

## 4

## Agriculture



*Gurpreet, Madho and Tina were walking through the village where they saw a farmer tilling land. The farmer told them that he was growing wheat and had just added manure to the soil to make it more fertile. He told the children that the wheat would fetch a good price in the mandi from where it would be taken to factories to make bread and biscuits from flour.*

This transformation from a plant to a finished product involves three types of economic activities. These are primary, secondary and tertiary activities.

Primary activities include all those connected with extraction and production of natural resources. Agriculture, fishing and gathering are good examples. Secondary activities are concerned with the processing of these resources. Manufacturing of steel, baking of bread and weaving of cloth are examples of this activity. Tertiary activities provide support to the primary and secondary sectors through services. Transport, trade, banking, insurance and advertising are examples of tertiary activities.

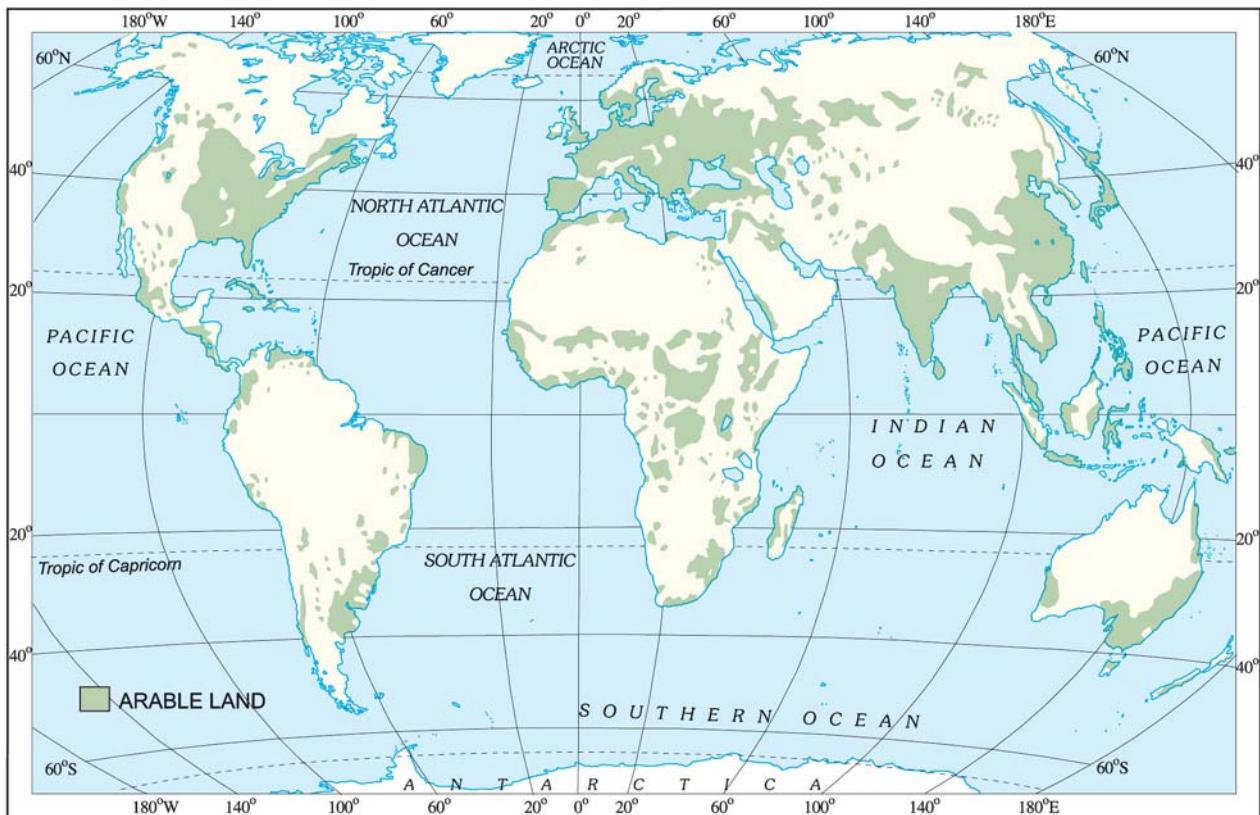
Agriculture is a primary activity. It includes growing crops, fruits, vegetables, flowers and rearing of livestock. In the world, 50 per cent of persons are engaged in agricultural activity. Two-thirds of India's population is still dependent on agriculture.

Favourable topography of soil and climate are vital for agricultural activity. The land on which the crops are grown is known as arable land (Fig. 4.1). In the map you can see that agricultural activity is concentrated in those regions of the world where suitable factors for the growing of crops exist.

### Word Origin

The word agriculture is derived from Latin words *ager* or *agri* meaning soil and *culture* meaning, cultivation or tilling of soil.





**Fig. 4.1: World Distribution of Arable Land**

### Do you know?

**Agriculture**  
The science and art of cultivation on the soil, raising crops and rearing livestock. It is also called farming.

**Sericulture**  
Commercial rearing of silk worms. It may supplement the income of the farmer.

**Pisciculture**  
Breeding of fish in specially constructed tanks and ponds.

**Viticulture**  
Cultivation of grapes.

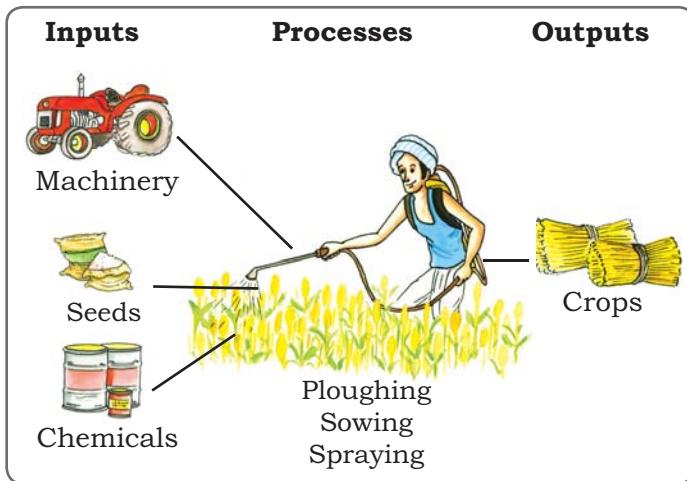
**Horticulture**  
Growing vegetables, flowers and fruits for commercial use.

**+ Culture**

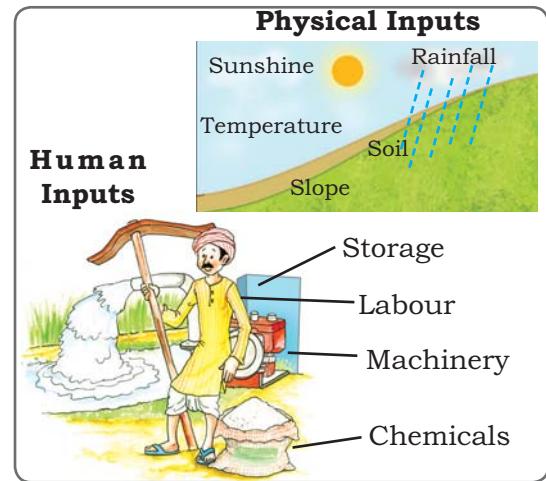
Agri  
 Seri  
 Pisci  
 Viti  
 Horti

## FARM SYSTEM

Agriculture or farming can be looked at as a system. The important inputs are seeds, fertilisers, machinery and



**Fig 4.2:** The farm system of an arable farm



**Fig 4.3:** Physical and human farm inputs

labour. Some of the operations involved are ploughing, sowing, irrigation, weeding and harvesting. The outputs from the system include crops, wool, dairy and poultry products.

### TYPES OF FARMING

#### Interesting Fact

##### Organic Farming

In this type of farming, organic manure and natural pesticides are used instead of chemicals. No genetic modification is done to increase the yield of the crop.



Farming is practised in various ways across the world. Depending upon the geographical conditions, demand of produce, labour and level of technology, farming can be classified into two main types. These are **subsistence farming** and **commercial farming**.

### Subsistence Farming

This type of farming is practised to meet the needs of the farmer's family. Traditionally, low levels of technology and household labour are used to produce on small output. Subsistence farming can be further classified as intensive subsistence and primitive subsistence farming.

In **intensive subsistence agriculture** the farmer cultivates a small plot of land using simple tools and more labour. Climate with large number of days with sunshine and fertile soils permit growing of more than one crop annually on the same plot. Rice is the main crop. Other crops include wheat, maize, pulses and oilseeds. Intensive subsistence agriculture is prevalent in the thickly populated areas of the monsoon regions of south, southeast and east Asia.

**Primitive subsistence agriculture** includes shifting cultivation and nomadic herding.

**Shifting cultivation** is practised in the thickly forested areas of Amazon basin, tropical Africa, parts of southeast Asia and Northeast India. These are the areas of heavy rainfall and quick regeneration of vegetation. A plot of land is cleared by felling the trees and burning them. The ashes are then mixed with the soil and crops like maize, yam, potatoes and cassava are grown. After the soil loses its fertility, the land is abandoned and the cultivator moves to a new plot. Shifting cultivation is also known as 'slash and burn' agriculture.

**Nomadic herding** is practised in the semi-arid and arid regions of Sahara, Central Asia and some parts of India, like Rajasthan and Jammu and Kashmir. In this type of farming, herdsmen move from place to place with their animals for fodder and water, along defined routes. This type of movement arises in response to climatic constraints and terrain. Sheep, camel, yak and goats are most commonly reared. They provide milk, meat, wool, hides and other products to the herders and their families.



**Fig 4.4:** Nomadic Herders with their camels

## Commercial Farming

In commercial farming crops are grown and animals are reared for sale in market. The area cultivated and the amount of capital used is large. Most of the work is done by machines. Commercial farming includes commercial grain farming, mixed farming and plantation agriculture (Fig 4.5).

In *commercial grain farming* crops are grown for commercial purpose. Wheat and maize are common commercially grown grains. Major areas where commercial grain farming is practised are temperate grasslands of North America, Europe and Asia. These areas are sparsely populated with large farms spreading over hundreds of hectares. Severe winters restrict the growing season and only a single crop can be grown.

In **mixed farming** the land is used for growing food and fodder crops and rearing livestock.



**Fig 4.5:** Sugarcane plantation



It is practised in Europe, eastern USA, Argentina, southeast Australia, New Zealand and South Africa.



*Fig 4.6 : Banana Plantation*



*Fig 4.7: Rice Cultivation*



*Fig 4.8: Wheat Harvesting*



*Fig 4.9: Bajra Cultivation*

**Plantations** are a type of commercial farming where single crop of tea, coffee, sugarcane, cashew, rubber, banana or cotton are grown. Large amount of labour and capital are required. The produce may be processed on the farm itself or in nearby factories. The development of a transport network is thus essential for such farming.

Major plantations are found in the tropical regions of the world. Rubber in Malaysia, coffee in Brazil, tea in India and Sri Lanka are some examples.

### **Major Crops**

A large variety of crops are grown to meet the requirement of the growing population. Crops also supply raw materials for agro based industries. Major food crops are wheat, rice, maize and millets. Jute and cotton are fibre crops. Important beverage crops are tea and coffee.

**Rice:** Rice is the major food crop of the world. It is the staple diet of the tropical and sub-tropical regions. Rice needs high temperature, high humidity and rainfall. It grows best in alluvial clayey soil, which can retain water. China leads in the production of rice followed by India, Japan, Sri Lanka and Egypt. In favourable climatic conditions as in West Bengal and Bangladesh two to three crops a year are grown.

**Wheat:** Wheat requires moderate temperature and rainfall during growing season and bright sunshine at the time of harvest. It thrives best in well drained loamy soil. Wheat is grown extensively in USA, Canada, Argentina, Russia, Ukraine, Australia and India. In India it is grown in winter.

**Millets:** They are also known as coarse grains and can be grown on less fertile and sandy soils. It is a hardy crop that needs low rainfall and high to

moderate temperature and adequate rainfall. Jowar, bajra and ragi are grown in India. Other countries are Nigeria, China and Niger.



Fig 4.10: Maize Cultivation

**Maize:** Maize requires moderate temperature, rainfall and lots of sunshine. It needs well-drained fertile soils. Maize is grown in North America, Brazil, China, Russia, Canada, India, and Mexico.



Fig 4.11: Cotton Cultivation

Pakistan, Brazil and Egypt are the leading producers of cotton. It is one of the main raw materials for the cotton textile industry.

**Jute:** Jute was also known as the 'Golden Fibre'. It grows well on alluvial soil and requires high temperature, heavy rainfall and humid climate. This crop is grown in the tropical areas. India and Bangladesh are the leading producers of jute.



Fig 4.12: Coffee Plantation

**Coffee:** Coffee requires warm and wet climate and well-drained loamy soil. Hill slopes are more suitable for growth of this crop. Brazil is the leading producer followed by Columbia and India.

**Tea:** Tea is a beverage crop grown on plantations. This requires cool climate and well distributed high rainfall throughout the year for the growth of its tender leaves.

### Do you know?

Maize is also known as corn. Various colourful varieties of maize are found across the world.



### Interesting Fact

**Who discovered the Coffee Plant?**

There are different versions about the discovery of coffee. In about AD 850, Kaldi, an Arab goat-herder, who was puzzled by the queer antics of his flock, tasted the berries of the evergreen bush on which the goats were feeding. On experiencing a sense of exhilaration, he proclaimed his discovery to the world.



**Fig 4.13:** Tea Plantation

It needs well-drained loamy soils and gentle slopes. Labour in large number is required to pick the leaves. Kenya, India, China, Sri Lanka produce the best quality tea in the world.

### AGRICULTURAL DEVELOPMENT

Agricultural Development refers to efforts made to increase farm production in order to meet the growing demand of increasing population. This can be achieved in many ways such as increasing the cropped area, the number of crops grown, improving irrigation facilities, use of fertilisers and high yielding variety of seeds. Mechanisation of agriculture is also another aspect of agricultural development. The ultimate aim of agricultural development is to increase food security.

Agriculture has developed at different places in different parts of the world. Developing countries with large populations usually practise intensive agriculture where crops are grown on small holdings mostly for subsistence. Larger holdings are more suitable for commercial agriculture as in USA, Canada and Australia. With the help of two case studies of farms — one from India and the other from the USA, let us understand about agriculture in the developing and a developed country.

### A Farm in India

There is a small village Adilabad in Ghazipur district of Uttar Pradesh. Munna Lal is a small farmer in this village who has farmland of about 1.5 hectares. His house is in the main village. He purchases high yielding varieties of

seeds from the market every alternate year. The land is fertile and he grows atleast two crops in a year which are normally wheat or rice and pulses. The farmer takes advice of his friends and elders as well as government agricultural officers regarding farming practices. He takes a tractor on rent for ploughing his field, though some of his friends still use traditional method of using bullocks for ploughing. There is a tubewell in the nearby field which he takes on rent to irrigate his field.



**Fig 4.14:** A farmer ploughing a field

Munna Lal also has two buffaloes and few hens. He sells milk in the cooperative store located in the nearby town. He is a member of the co-operative society which also advises him on the type of fodder for his animals, safety measures to protect the health of the livestock and artificial insemination.

All the members of the family help him in various farm activities. Sometimes, he takes credit from a bank or the agricultural co-operative society to buy HYV seeds and implements.

He sells his produce in the *mandi* located in the nearby town. Since majority of the farmers do not have lack storage facilities, they are forced to sell the produce even when the market is not favourable to them. In recent years, the government has taken some steps to develop storage facilites.

### A Farm in the USA

The average size of a farm in the USA is much larger than that of an Indian farm. A typical farm size in the USA is about 250 hectares. The farmer generally resides in the farm. Some of the major crops grown are corn, soyabean, wheat, cotton and sugarbeet. Joe Horan, a farmer in the Midwest USA, in Iowa State owns about 300 hectares of land. He grows corn on his field after making sure that soil and water resources meet the needs of this crop. Adequate measures are taken to control pests that can damage the crop. From time to time he sends the soil samples to a soil testing laboratory

to check whether the nutrients are sufficient or not. The results help Joe Horan to plan a scientific fertiliser programme. His computer is linked to the satellite which gives him a precise picture of his field. This helps him to use chemical fertilisers



**Fig 4.15:** Agricultural Field in India



**Fig 4.16:** A Farm in the USA



**Fig 4.17:** Spray of Pesticides

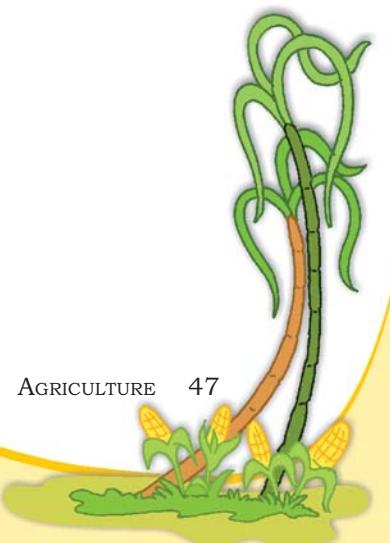




Fig 4.18: Mechanised Harvesting in the USA

and pesticides wherever they are required. He uses tractors, seed drills, leveller, combined harvester and thresher to perform various agricultural operations. A grains are stored in the automated grain storage or despatched to market agencies. The farmer in USA works like a businessman and not like a peasant farmer.

## Exercises

### 1. Answer the following questions.

- What is agriculture?
- Name the factors influencing agriculture?
- What is shifting cultivation? What are its disadvantages?
- What is plantation agriculture?
- Name the fibre crops and name the climatic conditions required for their growth.

### 2. Tick the correct answer.

- |                                      |                       |            |
|--------------------------------------|-----------------------|------------|
| (i) Horticulture means               |                       |            |
| (a) growing of fruits and vegetables | (b) primitive farming |            |
| (c) growing of wheat                 |                       |            |
| (ii) Golden fibre refers to          |                       |            |
| (a) tea                              | (b) cotton            | (c) jute   |
| (iii) Leading producers of coffee    |                       |            |
| (a) Brazil                           | (b) India             | (c) Russia |

### 3. Give reasons.

- In India agriculture is a primary activity.
- Different crops are grown in different regions.

### 4. Distinguish between the followings.

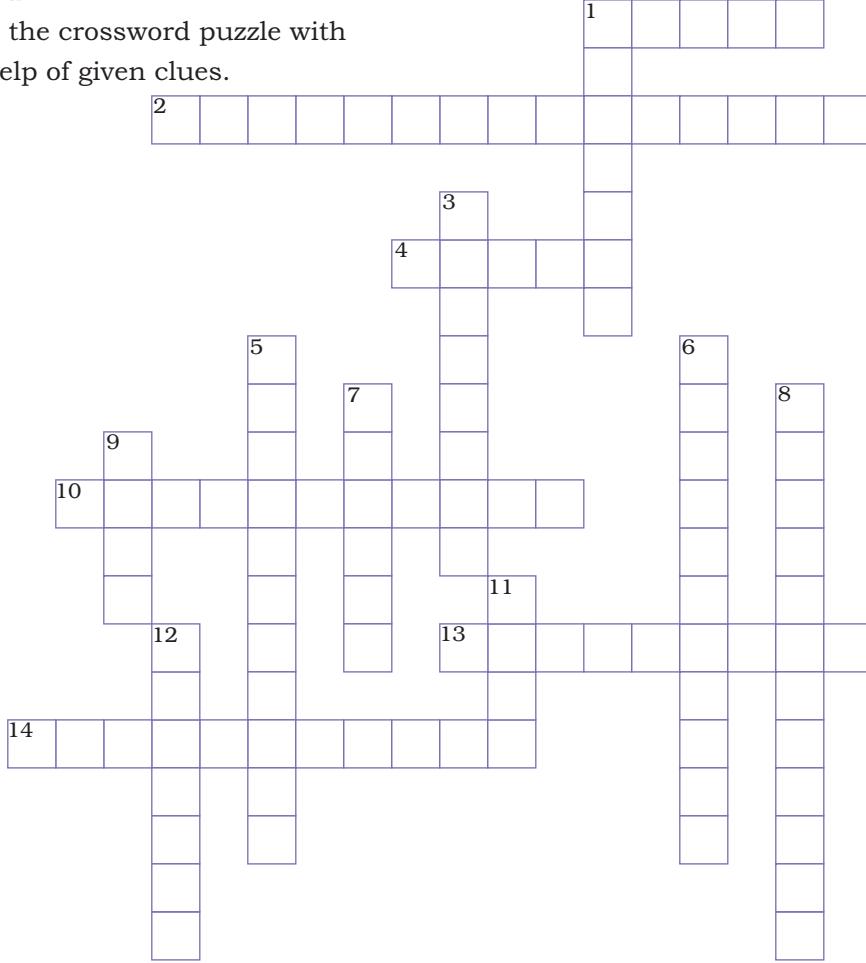
- Primary activities and tertiary activities
- Subsistence farming and intensive farming.

### 5. Activity

- Collect seeds of wheat, rice, jowar, bajra, ragi, maize, oilseeds and pulses available in the market. Bring them to the class and find out in which type of soil they grow.
- Find out the difference between the life style of farmers in the USA and India on the basis of pictures collected from magazines, books, newspapers and the internet.

### 6. For Fun

Solve the crossword puzzle with the help of given clues.

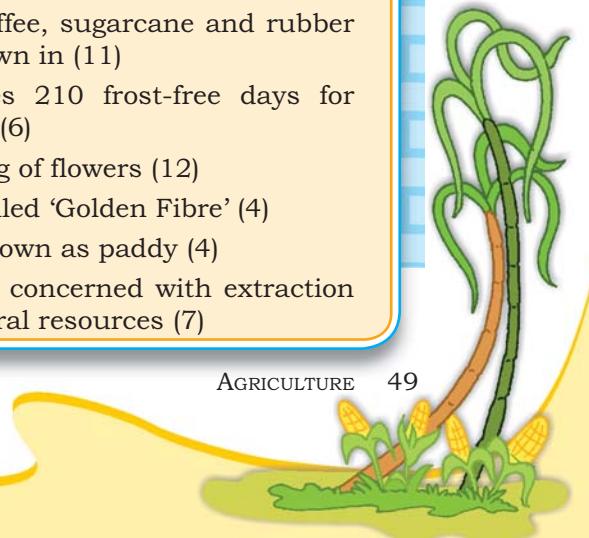


#### Across

1. Crop that needs well drained fertile soils, moderate temperatures and lots of sunshine (5)
2. Increasing production through use of HYV seeds, chemical fertilisers and pesticides (5,10)
4. USA, Canada, Russia, Australia are major producers of this crop (5)
10. Type of farming to meet family needs (11)
13. Rearing of animals for sale (9)
14. Growing grapes for wines (11)

#### Down

1. Coarse grains are also called (7)
3. Cultivation involving slash and burn (8)
5. Growing of crops, fruits and vegetables (11)
6. Tea, coffee, sugarcane and rubber are grown in (11)
7. Requires 210 frost-free days for growth (6)
8. Growing of flowers (12)
9. Also called 'Golden Fibre' (4)
11. Also known as paddy (4)
12. Activity concerned with extraction of natural resources (7)



## AGRICULTURE



India is an agriculturally important country. Two-thirds of its population is engaged in agricultural activities. Agriculture is a primary activity, which produces most of the food that we consume. Besides food grains, it also produces raw material for various industries.

***Can you name some industries based on agricultural raw material?***

Moreover, some agricultural products like tea, coffee, spices, etc. are also exported.

### **TYPES OF FARMING**

Agriculture is an age-old economic activity in our country. Over these years, cultivation methods have changed significantly depending upon the characteristics of physical environment, technological know-how and socio-cultural practices. Farming varies from subsistence to commercial type. At present, in different parts of India, the following farming systems are practised.

#### **Primitive Subsistence Farming**

This type of farming is still practised in few pockets of India. Primitive subsistence agriculture is practised on small patches of land with the help of primitive tools like hoe, dao and digging sticks, and family/community labour. This type of farming depends upon monsoon, natural fertility of the soil and suitability of other environmental conditions to the crops grown.

It is a 'slash and burn' agriculture. Farmers clear a patch of land and produce cereals and other food crops to sustain their family. When the soil fertility decreases, the farmers shift and clear a fresh patch of land for cultivation. This type of shifting allows Nature to replenish the fertility of the soil

through natural processes; land productivity in this type of agriculture is low as the farmer does not use fertilisers or other modern inputs. It is known by different names in different parts of the country.

***Can you name some such types of farmings?***

It is *jhumming* in north-eastern states like Assam, Meghalaya, Mizoram and Nagaland; Pamlou in Manipur, Dipa in Bastar district of Chattishgarh, and in Andaman and Nicobar Islands.

**Jhumming:** The 'slash and burn' agriculture is known as 'Milpa' in Mexico and Central America, 'Conuco' in Venezuela, 'Roca' in Brazil, 'Masole' in Central Africa, 'Ladang' in Indonesia, 'Ray' in Vietnam.

In India, this primitive form of cultivation is called 'Bewar' or 'Dahiya' in Madhya Pradesh, 'Podu' or 'Penda' in Andhra Pradesh, 'Pama Dabi' or 'Koman' or 'Bringa' in Orissa, 'Kumari' in Western Ghats, 'Valre' or 'Walre' in South-eastern Rajasthan, 'Khil' in the Himalayan belt, 'Kuruwa' in Jharkhand, and 'Jhumming' in the North-eastern region.



**Fig. 4.1**

Rinjha lived with her family in a small village at the outskirts of Diphu in Assam. She enjoys watching her family members clearing, slashing and burning a patch of land for cultivation. She often helps them in irrigating the fields with water running through a bamboo canal from the nearby spring. She loves the surroundings and wants to stay here as long as she can, but this little girl has no idea about the declining fertility of the soil and her family's search for fresh a patch of land in the next season.

*Can you name the type of farming Rinjha's family is engaged in?*

*Can you enlist some crops which are grown in such farming?*

### Intensive Subsistence Farming

This type of farming is practised in areas of high population pressure on land. It is labour-intensive farming, where high doses of biochemical inputs and irrigation are used for obtaining higher production.

*Can you name some of the states of India where such farming is practised?*

Though the 'right of inheritance' leading to the division of land among successive generations has rendered land-holding size uneconomical, the farmers continue to take maximum output from the limited land in the absence of alternative source of livelihood. Thus, there is enormous pressure on agricultural land.

### Commercial Farming

The main characteristic of this type of farming is the use of higher doses of modern inputs, e.g. high yielding variety (HYV) seeds, chemical fertilisers, insecticides and pesticides in order to obtain higher productivity. The degree of commercialisation of agriculture varies from one region to another. For example, rice is a commercial crop in Haryana and Punjab, but in Orissa, it is a subsistence crop.

*Can you give some more examples of crops which may be commercial in one region and may provide subsistence in another region?*

Plantation is also a type of commercial farming. In this type of farming, a single crop is grown on a large area. The plantation has an interface of agriculture and industry. Plantations cover large tracts of land, using capital intensive inputs, with the help of migrant labourers. All the produce is used as raw material in respective industries.

In India, tea, coffee, rubber, sugarcane, banana, etc.. are important plantation crops. Tea in Assam and North Bengal coffee in



**Fig. 4.2:** Banana plantation in Southern part of India



**Fig. 4.3:** Bamboo plantation in North-east

Karnataka are some of the important plantation crops grown in these states. Since the production is mainly for market, a well-developed network of transport and communication connecting the plantation areas, processing industries and markets plays an important role in the development of plantations.



