to remain healthy and disease-free. Cereal plants are rich in carbohydrates and provide energy to the body. Pulse crops (legumes) are rich in proteins and help in body-building. Vegetables and fruits are rich in minerals and vitamins which are body-protecting nutrients. Oil-seed crops are energy providing plants.

With the increasing human population, the need for food is increasing. Therefore, there is a need to produce as much food as possible from the land available by raising crops. The various practices involved in crop production have, therefore, become more scientific.

#### Types of crops

- **Cereal crops** like wheat, rice, maize, barley, sorghum, millets, oats, etc. are a rich source of carbohydrates that meet our energy requirements.
- **Pulses** like gram (chana), green pea (moong), pigeon pea (arhar), lentil (masoor), etc. provide us proteins.
- **Oilseed crops** like soyabean, groundnut, sesame, mustard, sunflower, linseed, etc. are the sources of oil, fat and fatty acids.

- Fruits and vegetable crops like orange, apple, mango, banana, pineapple, cabbage, cauliflower, potato, brinjal, etc. are mainly the source of vitamins, minerals, roughage, proteins and carbohydrates.
- **Spices** like chilly, turmeric, black pepper, etc. are used for enhancing palatability of food.
- **Fodder crops** like berseem, oat, sudan grass, sorghum, etc. provide green fodder to the cattle.

#### Crop seasons

On the basis of seasonal variations, the crops in India can be classified into three main groups:

- (i) Rabi: It is a winter season crop grown from-November to April. Wheat, gram, peas, mustard, linseed are rabi crops.
- (ii) Kharif: It is a rainy season crop grown from June to October. Paddy, soyabean, pigeon pea, maize, cotton, green gram and black gram are kharif crops.
- (iii) Zaid: It is summer season crop grown from April to June. Cucumbers, melons, etc. are zaid crops.

#### **IMPROVEMENT IN CROP YIELDS**

To produce more food from the crops, it is essential that we should understand the factors affecting the crop production, and how can each be modified in order to get better yield from per unit area of land. Following are the factors involved in better crop production:

- (i) Adopting improved agricultural practices
- (ii) Proper and timely management of soil
- (iii) Need of nutrients for plant growth and development
- (iv) Timely application of manures and fertilizers
- (v) Proper management of water resources
- (vi) Protection of crops from pests and diseases
- (vii) Scientific storage of food materials to prevent its spoilage by pests, etc.
- (viii) Distribution of the food materials to market as and when required.

Presently, evolution of certain strains of various crops has made it possible to grow a crop in any season or throughout the year like maize, sorghum, tomato, etc. Our scientists have made it possible to increase the production of food grains approximately four times more from 1960 to 2004 with only 25% increase in the cultivable land area. It was made possible by following three major activities:

- (i) Crop variety improvement (i.e., choice of seeds for planting).
- (ii) Crop production improvement (i.e., nurturing of the crop plants).
- (iii) Crop protection management (i.e., protection of growing and harvested crops from loss).

## **ILLUSTRATION**

2. What are the desirable agronomic characteristics for crop improvement? (NCERT)

**Ans.:** Desirable agronomic characteristics are:

(i) Tallness and profuse branching are desirable characters for fodder crops.
(ii) Dwarfness is desired in cereals, so that less nutrients are consumed by these crops.

- 3. How do biotic and abiotic factors affect crop production? (NCERT)
- Ans.: Factors responsible for loss of grains, during storage and production are.
   (i) Biatic factors like redents, pasts, incasts

(i) Biotic factors like rodents, pests, insects, etc.

(ii) Abiotic factors like temperature, humidity, moisture, etc. Combination of biotic and abiotic factors causes.

(a) Infestation of inects

- (b) Weight loss
- (c) Poor germination ability
- (d) Degradation in quality
- (e) Discolouration
- (f) Poor market price
- 4. What do we get from cereal, pulses, pulses, fruits and vegetables? (NCERT)
- Ans.: Cereals give carbohydrates which provide energy. Pulses give protein which build our body. Vegetable and fruits provide vitamins and minerals, carbohydrates, fats and proteins.

Which of the following condition will give the most benefits? Why? (NCERT)
(a) Farmers use high- quality seeds, do not adopt irrigation or use fertilizers.
(b) Farmers use ordinary seeds, adopt

irrigation and use fertilizer. (c) Farmers use quality seeds, adopt irrigation use fertilizer and use crop

irrigation use refinizer and use crop protection measures.
 .: (c) In this, farmers use quality seeds, adopt

Ans.: (c) In this, farmers use quality seeds, adopt irrigation, use fertilizers and use crop production measures. Use of good quality

5.

seeds is not sufficient until they are properly irrigated, enriched with fertilizers and protected from biotic factors.

#### **CROP VARIETY IMPROVEMENT**

The art of recognizing valuable traits and incorporating them into future generation is very important in plant breeding. Breeders search for individual plants that exhibit desirable traits. So, selection of a good variety of crop plant is very important. If existing variety of crop plant has several inferior traits such as, it is susceptible to diseases and pests; it is low responsive of fertilizers and irrigation; and it is least adaptable. Such inferior (i.e., less economical) varieties need incorporation of new genes from other genotypes for various required traits. This is possible by various genetic manipulation techniques. Therefore, genetic manipulations is incorporation of new genes for various traits from other genotypes into the crop variety so as to bring about desired changes. It is carried out through mutation, polyploidy hybridization, and DNA recombination technology. Plant breeding is the science and art of improving the heredity of plants in relation to their economic use. The various methods of breeding are as follow:

(a) Introduction: It is the transportation of crop plant or new variety from an area of cultivation to a region where it does not occur before for ornamental purposes, increasing yield of food, fruit or economic products, improvement in local varieties, new food or commercial products. Initial introduction is carried out in those areas which have similar climatic and soil conditions. Slowly its area is allowed to spread when it gets acclimatized to other local conditions. For example, crops such as potato, coffee, tea, tobacco, groundnut, papaya, etc., have been introduced in India from the other parts of the world.

**(b) Selection:** It is selection of plants with better traits for further multiplication. Selection by human beings is also called artificial selection. Artificially selection operating over long time span can give rise to varieties strikingly different from starting generation. For example, broccoli, cabbage, cauliflower and other varieties have been obtained through artificial selection from wild cabbage. There are following two patterns of selection:

- Mass selection: Seeds from a number of similar plants having the desired traits are mixed and sown to raise new off springs. Off springs with the undesirable traits are eliminated and the process

is continued with the remaining progeny in the same manner until the desired improvement is achieved. Grapes, apples, pear, watermelon, radish, onion and maize have been improved by this method.

**Pure-line selection:** Seeds from a single plant having the desirable trait is sown in separate rows to produce the off springs. Desired plants are again selected from the progeny and the process is continued for several generations. The inferior varieties are eliminated in each generation. Wheat varieties such as Kalyan Sona-227 and PV-18 have been developed by this method.

(c) Hybridization: Crop improvement through breeding better varieties of crop plants forms the backbone of modern agriculture. In order to obtain an improved variety, following steps should be taken:

- Choice of parents: Two older varieties of crop having different desirable characteristics, are selected. For example, if we want to obtain a variety having higher yield as well as disease resistance, we should select two existing varieties of crops, one having higher yield and the other having more resistance to diseases.
- **Cross-breeding the two parents:** Pollen grains of plants of one variety are dusted over the stigmas of plants of the other variety and vice-versa. It produces a new variety which has good characteristics of both parents.