## CROPPING PATTERN

You have studied the physical diversities and plurality of cultures in India. These are also reflected in agricultural practices and cropping patterns in the country. Various types of food and fibre crops, vegetables and fruits, spices and condiments, etc.. constitute some of the important crops grown in the country. India has three cropping seasons — **rabi, kharif and zaid**.

Rabi crops are sown in winter from October to December and harvested in summer from April to June. Some of the important rabi crops are wheat, barley, peas, gram and mustard. Though, these crops are grown in large parts of India, states from the north and north-western parts such as Punjab, Haryana, Himachal Pradesh, Jammu and Kashmir, Uttarakhand and Uttar Pradesh are important for the production of wheat and other rabi crops. Availability of precipitation during winter months due to the western temperate cyclones helps in the success of these crops. However, the success of the green revolution in Punjab, Haryana, western Uttar Pradesh and parts of Rajasthan has also been an important factor in the growth of the above-mentioned rabi crops.

Kharif crops are grown with the onset of monsoon in different parts of the country and these are harvested in September-October. Important crops grown during this season are paddy, maize, jowar, bajra, tur (arhar), moong, urad, cotton, jute, groundnut and soyabean. Some of the most important rice-growing regions are Assam, West Bengal, coastal regions of Orissa, Andhra Pradesh, Tamil Nadu, Kerala and Maharashtra, particularly the (Konkan coast) along with Uttar Pradesh and Bihar. Recently, paddy has also become an important crop of Punjab and Haryana. In states like Assam, West Bengal and Orissa, three crops of paddy are grown in a year. These are *Aus, Aman and Boro*.

In between the rabi and the kharif seasons, there is a short season during the summer months known as the **Zaid** season. Some of the crops produced during 'zaid' are watermelon, muskmelon, cucumber,

vegetables and fodder crops. Sugarcane takes almost a year to grow.

## Major Crops

A variety of food and non food crops are grown in different parts of the country depending upon the variations in soil, climate and cultivation practices. Major crops grown in India are rice, wheat, millets, pulses, tea, coffee, sugarcane, oil seeds, cotton and jute, etc.

**Rice:** It is the staple food crop of a majority of the people in India. Our country is the second largest producer of rice in the world after China. It is a kharif crop which requires high temperature, (above 25°C) and high humidity with annual rainfall above 100 cm. In the areas of less rainfall, it grows with the help of irrigation.

Rice is grown in the plains of north and north-eastern India, coastal areas and the deltaic regions. Development of dense network



Fig. 4.4 (a): Rice Cultivation



Fig. 4.4 (b): Rice is ready to be harvested in the field



*India: Distribution of Rice*

of canal irrigation and tubewells have made it possible to grow rice in areas of less rainfall such as Punjab, Haryana and western Uttar Pradesh and parts of Rajasthan.

**Wheat:** This is the second most important cereal crop. It is the main food crop, in north and north-western part of the country. This rabi crop requires a cool growing season and a bright sunshine at the time of ripening. It requires 50 to 75 cm of annual rainfall evenly-distributed over the growing season. There are two important wheat-growing zones in the country – the Ganga-Satluj plains in the north-west and black soil region of the Deccan. The major wheat-producing states are Punjab, Haryana, Uttar Pradesh, Bihar, Rajasthan and parts of Madhya Pradesh.



*Fig. 4.5: Wheat Cultivation*

**Millets:** Jowar, bajra and ragi are the important millets grown in India. Though, these are known as coarse grains, they have very high nutritional value. For example, ragi is very rich in iron, calcium, other micro nutrients and roughage. Jowar is the third most important food crop with respect to area and production. It is a rain-fed crop mostly grown in the moist areas which hardly needs irrigation. Maharashtra is the largest producer of jowar followed by Karnataka, Andhra Pradesh and Madhya Pradesh.

Bajra grows well on sandy soils and shallow black soil. Rajasthan is the largest producer of bajra followed by Uttar Pradesh, Maharashtra, Gujarat and Haryana. Ragi is a crop of dry



*Fig. 4.6: Bajra Cultivation*

regions and grows well on red, black, sandy, loamy and shallow black soils. Karnataka is the largest producer of ragi followed by Tamil Nadu. Apart from these states, Himachal Pradesh, Uttarakhand, Sikkim, Jharkhand and Arunachal Pradesh are also important for the production of ragi.

**Maize:** It is a crop which is used both as food and fodder. It is a kharif crop which requires



*Fig. 4.7: Maize Cultivation*

temperature between 21°C to 27°C and grows well in old alluvial soil. In some states like Bihar maize is grown in rabi season also. Use of modern inputs such as HYV seeds, fertilisers and irrigation have contributed to the increasing production of maize. Major maize-producing states are Karnataka, Uttar Pradesh, Bihar, Andhra Pradesh and Madhya Pradesh.

**Pulses:** India is the largest producer as well as the consumer of pulses in the world. These are the major source of protein in a vegetarian



*India: Distribution of Wheat*

diet. Major pulses that are grown in India are tur (arhar), urad, moong, masur, peas and gram. Can you distinguish which of these pulses are grown in the kharif season and which are grown in the rabi season? Pulses need less moisture and survive even in dry conditions. Being leguminous crops, all these crops except arhar help in restoring soil fertility by fixing nitrogen from the air. Therefore, these are mostly grown in rotation with other crops. Major pulse producing states in India are Madhya Pradesh, Uttar Pradesh, Rajasthan, Maharashtra and Karnataka.

#### **Food Crops other than Grains**

**Sugarcane:** It is a tropical as well as a subtropical crop. It grows well in hot and humid climate with a temperature of 21°C to 27°C and an annual rainfall between 75cm.



*Fig. 4.8: Sugarcane Cultivation*

and 100cm. Irrigation is required in the regions of low rainfall. It can be grown on a variety of soils and needs manual labour from sowing to harvesting. India is the second largest producer of sugarcane only after Brazil. It is the main

source of sugar, gur (jaggery), khandsari and molasses. The major sugarcane-producing states are Uttar Pradesh, Maharashtra, Karnataka, Tamil Nadu, Andhra Pradesh, Bihar, Punjab and Haryana.

**Oil Seeds:** India is the largest producer of oil-seeds in the world. Different oil seeds are grown covering approximately 12 per cent of the total cropped area of the country. Main oil-seeds produced in India are groundnut, mustard, coconut, sesamum (til), soyabean, castor seeds, cotton seeds, linseed and sunflower. Most of these are edible and used as cooking mediums. However, some of these are also used as raw material in the production of soap, cosmetics and ointments.

Groundnut is a kharif crop and accounts for about half of the major oilseeds produced in the country. Andhra Pradesh is the largest producer of groundnut followed by Tamil Nadu, Karnataka, Gujarat and Maharashtra – linseed and mustard are rabi crops. Sesamum is a kharif crop in north and rabi crop in south India. Castor seed is grown both as rabi and kharif crop.

**Tea:** Tea cultivation is an example of plantation agriculture. It is also an important beverage crop introduced in India initially by the British. Today, most of the tea plantations are owned by Indians. The tea plant grows well in tropical and sub-tropical climates endowed with deep and fertile well-drained soil, rich in humus and organic matter. Tea bushes require warm and moist frost-free climate all through the year. Frequent showers evenly distributed over the year ensure continuous growth of tender leaves. Tea is a labour-intensive industry. It requires abundant,



*Fig. 4.9: Groundnut, sunflower and mustard are ready to be harvested in the field*

cheap and skilled labour. Tea is processed within the tea garden to restore its freshness. Major tea-producing states are Assam, hills of Darjeeling and Jalpaiguri districts, West Bengal, Tamil Nadu and Kerala. Apart from these, Himachal Pradesh, Uttarakhand, Meghalaya, Andhra Pradesh and Tripura are also tea-producing states in the country. India is the leading producer as well as exporter of tea in the world.

**Coffee:** India produces about four per cent of the world's coffee production. Indian coffee is known in the world for its good quality. The Arabica variety initially brought from Yemen is produced in the country. This variety is in great demand all over the world. Initially its cultivation was introduced on the Baba Budan Hills and



**Fig. 4.10: Tea Cultivation**

**Fig. 4.11: Tea-leaves Harvesting**

India is a producer of tropical as well as temperate fruits. Mangoes of Maharashtra, Andhra Pradesh, Uttar Pradesh and West Bengal, oranges of Nagpur and Cherrapunjee (Meghalaya), bananas of Kerala, Mizoram, Maharashtra and Tamil Nadu, lichi and guava of Uttar Pradesh and Bihar, pineapples of Meghalaya, grapes of Andhra Pradesh and Maharashtra, apples, pears, apricots and walnuts of Jammu and Kashmir and Himachal Pradesh are in great demand the world over.



**Fig. 4.12: Apricots, apple and pomegranate**

even today its cultivation is confined to the Nilgiri in Karnataka, Kerala and Tamil Nadu.

**Horticulture Crops:** India is the largest producer of fruits and vegetables in the world.

India produces about 13 per cent of the world's vegetables. It is an important producer of pea, cauliflower, onion, cabbage, tomato, brinjal and potato.



**Fig. 4.13: Cultivation of vegetables – peas, cauliflower, tomato and brinjal**



## Non-Food Crops

**Rubber:** It is an equatorial crop, but under special conditions, it is also grown in tropical and sub-tropical areas. It requires moist and humid climate with rainfall of more than 200 cm. and temperature above 25°C.

Rubber is an important industrial raw material. It is mainly grown in Kerala, Tamil Nadu, Karnataka and Andaman and Nicobar islands and Garo hills of Meghalaya. India ranks fifth among the world's natural rubber producers.

### Activity

List the items which are made of rubber and are used by us.

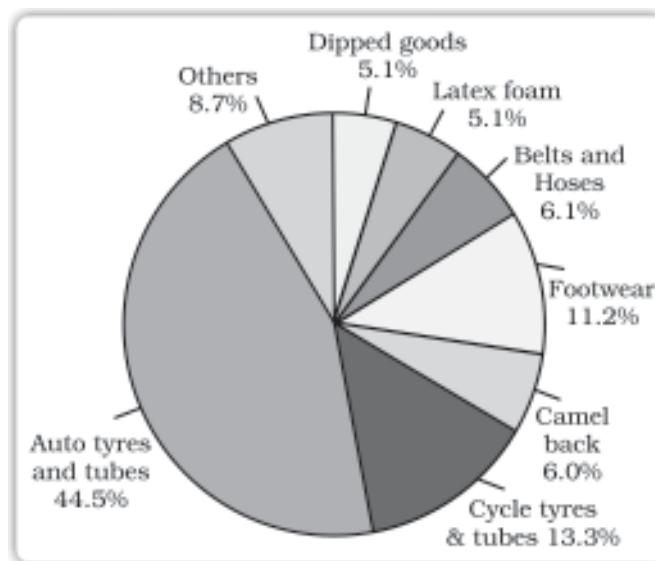


Fig. 4.14: Consumption of natural rubber

**Fibre Crops:** Cotton, jute, hemp and natural silk are the four major fibre crops grown in India. The first three are derived from the crops grown in the soil, the latter is obtained from cocoons of the silkworms fed on green leaves specially mulberry. Rearing of silk worms for the production of silk fibre is known as **sericulture**.

**Cotton:** India is believed to be the original home of the cotton plant. Cotton is one of the main raw materials for cotton textile industry. India is the third-largest producer of cotton in the world. Cotton grows well in drier parts of the black cotton soil of the Deccan plateau. It requires high temperature, light rainfall or



Fig. 4.15: Cotton Cultivation

irrigation, 210 frost-free days and bright sunshine for its growth. It is a kharif crop and requires 6 to 8 months to mature. Major cotton-producing states are – Maharashtra, Gujarat, Madhya Pradesh, Karnataka, Andhra Pradesh, Tamil Nadu, Punjab, Haryana and Uttar Pradesh.

**Jute:** It is known as the golden fibre. Jute grows well on well-drained fertile soils in the flood plains where soils are renewed every year. High temperature is required during the time of growth. West Bengal, Bihar, Assam, Orissa and Meghalaya are the major jute producing states. It is used in making gunny bags, mats, ropes, yarn, carpets and other artefacts. Due to its high cost, it is losing market to synthetic fibres and packing materials, particularly the nylon.

## Technological and Institutional Reforms

It was mentioned in the previous pages that agriculture has been practised in India for thousands of years. Sustained uses of land without compatible techno-institutional changes have hindered the pace of agricultural development. Inspite of development of sources of irrigation most of the farmers in large parts of the country still depend upon monsoon and natural fertility in order to carry on their agriculture. For a growing population, this poses a serious challenge. Agriculture which provides livelihood for more than 60 per cent of its population, needs some serious technical and institutional reforms. Thus, collectivisation,



Fig. 4.16: Modern technological equipments used in agriculture

consolidation of holdings, cooperation and abolition of zamindari, etc. were given priority to bring about institutional reforms in the country after Independence. 'Land reform' was the main focus of our First Five Year Plan. The right of inheritance had already lead to fragmentation of land holdings necessitating consolidation of holdings.

The laws of land reforms were enacted but the laws of implementation was lacking or lukewarm. The Government of India embarked upon introducing agricultural reforms to improve Indian agriculture in the 1960s and 1970s. The Green Revolution based on the use of package technology and the White Revolution (Operation Flood) were some of the strategies initiated to improve the lot of Indian agriculture. But, this too led to the concentration of development in few selected areas. Therefore, in the 1980s and 1990s, a comprehensive land development programme was initiated, which included both institutional and technical reforms. Provision for crop insurance against drought, flood, cyclone, fire and disease, establishment of Grameen banks, cooperative societies and banks for providing loan facilities to the farmers at lower rates of interest were some important steps in this direction.

Kissan Credit Card (KCC), Personal Accident Insurance Scheme (PAIS) are some other schemes introduced by the Government of India for the benefit of the farmers. Moreover, special weather bulletins and agricultural

programmes for farmers were introduced on the radio and television. The government also announces minimum support price, remunerative and procurement prices for important crops to check the exploitation of farmers by speculators and middlemen.

### Bhoodan – Gramdan

Mahatma Gandhi declared Vinoba Bhave as his spiritual heir. He also participated in Satyagraha as one of the foremost satyagrahis. He was one of the votaries of Gandhi's concept of **gram swarajya**. After Gandhiji's martyrdom, Vinobha Bhave undertook **padyatra** to spread Gandhiji's message covered almost the entire country. Once, when he was delivering a lecture at Pochampalli in Andhra Pradesh, some poor landless villagers demanded some land for their economic well-being. Vinoba Bhave could not promise it to them immediately but assured them to talk to the Government of India regarding provision of land for them if they undertook cooperative farming. Suddenly, Shri Ram Chandra Reddy stood up and offered 80 acres of land to be distributed among 80 land-less villagers. This act was known as 'Bhoodan'. Later he travelled and introduced his ideas widely all over India. Some zamindars, owners of many villages offered to distribute some villages among the landless. It was known as **Gramdan**. However, many land-owners chose to provide some part of their land to

the poor farmers due to the fear of land ceiling act. This Bhoojan-Gramdan movement initiated by Vinobha Bhave is also known as the **Blood-less Revolution**.

### Contribution of agriculture to the national economy, employment and output

Agriculture has been the backbone of the Indian economy though its share in the Gross Domestic Product (GDP) has registered a declining trend from 1951 onwards; yet its share in providing employment and livelihood to the population continues to be as high as 63 per cent in 2001.

The declining share of agriculture in the GDP is a matter of serious concern because any decline and stagnation in agriculture will lead to a decline in other spheres of the economy having wider implications for society.

Considering the importance of agriculture in India, the Government of India made concerted efforts to modernise agriculture. Establishment of Indian Council of Agricultural Research (ICAR), agricultural universities, veterinary services and animal breeding centres, horticulture development, research and development in the field of meteorology and weather forecast, etc. were given priority for improving Indian agriculture. Apart from this, improving the rural infrastructure was also considered essential for the same.

#### Activity

Find out why an Indian farmer does not want his son to become a farmer.

**Table 4.1: India: Growth of GDP and major sectors (in %)**

Sector	1980-91	1992-2001	2002-07 (Tenth plan projected)
Agriculture	3.6	3.3	4.0
Industries	7.1	6.5	9.5
Services	6.7	8.2	9.1
GDP	5.6	6.4	8.0

*Source: Tenth Five Year Plan, 2002-07*

From the above table, it is clear that though the GDP growth rate is increasing over the years, it is not generating sufficient employment opportunities in the country. The growth rate in agriculture is decelerating which is an alarming situation. Today, Indian farmers are facing a big challenge from international competition and our government is going ahead with reduction in the public investment in agriculture sector particularly in irrigation, power, rural roads, market and mechanisation. Subsidy on fertilisers is decreased leading to increase in the cost of production. Moreover, reduction in import duties on agricultural products have proved detrimental to agriculture in the country. Farmers are withdrawing their investment from agriculture causing a downfall in the employment in agriculture.

**Why are farmers committing suicides in several states of the country?**

When farmers have been facing so many problems and land under agriculture is decreasing, can we think of alternative employment opportunities in the agriculture sector?

### FOOD SECURITY

You know that food is a basic need and every citizen of the country should have access to food which provides minimum nutritional level. If any segment of our population does not have this access, that segment suffers from lack of food security. The number of people who do not have food security is disproportionately large in some regions of our country, particularly in economically less developed states with higher incidence of poverty. The remote areas of the country are more prone to natural disasters and uncertain food supply. In order to ensure availability of food to all sections of society our government carefully designed a national food security system. It consists of two components (a) buffer stock and (b) public distribution system (PDS).

As you know, PDS is a programme which provides food grains and other essential commodities at subsidised prices in rural and urban areas.

India's food security policy has a primary objective to ensure availability of foodgrains to the common people at an affordable price. It has enabled the poor to have access to food. The focus of the policy is on growth in agriculture production and on fixing the support price for procurement of wheat and rice, to maintain their stocks. Food Corporation of India (FCI) is responsible for procuring and stocking foodgrains, whereas distribution is ensured by public distribution system (PDS).

The FCI procures foodgrains from the farmers at the government announced minimum support price (MSP). The government used to provide subsidies on agriculture inputs such as fertilizers, power and water. These subsidies have now reached unsustainable levels and have also led to large scale inefficiencies in the use of these scarce inputs. Excessive and imprudent use of fertilizers and water has led to waterlogging, salinity and depletion of essential micronutrients in the soil. The high MSP, subsidies in input and committed FCI purchases have distorted the cropping pattern. Wheat and paddy crops are being grown more for the MSP they get. Punjab and Haryana are foremost examples. This has also created a serious imbalance in inter-crop parities.

You already know that the consumers are divided into two categories : below poverty line (BPL) and above poverty line (APL), with the issue price being different for each category. However, this categorisation is not perfect and a number of deserving poor have been excluded from the BPL category. Moreover, some of the so called APL slip back to BPL, because of the failure of even one crop and it is administratively difficult to accommodate such shifts.

Each district and block can be made self sufficient in foodgrain production if government provides proper agricultural infrastructure, credit linkages and also encourages the use of latest techniques. Instead of concentrating only

on rice or wheat, the food crop with a better growth potential in that particular area must be encouraged. Creation of necessary infrastructure like irrigation facilities, availability of electricity etc. may also attract private investments in agriculture.

The focus on increasing foodgrain production which should be on a sustainable basis and also free trade in grains will create massive employment and reduce poverty in rural areas.

There has been a gradual shift from cultivation of food crops to cultivation of fruits, vegetables, oil-seeds and industrial crops. This has led to the reduction in net sown area under cereals and pulses. With the growing population of India, the declining food production puts a big question mark over the country's future food security. The competition for land between non-agricultural uses such as housing etc. and agriculture has resulted in reduction in the net sown area. The productivity of land has started showing a declining trend. Fertilisers, pesticides and insecticides, which once showed dramatic results, are now being held responsible for degrading the soils. Periodic scarcity of water has led to reduction in area under irrigation. Inefficient water management has led to water logging and salinity.

*Do you know why foodgrains production has remained stagnant or fallen for six consecutive years?*

Table 4.2: India: Foodgrains production  
(million tons)

Cereals	1999- 2000	2000- 2001	2001- 2002	2002- 2003	2003- 2004	2004- 2005
Rice	89.7	85.0	93.3	71.8	88.3	85.3
Wheat	76.4	69.7	72.8	65.8	72.1	72.0
Coarse	30.3	31.1	33.4	26.1	38.1	33.9
Pulses	13.4	11.1	13.4	11.1	14.9	13.4
<b>Total</b>	<b>209.8</b>	<b>196.8</b>	<b>212.9</b>	<b>174.8</b>	<b>213.5</b>	<b>204.6</b>

Source: Economic Survey, 2005-06

One important reason is land degradation. Free power to a section of farmers has encouraged them to pump groundwater to



grow water-intensive crops in low-rainfall areas (rice in Punjab, sugarcane in Maharashtra). This unsustainable pumping has reduced water storage in aquifers. Consequently, many wells and tubewells have run dry. This has pushed the marginal and small farmers out of cultivation.

The big farmers with deeper tubewells still have water, but many others face a water crisis. Inadequate storage and marketing facilities also act as a disincentive to the farmer. Thus, the farmers are badly affected by the uncertainties of production and market. They suffer from a double disadvantage as they pay high prices for inputs such as HYV seeds, fertilisers etc. but lack the bargaining power to fix prices in their favour. All the production reaches the market simultaneously. The higher the supply the lower is the demand. This causes distress sale

also. Therefore, there can be no food security without the security of the small farmers.

### Impact of Globalisation on Agriculture

Globalisation is not a new phenomenon. It was there at the time of colonisation. In the nineteenth century when European traders came to India, at that time too, Indian spices were exported to different countries of the world and farmers of south India were encouraged to grow these crops. Till today it is one of the important items of export from India.

During the British period cotton belts of India attracted the British and ultimately cotton was exported to Britain as a raw material for their textile industries. Cotton textile industry in Manchester and Liverpool flourished due to the availability of good quality cotton from India. You have read about

**'11th Plan must focus on farming'** **The seeds of farmer suicides**

**Deaths Keeping Pace With Rising Indebtedness**

**TILL DEBT DO US PART**

**Percentage of households indebted in 91-92: 29%**

16th October, 2006

**World Food Day**

**Theme : Invest in Agriculture for Food Security**

**Centre eases imports to check price rise**

**Beyond GM food**

**What Delhi Govt is not doing...**

**Diversify your diet for Achieving better Nutrition for Health and Development**

### Activity

Organise a debate on food security of India, its need and efforts

the Champaran movement which started in 1917 in Bihar. This was started because farmers of that region were forced to grow indigo on their land because it was necessary for the textile industries which were located in Britain. They were unable to grow foodgrains to sustain their families.

Under globalisation, particularly after 1990, the farmers in India have been exposed to new challenges. Despite being an important producer of rice, cotton, rubber, tea, coffee, jute and spices our agricultural products are not able to compete with the developed countries because of the highly subsidised agriculture in those countries.



Fig. 4.17: Tissue culture of teak clones

Today, Indian agriculture finds itself at the crossroads. To make agriculture successful and profitable, proper thrust should be given to the improvement of the condition of marginal and small farmers. The green revolution promised much. But today it's under controversies. It is being alleged that it has caused land degradation due to overuse of chemicals, drying aquifers and vanishing biodiversity. The keyword today is "gene revolution". Which includes genetic engineering.

**i** Genetic engineering is recognised as a powerful supplement in inventing new hybrid varieties of seeds.

**i** Change in cropping pattern for example from cereals to high-value crops will mean that India will have to import food. During 1960's this would have been seen as a disaster. But if India imports cereals while exporting high-value commodities, it will be following successful economies like Italy, Israel and Chile. These countries exports farm products (fruits, olives, speciality seeds and wine) and import cereals. Are we ready to take this risk? Debate the issue.

**Can you name any gene modified seed used vastly in India?**



Fig. 4.18: Problems associated with heavy pesticide use are widely recognised in developed and developing countries

Infact organic farming is much in vogue today because it is practised without factory made chemicals such as fertilisers and pesticides. Hence, it does not affect environment in a negative manner.

A few economists think that Indian farmers have a bleak future if they continue growing foodgrains on the holdings that grow smaller and smaller as the population rises. India's rural population is about 600 million which depends upon 250 million (approximate) hectares of agricultural land, an average of less than half a hectare per person.

Indian farmers should diversify their cropping pattern from cereals to high-value crops. This will increase incomes and reduce environmental degradation simultaneously. Because fruits, medicinal herbs, flowers, vegetables, bio-diesel crops like jatropha and jojoba need much less irrigation than rice or sugarcane. India's diverse climate can be harnessed to grow a wide range of high-value crops.

**1.** Multiple choice questions.

- (i) Which one of the following describes a system of agriculture where a single crop is grown on a large area?
  - (a) Shifting Agriculture
  - (b) Plantation Agriculture
  - (c) Horticulture
  - (d) Intensive Agriculture
- (ii) Which one of the following is a rabi crop?
 

(a) Rice	(c) Millets
(b) Gram	(d) Cotton
- (iii) Which one of the following is a leguminous crop?
 

(a) Pulses	(c) Millets
(b) Jawar	(d) Sesamum
- (iv) Which one of the following is announced by the government in support of a crop?
  - (a) Maximum support price
  - (b) Minimum support price
  - (c) Moderate support price
  - (d) Influential support price

**2.** Answer the following questions in 30 words.

- (i) Name one important beverage crop and specify the geographical conditions required for its growth.
- (ii) Name one staple crop of India and the regions where it is produced.
- (iii) Enlist the various institutional reform programmes introduced by the government in the interest of farmers.
- (iv) The land under cultivation has got reduced day by day. Can you imagine its consequences?

**3.** Answer the following questions in about 120 words.

- (i) Suggest the initiative taken by the government to ensure the increase in agricultural production.
- (ii) How did the partition of the country in 1947 affect the jute industry?
- (iii) Describe the impact of globalisation on Indian agriculture.
- (iv) Describe the geographical conditions required for the growth of rice.

**PROJECT WORK**

1. Group discussion on the necessity of literacy among farmers.
2. On an outline map of India show wheat producing areas.

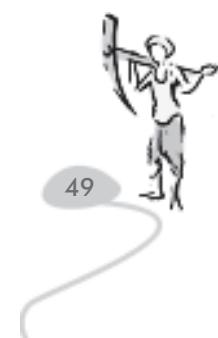


## ACTIVITY

Solve the puzzle by following your search horizontally and vertically to find the hidden answers.

A	Z	M	X	N	C	B	V	N	X	A	H	D	Q
S	D	E	W	S	R	J	D	Q	J	Z	V	R	E
D	K	H	A	R	I	F	G	W	F	M	R	F	W
F	N	L	R	G	C	H	H	R	S	B	S	V	T
G	B	C	W	H	E	A	T	Y	A	C	H	B	R
H	R	T	K	A	S	S	E	P	H	X	A	N	W
J	I	E	S	J	O	W	A	R	J	Z	H	D	T
K	C	L	A	E	G	A	C	O	F	F	E	E	Y
L	T	E	F	Y	M	T	A	T	S	S	R	G	I
P	D	E	J	O	U	Y	V	E	J	G	F	A	U
O	U	M	H	Q	S	U	D	I	T	S	W	S	P
U	O	A	C	O	T	T	O	N	E	A	H	F	O
Y	O	L	F	L	U	S	R	Q	Q	D	T	W	I
T	M	U	A	H	R	G	Y	K	T	R	A	B	F
E	A	K	D	G	D	Q	H	S	U	O	I	W	H
W	Q	Z	C	X	V	B	N	M	K	J	A	S	L

1. The two staple food crops of India.
2. This is the summer cropping season of India.
3. Pulses like arhar, moong, gram, urad contain....
4. It is a coarse grain.
5. The two important beverages in India are...
6. One of the four major fibers grown on black soils.



**H**ave you ever thought about the most important factor which supports trees, grasses, crops and numerous life-forms over the earth's surface? Can one grow a blade of grass without soil? While some plants and organisms which are aquatic in nature can sustain in water, do they not derive nutrients from soil through water? You will realise that soil is the most important layer of the earth's crust. It is a valuable resource. The bulk of our food and much of our clothing is derived from land-based crops that grow in the soil. The soil on which we depend so much for our day-to-day needs has evolved over thousands of years. The various agents of weathering and gradation have acted upon the parent rock material to produce a thin layer of soil.

Soil is the mixture of rock debris and organic materials which develop on the earth's surface. The major factors affecting the formation of soil are relief, parent material, climate, vegetation and other life-forms and time. Besides these, human activities also influence it to a large extent. Components of the soil are mineral particles, humus, water and air. The actual amount of each of these depend upon the type of soil. Some soils are deficient in one or more of these, while there are some others that have varied combinations.

Have you ever dug a pit in the field of your school to plant a tree while celebrating Van-Mahotsava? Was the pit of uniform layer of soil or did you notice different colours from the top to the bottom of the pit?

If we dig a pit on land and look at the soil, we find that it consists of three layers which

are called horizons. 'Horizon A' is the topmost zone, where organic materials have got incorporated with the mineral matter, nutrients and water, which are necessary for the growth of plants. 'Horizon B' is a transition zone between the 'horizon A' and 'horizon C', and contains matter derived from below as well as from above. It has some organic matter in it, although the mineral matter is noticeably weathered. 'Horizon C' is composed of the loose parent material. This layer is the first stage in the soil formation process and eventually forms the above two layers. This arrangement of layers is known as the soil profile. Underneath these three horizons is the rock which is also known as the parent rock or the bedrock. Soil, which is a complex and varied entity has always drawn the attention of the scientists. In order to understand its importance, it is essential to attempt a scientific study of the soil. Classification of the soil is an effort to achieve this objective.

#### **CLASSIFICATION OF SOILS**

India has varied relief features, landforms, climatic realms and vegetation types. These have contributed in the development of various types of soils in India.

In ancient times, soils used to be classified into two main groups – *Urvara* and *Usara*, which were fertile and sterile, respectively. In the 16th century A.D., soils were classified on the basis of their inherent characteristics and external features such as texture, colour, slope of land and moisture content in the soil. Based on texture, main soil types were identified as

sandy, clayey, silty and loam, etc. On the basis of colour, they were red, yellow, black, etc.

Since Independence, scientific surveys of soils have been conducted by various agencies. Soil Survey of India, established in 1956, made comprehensive studies of soils in selected areas like in the Damodar Valley. The National Bureau of Soil Survey and the Land Use Planning an Institute under the control of the Indian Council of Agricultural Research (ICAR) did a lot of studies on Indian soils. In their effort to study soil and to make it comparable at the international level, the ICAR has classified the Indian soils on the basis of their nature and character as per the United States Department of Agriculture (USDA) Soil Taxonomy.

**ICAR has classified the soils of India into the following order as per the USDA soil taxonomy**

Sl. No.	Order	Area (in Thousand Hectares)	Percentage
(i)	Inceptisols	130372.90	39.74
(ii)	Entisols	92131.71	28.08
(iii)	Alfisols	44448.68	13.55
(iv)	Vertisols	27960.00	8.52
(v)	Aridisols	14069.00	4.28
(vi)	Ultisols	8250.00	2.51
(vii)	Mollisols	1320.00	0.40
(viii)	Others	9503.10	2.92
<b>Total</b>		<b>100</b>	

Source : Soils of India, National Bureau of Soil Survey and Land Use Planning, Publication Number 94

On the basis of genesis, colour, composition and location, the soils of India have been classified into:

- (i) Alluvial soils
- (ii) Black soils
- (iii) Red and Yellow soils
- (iv) Laterite soils
- (v) Arid soils
- (vi) Saline soils
- (vii) Peaty soils
- (viii) Forest soils.

### Alluvial Soils

Alluvial soils are widespread in the northern plains and the river valleys. These soils cover

about 40 per cent of the total area of the country. They are depositional soils, transported and deposited by rivers and streams. Through a narrow corridor in Rajasthan, they extend into the plains of Gujarat. In the Peninsular region, they are found in deltas of the east coast and in the river valleys.



**Figure 6.1 : Alluvial Soil**

The alluvial soils vary in nature from sandy loam to clay. They are generally rich in potash but poor in phosphorous. In the Upper and Middle Ganga plain, two different types of alluvial soils have developed, viz. *Khadar* and *Bhangar*. *Khadar* is the new alluvium and is deposited by floods annually, which enriches the soil by depositing fine silts. *Bhangar* represents a system of older alluvium, deposited away from the flood plains. Both the *Khadar* and *Bhangar* soils contain calcareous concretions (*Kankars*). These soils are more loamy and clayey in the lower and middle Ganga plain and the Brahmaputra valley. The sand content decreases from the west to east.

The colour of the alluvial soils varies from the light grey to ash grey. Its shades depend on the depth of the deposition, the texture of the materials, and the time taken for attaining maturity. Alluvial soils are intensively cultivated.

### Black Soil

Black soil covers most of the Deccan Plateau which includes parts of Maharashtra, Madhya Pradesh, Gujarat, Andhra Pradesh and some parts of Tamil Nadu. In the upper reaches of the Godavari and the Krishna, and the north

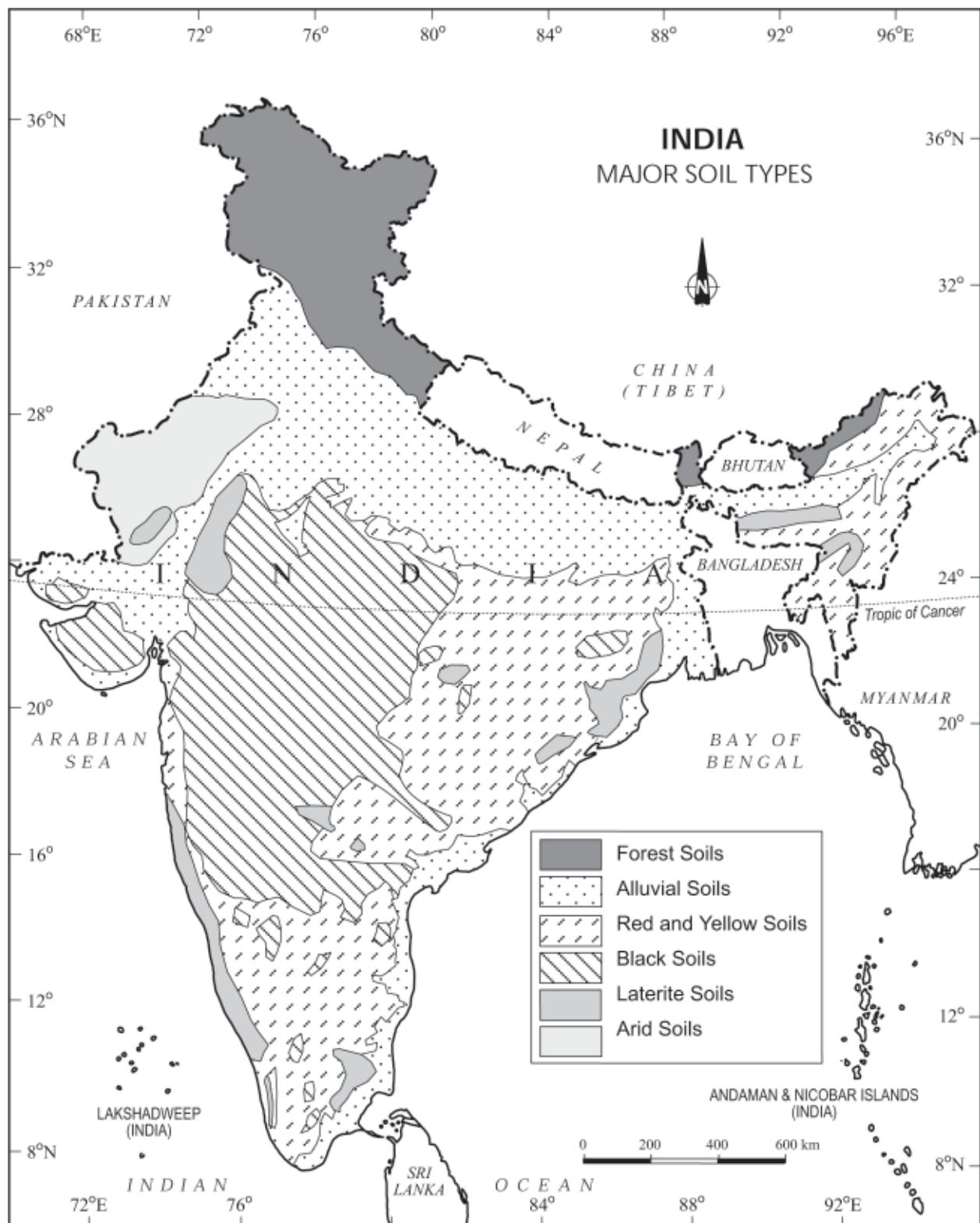
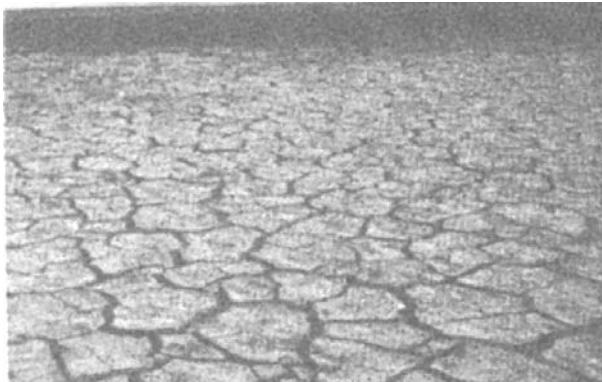


Figure 6.2 : Major Soil Types of India

western part of the Deccan Plateau, the black soil is very deep. These soils are also known as the 'Regur Soil' or the 'Black Cotton Soil'. The black soils are generally clayey, deep and impermeable. They swell and become sticky when wet and shrink when dried. So, during the dry season, these soil develop wide cracks. Thus, there occurs a kind of '*self ploughing*'. Because of this character of slow absorption and loss of moisture, the black soil retains the moisture for a very long time, which helps the crops, especially, the rain fed ones, to sustain even during the dry season.



**Figure 6.3 : Black Soil During Dry Season**

Chemically, the black soils are rich in lime, iron, magnesia and alumina. They also contain potash. But they lack in phosphorous, nitrogen and organic matter. The colour of the soil ranges from deep black to grey.

### Red and Yellow Soil

Red soil develops on crystalline igneous rocks in areas of low rainfall in the eastern and southern part of the Deccan Plateau. Along the piedmont zone of the Western Ghat, long stretch of area is occupied by red loamy soil. Yellow and red soils are also found in parts of Orissa and Chattisgarh and in the southern parts of the middle Ganga plain. The soil develops a reddish colour due to a wide diffusion of iron in crystalline and metamorphic rocks. It looks yellow when it occurs in a hydrated form. The fine-grained red and yellow soils are normally fertile, whereas coarse-grained soils found in dry upland areas are poor in fertility. They are generally poor in nitrogen, phosphorous and humus.

### Laterite Soil

Laterite has been derived from the Latin word 'Later' which means brick. The laterite soils develop in areas with high temperature and high rainfall. These are the result of intense leaching due to tropical rains. With rain, lime and silica are leached away, and soils rich in iron oxide and aluminium compound are left behind. Humus content of the soil is removed fast by bacteria that thrives well in high temperature. These soils are poor in organic matter, nitrogen, phosphate and calcium, while iron oxide and potash are in excess. Hence, laterites are not suitable for cultivation; however, application of manures and fertilisers are required for making the soils fertile for cultivation.

Red laterite soils in Tamil Nadu, Andhra Pradesh and Kerala are more suitable for tree crops like cashewnut.

Laterite soils are widely cut as bricks for use in house construction. These soils have mainly developed in the higher areas of the Peninsular plateau. The laterite soils are commonly found in Karnataka, Kerala, Tamil Nadu, Madhya Pradesh and the hilly areas of Orissa and Assam.

### Arid Soils

Arid soils range from red to brown in colour. They are generally sandy in structure and saline in nature. In some areas, the salt content is so high that common salt is obtained by evaporating the saline water. Due to the dry climate, high temperature and accelerated evaporation, they lack moisture and humus. Nitrogen is insufficient and the phosphate



**Figure 6.4 : Arid Soil**

content is normal. Lower horizons of the soil are occupied by 'kankar' layers because of the increasing calcium content downwards. The 'Kankar' layer formation in the bottom horizons restricts the infiltration of water, and as such when irrigation is made available, the soil moisture is readily available for a sustainable plant growth. Arid soils are characteristically developed in western Rajasthan, which exhibit characteristic arid topography. These soils are poor and contain little humus and organic matter.

### **Saline Soils**

They are also known as *Usara* soils. Saline soils contain a larger proportion of sodium, potassium and magnesium, and thus, they are infertile, and do not support any vegetative growth. They have more salts, largely because of dry climate and poor drainage. They occur in arid and semi-arid regions, and in waterlogged and swampy areas. Their structure ranges from sandy to loamy. They lack in nitrogen and calcium. Saline soils are more widespread in western Gujarat, deltas of the eastern coast and in Sunderban areas of West Bengal. In the Rann of Kuchchh, the Southwest Monsoon brings salt particles and deposits there as a crust. Seawater intrusions in the deltas promote the occurrence of saline soils. In the areas of intensive cultivation with excessive use of irrigation, especially in areas of green revolution, the fertile alluvial soils are becoming saline. Excessive irrigation with dry climatic conditions promotes capillary action, which results in the deposition of salt on the top layer of the soil. In such areas, especially in Punjab and Haryana, farmers are advised to add gypsum to solve the problem of salinity in the soil.

### **Peaty Soils**

They are found in the areas of heavy rainfall and high humidity, where there is a good growth of vegetation. Thus, large quantity of dead organic matter accumulates in these areas, and this gives a rich humus and organic content to the soil. Organic matter in these soils may go even up to 40-50 per cent. These

soils are normally heavy and black in colour. At many places, they are alkaline also. It occurs widely in the northern part of Bihar, southern part of Uttaranchal and the coastal areas of West Bengal, Orissa and Tamil Nadu.

### **Forest Soils**

As the name suggests, forest soils are formed in the forest areas where sufficient rainfall is available. The soils vary in structure and texture depending on the mountain environment where they are formed. They are loamy and silty on valley sides and coarse-grained in the upper slopes. In the snow-bound areas of the Himalayas, they experience denudation, and are acidic with low humus content. The soils found in the lower valleys are fertile.

It is evident from the foregoing discussions that soils, their texture, quality and nature are vital for the germination and growth of plant and vegetation including crops. Soils are living systems. Like any other organism, they too develop and decay, get degraded, respond to proper treatment if administered in time. These have serious repercussions on other components of the system of which they themselves are important parts.

### **SOIL DEGRADATION**

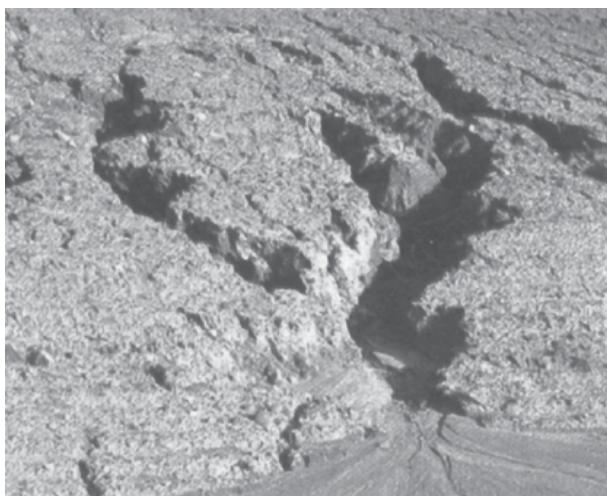
In a broad sense, soil degradation can be defined as the decline in soil fertility, when the nutritional status declines and depth of the soil goes down due to erosion and misuse. Soil degradation is the main factor leading to the depleting soil resource base in India. The degree of soil degradation varies from place to place according to the topography, wind velocity and amount of the rainfall.

### **SOIL EROSION**

The destruction of the soil cover is described as soil erosion. The soil forming processes and the erosional processes of running water and wind go on simultaneously. But generally, there is a balance between these two processes. The rate of removal of fine particles from the surface is the same as the rate of addition of particles to the soil layer.

Sometimes, such a balance is disturbed by natural or human factors, leading to a greater rate of removal of soil. Human activities too are responsible for soil erosion to a great extent. As the human population increases, the demand on the land also increases. Forest and other natural vegetation is removed for human settlement, for cultivation, for grazing animals and for various other needs.

Wind and water are powerful agents of soil erosion because of their ability to remove soil and transport it. Wind erosion is significant in arid and semi-arid regions. In regions with heavy rainfall and steep slopes, erosion by running water is more significant. Water erosion which is more serious and occurs extensively in different parts of India, takes place mainly in the form of sheet and gully erosion. Sheet erosion takes place on level lands after a heavy shower and the soil removal is not easily noticeable. But it is harmful since it removes the finer and more fertile top soil. Gully erosion is common on steep slopes. Gullies deepen with rainfall, cut the agricultural lands into small fragments and make them unfit for cultivation. A region with a large number of deep gullies or ravines is called a badland topography. Ravines are widespread, in the Chambal basin. Besides this, they are also found in Tamil Nadu and West Bengal. The country is losing about 8,000 hectares of land to ravines every year. What types are prone to gully erosion?



**Figure 6.5 : Soil Erosion**

Soil erosion is a serious problem for Indian agriculture and its negative effects are seen in other spheres also. Eroded materials are carried down to rivers and they lower down their carrying capacity, and cause frequent floods and damage to agricultural lands.

Deforestation is one of the major causes of soil erosion. Plants keep soils bound in locks of roots, and thus, prevent erosion. They also add humus to the soil by shedding leaves and twigs. Forests have been denuded practically in most parts of India but their effect on soil erosion are more in hilly parts of the country.

A fairly large area of arable land in the irrigated zones of India is becoming saline because of over-irrigation. The salt lodged in the lower profiles of the soil comes up to the surface and destroys its fertility. Chemical fertilisers in the absence of organic manures are also harmful to the soil. Unless the soil gets enough humus, chemicals harden it and reduce its fertility in the long run. This problem is common in all the command areas of the river valley projects, which were the first beneficiaries of the Green Revolution. According to estimates, about half of the total land of India is under some degree of degradation.

Every year, India loses millions of tonnes of soil and its nutrients to the agents of its degradation, which adversely affects our national productivity. So, it is imperative to initiate immediate steps to reclaim and conserve soils.

### **Soil Conservation**

If soil erosion and exhaustion are caused by humans; by corollary, they can also be prevented by humans. Nature has its own laws of maintaining balance. Nature offers enough opportunities for humans to develop their economy without disturbing the ecological balance. Soil conservation is a methodology to maintain soil fertility, prevent soil erosion and exhaustion, and improve the degraded condition of the soil.

Soil erosion is essentially aggravated by faulty practices. The first step in any rational solution is to check open cultivable lands on slopes from farming. Lands with a slope gradient of 15 - 25 per cent should not be used

for cultivation. If at all the land is to be used for agriculture, terraces should carefully be made. Over-grazing and shifting cultivation in many parts of India have affected the natural cover of land and given rise to extensive erosion. It should be regulated and controlled by educating villagers about the consequences. Contour bunding, Contour terracing, regulated forestry, controlled grazing, cover cropping, mixed farming and crop rotation are some of the remedial measures which are often adopted to reduce soil erosion.



**Figure 6.6 : Terrace Farming**

Efforts should be made to prevent gully erosion and control their formation. Finger gullies can be eliminated by terracing. In bigger gullies, the erosive velocity of water may

be reduced by constructing a series of check dams. Special attention should be made to control headward extension of gullies. This can be done by gully plugging, terracing or by planting cover vegetation.

In arid and semi-arid areas, efforts should be made to protect cultivable lands from encroachment by sand dunes through developing shelter belts of trees and agro-forestry. Lands not suitable for cultivation should be converted into pastures for grazing. Experiments have been made to stabilise sand dunes in western Rajasthan by the Central Arid Zone Research Institute (CAZRI).

The Central Soil Conservation Board, set up by the Government of India, has prepared a number of plans for soil conservation in different parts of the country. These plans are based on the climatic conditions, configuration of land and the social behaviour of people. Even these plans are fragmental in nature. Integrated land use planning, therefore, seems to be the best technique for proper soil conservation. Lands should be classified according to their capability; land use maps should be prepared and lands should be put to right uses. The final responsibility for achieving the conservation of land will rest on the people who operate on it and receive the benefits.

### **EXERCISES**

1. Choose the right answer from the four alternatives given below.
  - (i) Which one of the following is the most widespread and most productive category of soil?
 

(a) Alluvial Soil	(c) Black Soil
(b) Laterite Soil	(d) Forest Soil
  - (ii) 'Regur Soil' is another name for the.
 

(a) Saline Soil	(c) Black Soil
(b) Arid Soil	(d) Laterite Soil
  - (iii) Which one of the following is the main reason for the loss of the top soil in India?
 

(a) Wind erosion	(c) Excessive leaching
(b) Water erosion	(d) None of these

- (iv) Arable land in the irrigated zones of India is turning saline due to which of the following reasons?  
(a) Addition of gypsum (c) Over irrigation  
(b) Over grazing (d) Use of fertilisers
2. Answer the following questions in about 30 words.
- (i) What is soil?  
(ii) What are the main factors responsible for the formation of soil?  
(iii) Mention the three horizons of a soil profile.  
(iv) What is soil degradation?  
(v) What is the difference between *Khadar* and *Bhangar*?
3. Answer the following questions in not more than 125 words.
- (i) What are black soils? Describe their formation and characteristics.  
(ii) What is soil conservation? Suggest some measures to conserve soil.  
(iii) How do you know that a particular type of soil is fertile or not? Differentiate between naturally determined fertility and culturally induced fertility.

**Project/Activity**

1. Collect various samples of soil and prepare a report on the type(s) of soils found in your region.
2. On an outline map of India, mark the areas covered by the following soil categories.
  - (i) Red soil
  - (ii) Laterite soil
  - (iii) Alluvial soil.

## **Primary Activities**



Human activities which generate income are known as *economic activities*. Economic activities are broadly grouped into primary, secondary, tertiary and quaternary activities. Primary activities are directly dependent on environment as these refer to utilisation of earth's resources such as land, water, vegetation, building materials and minerals. It, thus includes, hunting and gathering, pastoral activities, fishing, forestry, agriculture, and mining and quarrying.

Why inhabitants of coastal and plain regions are engaged in fishing and agriculture respectively? What are the physical and social factors which affect the type of primary activities in different regions?

### **DO YOU KNOW**

People engaged in primary activities are called red-collar workers due to the outdoor nature of their work.

### **HUNTING AND GATHERING**

The earliest human beings depended on their immediate environment for their sustenance. They subsisted on: (a) animals which they hunted; and (b) the edible plants which they gathered from forests in the vicinity.

Primitive societies depended on wild animals. People located in very cold and extremely hot climates survived on hunting. The people in the coastal areas still catch fish though fishing has experienced modernisation due to technological progress. Many species, now have become extinct or endangered due to illegal hunting (poaching). The early hunters used primitive tools made of stones, twigs or arrows so the number of animals killed was limited. Why has hunting been banned in India?

Gathering and hunting are the oldest economic activity known. These are carried out at different levels with different orientations.

Gathering is practised in regions with harsh climatic conditions. It often involves primitive societies, who extract, both plants and



animals to satisfy their needs for food, shelter and clothing. This type of activity requires a small amount of capital investment and operates at very low level of technology. The yield per person is very low and little or no surplus is produced.



**Fig. 5.1: Women Gathering Oranges in Mizoram**

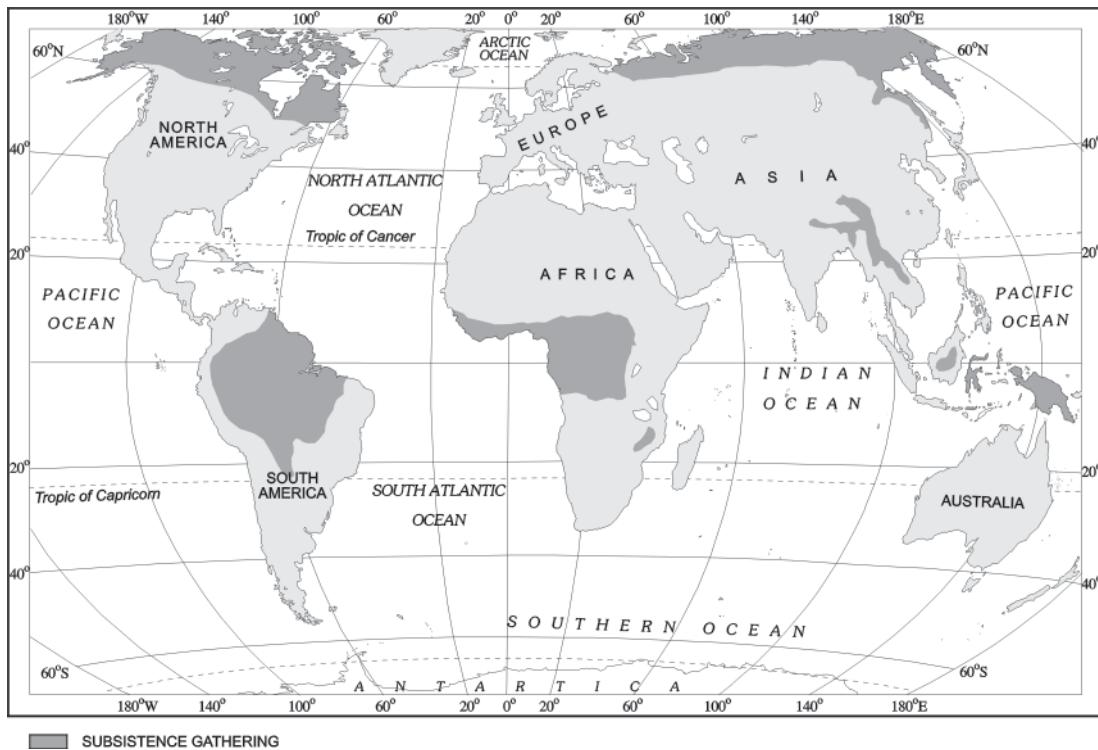
Gathering is practised in: (i) high latitude zones which include northern Canada, northern Eurasia and southern Chile; (ii) Low latitude zones such as the Amazon Basin, tropical Africa, Northern fringe of Australia and the interior parts of Southeast Asia (Fig. 5.2).