The process of crossing plants of two varieties having different traits to produce a hybrid having good traits of both is called hybridization. The crossing may be **intervarietal** (between different varieties), **intergeneric** (between different genera), interspecific (between different species of the same genus). The most common type of breeding is intervarietal.

#### CROP PRODUCTION MANAGEMENT

Crop production management controls various aspects of crop production so as to obtain the maximum and the best yield. In India, more than 70 per cent of population is engaged in agriculture and related activities directly or indirectly for livelihood. Being an agricultural country, having diverse climatic terrain, different farming practises are being followed in the different parts. Even the financial conditions of the farmers are not uniform. Some are very small farmers, some are big and others are big and progressive in land holdings and practises. The small farmers having less land follow age old agricultural practices. On the other hand, the big and bigger farmers having better financial status use modern technology to improve their farming.

There is a direct correlation between higher yields and input applications. The crop production management has three components:

- Nutrients management
- Irrigation
- Cropping patterns.

#### Nutrients management

Plants require certain elements which are known as plant nutrients. Though plants absorb a large number of elements from the environment, sixteen of these are found to be essential for their growth and development. Plant requires nutrients as they influence plant nutrition and metabolism and it is unable to complete its life cycle in absence of nutrients. Hence, these are required for plant development.

#### Sources of essential plant nutrients

There are three different sources from where a plant gets the 16 essential nutrients. These sources are air, water and soil. On the basis of these sources, essential plant nutrients are tabulated as follows:

#### Table: Sources of plant nutrients

Air	Water	Soil	
Carbon	Hydrogen	Nitrogen, Phosphorus,	
Oxygen		Potassium, Magnesium, Sulphur,	
		Iron, Manganese, Boron, Zinc,	
		Copper, Molybdenum, Chlorine	
		and Calcium.	

The table shows that plants get nutrients from the three sources— from air, water and soil. Though the number of nutrients taken by plants from air and water are very important as they constitute 94 to 99.5 per cent of total plant tissue, the remaining 0.5 per cent plant tissues are synthesized from soil constituents.

#### **Classification of nutrients**

The nutrients are classified on the basis of their requirement as mentioned below:

- Macronutrients: Out of the thirteen soil nutrients, plants require six nutrients in comparatively larger amounts. These are nitrogen, phosphorus, potassium, calcium, magnesium and sulphur. These are called major or macronutrients.

 Micronutrients: The remaining nutrients such as iron, manganese, zinc, copper, molybdenum and chlorine are required by plants in comparatively smaller quantities, but they are also essential for the growth of the plants. These are called minor or micronutrients.

#### Mode of intake of soil nutrients

The soil nutrients remain dissolved in water. They are absorbed by roots from the soil by the plants. The most important nutrients (elements) required for plant growth are nitrogen, phosphorus and potassium (NPK). NPK are primary plant nutrients, so if crop plants are grown in the same soil, year after year, then the primary nutrients present in the soil would go on decreasing more rapidly than other nutrients. Such a specific deficiency of nitrogen, phosphorus and potassium in the soil is recouped by adding chemical fertilizers and manures in the soil to make it fertile again.

#### Manures

Manures are organic substances obtained through the decomposition of plant wastes like straw and animals wastes like cow dung. The decomposition is brought about by the action of microbes.

#### Advantages of manures

- Manures enrich the soil with nutrients. Which can replenish the general deficiency of nutrients in the soil.
- Manures contain large quantities of organic matter (called humus) which they supply to the soil that restores the soil texture for better retention of water and aeration of soil.
- They also avoid water logging in clay soils.

#### Disadvantages of manures

- Manures contain nutrients in small quantities and therefore are needed to be supplied to crops in large quantities.
- Manures are bulky and so it is inconvenient to store and transport them.
- Manure is not nutrient specific and, hence, it is not much useful when a particular nutrient is required in the soil for a particular crop.

#### **Types of manures**

Based on the kind of biological material used, manures are classified as follows:

- (i) Farm Yard Manure (FYM): It is the decomposed mixture of cattle excreta and urine along with litter and left over organic matter such as roughage of fodder.
- (ii) **Compost:** It is the process in which farm waste material like livestock excreta, vegetable waste, animal refuse (e.g., excreta of domestic animals), domestic waste, sewage waste, straw, eradicated weeds, etc., are decomposed in pits.
- (iii) Vermicompost: It is the process when compost is prepared by using earthworms to hasten the process of decomposition of plants and animal refuse. Here the earthworms help to breakdown the wastes. This activity along with the excreta of the worms makes the compost rich in nutrients.
- (iv) Green Manure: Green manuring is a practice which includes growing, ploughing and mixing of green crops with soil to improve physical structure and soil fertility. Green manures include both leguminous and non-leguminous plants. Generally the crops which require high nutrient input, are raised in the green manured field. Such crops are rice, maize, sugarcane, cotton, wheat, etc.

#### Fertilizers

A chemical fertilizer is a salt or an organic compound containing the necessary plant nutrients. On the basis of nutrients available in them, the fertilizers are divided into following group:

- (i) Nitrogenous fertilizers: These fertilizers supply the macronutrient nitrogen. Common examples are ammonium sulphate (NH<sub>4</sub>)<sub>2</sub> SO<sub>4</sub> ammonium nitrate NH<sub>4</sub>NO<sub>3</sub> calcium ammonium nitrate and urea CO(NH<sub>2</sub>)<sub>2</sub>.
- (ii) **Phosphatic fertilizers:** These are rich sources of macronutrient phosphorus. For example, single superphosphate, triple superphosphate and dicalcium phosphate.
- (iii) Potassic fertilizers: These are rich sources of potassium which is one of the essential plant nutrients. For example, muriate of potash, potassium sulphate K<sub>2</sub>SO<sub>4</sub>.
- (iv) Complex fertilizers: A fertilizer containing two or more nutrients (N, P<sub>2</sub> O<sub>5</sub> and K<sub>2</sub>O) is called complex fertilizer. For example, nitrophosphate, ammonium phosphate and urea ammonium phosphate.

## ILLUSTRATION

6. What are macronutrients and why are they called macronutrients?

Ans.: Macronutrients are the essential inorganic elements which are utilized by plants in large quantities. As they are required in large quantities they are called macronutrients e.g., carbon, hydrogen, oxygen, nitrogen, phosphorus, potassium, calcium etc.

#### 7. How do plants nutrients? (NCERT)

- Ans.: Nutrients which are found in the soil get dissolved in the water and is absorbed by the roots of the plants. The conducting tissue xyle transport this water to different parts of the plant.
- 8. Compare the use of manures and fertilizers in maintaining soil fertility. (NCERT)

**Ans.:** Effects of using manures on soil quality:

(i) The manures enrich the soil with nutrients.
(ii) They provide a lot of organic matter (humus) to the soil and thus restores water retention capacity of sandy soils and drainage in clayey soil.

(iii) The addition of manures reduces soil erosion.

(iv) They provide food or soil organisms, like soil friendly bacteria.

#### Effects of using fertilizers on soil quality:

(i) By the continuous use of fertilizer, the sol becomes powder, dry and rate of soil erosion increases.

(ii) By the use of fertilizers, the organic matter decreases which further decreases the porosity of soil and the plant roots do not get oxygen properly.

(iii) The nature of soil changes to acidic or basic.

#### Judicious use of fertilizers

Excessive use of fertilizers over a long period has the following bad effects on soil and environment:

(i) Fertilizers change soil chemistry: Excessive use of fertilizers in the long run degrades the quality of the soil and disturbs the ecosystem. The unused part of the fertilizers makes the soil either alkaline or acidic, depending upon their nature. (ii) Fertilizers cause water pollution: High doses of these chemicals get washed off through irrigation and rainfall as drainage and reach rivers, lakes, streams and other water bodies and pollute them. In the water bodies, these salts increase the growth of algae (algal bloom). The algae deoxygenates the water, making it unfit for acquatic animals.

Therefore, it is very essential that the chemical fertilizers are used very judicously.

#### **Bio fertilizers**

Organisms which enrich the soil with nutrients are called biofertilizers. Bio fertilizers are used for the specific crop plants such as pulses, legumes, oil seeds and rice. Biofertilizers are renewable and nonpollutant sources of plant nutrients such as nitrogen. They are not alternatives to chemical fertilizers but can play a supplementary role in supplying nitrogen to specific crops under specific soil conditions.

Two biofertilizers, Rhizobium cultures and blue green algae (Noztoc and Anabaena) are being used in cultivating pulses, legumes, oil seeds and wet-land rice.

#### Some of the biofertilizers are given below:

- Legume (Rhizobium symbiosis).
- Azolln (Anabaena symbiosis).
- Free-living bacteria (Azotobacter) living in soil symbiotically.
- Cyanobacteria (Anabaena, Nostoc).
- Mycorrhiza (symbiotic association of fungi with roots of higher plants)

## ILLUSTRATION

- 9. Name a farming system with minimal or no use of chemical fertilizer?
- Ans.: Ecological farming or organic farming

#### Irrigation

Irrigation is the application of water to the soil for the purpose of supplying moisture essential for plant growth especially during stress periods. Irrigation is necessary for the survival and proper development of the crop plants. It is necessary to provide sufficient moisture for the germination of seeds as they do not germinate in dry soils. Similarly, roots of crop plants fail to develop and elongate in dry soil. Also, irrigation is essential for the absorption of nutrient elements by the crop plants from the soil. The irrigation or water requirements of crop plants depends on the following two factors;

(i) Irrigation depending on the nature of the crop plants (i.e., crop-based irrigation);

(ii) Irrigation depending on the nature of soil of the crop fields (i.e., soil-based irrigation).

- **Crop-based irrigation:** Water requirements of different crops are different during the various stages of their growth and maturation (ripening). Some crop plants require more water, while others need less water. For example, paddy crop (rice crop) is transplanted in standing water (wet lands) and requires continuous water supply, whereas, other crops such as wheat, gram and cotton requires less water.
- Soil based irrigation: The crops grown in a sandy soil need irrigation more frequently, whereas the frequency of irrigation is comparatively less for crops grown in a clayey soil. This is because, sandy soil is highly porous having high permeability, water quickly percolates down the soil and the crop plants are not able to absorb adequate amounts of water. In contrast to sandy soil, clayey soil is much less permeable, so it can retain water for a much longer time.

#### **Irrigation systems**

Drought and poor rainfall pose a serious threat to rain-fed farming areas. These areas need supply of water from external sources. Under such conditions, irrigation system is adopted to supply water from different water resources. Some common irrigation systems are discussed below.

(a) Wells: Wells are constructed wherever exploitable ground water is present. There are two types of wells :

> (i) Dug wells: These are open wells where water gets collected from water bearing strata. They are owned privately by the farmers. They do not have long life and soon become dry whenever water table goes down.

(ii) Tube wells: Shallow tube-wells meant for irrigation are privately owned and water is lifted by bullock operated devices or by electrically operated or diesel operated pumps. They get water from porous soil strata. Deep bore tube wells take water from the deeper strata and have longer life period of many years.

(a) Tanks: Tanks are small storage reservoirs, which catch and store the runoff of smaller

catchment areas. Small dams are built below the higher elevations of the catchment areas. Outflow of water from these reservoirs is regulated so that all areas get adequate water for irrigation.

- (c) Canal system: Canals take water for irrigation from rivers, dams, lakes or reservoirs to agricultural land. Canals form an extensive irrigation system. Main canal divides into distributaries. These distributaries ultimately supply water to the individual field or group of fields.
- (d) River lift system: In areas where canal flow is insufficient or irregular due to inadequate water release, this system is very useful. Water is lifted directly from the rivers for supplementary irrigation in areas close to rivers.

#### Rainwater harvesting and watershed management

In rainwater harvesting, rainwater is collected and recycled into ground by digging tunnels. This water percolates into the soil. Thus, the water-table is maintained. In watershed management, small check dams are built up in watershed areas to increase percolation of water into the ground, reduce flow of rainwater to prevent soil erosion.

#### Irrigation methods

Artificial applications of water to the land are through the following methods:

- **Sprinkler (or overhead irrigation):** Water is piped to one or more central locations within the field and distributed by overhead high-pressure sprinklers or guns.
- **Drip irrigation (or trickle irrigation):** Water is delivered at or near the root zone of plants, drop by drop. This is most water efficient method as evaporation and run off are minimized.
- **Surface irrigation:** Historically, this has been the most common method of irrigating agricultural land. Water moves over and across the land by simple gravity flow in order to wet it and to infiltrate the soil.

#### Cropping patterns

In order to get maximum benefit from a piece of land, operating as a unit for the production of agricultural products, different patterns of growing crops are followed. These patterns are mixed cropping, intercropping and crop rotation.

#### Mixed cropping

It is the technique of growing two or more different crops together in the same field. The different crops to be grown together are so chosen that they do not have common pests and pathogens or similar requirements to water and animals. For example, ground nut and sunflower/gram, ragi and gram, wheat and gram/mustard, cotton and mung bean/groundnut.

#### Criteria for the selection of crops

The following criteria are taken into consideration while selecting crops for mixed cropping:

- (i) Root pattern: Both the crops should not have same root pattern. One crop should have deep penetrating roots (e.g., dicot) whereas other should have shallow roots (e.g., monocot).
- (ii) Water requirement: Both the crop plants should have different water requirements. If one of the crops requires higher amount of water, the other should require lesser amount.
- (iii) Nutrient demand: If one crop plant requires higher amount of nutrition, the other should require lesser amount of nutrition.
- (iv) Duration of crops: Both the crops should have different maturation time. If one is long duration crop, the other should be short duration (early maturing).
- (v) Growth habit: If one plant is tall, other should be dwarf. They should have different structures of leaves, stem, branching pattern of stem and flowers (different canopy).

#### Advantages of mixed cropping

- No risk of crop failure: The risk of total crop failure due to uncertain monsoon is reduced if two crops of different nature are grown simultaneously as a mixed crop.
- Variety of produce: A variety of produce could be produced from a single crop field to meet the varying requirements like cereals, pulses, vegetables etc.
- Increase in yield: Components of crops have a complimentary effect on one another. For example, legume crops have a beneficial effect on cereals or non-legume crops as they help in

fixing nitrogen in the soil. There is higher yield by this method.