In modern times some gathering is market-oriented and has become commercial. Gatherers collect valuable plants such as leaves, barks of trees and medicinal plants and after simple processing sell the products in the market. They use various parts of the plants, for example, the bark is used for quinine, tanin extract and cork—leaves supply materials for beverages, drugs, cosmetics, fibres, thatch and fabrics; nuts for food and oils and tree trunk yield rubber, balata, gums and resins.

### DO YOU KNOW

The name of the part of the chewing gum after the flavour is gone? It is called Chicle—it is made from the milky juice of zapota tree.

Gathering has little chance of becoming important at the global level. Products of such an



**Fig. 5.2: Areas of Subsistence Gathering**

activity cannot compete in the world market. Moreover, synthetic products often of better quality and at lower prices, have replaced many items supplied by the gatherers in tropical forests.

## PASTORALISM

At some stage in history, with the realisation that hunting is an unsustainable activity, human beings might have thought of domestication of animals. People living in different climatic conditions selected and domesticated animals found in those regions. Depending on the geographical factors, and technological development, animal rearing today is practised either at the subsistence or at the commercial level.

### Nomadic Herding

Nomadic herding or pastoral nomadism is a primitive subsistence activity, in which the herders rely on animals for food, clothing, shelter, tools and transport. They move from one place to another along with their livestock, depending on the amount and quality of pastures and water. Each nomadic community occupies a well-identified territory as a matter of tradition.



**Fig. 5.3: Nomads taking their sheep up to the Mountains at the onset of summer**

A wide variety of animals is kept in different regions. In tropical Africa, cattle are the most important livestock, while in Sahara and Asiatic deserts, sheep, goats and camel are reared. In the mountainous areas of Tibet and Andes, yak and llamas and in the Arctic and sub Arctic areas, reindeer are the most important animals.

Pastoral nomadism is associated with three important regions. The core region extends from the Atlantic shores of North Africa eastwards across the Arabian peninsula into Mongolia and Central China. The second region extends over the tundra region of Eurasia. In the southern hemisphere there are small areas in South-west Africa and on the island of Madagascar (Fig. 5.4)

Movement in search of pastures is undertaken either over vast horizontal distances or vertically from one elevation to another in the mountainous regions. The process of migration from plain areas to pastures on mountains during summers and again from mountain pastures to plain areas during winters is known as *transhumance*. In mountain regions, such as Himalayas, Gujjars, Bakarwals, Gaddis and Bhotiyas migrate from plains to the mountains in summers and to the plains from the high altitude pastures in winters. Similarly, in the tundra regions, the nomadic herders move from south to north in summers and from north to south in winters.

The number of pastoral nomads has been decreasing and the areas operated by them shrinking. This is due to (a) imposition of political boundaries; (b) new settlement plans by different countries.

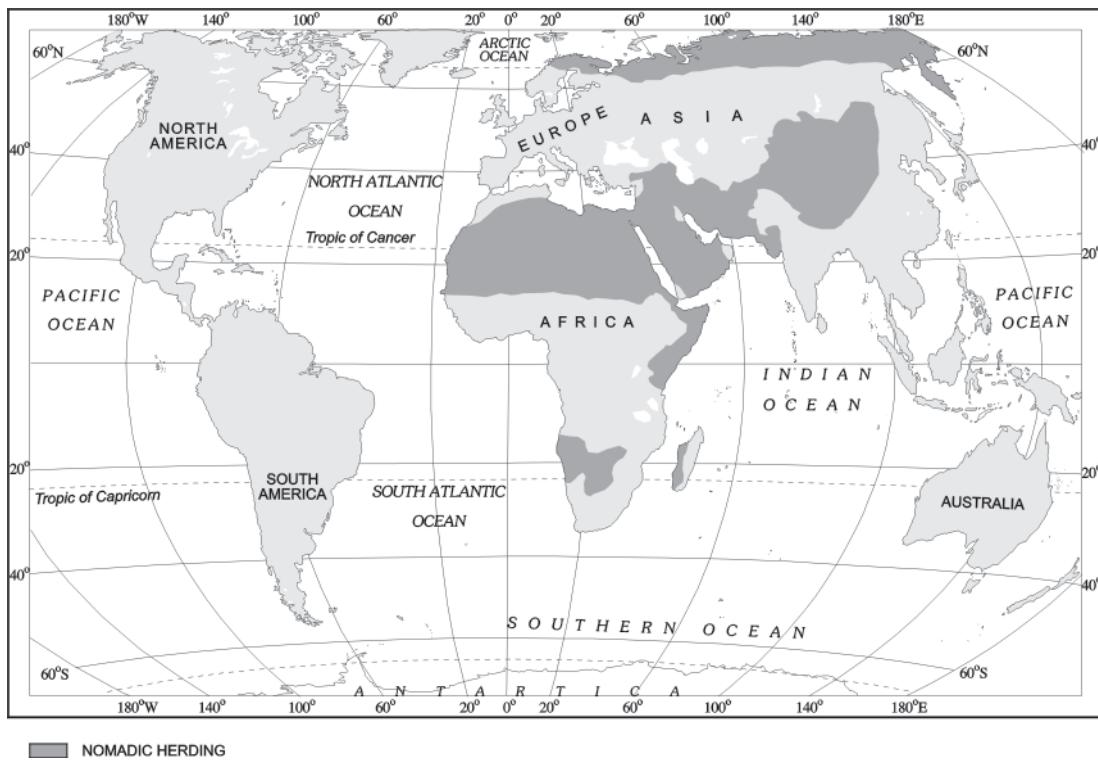
### Commercial Livestock Rearing

Unlike nomadic herding, commercial livestock rearing is more organised and capital intensive. Commercial livestock ranching is essentially associated with western cultures and is practised on permanent ranches. These ranches cover large areas and are divided into a number of parcels, which are fenced to regulate the grazing. When the grass of one parcel is grazed, animals are moved to another parcel. The number of animals in a pasture is kept according to the carrying capacity of the pasture.

This is a specialised activity in which only one type of animal is reared. Important animals include sheep, cattle, goats and horses. Products such as meat, wool, hides and skin are processed and packed scientifically and exported to different world markets.

Rearing of animals in ranching is organised on a scientific basis. The main





**Fig. 5.4: Areas of Nomadic Herding**



**Fig. 5.5: Commercial Livestock Rearing**

Reindeer rearing in the northern regions of Alaska where most of the Eskimos own about two-third of the stock.

emphasis is on breeding, genetic improvement, disease control and health care of the animals.

New Zealand, Australia, Argentina, Uruguay and United States of America are important countries where commercial livestock rearing is practised (Fig. 5.6).

## AGRICULTURE

Agriculture is practised under multiple combinations of physical and socio-economic conditions, which gives rise to different types of agricultural systems.

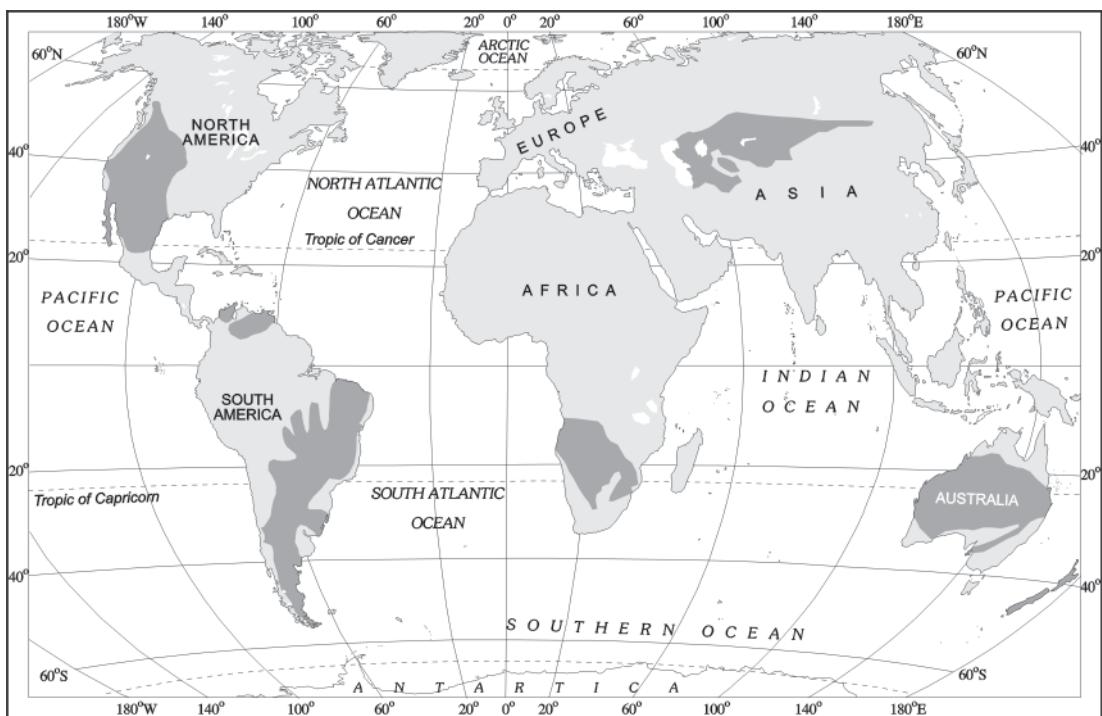
Based on methods of farming, different types of crops are grown and livestock raised. The following are the main agricultural systems.

### Subsistence Agriculture

Subsistence agriculture is one in which the farming areas consume all, or nearly so, of the products locally grown. It can be grouped in two categories — Primitive Subsistence Agriculture and Intensive Subsistence Agriculture.

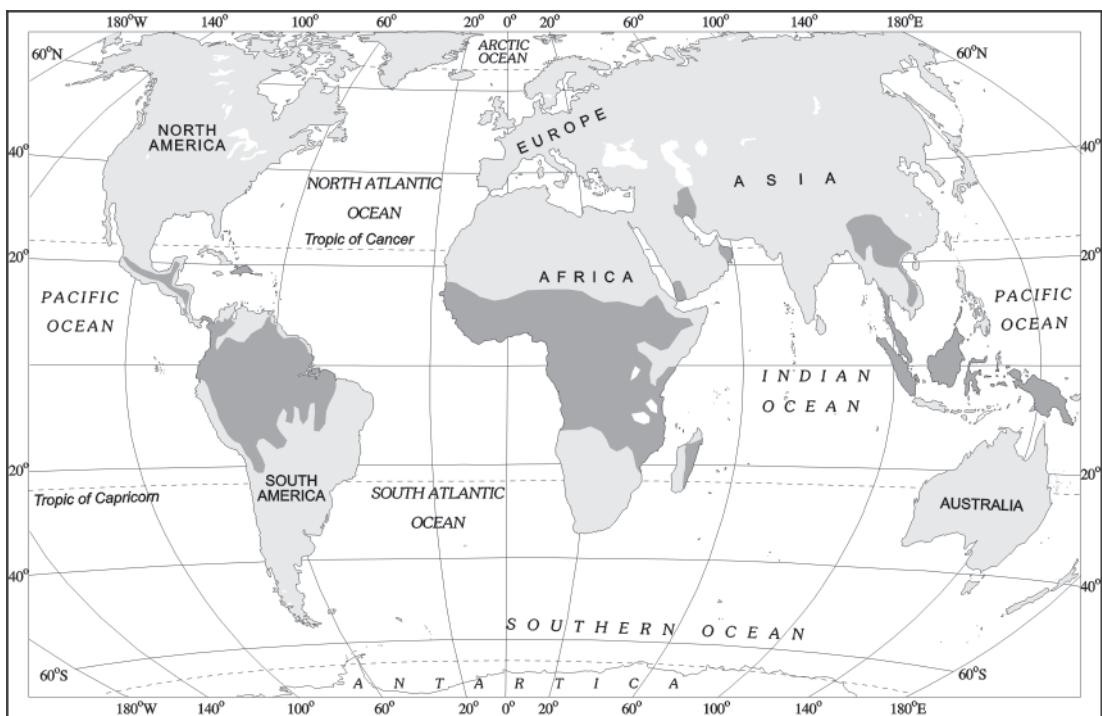
#### Primitive Subsistence Agriculture

Primitive subsistence agriculture or shifting cultivation is widely practised by many tribes in the tropics, especially in Africa, south and central America and south east Asia (Fig. 5.7).



■ COMMERCIAL LIVESTOCK REARING

**Fig. 5.6: Areas of Commercial Livestock Rearing**



■ SUBSISTENCE AGRICULTURE

**Fig. 5.7: Areas of Primitive Subsistence Agriculture**



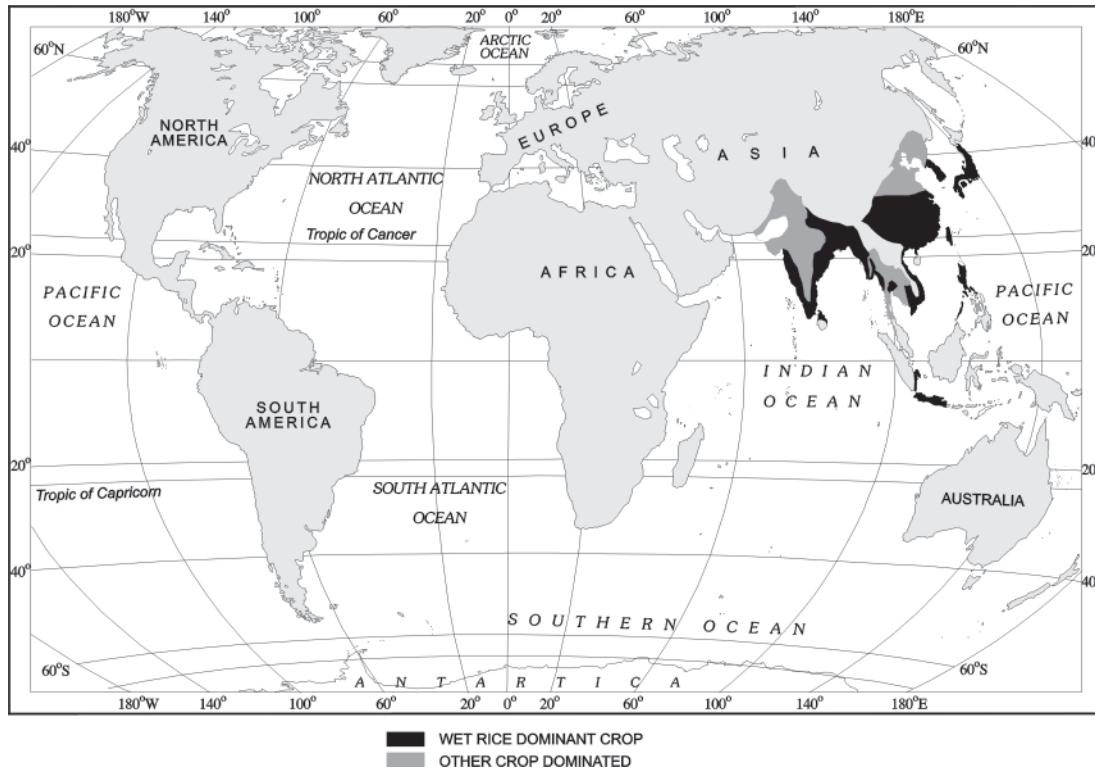
The vegetation is usually cleared by fire, and the ashes add to the fertility of the soil. Shifting cultivation is thus, also called **slash and burn agriculture**. The cultivated patches are very small and cultivation is done with very primitive tools such as sticks and hoes. After sometime (3 to 5 years) the soil loses its fertility and the farmer shifts to another parts and clears other patch of the forest for cultivation. The farmer may return to the earlier patch after sometime. One of the major problems of shifting cultivation is that the cycle of *jhum* becomes less and less due to loss of fertility in different parcels. It is prevalent in tropical region in different names, e.g. **Jhuming** in North eastern states of India, **Milpa** in central America and Mexico and **Ladang** in Indonesia and Malaysia. Find out other areas and the names with which shifting cultivation is done.

### **Intensive Subsistence Agriculture**

This type of agriculture is largely found in densely populated regions of monsoon Asia.

Basically, there are two types of intensive subsistence agriculture.

- (i) *Intensive subsistence agriculture dominated by wet paddy cultivation:* This type of agriculture is characterised by dominance of the rice crop. Land holdings are very small due to the high density of population. Farmers work with the help of family labour leading to intensive use of land. Use of machinery is limited and most of the agricultural operations are done by manual labour. Farm yard manure is used to maintain the fertility of the soil. In this type of agriculture, the yield per unit area is high but per labour productivity is low.
- (ii) *Intensive subsidence agriculture dominated by crops other than paddy:* Due to the difference in relief, climate, soil and some of the other geographical factors, it is not practical to grow paddy in many parts of monsoon Asia. Wheat, soyabean, barley and sorghum are grown in northern China, Manchuria, North Korea and North Japan. In India wheat is grown in western



**Fig. 5.8: Areas of Intensive Subsistence Farming**



**Fig. 5.9: Rice Transplantation**

parts of the Indo-Gangetic plains and millets are grown in dry parts of western and southern India. Most of the characteristics of this type of agriculture are similar to those dominated by wet paddy except that irrigation is often used.

The Europeans colonised many parts in the world and they introduced some other forms of agriculture such as plantations which were mainly profit-oriented large scale production systems.

### Plantation Agriculture

Plantation agriculture as mentioned above was introduced by the Europeans in colonies situated in the tropics. Some of the important plantation crops are tea, coffee, cocoa, rubber, cotton, oil palm, sugarcane, bananas and pineapples.

The characteristic features of this type of farming are large estates or plantations, large capital investment, managerial and technical support, scientific methods of cultivation, single crop specialisation, cheap labour, and a good system of transportation which links the estates to the factories and markets for the export of the products.

The French established cocoa and coffee plantations in west Africa. The British set up large tea gardens in India and Sri Lanka, rubber plantations in Malaysia and sugarcane and banana plantations in West Indies. Spanish and Americans invested heavily in

coconut and sugarcane plantations in the Philippines. The Dutch once had monopoly over sugarcane plantation in Indonesia. Some coffee fazendas (large plantations) in Brazil are still managed by Europeans.

Today, ownership of the majority of plantations has passed into the hands of the government or the nationals of the countries concerned.



**Fig. 5.10: Tea Plantation**

The slopes of hills are used for tea plantations because of favourable geographical conditions.

### Extensive Commercial Grain Cultivation

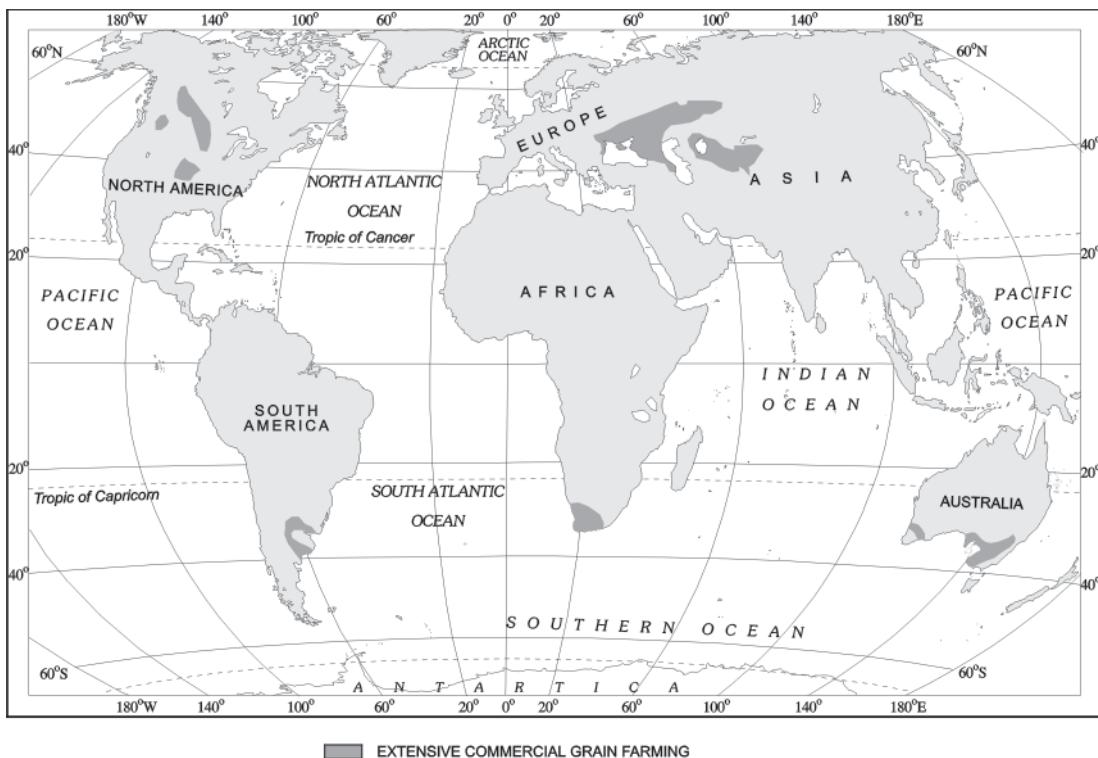
Commercial grain cultivation is practised in the interior parts of semi-arid lands of the mid-latitudes. Wheat is the principal crop, though other crops like corn, barley, oats and rye are also grown. The size of the farm is very large, therefore entire operations of cultivation from



**Fig. 5.11: Mechanised Grain Farming**

Combine crews are capable of harvesting grain over many hectares in a single day.





**Fig. 5.12: Areas of Extensive Commercial Grain Farming**

This type of agriculture is best developed in Eurasian steppes, the Canadian and American Prairies, the Pampas of Argentina, the Velds of South Africa, the Australian Downs and the Canterbury Plains of New Zealand. (Locate these areas on the world map).

### Mixed Farming

This form of agriculture is found in the highly developed parts of the world, e.g. North-western Europe, Eastern North America, parts of Eurasia and the temperate latitudes of Southern continents (Fig. 5.14).

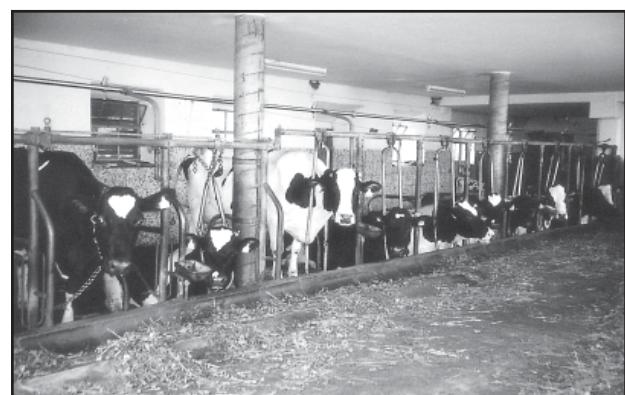
Mixed farms are moderate in size and usually the crops associated with it are wheat, barley, oats, rye, maize, fodder and root crops. Fodder crops are an important component of mixed farming. Crop rotation and intercropping play an important role in maintaining soil fertility. Equal emphasis is laid on crop cultivation and animal husbandry. Animals like cattle, sheep, pigs and poultry provide the main income along with crops.

Mixed farming is characterised by high capital expenditure on farm machinery and

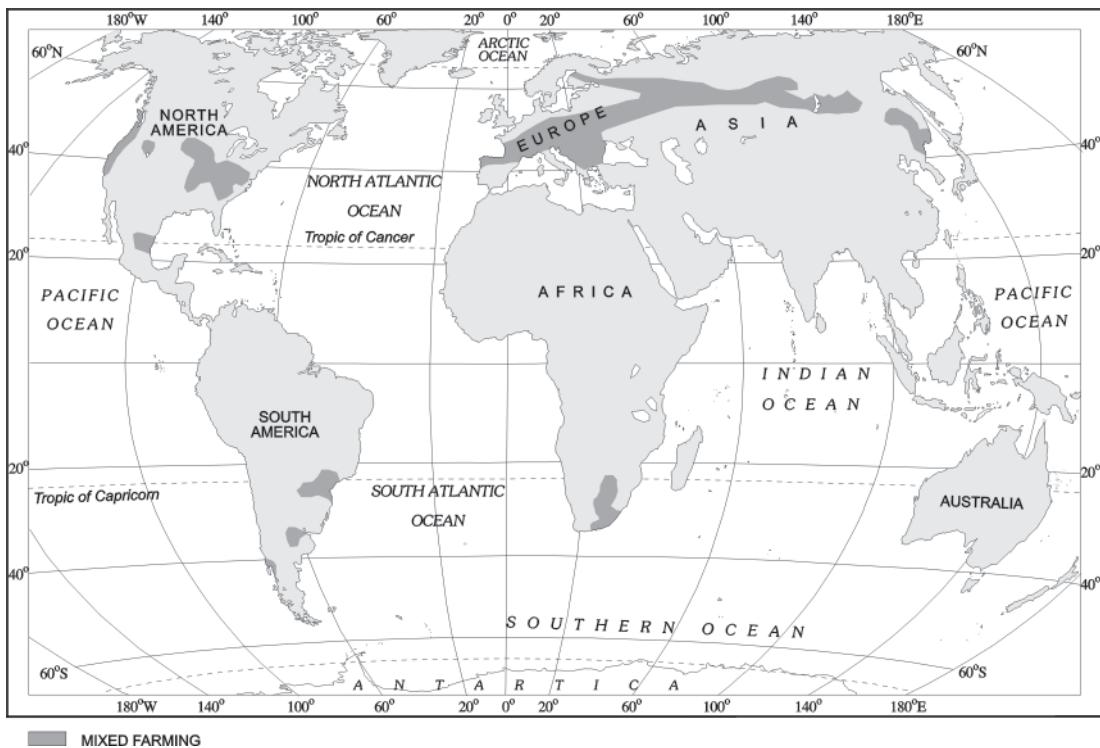
building, extensive use of chemical fertilisers and green manures and also by the skill and expertise of the farmers.

### Dairy Farming

Dairy is the most advanced and efficient type of rearing of milk animals. It is highly capital intensive. Animal sheds, storage facilities for fodder, feeding and milching machines add to the cost of dairy farming. Special emphasis is laid on cattle breeding, health care and veterinary services.



**Fig. 5.13: A Dairy Farm in Austria**



**Fig. 5.14: Areas of Mixed Farming**

It is highly labour intensive as it involves rigorous care in feeding and milching. There is no off season during the year as in the case of crop raising.

It is practised mainly near urban and industrial centres which provide neighbourhood market for fresh milk and dairy products. The development of transportation, refrigeration, pasteurisation and other preservation processes have increased the duration of storage of various dairy products.

There are three main regions of commercial dairy farming. The largest is North Western Europe the second is Canada and the third belt includes South Eastern Australia, New Zealand and Tasmania (Fig. 5.16).