#### Intercropping

It is growing of two or more crops simultaneously in different strips or rows in a same field in definite row patterns. The row patterns may be in the ratio of 1 :1, 1 : 2, or 1:3, i.e., one row of main crop followed by one, two or three rows of intercrops. The crops selected for intercropping have different nutrient requirements, different sowing and harvesting dates, e.g., soyabean + maize, Finger millet (bajra) + cow pea (Lobia).



#### Advantages of intercropping

- **Productivity:** Intercropping increases productivity per unit area.
- Efficiency: It saves time and labour of the farmer and makes better use of resources. -
- Sowing: Seeds of different crops can be sown separately.

#### **Crop rotation**

It is defined as the practice of growing different crops on a piece of land in a preplanned succession. Depending upon the duration, crop rotation is done for different crop combinations. During crop rotation, leguminous crops are also grown in rotation with nonleguminous crops. Leguminous plants are provided with nodulated roots. The root nodules contain nitrogen fixing bacteria (Rhizobium), which have the ability to fix up atmospheric nitrogen into nitrates and in turn enrich the soil. Thus, when cereal crops are gown in the soil they absorb most of nitrogen present in the soil. This reduces soil fertility. If in next season leguminous crop is grown, it restores the soil fertility by converting atmospheric nitrogen into nitrates. If crop rotation is done properly then two or three

#### Advantages of crop rotation

- It prevents building up of diseases and pests of particular crop.
- It helps in replenishment of soil fertility.
- It prevents depletion of selective nutrients.



#### **CROP PROTECTION MANAGEMENT**

The crop plants provide us the products of economic or commercial values and grown in community for specific purposes; they provide us food, fibres, drugs, building materials and so many other countless products for our daily use. Thus, it becomes our prime duty to provide protection to crop plants from their enemies. These enemies are weeds, insect pests, and disease inciting agents (pathogens).

#### Weed and weed control

A plant species growing spontaneously at unwanted habitat (or in the cultivated field) is called a weed. Weeds damage our crop plants, by competing with them for space, water, light and nutrients. The overall losses caused by weeds in India had been estimated at 27% of field crop production. Therefore, eradication of weeds from crop fields during the early stage of crop growth is our prime concern.

The process of removing weeds from a crop is called weeding. Weeds can be controlled by the following methods:

- Mechanical methods: Weeds are uprooted by hands or by using trowel (khurpi). Most weeds get removed during ploughing, land tilling or mowing (cutting with machines) or by burning and flooding before sowing.
- Cultural methods: These include methods like preparation of proper seed bed, timely sowing of crops, intercropping and crop rotation.
- Chemical methods: Destroying the weeds by spraying special chemicals called weedicides like 2, 4-D (2-4-dichlorophenoxy acetic acid), MCPA (2-methyl, 4-chlorophenoxy acetic acid), atrazine and butachlor.

- **Biological methods:** In this method, some appropriate insects or other organisms are deliberately put into the field which selectively destroy weed plants without harming the crop plants. For example, cochineal insects are used to eradicate the weeds called Opuntia (prickly pear). Similarly, some crop plants like soyabean, millet, barley, etc. do not allow the growth of weeds. Such crop plants are called smoother crops.

Some of the important weeds of our crop field are Parthenium (Gajar ghas), Xanthium (Gokhroo), Cyprus rotundus (Motha), Abutelon indicum (Kanjhi), Achyranthus aspera (Latieera), Convolvulus (Hirankhuri), etc.



#### Insect pests

Harmful creatures for our crop plants are smallinsects which attack the plants. Insect pests are of following types:

- **Chewing insect:** Insect pests of this category cut the roots, stem and leaves with the help of their chewing mouth parts. They chew and swallow the pieces of plant parts. Examples, grasshoppers, caterpillars, locusts, etc.
- Sucking insects: These insects puncture the plant parts and suck the cell sap with the help of their needle like hollow beaks. Examples, leaf hoppers, aphids, bugs, etc.
- Internal feeders: These insects bore into stem and fruits. They live inside the plant parts and harm the crop yield. Examples, weevils, borers, etc.



- **By using pesticides:** The chemicals used to eliminates pests are called pesticides. Pesticides include insecticides (for killing insects), weedicides (for killing weeds), rodenticides (for killing rats), and fungicides (for killing fungi).
- **By using natural insecticides:** Like neem, nicotine, pyrethrum, etc.
- Biological methods of pest control: In these methods, some insects, birds or some other organisms are deliberately left in the affected crop fields to kill the pests selectively, e.g., Australian ladybirds were left in citrus orchards to control the scale insects in California, U.S.A.

#### **Disease inciting agents (Pathogens)**

Several diseases of crop plants are caused by pathogenic organisms which damage the plants and reduce the yield. Main pathogens of crop plants are fungi, bacteria, viruses, mycoplasmas, nematodes etc. These diseases can be easily transmitted from diseased plant to healthy plants, i.e., they are infectious.



To visit a field of rice in the month of July or August and make a list of weeds, insect pests and disease one can observe.

#### **Observation:**

**Weeds** - Amaranthus viridis (Chaulai), Cyperus rotundus (Motha),

**Insect pests** - Blast, (Brown boat-shaped lesion appear on the leaves).

Storage of grains

One of the most important aspect of agriculture is proper storage of harvested grains and other agricultural products. Proper storage is necessary to get seasonal foods regularly throughout the year. It has been observed that improper storage of grains and seeds results in spoilage and wastage. In India, the loss due to improper storage of grains has been estimated to be approximately 9% annually. There are two main factors responsible for losses during storage. They are:

- (i) Biotic factors: The living organisms which influence the storage of grains are called biotic factors. These include insects (beetle, weevil, grain borer, etc.,) rodents (rat, mouse, squirrel, etc.), birds, mites, fungi, bacteria, etc.
- (ii) Abiotic factors: The non-living environmental factors are called abiotic factors. These include moisture and temperature.

#### **Preventive and control measures**

Biotic and abiotic factors which cause destruction of grains during storage can be prevented and controlled by using the following measures:

- Maintenance of hygiene: The store houses or god owns where grains are to be stored, the gunny bags or earthem pots which are used for storage should be absolutely dry and clean. They should be free from dust, dirt, webbing or refuse of the previous stored grains. If there are any cracks or holes in the wall, flour or ceiling, these should be properly sealed.
- **Drying:** It is desirable that the grains and nonperishable food such as flour, sugar, spices and nuts should be dried first in sunlight and then in shade. The moisture content of grains should be below 9 per cent.
- **Fumigation:** Chemical pesticides are used as fumigants, i.e., the solution of pesticides is converted into fumes. These fumes kill the insect pests and other harmful biological agents. Before storage of food grains, the store houses or godowns, the gunny bags used for storage should be fumigated by suitable pesticides. Ethylene dichloride carbon tetrachloride (EDCT), methyl bromide and aluminium phosphide are commonly used as fumigants.



Make a herbarium of cereals, pulses and oil seed and identify the seasons of their sowing and harvesting. **Observation:** 

#### Rabi crops

Season of sowing: October – November Season of Harvesting: March – April



- 10. What factors are responsible for losses of grains during storage? (NCERT)
- Ans.: The factors responsible for loss of grains during storage are:
  (i) Abiotic factors like moisture (present in food grains) humidity (of air) and temperature.
  (ii) Biotic factors like insects, rodents, birds, mites, bacteria and fungi.
- 11. Why should preventive measures and biological control methods be preferred for protecting crops? (NCERT)
- Ans.: Diseases in plants are caused by pathogens. To get rid of pathogens, some preventive measures and biological control methods are used as they are: simple, economic and minimize pollution without affecting the soil quality

#### ANIMAL HUSBANDRY

Animal husbandry is the farming or management of animal livestock which includes various aspects such as animal's shelter, feeding, breeding, health and disease control. Good animal husbandry practices are needed to meet out the growing demand of milk, eggs, meat, etc. These practices finally benefit the farmers. It is under animal husbandry through operation flood and silver revolution that milk and egg production respectively registered a considerable increase. The farming or management of animal livestock includes cattle farming; poultry farming; fish production and bee keeping.

#### Cattle farming

Cows and bullocks are the major backbone of Indian agriculture and play an important role in the rural economy. Generic name of cow (cattle) is Bos indicus; it is adapted for drier regions of the country such as Gujarat and Rajasthan. Buffalo is commonly called Indian water buffalo; its generic name is Bubalus bubalis. It is well adapted for wet areas and river beds of Kerala, Bengal, Andra Pradesh and Tamil Nadu.

#### Purposes of cattle farming

Cattle farming is done mainly for two purposes; dairy and draught.

- (i) Dairy animals: Dairy animals include those animals which are kept for obtaining milk. They are also called milch animals. These include cow, buffalo, goat, camel and yak.
- (ii) Draught animals: Animals used in agriculture and for transport are called draught animals, e.g., bullocks, horses, elephant, mules etc. In India, there are about 84 million draught animals.





Sahiwal breed of cow

Murrah breed of buffalo

Fig.: Indigenous breeds of cattle



Ans.: Cross- breeding.

#### Breeds of cow

- **indigenous breeds:** Sahiwal, Gir, Red Sindhi, Tharparkar.
- **Exotic breeds** (breeds which have been imported from abroad and reared in India): Jersey, Holstein-Friesian, and Brown Swiss.
- **Cross-breeds of improved breeds:** Karan Swiss, Karan Fries, Fries wall.

#### **Breeds of buffalo**

Murrah, Meshsana and Surti are some common breeds of buffaloes reared in India.

#### Breeding for the desired quality

The exotic and local breeds can be crossed to get animals with both desired qualities. The breeding may be done by natural method or artificial insemination, i.e., injecting the semen obtained from the desired bull into the reproductive tract of the desired cow. Some successful cross-breeds on these lines are:

- Karan Swiss: It is a cross-breed of Brown Swiss and Sahiwal.
- **Karan Fries:** It is a cross-breed of Holstein-Friesian and Tharparkar.
- **Frieswal:** it is a cross-breed of Holstein-Friesian and Sahiwal.

#### Milk production

Production of good quality milk depends on several factors. Some of them are:

(i) Influence of breed: The quality and quantity of milk of some breeds is comparatively much better than others. For example, exotic or foreign breeds of cattle have long lactation periods and give more amount of milk. Jersey cow (native of Island of Jersey, U.S.A.) and Brown Swiss cows (native of Switzerland) produce on an average 60 litres of milk in a day. On the other hand, local breeds (for example. Red Sindhi and Sahiwal) produce on an average only 6-8 litres of milk per day. Milk of Red Sindhi cow contains higher fat than those of Holstein (native of Holand) and Brown Swiss.

The period from the time the calf is born until the cow ceases to give milk is called the 'period of lactation'.

- (ii) Seasonal change: Generally the quality of milk is better in cold weather and decreases in warm weather. During summer, the yield of milk is reduced but the fat content is increased.
- (iii) Physical health of the animal: If the cattle is not healthy and suffering from some disease, the quality of milk is affected.
- (iv) Feed of the cattle: The quality of milk is temporarily affected by variation in feeds.

#### Buffalo milk

Buffalo is potentially the most productive economic animal. It has an exceptionally long productive life of about 20 years. Also, Buffalo's milk is richer in fat, tocopherol (Vitamin E), proteins, calcium, and phosphorus and contains low sodium, potassium, cholesterol. Buffalo's milk is ideal for making milk products such as khoa, rabri, dahi, ghee, etc., and is always in great demand.

#### **Diseases of cattle**

Cattle and buffaloes suffer from several diseases which not only cause ill health but reduce the milk production. Some severe diseases, if not properly cared, lead to the death of animals. Therefore, treatment in early stages of the disease is more effective.

Many other infectious diseases are caused by fungi, bacteria and viruses. Some of them are listed below:

- (i) Anthrax: It is a contagious and fatal disease caused by anthrax bacteria. Animal dies within a few days of infection
- (ii) Haemorrhagic septicemia: It is an acute and most serious disease of cattle caused by bacteria. It causes death of animal within few hours.
- (iii) Foot and mouth disease: It is highly contagious viral disease which is not fatal except in young ones. In this disease, blisters appear on the mouth and foot. The milk production is greatly reduced.
- (iv) Rinderpest (cattle plague): It is a viral disease characterised by fever, ulceration in the mouth. This disease is also highly contagious and fatal.
- (v) **Tuberculosis:** It is a chronic infectious disease caused by bacteria. It spreads to humans through infected milk or meat.

#### Diseases of animals transmitted to human beings

- Viral diseases: rabies, cow pox, encephalitis.
- **Bacterial diseases:** anthrax, tuberculosis, brucellosis.
- Fungal diseases: actinomycosis, aspergillosis, ringworm.
- **Parasitic diseases:** amoebiasis, trypanosomiasis, ascariasis.

#### Symptoms of sick cattle

- The cattle becomes inactive and remains isolated.
- It stops eating food.
- It moves slowly or limps.
- The cattle may pass loose dung and coloured urine.
- The milk yield or working capacity of animal is reduced drastically.
- The cattle may run high temperature and shiver.

#### **Prevention of cattle diseases**

- The animals should be kept in spacious and airy shelter.
- Proper cleanliness should be maintained in cattle sheds.
- The animals should be given regular bath and groomed.
- The animals should be given nutritious feed.
- They should be vaccinated at regular intervals.
- Proper disposal of wastes and isolation of sick animals is very important.

#### **Poultry farming**

Poultry is a class of domesticated fowl (particularly young ones of common domestic fowl) used for food and for their eggs. The word, poultry has originated from the old French word 'poult' means chicken, the young one of common domestic fowl. The common poultry birds are chicken, turkey, duck, geese, guineafowl and pigeon. Eggs and high quality meat obtained from poultry give us a balanced diet and serves as a cheap source of animal protein. Now a days, the poultry products have become the choice of millions as staple food.

The constant efforts in the field of poultry farming has made it possible to increase the production of eggs in our country. India has become 5<sup>th</sup> largest country in the world in poultry production after China, former USSR, USA and Japan. An egg laying poultry is called egger or layer and the poultry reared for obtaining meat is called chicken or broiler.

Poultry farming includes housing, rearing, sanitation, disease-control and marketing of poultry birds and their products.

# A CTIVITY CORNER

Visit a livestock farm and note the following:

- (i) Number of cattle and number of different breeds
- (ii) The amount of daily milk production from the different breeds.