### Mediterranean Agriculture

Mediterranean agriculture is highly specialised commercial agriculture. It is practised in the countries on either side of the Mediterranean

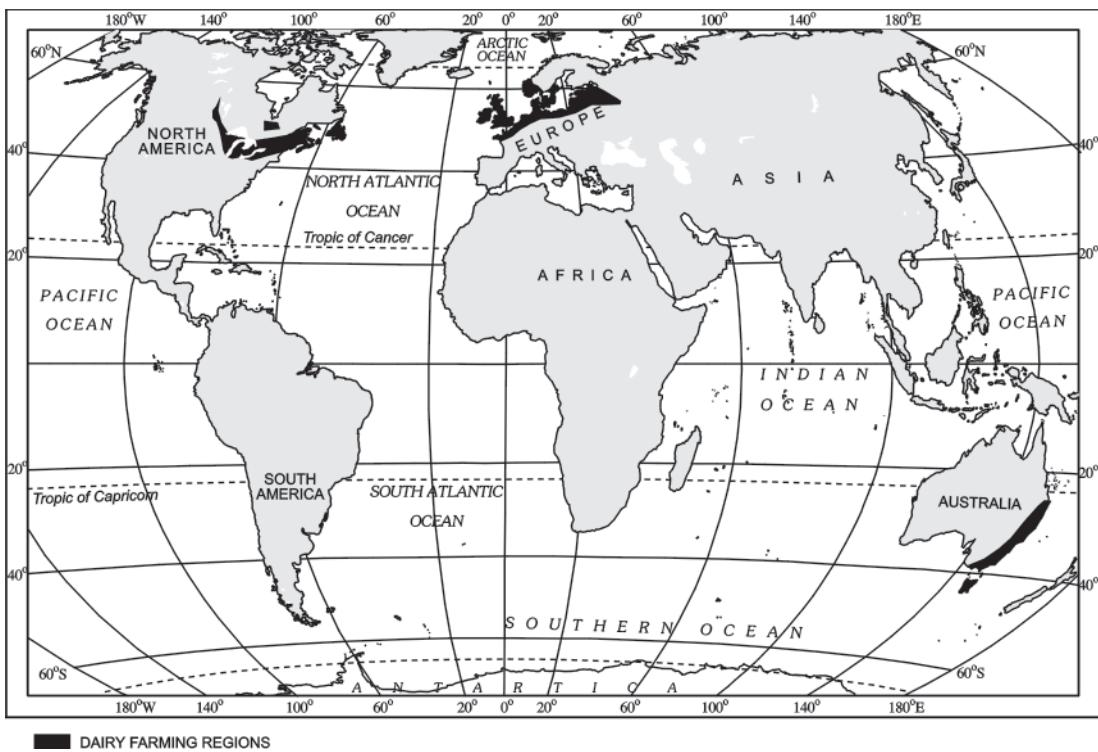


**Fig. 5.15 (a): A vineyard in Switzerland**



**Fig. 5.15 (b): Collection of grapes in a collective farm of Kazakhstan**





**Fig. 5.16: Areas of Dairy Farming**

sea in Europe and in north Africa from Tunisia to Atlantic coast, southern California, central Chile, south western parts of South Africa and south and south western parts of Australia. This region is an important supplier of citrus fruits.

**Viticulture** or grape cultivation is a speciality of the Mediterranean region. Best quality wines in the world with distinctive flavours are produced from high quality grapes in various countries of this region. The inferior grapes are dried into raisins and currants. This region also produces olives and figs. The advantage of Mediterranean agriculture is that more valuable crops such as fruits and vegetables are grown in winters when there is great demand in European and North American markets.

#### Market Gardening and Horticulture

Market gardening and horticulture specialise in the cultivation of high value crops such as vegetables, fruits and flowers, solely for the urban markets. Farms are small and are located where there are good transportation

links with the urban centre where high income group of consumers is located. It is both labour and capital intensive and lays emphasis on the use of irrigation, HYV seeds, fertilisers, insecticides, greenhouses and artificial heating in colder regions.

This type of agriculture is well developed in densely populated industrial districts of north west Europe, north eastern United States of America and the Mediterranean regions. The Netherlands specialises in growing flowers and horticultural crops especially tulips, which are flown to all major cities of Europe.

The regions where farmers specialise in vegetables only, the farming is known as **truck farming**. The distance of truck farms from the market is governed by the distance that a truck can cover overnight, hence the name truck farming.

In addition to market gardening, a modern development in the industrial regions of Western Europe and North America is factory farming. Livestock, particularly poultry and cattle rearing, is done in stalls and pens, fed on manufactured feedstuff and carefully



**Figure 5.17 (a): Vegetables being grown in the vicinity of the city**



**Figure 5.17 (b): Vegetables being loaded into a truck and cycle carts for transporting to city markets**

supervised against diseases. This requires heavy capital investment in terms of building, machinery for various operations, veterinary services and heating and lighting. One of the important features of poultry farming and cattle rearing is breed selection and scientific breeding.

Types of farming can also be categorised according to the farming organisation. Farming organisation is affected by the way in which farmers own their farms and various policies of the government which help to run these farms.

### **Co-operative Farming**

A group of farmers form a co-operative society by pooling in their resources voluntarily for more efficient and profitable farming. Individual farms remain intact and farming is a matter of cooperative initiative.

Co-operative societies help farmers, to procure all important inputs of farming, sell the products at the most favourable terms and help in processing of quality products at cheaper rates.

Co-operative movement originated over a century ago and has been successful in many western European countries like Denmark, Netherlands, Belgium, Sweden, Italy etc. In Denmark, the movement has been so successful that practically every farmer is a member of a co-operative.

### **Collective Farming**

The basic principle behind this type of farming

is based on social ownership of the means of production and collective labour. Collective farming or the model of **Kolkhoz** was introduced in erstwhile Soviet Union to improve upon the inefficiency of the previous methods of agriculture and to boost agricultural production for self-sufficiency.

The farmers pool in all their resources like land, livestock and labour. However, they are allowed to retain very small plots to grow crops in order to meet their daily requirements.

Yearly targets are set by the government and the produce is also sold to the state at fixed prices. Produce in excess of the fixed amount is distributed among the members or sold in the market. The farmers have to pay taxes on the farm produce, hired machinery etc. Members are paid according to the nature of the work allotted to them by the farm management. Exceptional work is rewarded in cash or kind. This type of farming was introduced in former Soviet Union under the socialist regime which was adopted by the socialist countries. After its collapse, these have already been modified.

### **MINING**

The discovery of minerals in the history of human development, is reflected in many stages in terms of copper age, bronze age and iron age. The use of minerals in ancient times was largely confined to the making of tools, utensils and weapons. The actual development of mining began with the industrial revolution and its importance is continuously increasing.





**Fig. 5.18: Oil drilling operation in the Gulf of Mexico**

### Factors Affecting Mining Activity

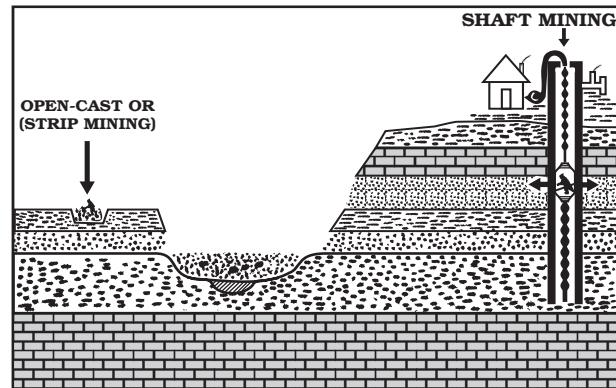
The profitability of mining operations thus, depends on two main factors:

- Physical factors include the size, grade and the mode of occurrence of the deposits.
- Economic factors such as the demand for the mineral, technology available and used, capital to develop infrastructure and the labour and transport costs.

### Methods of Mining

Depending on the mode of occurrence and the nature of the ore, mining is of two types: surface and underground mining. The surface mining also known as *open-cast* mining is the easiest and the cheapest way of mining minerals that occur close to the surface. Overhead costs such

as safety precautions and equipment is relatively low in this method. The output is both large and rapid.



**Fig. 5.19: Methods of Mining**

When the ore lies deep below the surface, **underground mining method** (shaft method) has to be used. In this method, vertical shafts have to be sunk, from where underground galleries radiate to reach the minerals. Minerals are extracted and transported to the surface through these passages. It requires specially designed lifts, drills, haulage vehicles, ventilation system for safety and efficient movement of people and material. This method is risky. Poisonous gases, fires, floods and caving in lead to fatal accidents. Have you ever read about mine fires and flooding of coal mines in India?

The developed economies are retreating from mining, processing and refining stages of production due to high labour costs, while the developing countries with large labour force and striving for higher standard of living are becoming more important. Several countries of Africa and few of south America and Asia have over fifty per cent of the earnings from minerals alone.





## EXERCISES

**1.** Choose the right answer from the four alternatives given below.

- (i) Which one of the following is not a plantation crop?
  - (a) Coffee
  - (c) Wheat
  - (b) Sugarcane
  - (d) Rubber
- (ii) In which one of the following countries co-operative farming was the most successful experiment?
  - (a) Russia
  - (c) India
  - (b) Denmark
  - (d) The Netherlands
- (iii) Growing of flowers is called:
  - (a) Truck farming
  - (c) Mixed farming
  - (b) Factory farming
  - (d) Floriculture
- (iv) Which one of the following types of cultivation was developed by European colonists?
  - (a) Kolkoz
  - (c) Mixed farming
  - (b) Viticulture
  - (d) Plantation
- (v) In which one of the following regions is extensive commercial grain cultivation not practised?
  - (a) American Canadian prairies
  - (c) Pampas of Argentina
  - (b) European Steppes
  - (d) Amazon Basin
- (vi) In which of the following types of agriculture is the farming of citrus fruit very important?
  - (a) Market gardening
  - (c) Mediterranean agriculture
  - (b) Plantation agriculture
  - (d) Co-operative farming
- (vii) Which one type of agriculture amongst the following is also called 'slash and burn agriculture'?
  - (a) Extensive subsistence agriculture
  - (b) Primitive subsistence agriculture
  - (c) Extensive commercial grain cultivation
  - (d) Mixed farming
- (viii) Which one of the following does not follow monoculture?
  - (a) Dairy farming
  - (c) Plantation agriculture
  - (b) Mixed farming
  - (d) Commercial grain farming

**2.** Answer the following questions in about 30 words.

- (i) Future of shifting cultivation is bleak. Discuss.
- (ii) Market gardening is practised near urban areas. Why?
- (iii) Large scale dairy farming is the result of the development of transportation and refrigeration.



**3.** Answer the following questions in not more than 150 words.

- (i) Differentiate between Nomadic Herding and Commercial Livestock Rearing.
- (ii) Discuss the important characteristic features of plantation agriculture. Name a few important plantation crops from different countries.

### **Project/Activity**

Visit a nearby village and observe the cultivation of some crops. Ask the farmers and list the various operations.

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**Unit III**  
**Chapter 5**

## **LAND RESOURCES AND AGRICULTURE**



You must have observed that the land around you is put to different uses. Some land is occupied by rivers, some may have trees and on some parts roads and buildings have been built. Different types of lands are suited to different uses. Human beings thus, use land as a resource for production as well as residence and recreation. Thus, the building of your school, roads on which you travel, parks in which you play, fields in which crops are grown and the pastures where animals graze represent different uses to which land is put.

### **Land Use Categories**

Land-use records are maintained by land revenue department. The land use categories add up to *reporting area*, which is somewhat different from the *geographical area*. The Survey of India is responsible for measuring *geographical area* of administrative units in India. Have you ever used a map prepared by Survey of India? The difference between the two concepts are that while the former changes somewhat depending on the estimates of the land revenue records, the latter does not change and stays fixed as per Survey of India measurements. You may be familiar with land use categories as they are also included in your Social Science textbook of Class X.

The land-use categories as maintained in the Land Revenue Records are as follows :

- (i) Forests : It is important to note that area under actual forest cover is different from area classified as forest. The latter is the area which the Government has identified and demarcated for forest growth. The land revenue records are consistent with the latter definition. Thus, there may be an increase in this category without any increase in the actual forest cover.
- (ii) Land put to Non-agricultural Uses : Land under settlements (rural and urban), infrastructure (roads, canals, etc.), industries, shops, etc. are included in this category. An expansion in the secondary and tertiary activities

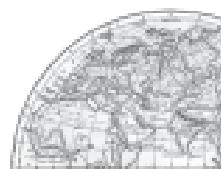
would lead to an increase in this category of land-use.

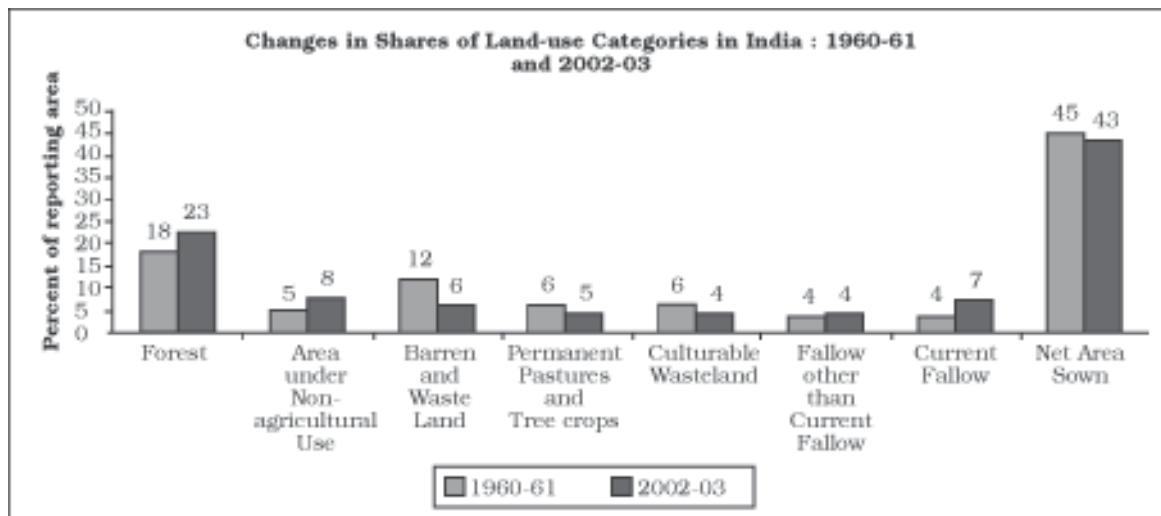
- (iii) Barren and Wastelands : The land which may be classified as a wasteland such as barren hilly terrains, desert lands, ravines, etc. normally cannot be brought under cultivation with the available technology .
- (iv) Area under Permanent Pastures and Grazing Lands : Most of this type land is owned by the village 'Panchayat' or the Government. Only a small proportion of this land is privately owned. The land owned by the village panchayat comes under 'Common Property Resources'.
- (v) Area under Miscellaneous Tree Crops and Groves(Not included is Net sown Area) : The land under orchards and fruit trees are included in this category. Much of this land is privately owned.
- (vi) Culturable Waste-Land : Any land which is left fallow (uncultivated) for more than five years is included in this category. It can be brought under cultivation after improving it through reclamation practices.
- (vii) Current Fallow : This is the land which is left without cultivation for one or less than one agricultural year. Fallowing is a cultural practice adopted for giving the land rest. The land recaps the lost fertility through natural processes.
- (viii) Fallow other than Current Fallow : This is also a cultivable land which is left uncultivated for more than a year but less than five years. If the land is left uncultivated for more than five years, it would be categorised as culturable wasteland.
- (ix) Net Area Sown : The physical extent of land on which crops are sown and harvested is known as net sown area.

## Land-use Changes in India

Land-use in a region, to a large extent, is influenced by the nature of economic activities carried out in that region. However, while economic activities change over time, land, like many other natural resources, is fixed in terms of its area. At this stage, one needs to appreciate three types of changes that an economy undergoes, which affect land-use.

- (i) The **size of the economy** (measured in terms of value for all the goods and services produced in the economy) grows over time as a result of increasing population, change in income levels, available technology and associated factors. As a result, the pressure on land will increase with time and marginal lands would come under use.
- (ii) Secondly, **the composition of the economy** would undergo a change over time. In other words, the secondary and the tertiary sectors usually grow much faster than the primary sector, specifically the agricultural sector. This type of change is common in developing countries like India. This process would result in a gradual shift of land from agricultural uses to non-agricultural uses. You would observe that such changes are sharp around large urban areas. The agricultural land is being used for building purposes.
- (iii) Thirdly, though the contribution of the agricultural activities reduces over time, the pressure on land for agricultural activities does not decline. The reasons for continued pressure on agricultural land are:
  - (a) In developing countries, the share of population dependent on agriculture usually declines much more slowly compared to the decline in the sector's share in GDP.
  - (b) The number of people that the agricultural sector has to feed is increasing day by day.





Note : Categories (iv) and (v) of Section I have been clubbed together in the graph.

**Fig. 5.1**

### Activity

Compare the change in shares of primary, secondary and tertiary sectors in GDP between 1960-61 and 1999-2000 with the changes of land-use between 1960-61 and 2002-03 using Appendix (viii) tables 1 and 2.

India has undergone major changes within the economy over the past four or five decades, and this has influenced the land-use changes in the country. These changes between 1960-61 and 2002-03 have been shown in Fig. 5.1. There are two points that you need to remember before you derive some meaning from this figure. Firstly, the percentages shown in the figure have been derived with respect to the reporting area. Secondly, since even the reporting area has been relatively constant over the years, a decline in one category usually leads to an increase in some other category.

Three categories have undergone increases, while four have registered declines. Share of area under forest, area under non-agricultural uses and current fallow lands have shown an increase. The following observations can be made about these increases:

- The *rate of increase* is the highest in case of area under non-agricultural uses. This is due to the changing structure of Indian economy, which is increasingly depending on the contribution from

industrial and services sectors and expansion of related infrastructural facilities. Also, an expansion of area under both urban and rural settlements has added to the increase. Thus, the area under non-agricultural uses is increasing at the expense of wastelands and agricultural land.

- The increase in the share under forest, as explained before, can be accounted for by increase in the demarcated area under forest rather than an actual increase in the forest cover in the country.
- The increase in the current fallow cannot be explained from information pertaining to only two points. The trend of current fallow fluctuates a great deal over years, depending on the variability of rainfall and cropping cycles.

The four categories that have registered a decline are barren and wasteland, culturable wasteland, area under pastures and tree crops and net area sown.

The following explanations can be given for the declining trends:

- As the pressure on land increased, both from the agricultural and non-agricultural sectors, the wastelands and culturable wastelands have witnessed decline over time.
- The decline in net area sown is a recent



phenomenon that started in the late nineties, before which it was registering a slow increase. There are indications that most of the decline has occurred due to the increases in area under non-agricultural use. (Note : the expansion of building activity on agricultural land in your village and city).

- (iii) The decline in land under pastures and grazing lands can be explained by pressure from agricultural land. Illegal encroachment due to expansion of cultivation on common pasture lands is largely responsible for this decline.

weaker sections since many of them depend on income from their livestock due to the fact that they have limited access to land. CPRs also are important for women as most of the fodder and fuel collection is done by them in rural areas. They have to devote long hours in collecting fuel and fodder from a degraded area of CPR.

CPRs can be defined as community's natural resource, where every member has the right of access and usage with specified obligations, without anybody having property rights over them. Community forests, pasture lands, village water bodies and other public spaces where a group larger than a household or family unit exercises rights of use and carries responsibility of management are examples of CPRs.

### Agricultural Land Use in India

Land resource is more crucial to the livelihood of the people depending on agriculture:

- (i) Agriculture is a purely land based activity unlike secondary and tertiary activities. In other words, contribution of land in agricultural output is more compared to its contribution in the outputs in the other sectors. Thus, lack of access to land is directly correlated with incidence of poverty in rural areas.
- (ii) Quality of land has a direct bearing on the productivity of agriculture, which is not true for other activities.
- (iii) In rural areas, aside from its value as a productive factor, land ownership has a social value and serves as a security for credit, natural hazards or life contingencies, and also adds to the social status.

An estimation of the total stock of agricultural land resources (i.e. total cultivable land can be arrived at by adding up net sown area, all fallow lands and culturable wasteland. It may be observed from Table 5.1 that over the years, there has been a marginal decline in the available total stock of cultivable land as a percentage to total reporting area. There has been a greater decline of cultivated land, in spite of a corresponding decline of cultivable wasteland.

### Activity

What is the difference between actual increase and rate of increase? Work out the actual increase and rate of increases for all the land use categories between 1960-61 and 2002-03 from the data given in the Appendix (viii) (Table 1). Explain the results.

#### Note for Teacher

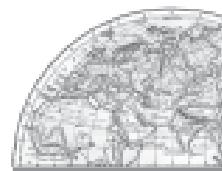
For calculating actual increase, the difference of the land-use categories should be worked out over the two periods.

For deriving the rate of increase, simple growth rate i.e. (difference of values between the two time points i.e. value of terminal year minus base year / base year or 1960-61 value) should be used, e.g.

$$\frac{\text{Net sown Area in 2002-03} - \text{Net sown Area in 1960-61}}{\text{Net sown Area in 1960-61}} \times 100$$

### Common Property Resources

Land, according to its ownership can broadly be classified under two broad heads – private land and common property resources (CPRs). While the former is owned by an individual or a group of individuals, the latter is owned by the state meant for the use of the community. CPRs provide fodder for the livestock and fuel for the households along with other minor forest products like fruits, nuts, fibre, medicinal plants, etc. In rural areas, such land is of particular relevance for the livelihood of the landless and marginal farmers and other



**Table 5.1 : Composition of Total Cultivable Land**

Agricultural Land-use Categories	As a percentage of Reporting Area		As a percentage to Total Cultivated land	
	1960-61	2002-03	1960-61	2002-03
Culturable Wasteland	6.23	4.41	10.61	7.52
Fallow other than Current Fallow	3.5	3.82	5.96	6.51
Current Fallow	3.73	7.03	6.35	11.98
Net Area Sown	45.26	43.41	77.08	73.99
<b>Total Cultivable Land</b>	<b>58.72</b>	<b>58.67</b>	<b>100.00</b>	<b>100.00</b>

It is clear from the above discussion that the scope for bringing in additional land under net sown area in India is limited. There is, thus, an urgent need to evolve and adopt land-saving technologies. Such technologies can be classified under two heads – those which raise the yield of any particular crop per unit area of land and those which increase the total output per unit area of land from all crops grown over one agricultural year by increasing land-use intensity. The advantage of the latter kind of technology is that along with increasing output from limited land, it also increases the demand for labour significantly. For a land scarce but labour abundant country like India, a high cropping intensity is desirable not only for fuller utilisation of land resource, but also for reducing unemployment in the rural economy.

The *cropping intensity (CI)* is calculated as follows :

$$\text{Cropping Intensity in percentage} = \frac{\text{GCA}}{\text{NSA}} \times 100$$

### Cropping Seasons in India

There are three distinct crop seasons in the northern and interior parts of country, namely *kharif*, *rabi* and *zaid*. The *kharif* season largely coincides with Southwest Monsoon under which the cultivation of tropical crops such as rice, cotton, jute, jowar, bajra and tur is possible. The *rabi* season begins with the onset of winter in October-November and ends in March-April. The low temperature conditions during

this season facilitate the cultivation of temperate and subtropical crops such as wheat, gram and mustard. *Zaid* is a short duration summer cropping season beginning after harvesting of rabi crops. The cultivation of watermelons, cucumbers, vegetables and fodder crops during this season is done on irrigated lands. However, this type of distinction in the cropping season does not exist in southern parts of the country. Here, the temperature is high enough to grow tropical crops during any period in the year provided the soil moisture is available. Therefore, in this region same crops can be grown thrice in an agricultural year provided there is sufficient soil moisture.

### Types of Farming

On the basis of main source of moisture for crops, the farming can be classified as **irrigated** and **rained (barani)**. There is difference in the nature of irrigated farming as well based on objective of irrigation, i.e. protective or productive. The objective of protective irrigation is to protect the crops from adverse effects of soil

**Table 5.2 : Cropping Seasons in India**

Cropping Season	Major Crops Cultivated	
	Northern States	Southern States
<b>Kharif</b> June-September	Rice, Cotton, Bajra, Maize, Jowar, Tur	Rice, Maize, Ragi, Jowar, Groundnut
<b>Rabi</b> October – March	Wheat, Gram, Rapeseeds and Mustard, Barley	Rice, Maize, Ragi, Groundnut, Jowar
<b>Zaid</b> April-June	Vegetables, Fruits, Fodder	Rice, Vegetables, Fodder

moisture deficiency which often means that irrigation acts as a supplementary source of water over and above the rainfall. The strategy of this kind of irrigation is to provide soil moisture to maximum possible area. Productive irrigation is meant to provide sufficient soil moisture in the cropping season to achieve high productivity. In such irrigation the water input per unit area of cultivated land is higher than protective irrigation. *Rainfed farming* is further classified on the basis of adequacy of soil moisture during cropping season into *dryland* and *wetland* farming. In India, the ***dryland farming*** is largely confined to the regions having annual rainfall less than 75 cm. These regions grow hardy and drought resistant crops such as *ragi*, *bajra*, *moong*, *gram* and *guar* (fodder crops) and practise various measures of soil moisture conservation and rain water harvesting. In ***wetland farming***, the rainfall is in excess of soil moisture requirement of plants during rainy season. Such regions may face flood and soil erosion hazards. These areas grow various water intensive crops such as rice, jute and sugarcane and practise aquaculture in the fresh water bodies.

## Cropping Pattern

### Foodgrains

The importance of foodgrains in Indian agricultural economy may be gauged from the fact these crops occupy about two-third of total cropped area in the country. Foodgrains are dominant crops in all parts of the country whether they have subsistence or commercial agricultural economy. On the basis of the structure of grain the foodgrains are classified as cereals and pulses.

### Cereals

The cereals occupy about 54 per cent of total cropped area in India. The country produces about 11 per cent cereals of the world and ranks third in production after China and U.S.A. India produces a variety of cereals, which are classified as fine grains (rice, wheat) and coarse grains (jowar, bajra, maize, ragi), etc. Account of important cereals has been given in the following paragraphs :

### Rice

Rice is a staple food for the overwhelming majority of population in India. Though, it is considered to be a crop of tropical humid areas, it has about 3,000 varieties which are grown in different agro-climatic regions. These are successfully grown from sea level to about 2,000 m altitude and from humid areas in eastern India to dry but irrigated areas of Punjab, Haryana, western U.P. and northern Rajasthan. In southern states and West Bengal the climatic conditions allow the cultivation of two or three crops of rice in an agricultural year. In West Bengal farmers grow three crops of rice called '*aus*', '*aman*' and '*boro*'. But in Himalayas and northwestern parts of the country, it is grown as a *kharif* crop during southwest Monsoon season.

India contributes 22 per cent of rice production in the world and ranks second after China. About one-fourth of the total cropped area in the country is under rice cultivation. West Bengal, Punjab, Uttar Pradesh, Andhra Pradesh and Tamil Nadu were five leading rice producing states in the country in 2002-03. The yield level of rice is high in Punjab, Tamil Nadu, Haryana, Andhra Pradesh, West Bengal and Kerala. In the first four of these states almost the entire land under rice cultivation is irrigated. Punjab and Haryana are not traditional rice



**Fig. 5.2 : Rice transplantation in southern parts of India**

growing areas. Rice cultivation in the irrigated areas of Punjab and Haryana was introduced in 1970s following the Green Revolution. Genetically improved varieties of seed, relatively high usage of fertilisers and pesticides and lower levels of susceptibility of the crop to pests due to

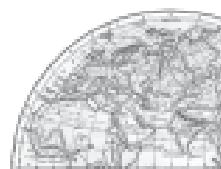




Fig. 5.3 : India – Distribution of Rice

dry climatic conditions are responsible for higher yield of rice in this region. The yield of this crop is very low in rainfed areas of Madhya Pradesh, Chhattisgarh and Orissa.

### **Wheat**

Wheat is the second most important cereal crop in India after rice. India produces about 12 per cent of total wheat production of world. It is primarily a crop of temperate zone. Hence, its cultivation in India is done during winter i.e. *rabi* season. About 85 per cent of total area under this crop is concentrated in north and central regions of the country i.e. Indo-Gangetic Plain, Malwa Plateau and Himalayas up to 2,700 m altitude. Being a *rabi* crop, it is mostly grown under irrigated conditions. But it is a rainfed crop in Himalayan highlands and parts of Malwa plateau in Madhya Pradesh.

About 14 per cent of the total cropped area in the country is under wheat cultivation. Uttar Pradesh, Punjab, Haryana, Rajasthan and Madhya Pradesh are five leading wheat producing states. The yield level of wheat is very high (above 4,000 k.g. per ha) in Punjab and Haryana whereas, Uttar Pradesh, Rajasthan and Bihar have moderate yields. The states like Madhya Pradesh, Himachal Pradesh and Jammu and Kashmir growing wheat under rainfed conditions have low yield.

### **Jowar**

The coarse cereals together occupy about 16.50 per cent of total cropped area in the country. Among these, *jowar* or *sorghum* alone accounts for about 5.3 per cent of total cropped area. It is main food crop in semi-arid areas of central and southern India. Maharashtra alone produces more than half of the total *jowar* production of the country. Other leading producer states of *jowar* are Karnataka, Madhya Pradesh and Andhra Pradesh. It is sown in both *kharif* and *rabi* seasons in southern states. But it is a *kharif* crop in northern India where it is mostly grown as a fodder crop. South of Vindhya-Chhal it is a rainfed crop and its yield level is very low in this region.

### **Bajra**

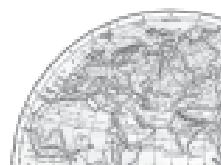
*Bajra* is sown in hot and dry climatic conditions in northwestern and western parts of the country. It is a hardy crop which resists frequent dry spells and drought in this region. It is cultivated alone as well as part of mixed cropping. This coarse cereal occupies about 5.2 per cent of total cropped area in the country. Leading producers of *bajra* are the states of Maharashtra, Gujarat, Uttar Pradesh, Rajasthan and Haryana. Being a rainfed crop, the yield level of this crop is low in Rajasthan and fluctuates a lot from year to year. Yield of this crop has increased during recent years in Haryana and Gujarat due to introduction of drought resistant varieties and expansion of irrigation under it.

### **Maize**

Maize is a food as well as fodder crop grown under semi-arid climatic conditions and over inferior soils. This crop occupies only about 3.6 per cent of total cropped area. Maize cultivation is not concentrated in any specific region. It is sown all over India except eastern and north-eastern regions. The leading producers of maize are the states of Madhya Pradesh, Andhra Pradesh, Karnataka, Rajasthan and Uttar Pradesh. Yield level of maize is higher than other coarse cereals. It is high in southern states and declines towards central parts.

### **Pulses**

Pulses are a very important ingredient of vegetarian food as these are rich sources of proteins. These are legume crops which increase the natural fertility of soils through nitrogen fixation. India is a leading producer of pulses and accounts for about one-fifth of the total production of pulses in the world. The cultivation of pulses in the country is largely concentrated in the drylands of Deccan and central plateaus and northwestern parts of the country. Pulses occupy about 11 per cent of the total cropped area in the country. Being the rainfed crops of drylands, the yields of pulses are low and fluctuate from year to year. Gram and *tur* are the main pulses cultivated in India.





**Fig. 5.4 : India – Distribution of Wheat**

### **Gram**

Gram is cultivated in subtropical areas. It is mostly a rainfed crop cultivated during rabi season in central, western and northwestern parts of the country. Just one or two light showers or irrigations are required to grow this crop successfully. It has been displaced from the cropping pattern by wheat in Haryana, Punjab and northern Rajasthan following the green revolution. At present, gram covers only about 2.8 per cent of the total cropped area in the country. Madhya Pradesh, Uttar Pradesh, Maharashtra, Andhra Pradesh and Rajasthan are the main producers of this pulse crop. The yield of this crop continues to be low and fluctuates from year to year even in irrigated areas.

### **Tur (Arhar)**

Tur is the second important pulse crop in the country. It is also known as *red gram* or *pigeon pea*. It is cultivated over marginal lands and under rainfed conditions in the dry areas of central and southern states of the country. This crop occupies only about 2 per cent of total cropped area of India. Maharashtra alone contributes about one-third of the total production of tur. Other leading producer states are Uttar Pradesh, Karnataka, Gujarat and Madhya Pradesh. Per hectare output of this crop is very low and its performance is inconsistent.

### **Activity**

Differentiate between different foodgrains. Mix grains of various kinds and separate cereals from pulses. Also, separate fine from coarse cereals.

### **Oilseeds**

The oilseeds are produced for extracting edible oils. Drylands of Malwa plateau, Marathwada, Gujarat, Rajasthan, Telangana and Rayalseema region of Andhra Pradesh and Karnataka plateau are oilseeds growing regions of India. These crops together occupy about 14 per cent of total cropped area in the country. Groundnut, rapeseed and mustard, soyabean and sunflower are the main oilseed crops grown in India.

### **Groundnut**

India produces about 17 per cent the total of groundnut production in the world. It is largely a rainfed *kharif* crop of drylands. But in southern India, it is cultivated during rabi season as well. It covers about 3.6 per cent of total cropped area in the country. Gujarat, Tamil Nadu, Andhra Pradesh, Karnataka and Maharashtra are the leading producers. Yield of groundnut is comparatively high in Tamil Nadu where it is partly irrigated. But its yield is low in Andhra Pradesh and Karnataka.

### **Rapeseed and Mustard**

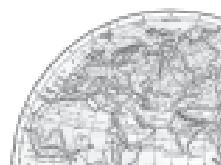
Rapeseed and mustard comprise several oilseeds as *rai*, *sarson*, *toria* and *taramira*. These are subtropical crops cultivated during rabi season in north-western and central parts of India. These are frost sensitive crops and their yields fluctuate from year to year. But with the expansion of irrigation and improvement in seed technology, their yields have improved and stabilised to some extent. About two-third of the cultivated area under these crops is irrigated. These oilseeds together occupy only 2.5 per cent of total cropped area in the country. Rajasthan contributes about one-third production while other leading producers are Uttar Pradesh, Haryana, West Bengal and Madhya Pradesh. Yields of these crops are comparatively high in Haryana and Rajasthan.

### **Other Oilseeds**

Soyabean and sunflower are other important oilseeds grown in India. Soyabean is mostly grown in Madhya Pradesh and Maharashtra.



**Fig. 5.5 : Farmers sowing soyabean seeds in Amravati, Maharashtra**



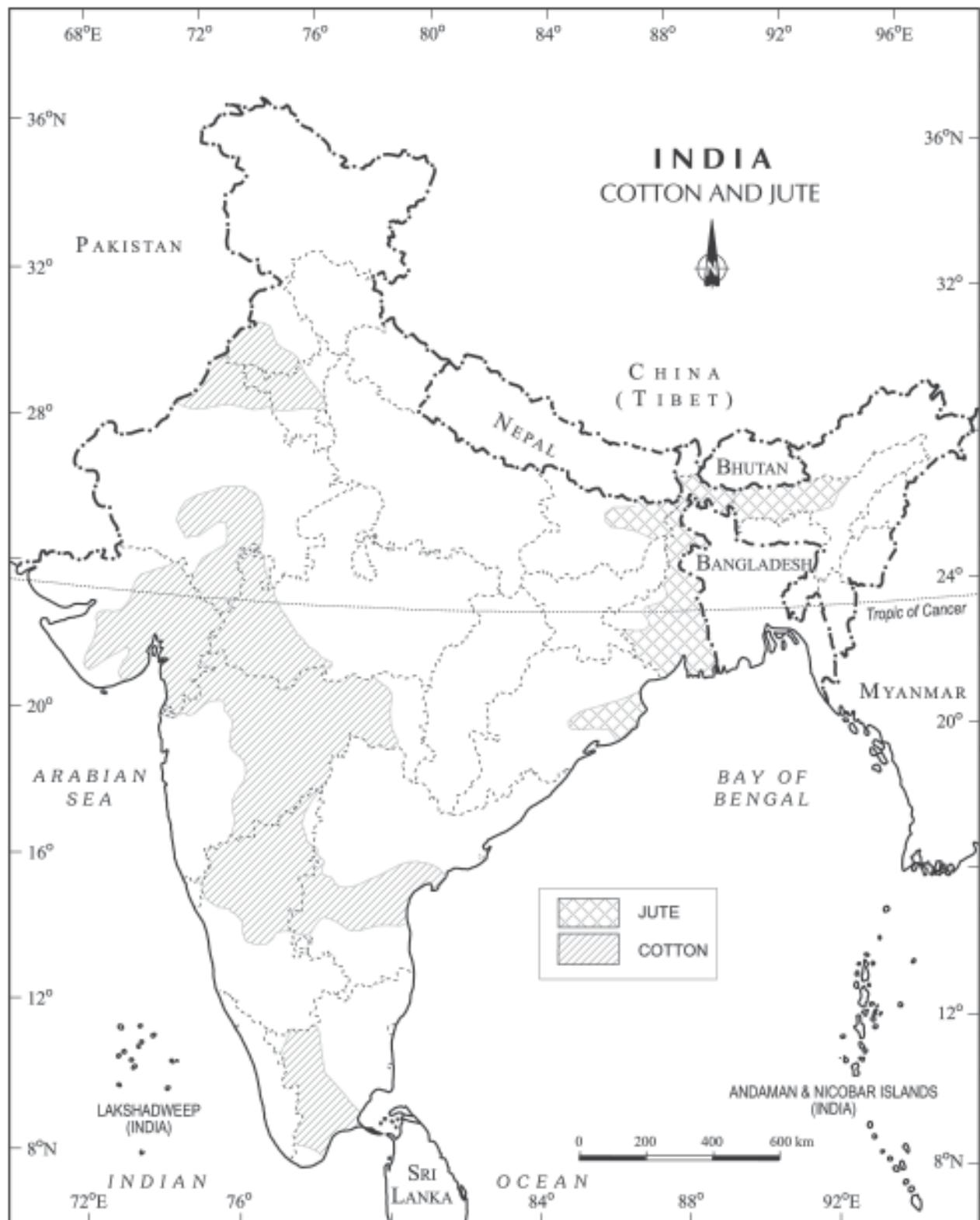


Fig. 5.6 : India – Distribution of Cotton and Jute

These two states together produce about 90 per cent of total output of soyabean in the country. Sunflower cultivation is concentrated in Karnataka, Andhra Pradesh and adjoining areas of Maharashtra. It is a minor crop in northern parts of the country where its yield is high due to irrigation.

### **Fibre Crops**

These crops provide us fibre for preparing cloth, bags, sacks and a number of other items. Cotton and jute are two main fibre crops grown in India.

#### **Cotton**

Cotton is a tropical crop grown in *kharif* season in semi-arid areas of the country. India lost a large proportion of cotton growing area to Pakistan during partition. However, its acreage has increased considerably during the last 50 years. India grows both short staple (Indian) cotton as well as long staple (American) cotton called '*narma*' in north-western parts of the country. Cotton requires clear sky during flowering stage.



**Fig. 5.7 : Cotton Cultivation**

India ranks fourth in the world in the production of cotton after China, U.S.A. and Pakistan and accounts for about 8.3 per cent of production of cotton in the world. Cotton occupies about 4.7 per cent of total cropped area in the country. There are three cotton growing areas, i.e. parts of Punjab, Haryana and northern Rajasthan in north-west, Gujarat and Maharashtra in the west and plateaus of Andhra Pradesh, Karnataka and Tamil Nadu

in south. Leading producers of this crop are Maharashtra, Gujarat, Andhra Pradesh, Punjab and Haryana. Per hectare output of cotton is high under irrigated conditions in north-western region of the country. Its yield is very low in Maharashtra where it is grown under rainfed conditions.

#### **Jute**

Jute is used for making coarse cloth, bags, sacks and decorative items. It is a cash crop in West Bengal and adjoining eastern parts of the country. India lost large jute growing areas to East Pakistan (Bangladesh) during partition. At present, India produces about three-fifth of jute production of the world. West Bengal accounts for about three-fourth of the production in the country. Bihar and Assam are other jute growing areas. Being concentrated only in a few states, this crop accounts for only about 0.5 per cent of total cropped area in the country.

#### **Other Crops**

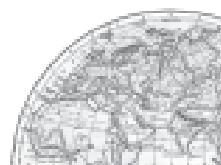
Sugarcane, tea and coffee are other important crops grown in India.

#### **Sugarcane**

Sugarcane is a crop of tropical areas. Under rainfed conditions, it is cultivated in sub-humid and humid climates. But it is largely an irrigated crop in India. In Indo-Gangetic plain, its cultivation is largely concentrated in Uttar Pradesh. Sugarcane growing area in western India is spread over Maharashtra and Gujarat. In



**Fig. 5.8 : Sugarcane Cultivation**





**Fig. 5.9 : India – Distribution of Sugarcane**

southern India, it is cultivated in irrigated tracts of Karnataka, Tamil Nadu and Andhra Pradesh.

India is the second largest producer of sugarcane after Brazil. It accounts for about 23 per cent of the world production of sugarcane. But it occupies only 2.4 per cent of total cropped area in the country. Uttar Pradesh produces about two-fifth of sugarcane of the country. Maharashtra, Karnataka, Tamil Nadu and Andhra Pradesh are other leading producers of this crop where yield level of sugarcane is high. Its yield is low in northern India.

#### **Tea**

Tea is a plantation crop used as beverage. Black tea leaves are fermented whereas green tea leaves are unfermented. Tea leaves have rich content of caffeine and tannin. It is an indigenous crop of hills in northern China. It is grown over undulating topography of hilly areas and well-drained soils in humid and sub-humid tropics and sub-tropics. In India, tea plantation started in 1840s in Brahmaputra valley of Assam which still is a major tea growing area in the country. Later on, its plantation was introduced in the sub-Himalayan region of West Bengal (Darjiling, Jalpaiguri and Cooch Bihar districts). Tea is also cultivated on the lower slopes of Nilgiri and Cardamom hills in Western Ghats. India is a



**Fig. 5.10 : Tea Farming**

leading producer of tea and accounts for about 28 per cent of total production in the world. India's share in the international market of tea has declined substantially. At present, it ranks third among tea exporting countries in the world

after Sri Lanka and China. Assam accounts for about 53.2 per cent of the total cropped area and contributes more than half of total production of tea in the country. West Bengal and Tamil Nadu are the other leading producers of tea.

#### **Coffee**

Coffee is a tropical plantation crop. Its seeds are roasted, ground and are used for preparing a beverage. There are three varieties of coffee i.e. *arabica*, *robusta* and *liberica*. India mostly grows superior quality coffee, *arabica*, which is in great demand in International market. But India produces only about 4.3 per cent coffee of the world and *ranks sixth* after Brazil, Vietnam, Colombia, Indonesia and Mexico. Coffee is cultivated in the highlands of Western Ghats in Karnataka, Kerala and Tamil Nadu. Karnataka alone accounts for more than two-third of total production of coffee in the country.

### **Agricultural Development in India**

Agriculture continues to be an important sector of Indian economy. In 2001 about 53 per cent population of the country was dependent on it. The importance of agricultural sector in India can be gauged from the fact that about 57 per cent of its land is devoted to crop cultivation, whereas, in the world, the corresponding share is only about 12 per cent. In spite of this, there is tremendous pressure on agricultural land in India, which is reflected from the fact that the land-human ratio in the country is only 0.31 ha which is almost half of that of the world as a whole (0.59 ha). Despite various constraints, Indian agriculture has marched a long way since Independence.

#### **Strategy of Development**

Indian agricultural economy was largely subsistence in nature before Independence. It had dismal performance in the first half of twentieth century. This period witnessed severe droughts and famines. During partition about one-third of the irrigated land in undivided India went to Pakistan. This reduced the proportion of irrigated area in Independent

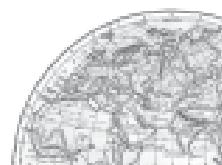




Fig. 5.11 : India - Distribution of Tea and Coffee

India. After Independence, the immediate goal of the Government was to increase foodgrains production by (i) switching over from cash crops to food crops; (ii) intensification of cropping over already cultivated land; and (iii) increasing cultivated area by bringing cultivable and fallow land under plough. Initially, this strategy helped in increasing foodgrains production. But agricultural production stagnated during late 1950s. To overcome this problem, Intensive Agricultural District Programme (IADP) and Intensive Agricultural Area Programme (IAAP) were launched. But two consecutive droughts during mid-1960s resulted in food crisis in the country. Consequently, the foodgrains were imported from other countries.

New seed varieties of wheat (Mexico) and rice (Philippines) known as high yielding varieties (HYVs) were available for cultivation by mid-1960s. India took advantage of this and introduced package technology comprising HYVs, along with chemical fertilizers in irrigated areas of Punjab, Haryana, Western Uttar Pradesh, Andhra Pradesh and Gujarat. Assured supply of soil moisture through irrigation was a basic pre-requisite for the success of this new agricultural technology. This strategy of agricultural development paid dividends instantly and increased the foodgrains production at very fast rate. This spurt of agricultural growth came to be known as '**Green Revolution**'. This also gave fillip to the development of a large number of agro-inputs, agro-processing industries and small-scale industries. This strategy of agricultural development made the country self-reliant in foodgrain production. But green revolution was initially confined to irrigated areas only. This led to regional disparities in agricultural development in the country till the seventies, after which the technology spread to the Eastern and Central parts of the country.

The Planning Commission of India focused its attention on the problems of agriculture in rainfed areas in 1980s. It initiated agro-climatic planning in 1988 to induce regionally balanced agricultural development in the country. It also emphasised

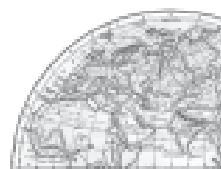
the need for diversification of agriculture and harnessing of resources for development of dairy farming, poultry, horticulture, livestock rearing and aquaculture.

Initiation of the policy of liberalisation and free market economy in 1990s is likely to influence the course of development of Indian agriculture. Lack of development of rural infrastructure, withdrawal of subsidies and price support, and impediments in availing of the rural credits may lead to inter-regional and inter-personal disparities in rural areas.

### **Growth of Agricultural Output and Technology**

There has been a significant increase in agricultural output and improvement in technology during the last fifty years.

- Production and yield of many crops such as rice and wheat has increased at an impressive rate. Among the other crops, the production of sugarcane, oilseeds and cotton has also increased appreciably. India ranks first in the production of pulses, tea, jute, cattle and milk. It is the second largest producer of rice, wheat, groundnut, sugarcane and vegetables.
- Expansion of irrigation has played a very crucial role in enhancing agricultural output in the country. It provided basis for introduction of modern agricultural technology such as high yielding varieties of seeds, chemical fertilizers, pesticides and farm machinery. The net irrigated area in the country has increased from 20.85 to 54.66 million ha over the period 1950-51 to 2000-01. Over these 50 years, *area irrigated more than once in an agricultural year* has increased from 1.71 to 20.46 million ha.
- Modern agricultural technology has diffused very fast in various areas of the country. Consumption of chemical fertilizers has increased by 15 times since mid-sixties. In 2001-02, per hectare consumption of chemical fertilizers in India was 91 kg which was equal to its average consumption in the world (90 kg). But in the irrigated areas of Punjab and Haryana,



the consumption of chemical fertilizers per unit area is three to four times higher than that of the national average. Since the high yielding varieties are highly susceptible to pests and diseases, the use of pesticides has increased significantly since 1960s.



Fig. 5.12 : Roto Till Drill - A modern agricultural equipment

### Problems of Indian Agriculture

The nature of problems faced by Indian agriculture varies according to agro-ecological and historical experiences of its different regions. Hence, most of the agricultural problems in the country are region specific. Yet, there are some problems which are common and range from physical constraints to institutional hindrances. A detailed discussion on these problems follows:

#### Dependence on Erratic Monsoon

Irrigation covers only about 33 per cent of the cultivated area in India. The crop production in rest of the cultivated land directly depends on rainfall. Poor performance of south-west Monsoon also adversely affects the supply of canal water for irrigation. On the other hand, the rainfall in Rajasthan and other drought prone areas is too meagre and highly unreliable. Even the areas receiving high annual rainfall experience considerable fluctuations. This makes them vulnerable to both droughts and floods. Drought is a common phenomenon in the low rainfall areas which may also experience occasional floods. The flash floods in drylands of Maharashtra, Gujarat, and Rajasthan in 2006 are examples of this phenomenon. Droughts and floods continue to be twin menace in Indian agriculture.

#### Low productivity

The yield of the crops in the country is low in comparison to the international level. Per hectare output of most of the crops such as rice, wheat, cotton and oilseeds in India is much lower than that of U.S.A., Russia and Japan. Because of the very high pressure on the land resources, the labour productivity in Indian agriculture is also very low in comparison to international level. The vast rainfed areas of the country, particularly drylands which mostly grow coarse cereals, pulses and oilseeds have very low yields.

Why is agricultural productivity low in dry regions?

#### Constraints of Financial Resources and Indebtedness

The inputs of modern agriculture are very expensive. This resource intensive approach has become unmanageable for marginal and small farmers as they have very meagre or no saving to invest in agriculture. To tide over these difficulties, most of such farmers have resorted to availing credit from various institutions and money lenders. Crop failures and low returns from agriculture have forced them to fall in the trap of indebtedness.

What are the implications of severe indebtedness? Do you feel that the recent incidents of farmers' suicides in different states of the country are the result of indebtedness?

#### Lack of Land Reforms

Indian peasantry had been exploited for a long time as there had been unequal distribution of land. Among the three revenue systems operational during British period i.e. Mahalwari, Ryotwari and Zamindari, the last one was most exploitative for the peasants. After independence, land reforms were accorded priority, but these

reforms were not implemented effectively due to lack of strong political will. Most of the state governments avoided taking politically tough decisions which went against strong political lobbies of landlords. Lack of implementation of land reforms has resulted in continuation of inequitable distribution of cultivable land which is detrimental to agricultural development.

### **Small Farm Size and Fragmentation of Landholdings**

There are a large number of marginal and small farmers in the country. More than 60 per cent of the ownership holdings have a size smaller than one (ha). Furthermore, about 40 per cent of the farmers have operational holding size smaller than 0.5 hectare (ha). The average size

of land holding is shrinking further under increasing population pressure. Furthermore, in India, the land holdings are mostly fragmented. There are some states where consolidation of holding has not been carried out even once. Even the states where it has been carried out once, second consolidation is required as land holdings have fragmented again in the process of division of land among the owners of next generations. The small size fragmented landholdings are uneconomic.

### **Lack of Commercialisation**

A large number of farmers produce crops for self-consumption. These farmers do not have enough land resources to produce more than their requirement. Most of the small and marginal farmers grow foodgrains, which are

**DUE TO RISING PRICES, FARMERS MAY GROW SUGARCANE IN MORE AREAS**

## **Oilseeds may lose acreage war to sugarcane, pulses**

By Suhasini Patil  
Mumbai

Indian farmers are likely to increase the acreage of sugarcane and pulses at the cost of oilseeds and cotton, especially in the centralised areas to benefit from the rising prices of these commodities vis-à-vis the minimum support price of each of them. Accordingly, the acreage meant for oil and mustard seeds may be used for chana and wheat; the demand might be increased by 3.5% (chana) and 2.7% (wheat), besides 15% increase in oilseed acreage. According to Mr. Sharad Shinde, President, Indian Oilseed Growers Association, for year 2005-06, Mr. Shinde is quick to add that any shortfall could be met by the 3.4 and loss-mitigation coefficient of supplementation held by NHB. "The price trend indicates and the acreage mean for oilseed has increased with a 4% price rise over the last three years in oilseed acreage, but the rise was not as sharp as in sugar, wheat and pulses," Mr. Shinde said. The acreage and rising prices of other acreage ready to bear the brunt of the fall in oilseed acreage. The acreage loss though is limited to 2.7% of total sown area in India.

**GROWING TALL**  
  
Sugarcane is the country's dependence on imports will continue due to excess of about 8% of its consumption requirement, according to Mr. Shinde.  
After six months of the new budget, sugar production is expected to be up by 5-7%.

By Sudesh Krishnamurthy  
New Delhi

New Delhi: While Bt cotton's profitability continues to rise, a key reason behind farmers' distress is Vidarbha, where cotton is reclaiming its position in the state, despite falling acreage. Pishing crop failure, the Panchayati Raj authorities are not advised on the cotton, as the latter is sold across Vidarbha with seed packet leading to seed bed loss. "But when a seed is not suited area?" The villages complained they had no choice, as the manufacturer's warning for late sowing is very small letters". Indeed, being at the heart of rural distress, the monsoon credit has come up for fresh roadmap. The Central has advised to provide loans on low interest rates.



## **In western UP, sugarcane is life**

By Anup Ghosh  
Lucknow

Central government's 2004-05 budget has already allocated Rs. 28.53 crore for the construction of irrigation projects in the state which will benefit 1.45 lakh farmers. This amount, however, is far less than what is required to meet the target. The central government has announced a package worth Rs. 120 crore for the state which includes a one-time grant of Rs. 100 crore.

The central government has also allocated Rs. 100 crore for the state which includes a one-time grant of Rs. 100 crore.

What changes have you noticed in agricultural sector and cropping pattern? Discuss in the class.

## **Planning Commission lends Vidarbha an ear**

### **Wants Advisory Against Bt Cotton In The Region**

By Sudesh Krishnamurthy  
New Delhi

New Delhi: While Bt cotton's profitability continues to rise, a key reason behind farmers' distress is Vidarbha, where cotton is reclaiming its position in the state, despite falling acreage. Pishing crop failure, the Panchayati Raj authorities are not advised on the cotton, as the latter is sold across Vidarbha with seed packet leading to seed bed loss. "But when a seed is not suited area?" The villages complained they had no choice, as the manufacturer's warning for late sowing is very small letters". Indeed, being at the heart of rural distress, the monsoon credit has come up for fresh roadmap. The Central has advised to provide loans on low interest rates.

**आर्थिक सुधारों का हमसफर बनने की उम्मीदे भी संजोए हैं**

कदम नाल की कमी से अक्षरोट को निर्वात में बाधा

**Rubber growers rake in Rs 3,000 crore in 2006**

3 January 2007

2007, prior to which the sector had received a major setback in 2005-06 due to a fall in rubber price. The 2006-07 output increased by 4.7% to 3,000 crore, a 6.2% increase over the previous year. The industry has emerged out of its woes. It is estimated that the monsoon would witness a 20-25% growth in 2007-08. The world rubber market will witness a 3-5% growth in 2007-08, which is good news for the sector.

meant for their own family consumption. Modernisation and commercialisation of agriculture have however, taken place in the irrigated areas.

### Vast Under-employment

There is a massive under-employment in the agricultural sector in India, particularly in the un-irrigated tracts. In these areas, there is a seasonal unemployment ranging from 4 to 8 months. Even in the cropping season work is not available throughout, as agricultural operations are not labour intensive. Hence, the people engaged in agriculture do not have the opportunity to work round the year.