#### **Observation:**

- (i) Number of Cattle: 52
- Number of Sahiwal breed -40
- (ii) Sahiwal -2800 litres

#### **Poultry breeds**

- Indigenous breeds: Aseel, chattisgarh, burosa kadaknath.
- **Exotic breeds:** White leghorn, barred plymc black minorca, rhode island red, australorp light Sussex.



#### Eggs and broilers production

There are two basic targets of poultry farming:

- (i) obtaining more and more eggs;
- (ii) getting flesh.

	Layers	Broilers	
1.	Layers are egg-laying birds,	Broilers are	
	managed for the purpose	maintained for getting	
	of <b>getting eggs.</b>	meat.	
2.	Layers start producing	They are raised up to	
	eggs at the age of 20	6-7 weeks in poultry	
	weeks. So they are kept	farms and then sent to	
	for longer period	market for meat	
	depending upon laying	purposes.	
	period (approximate 500		
	days).		
3.	They require enough space	They require	
	and adequate lighting.	conditions to grow fast	
		and low mortaility.	
4.	They need restricted and	The daily food	
	calculated feed with	requirement (ration)	
	vitamins, minerals and	for broilers is rich in	
	micronutrients.	protein and vitamin A	
		and K. The fat contents	
		should also be	
		adequate.	



**Ans.** 1.Shelter: Dairy animals and poultry birds require proper shelter, i.e., well designed diary and hygienic shelter.

2. Feeding: To get good yields of food products, proper feed is provided to dairy animals and poultry bird.

3. Caring for animal health: Animals and birds must be protected form diseases caused by virus, bacteria or fungi.

- 14. Discuss the implications of the following statement: "It is interesting to note that poultry is India's most efficient converter of low fibre food stuff into highly nutritioces animal protein food". (NCERT)
- **Ans.** The basic aim of poultry farming is to raise domestic fowl for egg production and chicken meat. Theses poultry bird are not only the efficient converters of agricultural by-products, particularly cheaper fibrous wastes (which is unfit for human consumption but can be formulate into cheaper diets for poultry birds) into high quality meat and also help in providing eggs, feathers and nutrient rich manure. For this reasons, it is said that, "poultry is India's most efficient converter of low fibre food stuff into highly nutritious animal protein food".
- 15. Which method is commonly used for improving cattle breeds and why?
- Ans. Cross- breeding is process in which indigenous varieties of cattle are crossed by exotic breeds to get a breed which is high yielding. During cross-breeding, the desired characters are taken into consideration. They progeny resulting from cross- breeding contains the desirable traits of both indigenous and exotic breed. The progeny should be high yielding, should have early maturity and should be resistant to climatic conditions.
- 16. What are the differences between broilers and layers and in their management?
- Ans. The poultry bird groomed of obtaining meat is called broiler. The egg laying poultry bird is called layer. The housing, nutritional and environmental requirements of broilers are somewhat different from those of egg layers. The ration (daily food requirement) for broilers should be protein rich with adequate fat. The level of vitamins A and K is kept high in the poultry feeds and layers require enough space and proper lightening.

#### Production of vegetarian eggs

The fertile eggs rot rapidly than the infertile eggs, thus, the production of infertile eggs is desired. Hens are capable of laying without the presence of cock and the eggs thus obtained are infertile. Such eggs are called vegetarian eggs.

#### Shelter

- Shelter for poultry birds should be clean, dry, wellilluminated and well-ventilated.
- Temperature in their living place should be kept between 34°C to 38°C.
- Housing should be made rat proof and should be such that poultry birds could be protected from predators, like cats and dogs.
- Birds of different ages like growers, egg layers, brooding birds and broilers should be housed separately.

#### **Diseases of poultry**

The poultry birds suffer from various diseases caused by viruses (flue, dermatitis, fowl pox, Ranikhet), bacteria (tuberculosis, cholera, diarrhoea), fungi (aspergillosis), parasites (worms, mites, lice), etc.

#### **Fish production**

Fish serves as the common man's food and a cheap source of animal protein that is easily digestible. Fish is a general term that includes Agnatha (i.e., jaw-less fishes), Chondrichthyes (i.e., cartilaginous fishes) and Osteichythyes (i.e., bony fishes).

The process involved in obtaining fish from the sources is called fishing, i.e., catching of fish. India ranks 7<sup>th</sup> among the leading fish producing countries.

Increase in the production of fish, shellfish, prawns, crabs and shrimps through culture fishery has brought a revolution. This revolution in fish food is called Blue revolution. Basically, fisheries are of two types:

- **Fin fishery** includes capturing, management and exploitation of cartilaginous and bony fishes.
- **Shell fishery** includes capturing, management and exploitation of crustaceans (prawns, crabs) and molluscs (oysters, mussels), etc.

Depending on the habitat from which fishes are obtained, fisheries are of two types- capture fishing and culture fishing.

**Capture fishing:** The fishes is caught from water, both marine and inland.

**Culture fishing:** It is cultivating, rearing and harvesting of fish. Culture fishery is also called fishes farming or **pisciculture**.

#### Marine fisheries

Marine fishes are caught by traditional and modern methods. Traditional methods include nets and gear operated fishing vessels. Modern methods include ecosounders and satellite to locate fish shoals. Marine fishery resources in India include 7500 km. of coastline and deep seas beyond it.

Fin fisheries like mullets, bhetki and pearl spot and shell fisheries like prawn, mussels, oysters and sea weeds have high economic value and are cultured in sea-water, examples of marine fish varieties that are consumed as food are Bombay duck, pomphret, tuna, sardine, eel, hilsa, mackerel and salmon. Culture of marine fin fishes, shell fishes and sea weeds is called **mariculture.** 



#### Inland fisheries

Inland fisheries includes capture fishing from fresh water resources as well as brackish water resources. The fresh water resources include rivers, canals, lakes, reservoirs, tanks, ponds, etc. Brackish water is saline water that flows from sea and gets mixed with fresh water. The common brackish water resources are estuaries and lagoons. They are also important fish reservoirs. Examples of Rohu (carp), Calbasu, Catla, Mrigal. Inland fishery accounts about 50% of total fish production in the country.



note the type of ration, housing and lighting facilities

given to them. Identify the growers and layers and broilers.

**Ration:** It consists of mashed cereals like wheat, maize, jowar, bajra, bran of rice, ground oil cakes, fish meal, meat meal and bone meal (fish and meat are separated from wastes of fish and meat processing (centres).

**Housing:** Wire cages/permanent brick house with solid floor. Floor of the poultry house covered with litter of some dry absorptive material (paddy house, chopped straw, saw dust, etc.).

Lighting: Well ventilated and well-illuminated house

## ILLUSTRATION

#### 17. How are fish obtained?(NCERT)

- **Ans.** There are two ways of obtaining fish. One is form natural resources, which is called capture fishing. The other ways is by fish farming, which is called culture fishing.
- 18. What are the advantages of composite fish culture?(NCERT)
- Ans. In composite fish culture, a combination of five or six fish species is used in a single fish pond. These species are selected so that they do not compete for food among themselves and have different types of food habits. As a result, the food available in all the parts of the pond is used. As Catlas are surface feeders, rohu feeds in the middle-zone of the pond, mrigals and common carps are bottom feeders and grass carps feed on the weeds, together these species can use all the food in the pond without competing with each other. This increases the fish yield from pond.
- 19. What is called the rearing of fish on a large scale? (NCERT)
- Ans. Pisciculture.