### Degradation of Cultivable Land

One of the serious problems that arises out of faulty strategy of irrigation and agricultural development is degradation of land resources. This is serious because it may lead to depletion of soil fertility. The situation is particularly alarming in irrigated areas. A large

tract of agricultural land has lost its fertility due to alkalisation and salinisation of soils and waterlogging. Alkalinity and salinity have already affected about 8 million ha land. Another 7 million ha land in the country has lost its fertility due to waterlogging. Excessive use of chemicals such as insecticides and pesticides has led to their concentration in toxic amounts in the soil profile. Leguminous crops have been displaced from the cropping pattern in the irrigated areas and duration of fallow has substantially reduced owing to multiple cropping. This has obliterated the process of natural fertilization such as nitrogen fixation. Rainfed areas in humid and semi-arid tropics also experience degradation of several types like soil erosion by water and wind erosion which are often induced by human activities.

### Activity

Prepare a list of agricultural problems in your own region. How similar or different are these problems compared to the problems mentioned in this chapter?



## EXERCISES

1. Choose the right answers of the following from the given options.
  - (i) Which one of the following is NOT a land-use category?
 

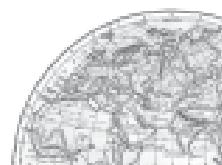
(a) Fallow land	(c) Net Area Sown
(b) Marginal land	(d) Culturable Wasteland
  - (ii) What one of the following is the main reason due to which share of forest has shown an increase in the last forty years?
 

(a) Extensive and efficient efforts of afforestation	(b) Increase in community forest land
(c) Increase in notified area allocated for forest growth	(d) Better peoples' participation in managing forest area.
  - (iii) Which one of the following is the main form of degradation in irrigated areas?
 

(a) Gully erosion	(c) Salinisation of soils
(b) Wind erosion	(d) Siltation of land



- (iv) Which one of the following crops is not cultivated under dryland farming?  
(a) Ragi (c) Groundnut  
(b) Jowar (d) Sugarcane
- (v) In which of the following group of countries of the world, HYVs of wheat and rice were developed?  
(a) Japan and Australia (c) Mexico and Philippines  
(b) U.S.A. and Japan (d) Mexico and Singapore
2. Answer the following questions in about 30 words.
- (i) Differentiate between barren and wasteland and culturable wasteland.
  - (ii) How would you distinguish between net sown area and gross cropped area?
  - (iii) Why is the strategy of increasing cropping intensity important in a country like India?
  - (iv) How do you measure total cultivable land?
  - (v) What is the difference between dryland and wetland farming?
3. Answer the following questions in about 150 words.
- (i) What are the different types of environmental problems of land resources in India?
  - (ii) What are the important strategies for agricultural development followed in the post-independence period in India?
- 
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- 



# 3

## Fibre to Fabric

In Class VI you have learnt about some fibres obtained from plants. You also learnt that wool and silk fibres are obtained from animals. Wool is obtained from the **fleece** (hair) of sheep or yak. Silk fibres come from cocoons of the silk moth. Do you know which part of the sheep's body yields fibres? Are you aware how these fibres are converted into the woollen yarn that we buy from the market to knit sweaters? Do you have any idea how silk fibres are made into silk, which is woven into saris?

In this Chapter we shall try to find answers to these questions.

### Animal fibres — wool and silk

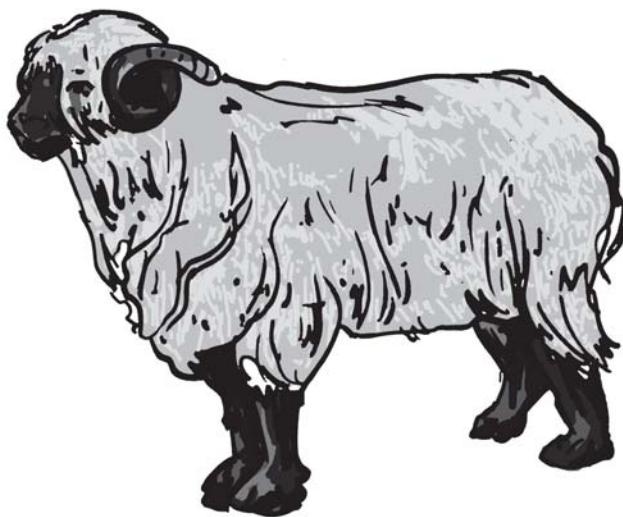
#### 3.1 Wool

Wool comes from sheep, goat, yak and some other animals. These wool-yielding animals bear hair on their body. Do you know why these animals have a thick coat of hair? Hair trap a lot of air. Air is a poor conductor of heat, as you would learn in Chapter 4. So, hair keeps these animals warm. Wool is derived from these hairy fibres.

#### Activity 3.1

Feel the hair on your body and arms and those on your head. Do you find any difference? Which one seems coarse and which one is soft?

Like us, the hairy skin of the sheep has two types of fibres that form its fleece: (i) the coarse beard hair, and (ii) the fine soft under-hair close to the skin. The fine hair provide the fibres for making wool. Some breeds of sheep possess only fine under-hair. Their parents are specially chosen to give birth to sheep which have only soft under-hair. This process of selecting parents for obtaining special characters in their offspring, such as soft under hair in sheep, is termed 'selective breeding'.



*Fig. 3.1 Sheep with thick growth of hair*

#### Animals that yield wool

Several breeds of sheep are found in different parts of our country (Table 3.1). However, the fleece of sheep is not the only source of wool, though wool commonly available in the market is

sheep wool (Fig. 3.1). Yak (Fig. 3.2) wool is common in Tibet and Ladakh. Angora wool is obtained from angora goats, (Fig. 3.3) found in hilly regions such as Jammu and Kashmir.

Wool is also obtained from goat hair (Fig. 3.4). The under fur of Kashmiri goat is soft. It is woven into fine shawls called Pashmina shawls.

The fur (hair) on the body of camels is also used as wool (Fig. 3.5). Llama and Alpaca, found in South America, also yield wool (Fig. 3.6 and 3.7).

### Activity 3.2

Collect pictures of animals whose hair is used as wool. Stick them in your scrap book. If you are unable to get pictures, try and draw them from the ones given in this book.

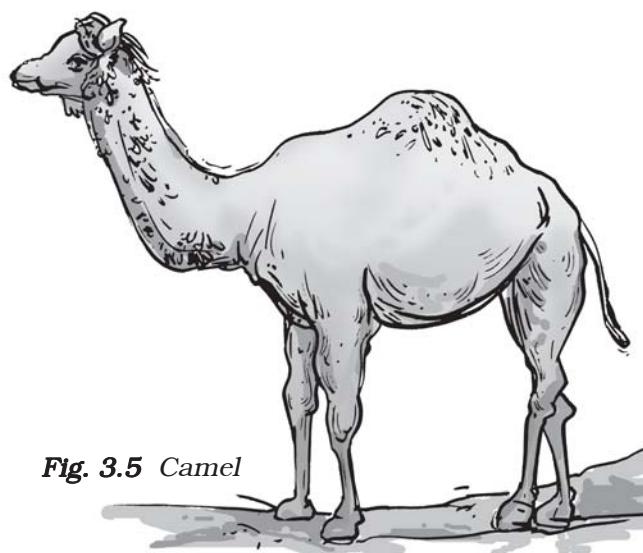
Find out words for sheep, goat, camel and yak in your local language and also in other languages of our country.



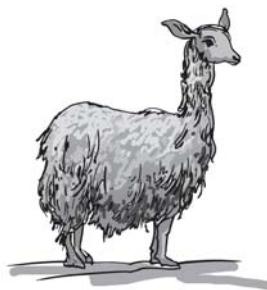
**Fig. 3.2** Yak



**Fig. 3.6** Llama



**Fig. 3.5** Camel



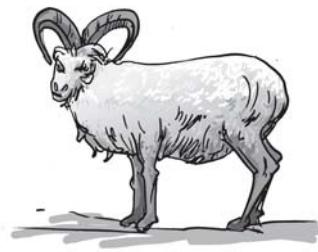
**Fig. 3.7** Alpaca

### Activity 3.3

Procure outline maps of India and the world. Find out and mark the places on the map where you find animals that provide wool. Use different colours to denote the location for different wool yielding animals.



**Fig. 3.3** Angora goat



**Fig. 3.4** Goat

## From fibres to wool

For obtaining wool, sheep are reared. Their hair is cut and processed into wool. Let us learn about this process.

**Rearing and breeding of sheep:** If you travel to the hills in Jammu & Kashmir, Himachal Pradesh, Uttaranchal, Arunachal Pradesh and Sikkim, or the plains of Haryana, Punjab, Rajasthan and Gujarat, you can see shepherds taking their herds of sheep for grazing. Sheep are herbivores and prefer grass and leaves. Apart from grazing sheep, rearers also feed them on a mixture of pulses, corn, jowar, oil cakes (material left after taking out oil from seeds) and minerals. In winter, sheep are kept indoors and fed on leaves, grain and dry fodder.

Sheep are reared in many parts of our country for wool. Table 3.1 gives the names of some breeds of sheep reared in our country for producing wool. The quality and texture of the fibres obtained from them is also indicated in the table.

Certain breeds of sheep have thick coat of hair on their body which yields good quality wool in large quantities. As

mentioned earlier, these sheep are “selectively bred” with one parent being a sheep of good breed.

Once the reared sheep have developed a thick growth of hair, hair is shaved off for getting wool.

## Processing fibres into wool

The wool which is used for knitting sweaters or for weaving shawls is the finished product of a long process, which involves the following steps:

**Step I:** The fleece of the sheep along with a thin layer of skin is removed from its body [Fig. 3.8 (a)]. This process is called **shearing**. Machines similar to those used by barbers are used to shave off hair. Usually, hair are removed during the hot weather. This enables sheep to survive without their protective coat of hair. The hair provide woollen fibres. Woollen fibres are then processed to obtain woollen yarn. Shearing does not hurt the sheep just as it does not hurt when you get a hair cut or your father shaves his beard. Do you know why? The uppermost layer of the skin is dead. Also, the hair of sheep grow again just as your hair does.

**Table 3.1 Some Indian breeds of sheep**

S.No.	Name of breed	Quality of wool	State where found
1.	Lohi	Good quality wool	Rajasthan, Punjab
2.	Rampur bushair	Brown fleece	Uttar Pradesh, Himachal Pradesh
3.	Nali	Carpet wool	Rajasthan, Haryana, Punjab
4.	Bakharwal	For woollen shawls	Jammu and Kashmir
5.	Marwari	Coarse wool	Gujarat
6.	Patanwadi	For hosiery	Gujarat

**Step II:** The sheared skin with hair is thoroughly washed in tanks to remove grease, dust and dirt. This is called **scouring**. Nowadays scouring is done by machines [Fig. 3.8 (b) and (c)].

**Step III:** After scouring, **sorting** is done. The hairy skin is sent to a factory where hair of different textures are separated or sorted.

**Step IV:** The small fluffy fibres, called burrs, are picked out from the hair. These are the same burrs which

sometimes appear on your sweaters. The fibres are scoured again and dried. This is the wool ready to be drawn into fibres.

**Step V:** The fibres can be dyed in various colours, as the natural fleece of sheep and goats is black, brown or white.

**Step VI:** The fibres are straightened, combed and rolled into yarn [Fig. 3.8 (d)]. The longer fibres are made into wool for sweaters and the shorter fibres are spun and woven into woollen cloth.



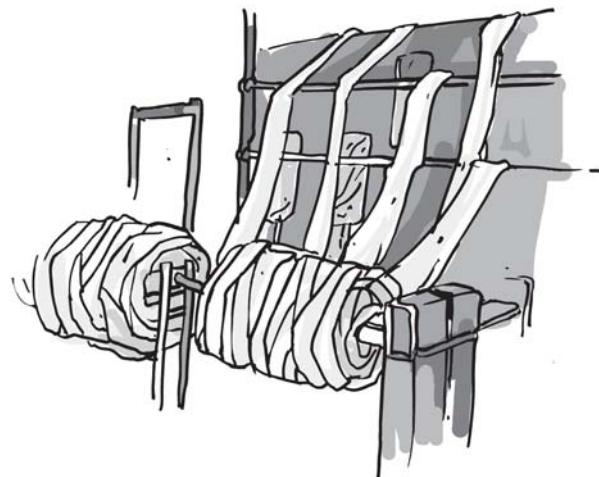
**Fig. 3.8 (a) Shearing a sheep**



**Fig. 3.8 (b) Scouring in tanks**



**Fig. 3.8 (c) Scouring by machines**



**Fig. 3.8 (d) Rolling into yarn**

## Occupational hazard

Wool industry is an important means of livelihood for many people in our country. But sorter's job is risky as sometimes they get infected by a bacterium, **anthrax**, which causes a fatal blood disease called sorter's disease. Such risks faced by workers in any industry are called occupational hazards.



Boojho is wondering why it hurts when someone pulls his hair but not when he goes for a haircut.

Boojho is wondering why a cotton garment cannot keep us as warm in winter as a woollen sweater does.

## Activity 3.4

Debate amongst your classmates whether it is fair on the part of humans to rear sheep and then chop off their hair for getting wool.

### 3.2 SILK

Silk fibres are also animal fibres. Silkworms spin the 'silk fibres'. The rearing of silkworms for obtaining silk is called **sericulture**. Find out from

your mother/aunt/grandmother the kind of silk saris they have. List the kinds of silk.

Before we discuss the process of obtaining silk, it is necessary to know the interesting life history of the silk moth.

### Life history of silk moth

The female silk moth lays eggs, from which hatch larvae which are called **caterpillars** or **silkworms**. They grow in size and when the caterpillar is ready to enter the next stage of its life history called **pupa**, it first weaves a net to hold itself. Then it swings its head from side to side in the form of the figure of eight (8). During these movements of the head, the caterpillar secretes fibre made of a

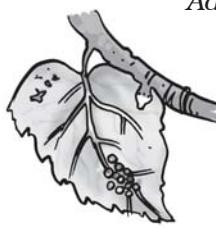


(a) Male



(b) Female

Adult silk moths



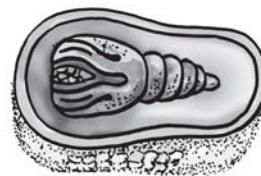
(c) Eggs on mulberry leaves



(d) Silkworm



(e) Cocoon



(f) Cocoon with developing moth

Fig. 3.9 (a to f) Life history of silk moth

**protein** which hardens on exposure to air and becomes silk fibre. Soon the caterpillar completely covers itself by silk fibres. This covering is known as **cocoon**. The further development of the moth continues inside the cocoon (Fig. 3.9). Silk fibres are used for weaving silk cloth. Can you imagine that the soft silk yarn is as strong as a comparable thread of steel!

The silk yarn (thread) is obtained from the cocoon of the silk moth. There is a variety of silk moths which look very different from one another and the silk yarn they yield is different in texture (coarse, smooth, shiny, etc.). Thus, *tassar* silk, *mooga* silk, *kosa* silk, etc., are obtained from cocoons spun by different types of moths. The most common silk moth is the **mulberry silk moth**. The silk fibre from the cocoon of this moth is soft, lustrous and elastic and can be dyed in beautiful colours.

Sericulture or culture of silkworms is a very old occupation in India. India produces plenty of silk on a commercial scale.

### Activity 3.5

Collect pieces of silk cloth of various types and paste them in your scrap book. You can find them in a tailor's shop among the heap of waste cut pieces.

In India, women are significantly involved in various kinds of industries related to silk production. These are rearing of silkworms, reeling of silk from cocoons and processing of raw silk into fabrics. By their enterprise, they contribute to the nation's economy. China leads the world in silk production. India also ranks among the leading silk producing countries.

Take help of your mother, aunt or teacher and identify the types of silk such as mulberry silk, *tassar* silk, *eri* silk, *mooga* silk, etc. Compare the texture of these silks with that of the artificial silk pieces, which contain synthetic fibres. Try and collect pictures of different moths whose caterpillars provide the various types of silk.

### Activity 3.6

Take an artificial (synthetic) silk thread and a pure silk thread. Burn these threads carefully. Did you notice any difference in the smell while burning? Now, burn a woollen fibre carefully. Did it smell like burning of artificial silk or that of pure silk? Can you explain why?

To remember when the cocoon stage is reached in the life history of the silk moth, try the following activity.

### Activity 3.7

Photocopy Fig. 3.9. Cut out pictures of the stages of the life history of the silk moth, and paste them on pieces of cardboard or chart paper. Jumble them. Now try and arrange the stages in the correct sequence. Whoever does it fastest wins.

You may also describe the life history in your own words. Write it down in your scrap book.

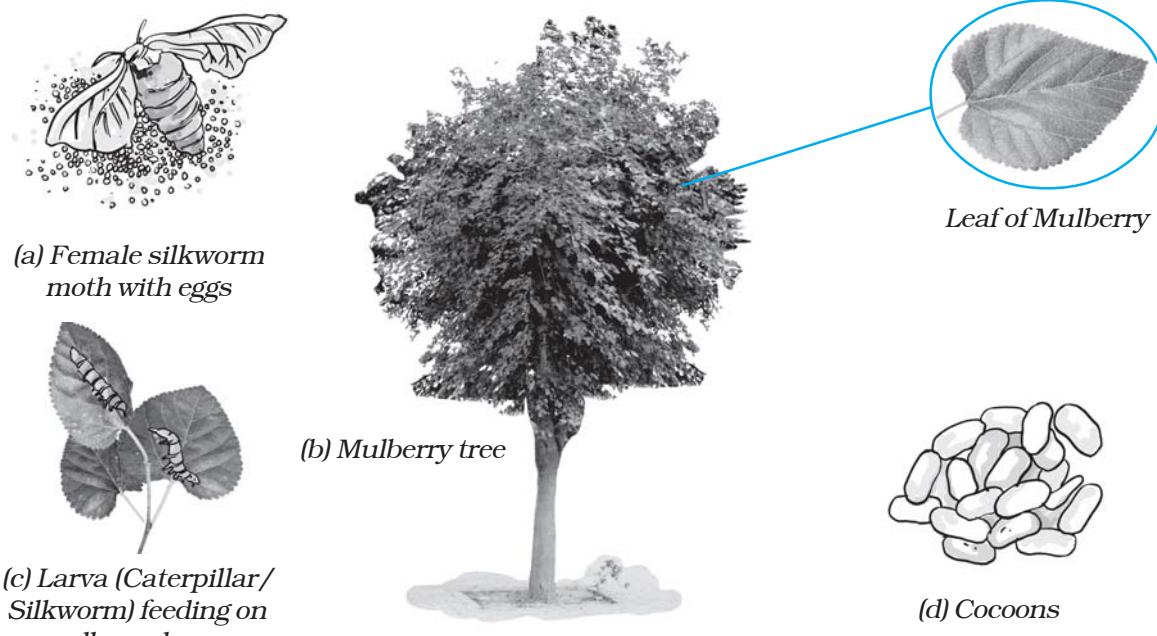
## From cocoon to silk

For obtaining silk, moths are reared and their cocoons are collected to get silk threads.

**Rearing silkworms:** A female silk moth lays hundreds of eggs at a time [Fig. 3.10 (a)]. The eggs are stored carefully on strips of cloth or paper and sold to silkworm farmers. The farmers

keep eggs under hygienic conditions and under suitable conditions of temperature and humidity.

The eggs are warmed to a suitable temperature for the larvae to hatch from eggs. This is done when mulberry trees [Fig. 3.10 (b)] bear a fresh crop of leaves. The larvae, called caterpillars or silkworms, eat day and night and increase enormously in size [Fig. 3.10 (c)].



**Fig. 3.10** Rearing silkworms

## Discovery of silk

The exact time of discovery of silk is perhaps unknown. According to an old Chinese legend, the empress Si-lung-Chi was asked by the emperor Huang-ti to find the cause of the damaged leaves of mulberry trees growing in their garden. The empress found white worms eating up mulberry leaves. She also noticed that they were spinning shiny cocoons around them. Accidentally a cocoon dropped into her cup of tea and a tangle of delicate threads separated from the cocoon. Silk industry began in China and was kept a closely guarded secret for hundreds of years. Later on, traders and travellers introduced silk to other countries. The route they travelled is still called the ‘silk route’.

The worms are kept in clean bamboo trays along with freshly chopped mulberry leaves. After 25 to 30 days, the caterpillars stop eating and move to a tiny chamber of bamboo in the tray to spin cocoons [Fig. 3.10 (d)]. Small racks or twigs may be provided in the trays to which cocoons get attached. The caterpillar or silkworm spins the cocoon inside which develops the silk moth.

**Processing silk:** A pile of cocoons is used for obtaining silk fibres. The cocoons are kept under the sun or boiled or exposed to steam. The silk fibres



Paheli wants to know if the cotton thread and silk thread are spun and woven in the same manner.

separate out. The process of taking out threads from the cocoon for use as silk is called **reeling the silk**. Reeling is done in special machines, which unwind the threads or fibres of silk from the cocoon. Silk fibres are then spun into silk threads, which are woven into silk cloth by weavers.

## Keywords

Cocoon

Scouring

Silk moth

Fleece

Sericulture

Silkworm

Reeling

Shearing

Sorting

## What you have learnt

- Silk comes from silkworms and wool from sheep, goat and yak. Hence silk and wool are animal fibres.
- The hairs of camel, llama and alpaca are also processed to yield wool.
- In India, mostly sheep are reared for getting wool.
- Sheep hair is sheared off from the body, scoured, sorted, dried, dyed, spun and woven to yield wool.
- Silkworms are caterpillars of silk moth.
- During their life cycle, the worms spin cocoons of silk fibres.
- Silk fibres are made of a protein.
- Silk fibres from cocoons are taken out and reeled into silk threads.
- Weavers weave silk threads into silk cloth.

## Exercises

1. You must be familiar with the following nursery rhymes:
    - (i) 'Baa baa black sheep, have you any wool.'
    - (ii) 'Mary had a little lamb, whose fleece was white as snow.'

Answer the following:

    - (a) Which parts of the black sheep have wool?
    - (b) What is meant by the white fleece of the lamb?
  2. The silkworm is (a) a caterpillar, (b) a larva. Choose the correct option.  
(i) a    (ii) b    (iii) both a and b    (iv) neither a nor b.
  3. Which of the following does not yield wool?  
(i) Yak    (ii) Camel    (iii) Goat    (iv) Woolly dog
  4. What is meant by the following terms?  
(i) Rearing (ii) Shearing (iii) Sericulture
  5. Given below is a sequence of steps in the processing of wool. Which are the missing steps? Add them.  
Shearing, \_\_\_\_\_, sorting, \_\_\_\_\_, \_\_\_\_\_.
  6. Make sketches of the two stages in the life history of the silk moth which are directly related to the production of silk.
  7. Out of the following, which are the two terms related to silk production?  
Sericulture, floriculture, moriculture, apiculture and silviculture.
- Hints:** (i) Silk production involves cultivation of mulberry leaves and rearing silkworms.
- (ii) Scientific name of mulberry is ***Morus alba***.
8. Match the words of Column I with those given in Column II:
- | <b>Column I</b>    | <b>Column II</b>          |
|--------------------|---------------------------|
| 1. Scouring        | (a) Yields silk fibres    |
| 2. Mulberry leaves | (b) Wool yielding animal  |
| 3. Yak             | (c) Food of silk worm     |
| 4. Cocoon          | (d) Reeling               |
|                    | (e) Cleaning sheared skin |

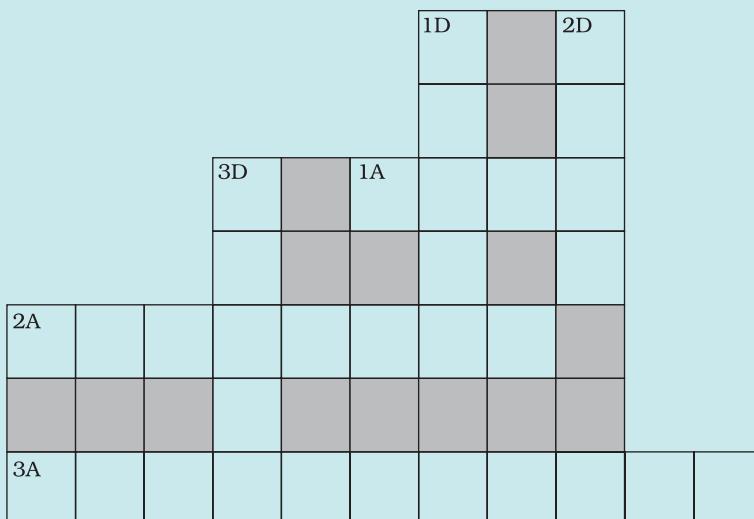
9. Given below is a crossword puzzle based on this lesson. Use hints to fill in the blank spaces with letters that complete the words.

**Down**

- (D) 1 : Thorough washing  
2 : Animal fibre  
3 : Long thread like structure

**Across**

- (A) 1 : Keeps warm  
2 : Its leaves are eaten by silkworms  
3 : Hatches from egg of moth



### Extended Learning — Activities and Projects

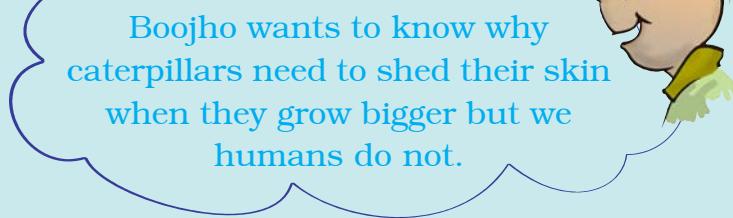
1.



Paheli wants to know the maximum length of continuous silk thread that can be obtained from a cocoon.

Find out for her.

2.



Do you have any idea?

3.



Boojho wants to know why  
caterpillars should not be collected  
with bare hands.

Can you help him?

4. Paheli wanted to buy a silk frock and went to the market with her mother. There they found that the artificial (synthetic) silk was much cheaper and wanted to know why. Do you know why? Find out.
5. Someone told Paheli that an animal called 'Vicuna' also gives wool. Can you tell her where this animal is found? Look for this in a dictionary or an encyclopaedia.
6. When handloom and textile exhibitions are held, certain stalls display real moths of various varieties of silk and their life histories. Try and visit these stalls with elders or teachers and see these moths and stages of their life history.
7. Look for eggs of any moth or butterfly in your garden or park or any other place full of plants. They look like tiny specks (dots) laid in a cluster on the leaves. Pull out the leaves containing eggs and place them in a cardboard box. Take some leaves of the same plant or another plant of the same variety, chop them and put them in the box. Eggs will hatch into caterpillars, which are busy eating day and night. Add leaves everyday for them to feed upon. Sometimes you may be able to collect the caterpillars. **But be careful.** Use a paper napkin or a paper to hold a caterpillar.

Observe everyday. Note the (i) number of days taken for eggs to hatch, (ii) number of days taken to reach the cocoon stage, and (iii) number of days to complete life cycle. Record your observations in your notebook.

**You can read more on the following website:**

[www.indiansilk.kar.nic.in/](http://www.indiansilk.kar.nic.in/)

### Did you know?

In terms of the number of sheep, India ranks third in the world, behind China and Australia. However, the New Zealand sheep are known to yield the best wool.

# 9

## Soil

**S**oil is one of the most important natural resources. It supports the growth of plants by holding the roots firmly and supplying water and nutrients. It is the home for many organisms. Soil is essential for agriculture. Agriculture provides food, clothing and shelter for all. Soil is thus an inseparable part of our life. The earthy fragrance of soil after the first rain is always refreshing.