#### Bee keeping

Bee keeping is an important enterprise of agriculture. It is concerned with the commercial production of honey and wax. The practice of bee keeping is called apiculture. Bee keeping is a low investment, less problematic and highly profitable enterprise. Therefore, farmer practice it as an additional source of extra income.

Apiculture or bee keeping provides us Honey (A sweet edible fluid containing sugar, water, minerals,

vitamins, amino acids, enzymes and pollen); Wax (secreted by wax glands of worker bees for construction of bee hive); Propolis and Poisons (used in some Ayurvedic and Homeopathic preparations).

In India, both local varieties (indigenous) as well as exotic varieties are used for commercial production of honey. The local varieties are Apis cerana indica (Indian bee), A. dorsata (Rock bee) and A.florea (Little bee). The exotic varieties used for honey production are Apis mellifera (Italian bee) and A. adamsoni (South African bee).

#### Colony and castes of honey bee

Honey bee is a social insect. The nest of the honey bee is known as the bee-hive. Honey bees provide a good example of team work and division of labour.

They live in colony and different tasks are done by different groups of bees in the same colony. Due to existence of several morphological forms, called castes, bees are said to be the polymorphic species. A caste can be defined as a collection of individuals within the colony that are morphologically distinct from other individuals and perform specific tasks. According to roles, there are following three types of castes in the colony of bee:

- Queen: The size of the body of queen is much larger than other castes of bees of the colony. The queen, as the mother of the colony, is responsible for laying eggs. She lays up to 2000 eggs every day of each season. Queen lays both fertilized (diploid. 2n) and unfertilized (haploid n) eggs. Queen and workers emerge from the fertilized eggs, whereas drones come out from unfertilized eggs.



Fig.: Three different castes of a colony of honey bee

**Drone:** It is haploid, fertile male. Males are larger than workers and are quite noisy. They are unable to gather food, but eat voraciously. Drones are stingless and their main role is to mate with queen. Since their role is only in the breeding season, therefore, they are made to leave the hive to save honey from them.

Worker: Worker is diploid, sterile female (i.e., it cannot reproduce). The size of worker is the smallest among the castes of bee. Workers are the most active members of the colony; they have almost all responsibilities on their shoulder. For various indoor and outdoor chores the workers are provided with a variety of organs such as hypo pharyngeal glands (for secretion of bee milk), wax glands (for building the cells of comb), pollen baskets on their hind legs (for the collection of pollen), sucking type mouth parts (for collecting the nectar), high level of secretion of invertase enzyme (in the honey sac for honey formation) and a sting at the tip of abdomen (for the defense of the colony).



- 20. What is pasturage and how is it related to honey production? (NCERT)
- Ans. The pasturage means the flowers available to the bees for nectar and pollen collection. In addition to adequate quantities of pasturage,

the kind of flowers available will determine the taste of the honey.

- 21. What are the desirable characters of bee varieties suitable for honey production? (NCERT)
- Ans.: (i) The variety of bee should be able to collect a large amount of honey.

(ii) They should stay in a give beehive for a longer period.

(iii) They should have capacity of breeding well.

#### 22. What is the role of workers in the bee-hive?

Ans. Workers do household chores, secreting wax, building hive, producing highly nutritious royal jelly and converting nectar into honey. They forage and collect nectar and pollen and they communicate by ultrasound signals, pheromones, dancing and gestures. Workers are sterile females and so their ovipositors are modified to form stings and accessory reproductive glands get modified to form poison glands. Through these devices workers tend to protect their hive from destroyers.

#### CONCEPT MAP



#### ESSENTIAL POINTS for COMPETITIVE EXAMS

- The term **'agriculture'** is derived from two Latin words - Ager = field and cultura - cultivation. It is the science of growing plants and raising animals useful to man. Another branch of agriculture is called horticulture (Hortus = garden, Cultura = cultivation). Horticulture is the science of growing vegetables, fruits and ornamental plants.
- A true fish is a gill-breathing, ectothermic, aquatic vertebrate that possesses fins and skin that is usually covered with scales.
- The word fish is commonly used both as singular and plural, but the zoologist uses fishes to mean more than one kind of fish.

#### Organic farming

- In recent past, the agriculture industry has resulted in the destruction of the ecological balance due to use of synthetic fertilizers and pesticides, plant growth regulators, liverstock feed additives and genetically modified organisms. To overcome the losses of the ecological balance and hazards of pollution, disease and hunger, it is the right time to shift our chemical- based agriculture into organic farming.
- Organic farming is defined as production of plants products by a farming system using organic manures, bio fertilizers, bio pesticides, resistant varieties, crop rotation and intercropping instead of using harmful chemical fertilizers, herbicides and pesticides.

#### **BREEDS OF CATTLE**

- There are 26 Indian breeds of cattle. The cattle breeds are classified into three groups :
  - (i) Milch breeds: They are milk producing female population of animals including cow, buffalo, goat, camel and yak.
  - (ii) Draught breeds: These animals are used in agriculture and transportation. Their meat is tough and they give little milk. Hence, they are used in agricultural practices such as tilling, irrigation and carting.
  - (iii) General utility breeds (Dual purpose breeds): These breeds provide milk as well as help in agricultural tasks. India, dual purpose breeds are favoured by farmers because in these breeds the cows are fairly good milk yielders

and the bullocks (sterilized males) are good for draught work.

#### Table: Breeds of Indian cattle

	Breeds	Distribution		
	Milch breeds			
1.	Gir	Gujarat, Rajasthan		
2.	Sahiwal	Punjab, Haryana, Uttar pradesh		
3.	Red Sindhi	Punjab, Haryana, Karnataka		
4.	Deoni	Andhra Pradesh		
	Draught breeds			
1.	Malvi	Rajasthan, Madhya Pradesh		
2.	Nagori	Delhi, Haryana, Uttar Pradesh,		
		Rajasthan		
3.	Hallikar	Karnataka		
4.	Kangayam	Tamil Nadu and other parts of		
		South India		

	Breeds	Distribution		
	General utility breeds			
1.	Haryana	Haryana, Punjab, Bihar,		
		Madhya Pradesh, Gujarat		
2.	Ongole	Andhra Pradesh		
3.	Kankrej	Gujarat		
4.	Tharparkar	Andhra Pradesh		
		(Tharparkar district),		
		Gujarat		

#### **BREEDS OF BUFFALOES**

• There are **seven breeds** of buffaloes in India. The best known breeds of Indian buffaloes are the Murrah, Jaffrabadi, Nili, Bhadavari and Surti.

#### Table : Some breeds of Indian buffaloes

	Breeds	Distribution		
1.	Murrah	Punjab, Haryana, Uttar Pradesh,		
		Assam, Jammu and Kashmir		
2.	Bhadavari	Uttar Pradesh, Madhya Pradesh		
3.	Jaffrabadi	Gujarat, Andhra Pradesh		
4.	Surti	Rajasthan, Gujarat, Maharashtra		
5.	Mehsana	Gujarat, Andhra Pradesh		
6.	Nagpuri	Central and South India		
7.	Nili Ravi	Punjab, Haryana, Andhra Pradesh		

#### BREEDS OF SHEEP

• There are 40 breeds of sheep in India.

- They are generally named after their place of origin or on the basis of prominent characteristics.
- Some exotic breeds of sheep are Merinor, Rambouillet, Suffolk, Dorset, Lincoln.

	Breeds	Distribution	
1.	Lohi	Punjab, Rajasthan	
2.	Rampur-Bushari	Uttarakhand/ Himachal Pradesh	
3.	Nali	Rajasthan	
4.	Bhakarwal	Jammu & Kashmir	
5.	Nellore	Maharashtra, Andhra Pradesh	
6.	Marwari	Rajasthan	
7.	Shahabadi	Bihar, West Bengal	
8.	Ganjam	Orissa	

#### BREEDS OF GOAT

- There are 20 breeds of goat in India. The various breeds of domestic goat have been derived from the wild goat Copra hircus.
- Some exotic breeds of goats are Alpine, Toggenberg, Saanen, Nubian, Angora.

#### **Table: Some goat breeds**

	Breeds	Distribution		
1.	Gaddi	Himachal Pradesh,		
		Uttarakhand		
2.	Kashmiri Pashmina	Kashmir, Himachal Pradesh		
3.	Jamunapari	Uttar Pradesh, Madhya		
		Pradesh		
4.	Beetal	Punjab, Haryana		
5.	Marwari	Gujarat, Rajasthan		

#### POULTRY BREEDS

- Poultry birds exclusively grown for meat are called broilers (e.g., Plymouth Rock), Layers are female fowls for egg production, cockerel are young male fowls and rooster are mature male fowls. Pullet is young hen of less than one year.
- Aseel, Busra, Ghagus, Brahma and Cochin are the pure breeds of India. Of these Aseel is one of the best table birds with plenty of flavoured flesh.
- The desi birds (indigenous breeds) generally have poor egg laying capacity.

#### Table: Some breeds of chickens

American breeds	English breeds	
Plymouth Rock	Australorp	
Wyandotte	Cornish (dark)	
Rhode Island red	Dorking (silver-grey)	
Jersy black giant	Orpington (buff and white)	
New Hampshire	Sussex	
Asiatic breeds	Mediterranean breeds	
Brahma (light)	Leghorn	
Cochin	Minorca (S. C. Black)	
Langshan (black)	Ancona Andalusian (blue)	

#### FRESH WATER FISHERIES

India has a large area of 1-6 million hectares under fresh water in the form of rivers, canals, irrigation channels, reservoirs, lakes, tanks, ponds and pools. Important products of inland fisheries fresh water are prawns (Palaeomon, Macrobrachium) and fishes like Labeo rohita (Rohu), Labeo calbasu (Calbasu), Catla catla (Catla), Wallago attu (Malli), Clarias batrachus (Magar), Mystus singhala (Singhara), Heteropneustes heteropneustes (Singhi).

Name	Distribution	
Fresh water fishes		
<b>1.</b> Rohu <i>(Labeo rohita)</i>	North, east and	
	south India	
<b>2.</b> Calbasu (L. <i>calbasu)</i>	All over India	
<b>3.</b> Catia <i>(Catla catla)</i>	All over India	
<ol> <li>Singhara (Mystus singhala)</li> </ol>	All over India	
Marine fishes		
<b>1.</b> Bombay duck (Harpodon sp)	Rajasthan	
<b>2.</b> Eel (Anguilla sp)	Coastal India	
<b>3.</b> Hilsa <i>(Hilsa)</i>	Coastal India	

#### Types of pond

- There are three types of pond required for the culture of Indian major carps :
  - (i) **Nursery ponds** Small ponds to receive tender hatchings and spawn.
  - (ii) Rearing ponds The young ones of fish are called fries. They are collected from the nursery ponds and released in rearing ponds where fries develop into fingerlings.
  - (iii) **Stocking ponds** Fishes are developed from fingerlings in stocking ponds.

#### SILK

- Silk is a natural fibrous substance obtained in the form of a long, continuous filament from cocoons (pupal nests) spun by a large variety of moth caterpillars.
- Silk is tough and bright but at the same time it is soft, light and elastic. The silk fibre never creates any reaction on the skin and can be used in all seasons. Hence, silk, the most beautiful of all textile fibres, is acclaimed as the queen of textiles.
- Silk is composed of two kinds of very large molecular weighted amphoteric colloidal proteins fibroin and sericin. Fibroin constitute about 75% and sericin the remaining 25% of the silk thread.

#### **Diseases of silkworm**

- **Pebrine or pepper disease** by protozoan Nose-ma bombyds. Parasite infects eggs and is, therefore, transmitted to next generation. It kills caterpillars.
- **Flacherie** is an infectious viral disease marked by body flaccidity and digestive disorders.
- **Muscaridine** is caused by a fungus, Spicaria or Botrytis.
- **Grasserie** is caused by a virus.

#### Economic importance of silk

- India is the fourth largest producer of raw silk in the world.
- Raw silk is used in many ways in the manufacture of woollen and knitted garments, parachute components, fishing lines, elastic webs, bolting silk cloth used in milling and chemical industry, insulation coils of telephone and wireless receivers.
- It is also used in the manufacture of winter suitings, overcoats, rain coats, artificial leather, rugs, blankets, strings for musical instruments etc.

#### **Royal jelly**

• Ego-s of queen hatch into white, legless larvae which spin delicate silken coocons around themselves and turn into pupae. Each pupa develops into an adult. The adult comes out by cutting wall of coocon first and secondly by breaking the wax cap of the cell.

During first 2 to 3 days, all larvae of bee are fed on a special proteinaceous food, called "Royal jelly" or bee milk which is secreted by the hypo pharyngeal glands of the young workers. After that coarse food, the "bee bread", which is mixture of honey and pollen grain is given. However, the queen forming larvae are fed on royal jelly for the full larval life and these larvae are also taken for further development into a special chamber called the queen's chamber of cell.

#### Honey

 It is a nearly neutral aromatic sweet syrup having: Levulose - 8.9%
 Dextrose - 21.28%

Dextrose		21.20/0
Maltose & other sugars	-	8.81%
Enzymes & pigments	-	2.21%
Ash	-	1.0%
Water	-	17.20%

- Honey is a natural sweetener.
- It is laxative, expectorant and blood purifier
- Honey is a tonic and immediate source of energy. It is good for children and in convalescence the medically ill persons.
- It is used in preparation of honey biscuits and honey bread.

#### Bee wax

- Bee wax is a very useful by product of bee keeping industry. It is yellowish to grayish brown in colour and insoluble in water but completely soluble in ether.
- Bee wax is a natural secretion of the worker bees and is poured out in thin delicate scales of flakes.
- Bee wax is used in cosmetics, creams, ointments, paints and polishes. Candles are only occasionally produced because bee wax tends to crack in cold.

#### Communication in honey bee

- **Prof Kari von Frisch** (1946 to 1969) got Nobel Prize for decoding the language of "bee dances". He discovered that scout bees perform two types of dances for communication.
  - **Round dance** is performed when a newly discovered food source is close (less than 75 metres) to the hive.
  - **Tail wagging dance** is performed for long distance sources.