**Fig. 9.1** Children playing with soil

### 9.1 SOIL TEEMING WITH LIFE

One day during the rainy season Paheli and Boojho observed an earthworm coming out of the soil. Paheli wondered whether there were other organisms also in the soil. Let us find out.

#### Activity 9.1

Collect some soil samples and observe them carefully. You can use a hand lens. Examine each sample carefully and fill in Table 9.1.

- Discuss your observations with your friends.
- Are the soil samples collected by your friends similar to the ones collected by you?

Boojho and Paheli have used soil in many ways. They enjoy playing with it. It is a great fun indeed.

Make a list of the uses of soil.

**Table 9.1**

S. No.	Soil source	Plants	Animals	Any other observations
1.	Garden soil	Grass, .....	Ant, .....	
2.	Soil from the roadside	.....		
3.	Soil from the area where construction is going on	.....		
4.		.....	.....	
5.		.....	.....	



I wonder why I found some pieces of plastic articles and polythene bags in the soil sample collected from the roadside and the garden.

Polythene bags and plastics pollute the soil. They also kill the organisms living in the soil. That is why there is a demand to ban the polythene bags and plastics. Other substances which pollute the soil are a number of waste products, chemicals and pesticides. Waste products and chemicals should be treated before they are released into the soil. The use of pesticides should be minimised.

I want to know whether the soil from a field can be used to make toys?

and then add a handful of soil to it. Stir it well with a stick to dissolve the soil. Now let it stand undisturbed for some time (Fig. 9.2). Afterwards, observe it and answer the following questions:

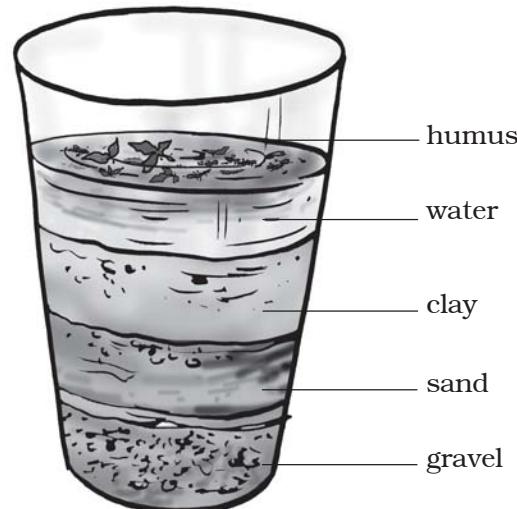


Fig. 9.2 Layers of soil

- Do you see layers of particles of different sizes in the glass tumbler?
- Draw a diagram showing these layers.
- Are there some dead rotting leaves or animal remains floating on water? The rotting dead matter in the soil is called **humus**.

You probably know that the soil is formed by the breaking down of rocks by the action of wind, water and climate. This process is called **weathering**. The nature of any soil depends upon the rocks from which it has been formed and the type of vegetation that grows in it.

A vertical section through different layers of the soil is called the **soil profile**. Each layer differs in feel (texture),

## 9.2 SOIL PROFILE

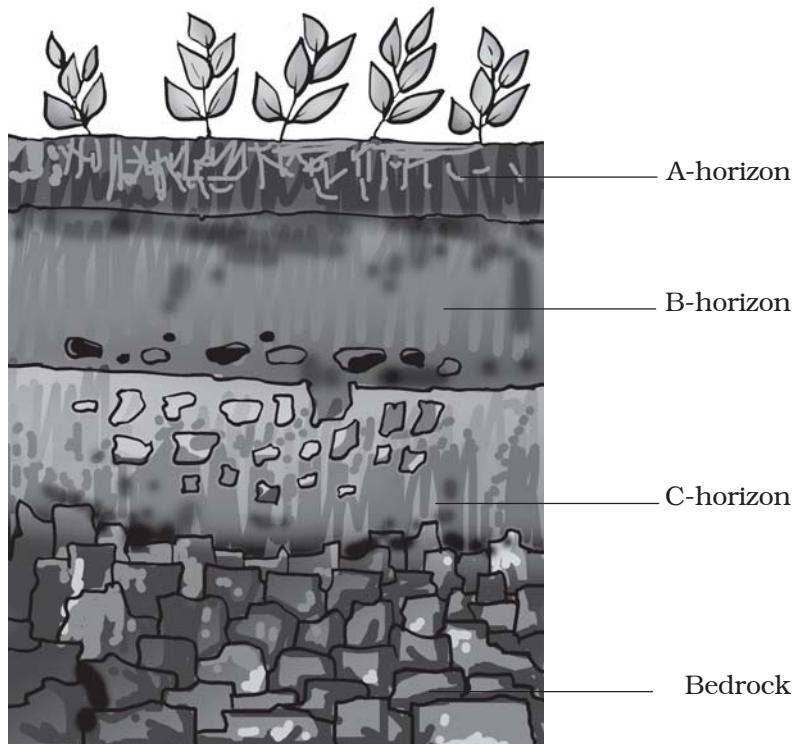
Soil is composed of distinct layers. Perform the following activity to find out how these layers are arranged.

### Activity 9.2

Take a little soil. Break the clumps with your hand to powder it. Now take a glass tumbler, three quarters filled with water,

colour, depth and chemical composition. These layers are referred to as **horizons** (Fig. 9.3).

soil fertile and provides nutrients to growing plants. This layer is generally soft, porous and can retain more water. It is called the **topsoil** or the **A-horizon**.



**Fig. 9.3** Soil profile

We usually see the top surface of the soil, not the layers below it. If we look at the sides of a recently dug ditch, we can see the inner layers of the soil, too. Such a view enables us to observe the soil profile at that place. Soil profile can also be seen while digging a well or laying the foundation of a building. It can also be seen at the sides of a road on a hill or at a steep river bank.

The uppermost horizon is generally dark in colour as it is rich in humus and minerals. The humus makes the

This provides shelter for many living organisms such as worms, rodents, moles and beetles. The roots of small plants are embedded entirely in the topsoil.

The next layer has a lesser amount of humus but more of minerals. This layer is generally harder and more compact and is called the **B-horizon** or the middle layer.

The third layer is the **C-horizon**, which is made up of small lumps of rocks with cracks and crevices. Below

this layer is the **bedrock**, which is hard and difficult to dig with a spade.

### 9.3 SOIL TYPES

As you know, weathering of rocks produces small particles of various materials. These include sand and clay. The relative amount of sand and clay depends upon the rock from which the particles were formed, that is the parent rock. **The mixture of rock particles and humus is called the soil.** Living organisms, such as bacteria, plant roots and earthworm are also important parts of any soil.

The soil is classified on the basis of the proportion of particles of various sizes. If soil contains greater proportion of big particles it is called **sandy soil**. If the proportion of fine particles is relatively higher, then it is called **clayey soil**. If the amount of large and fine particles is about the same, then the soil is called **loamy**. Thus, the soil can be classified as sandy, clayey and loamy.

The sizes of the particles in a soil have a very important influence on its properties. Sand particles are quite large. They cannot fit closely together, so there are large spaces between them. These spaces are filled with air. We say that the sand is well aerated. Water can drain quickly through the spaces between the sand particles. So, sandy soils tend to be light, well aerated and rather dry. Clay particles, being much smaller, pack tightly together, leaving little space for air. Unlike sandy soil,

water can be held in the tiny gaps between the particles of clay. So clay soils have little air. But they are heavy as they hold more water than the sandy soils.

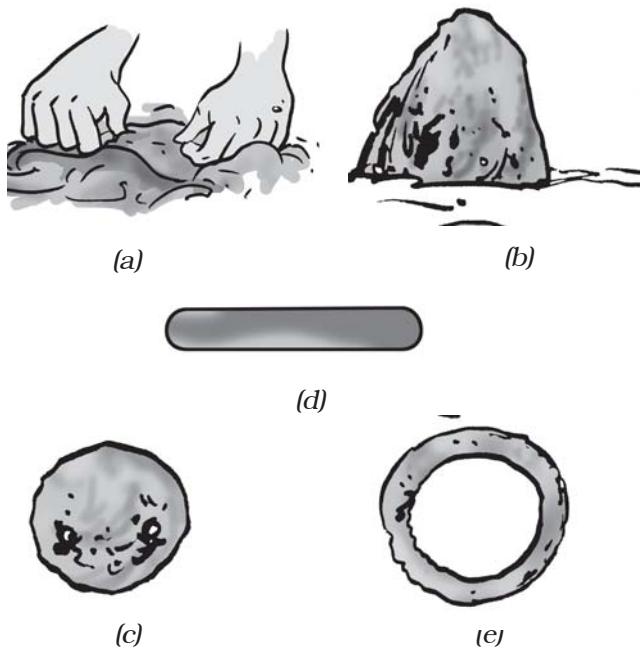
The best topsoil for growing plants is loam. **Loamy soil** is a mixture of sand, clay and another type of soil particle known as silt. Silt occurs as a deposit in river beds. The size of the silt particles is between those of sand and clay. The loamy soil also has humus in it. It has the right water holding capacity for the growth of plants.



I want to know:  
**What kind of soil should be used for making matkas and surahis?**

### Activity 9.3

Collect samples of clayey, loamy and sandy soils. Take a fistful of soil from one of the samples. Remove any pebbles, rocks or grass blades from it. Now add water drop by drop and knead the soil [Fig. 9.4 (a)]. Add just enough water so that a ball [Fig. 9.4 (b)] can be made from it, but at the same time it should not be sticky. Try to make a ball [Fig. 9.4 (c)] from this soil. On a flat surface, roll this ball into a cylinder [Fig. 9.4 (d)]. Try to make a ring from this cylinder [Fig. 9.4 (e)]. Repeat this activity with other samples also. Does the extent to which a soil can be shaped indicate its type?



**Fig. 9.4** Working with the soil

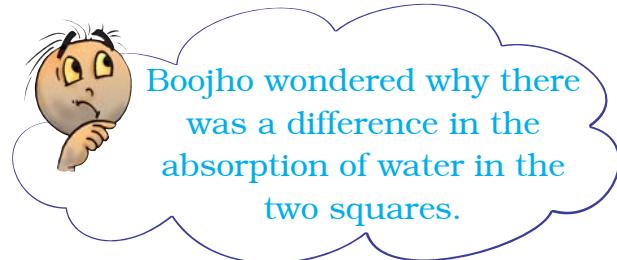
Can you suggest which type of soil would be the best for making pots, toys and statues?

#### 9.4 PROPERTIES OF SOIL

You have listed some uses of soil. Let us perform some activities to find the characteristics of the soil.

#### Percolation rate of water in soil

Boojho and Paheli marked two different squares of 50 cm × 50 cm each, one on the floor of their house and the other on the *kutcha* (unpaved) road. They filled two bottles of the same size with water. They emptied the water from the bottles, one each, at the same time in the two squares. They observed that the water on the floor flowed down and was not absorbed. On the *kutcha* road, on the other hand, the water was absorbed.



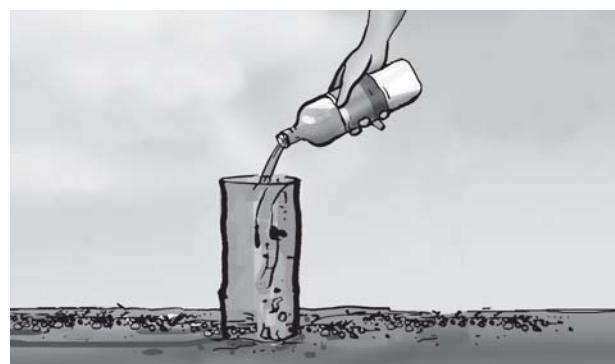
Now let us perform an activity to understand this.

#### Activity 9.4

For this activity divide yourself into three teams. Name the teams A, B and C. You will be finding out how fast the water passes down the soil. You will need a hollow cylinder or a pipe. Ensure that each team uses pipes of the same diameter. Some suggestions for obtaining such a pipe are given below:

1. If possible, get a small tin can and cut off its bottom.
2. If PVC pipe (approx. diameter 5 cm) is available, cut it into 20 cm long pieces and use them.

At the place where you collect the soil, place the pipe about 2 cm deep in the ground. Pour 200 mL water in the pipe slowly. For measuring 200 mL water you can use any empty 200 mL bottle. Note



**Fig. 9.5** Measuring rate of percolation

the time when you start pouring water. When all the water has percolated leaving the pipe empty, note the time again. Be careful not to let the water spill over or run down on the outside of the pipe while pouring. Calculate the rate of percolation by using the following formula:

$$\text{percolation rate (mL/min)} = \frac{\text{amount of water (mL)}}{\text{percolation time (min)}}$$

For example, suppose that for a certain sample, it took 20 minutes for 200 mL to percolate. So,

$$\text{rate of percolation} = \frac{200 \text{ mL}}{20 \text{ min}} = 10 \text{ mL/min}$$

Calculate the rate of percolation in your soil sample. Compare your findings with others and arrange the soil samples in the increasing order of the rate of percolation.

### 9.5 MOISTURE IN SOIL

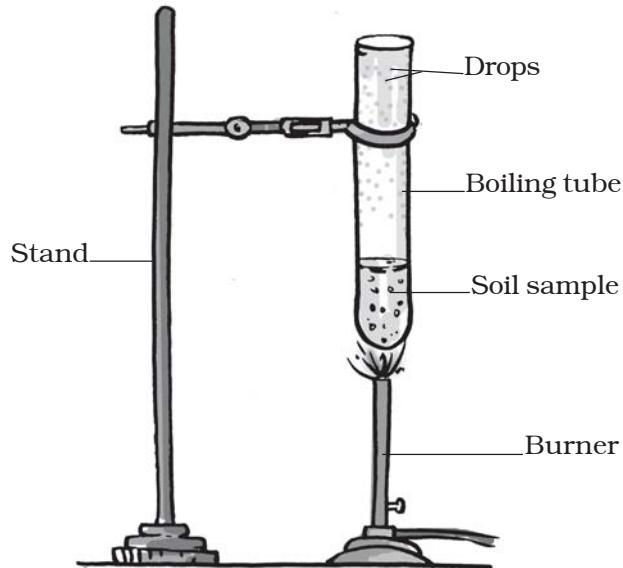
Have you ever passed through a farmland during a hot summer day? Perhaps you noticed that the air above the land is shimmering. Why is it so? Try out this activity and find the answer.

#### Activity 9.5

Take a boiling tube. Put two spoonfulls of a soil sample in it. Heat it on a flame (Fig. 9.6) and observe it. Let us find out what happens upon heating.

Do you see water drops anywhere? If yes, where did you find them?

On heating, water in the soil evaporates, moves up and condenses on the cooler inner walls of the upper part of the boiling tube.



**Fig. 9.6** Removing moisture from the soil

On a hot summer day, the vapour coming out of the soil reflects the sunlight and the air above the soil seems to shimmer.

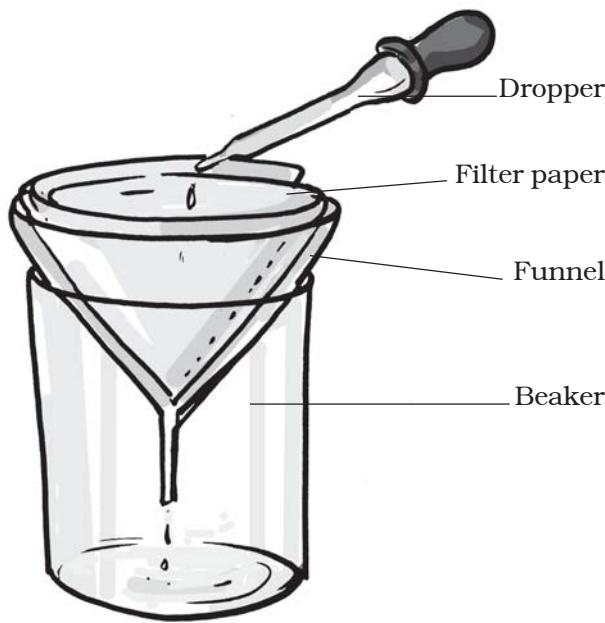
After heating the soil, take it out of the tube. Compare it with the soil which has not been heated. Note the difference between the two.

### 9.6 ABSORPTION OF WATER BY SOIL

Do all the soils absorb water to the same extent? Let us find out.

#### Activity 9.6

Take a plastic funnel. Take a filter paper (or a piece of newspaper sheet), fold and place it as shown in the figure. Weigh 50g of dry, powdered soil and pour it into the funnel. Measure a certain amount of water in a measuring cylinder and pour it drop by drop on the soil. You can use a dropper for this purpose. Do not let all the water fall at one spot.



**Fig. 9.7** Absorption of water in the soil

Pour water all over the soil. Keep pouring water till it starts dripping. Subtract the amount of water left in the measuring cylinder from the amount you started with. This is the amount of water retained by the soil. Record your results in your notebook in the following manner:

$$\text{Weight of soil} = 50\text{g}$$

$$\text{Initial volume of water in the measuring cylinder} = U \text{ mL}$$

$$\text{Final volume of water in the measuring cylinder} = V \text{ mL}$$

$$\begin{aligned}\text{Volume of water absorbed by the soil} \\ = (U - V) \text{ mL}\end{aligned}$$

$$\begin{aligned}\text{Weight of water absorbed by the soil} \\ = (U - V) \text{ g}\end{aligned}$$

(1 mL of water has weight equal to 1 g)

percentage of water absorbed

$$= \frac{(U - V)}{50} \times 100$$

Repeat this activity with different soil samples. Would you get the same results for all the samples? Discuss the results with your friends and answer the following question:

- Which soil would have the highest percolation rate?
- Which soil would have the lowest percolation rate?
- Boojho heard from his neighbour that 8–10 days after the rain, the level of water in a pond or well rises. Which type of soil will allow water to reach a well faster and in greater amount?
- Which type of soil retains the highest amount of water and which retains the least?
- Can you suggest any method to let more rain water percolate and reach the water underground?

## 9.7 SOIL AND CROPS

Different types of soils are found in different parts of India. In some parts there is clayey soil, in some parts there is loamy soil while in some other parts there is sandy soil.

Soil is affected by wind, rainfall, temperature, light and humidity. These are some important climatic factors which affect the soil profile and bring changes in the soil structure. The

Gram (g) and kilogram (kg) are actually units of mass. A mass of 1 gram weighs 1 gram weight, and a mass of 1 kilogram weighs 1 kilogram weight. However, in daily life, and in commerce and industry, the distinction between gram and gram weight is generally omitted.

climatic factors, as well as the components of soil, determine the various types of vegetation and crops that might grow in any region.

Clayey and loamy soils are both suitable for growing cereals like wheat, and gram. Such soils are good at

retaining water. For paddy, soils rich in clay and organic matter and having a good capacity to retain water are ideal. For lentils (*masoor*) and other pulses, loamy soils, which drain water easily, are required. For cotton, sandy-loam or loam, which drain water easily

### A case study

John, Rashida and Radha went to Leeladhar Dada and Sontosh Malviya of Sohagpur in Madhya Pradesh. Leeladhar Dada was preparing the soil to make items like *surahi*, *matki*, *kalla* (earthen frying pan) etc. The following is the conversation they all had with Leeladhar Dada:

- Where was the soil obtained from?

Dada—We brought the black soil from a piece of barren land.

- How is the soil prepared?

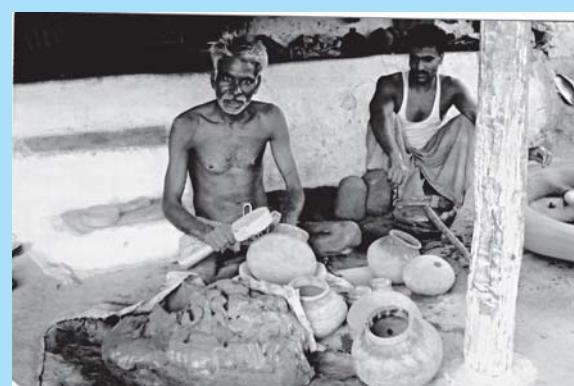
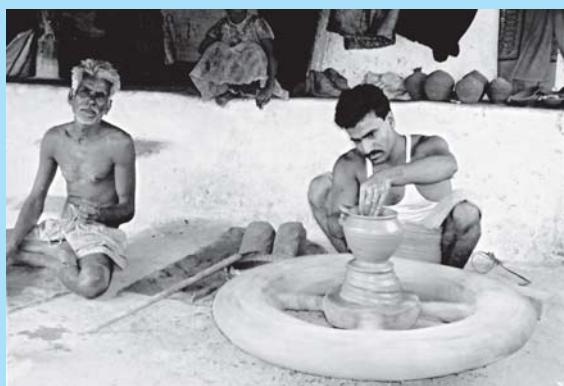
Dada—Dry soil will be placed in a large tank and would be cleaned of pebbles etc.

After removing these things the soil will be soaked for around 8 hours.

This soil would be kneaded after mixing horse dung. The kneaded soil would be placed on the wheel and given appropriate shape. The final shape is given with hands. The items are coloured after three days of drying. All the items are baked at high temperature after drying in the air.

- Why is the horse dung mixed in soil?

Dada—Burnt horse dung helps open up the pores in the soil. So that water could percolate out of the *matkas* and *surahis*, evaporate and cools the water inside. You know Sohagpuri *surahis* and *matkas* are famous in far off places like Jabalpur, Nagpur, Allahabad, etc.



**Fig. 9.8 Making pots**

and can hold plenty of air, are more suitable.

Crops such as wheat are grown in the fine clayey soils, because they are rich in humus and are very fertile. Find from your teachers, parents and farmers the type of soils and crops grown in your area. Enter the data in the following Table 9.2:

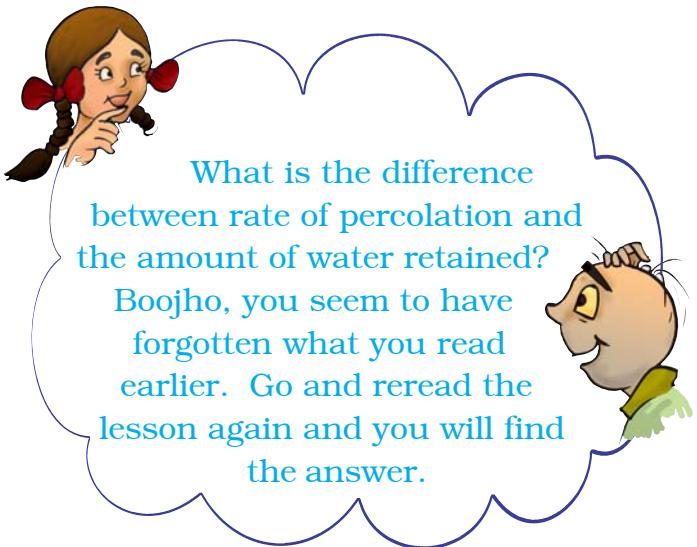
Which kind of soil would be most suitable for planting rice? Soil with a higher or lower rate of percolation?

**Table 9.2**

S. No.	Type of soil	Crop grown
1.	Clayey	Wheat .....
2.		
3.		

### Keywords

Clayey	Moisture
Humus	Sandy
Loamy	Water retention
Percolation	



### Soil erosion

The removal of land surface by water, wind or ice is known as erosion. Plant roots firmly bind the soil. In the absence of plants, soil becomes loose. So it can be moved by wind and flowing water. Erosion of soil is more severe in areas of little or no surface vegetation, such as desert or bare lands. So, cutting of trees and deforestation should be prevented and effort should be made to increase the green areas.

### What you have learnt

- Soil is important for life on the earth.
- Soil profile is a section through different layers of the soil. Various layers are called horizons.
- Soil is of different types: clayey, loamy and sandy.
- Percolation rate of water is different in different types of soil. It is highest in the sandy soil and least in the clayey soil.
- Different types of soils are used to cultivate different types of crops. Clay and loam are suitable for growing wheat, gram and paddy. Cotton is grown in sandy loam soil.

- Soil holds water in it, which is called soil moisture. The capacity of a soil to hold water is important for various crops.
- Clayey soil is used to make pots, toys and statues.

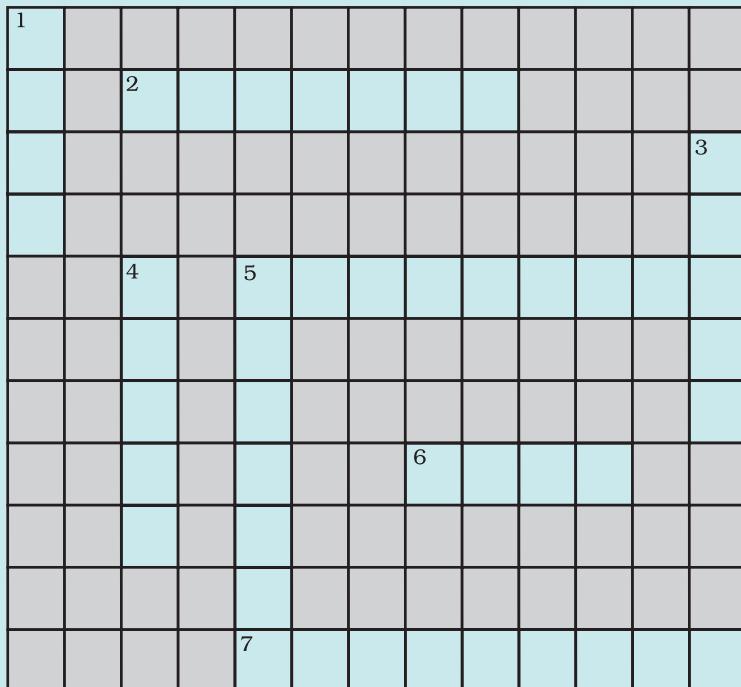
## Exercises

Tick the most suitable answer in questions 1 and 2.

- In addition to the rock particles, the soil contains
  - air and water
  - water and plants
  - minerals, organic matter, air and water
  - water, air and plants
- The water holding capacity is the highest in
  - sandy soil
  - clayey soil
  - loamy soil
  - mixture of sand and loam
- Match the items in Column I with those in Column II:

<b>Column I</b>	<b>Column II</b>
(i) A home for living organisms	(a) Large particles
(ii) Upper layer of the soil	(b) All kinds of soil
(iii) Sandy soil	(c) Dark in colour
(iv) Middle layer of the soil	(d) Small particles and packed tight
(v) Clayey soil	(e) Lesser amount of humus
- Explain how soil is formed.
- How is clayey soil useful for crops?
- List the differences between clayey soil and sandy soil.
- Sketch the cross section of soil and label the various layers.
- Razia conducted an experiment in the field related to the rate of percolation. She observed that it took 40 min for 200 mL of water to percolate through the soil sample. Calculate the rate of percolation.

9. Explain how soil pollution and soil erosion could be prevented.
10. Solve the following crossword puzzle with the clues given:



#### Across

2. Plantation prevents it.
5. Use should be banned to avoid soil pollution.
6. Type of soil used for making pottery.
7. Living organism in the soil.

#### Down

1. In desert soil erosion occurs through.
3. Clay and loam are suitable for cereals like.
4. This type of soil can hold very little water.
5. Collective name for layers of soil.

### Extended Learning — Activities and Projects

1. Boojho would like to know the difference between raw and baked soil? Investigate how the soil from which *matkas* are made is different from the soil used to make statues.

2. Paheli is worried. She could see a brick kiln from her house. Bricks were being made there. There was so much smoke coming out of the kiln. She was told that the best quality of clay is required for making pottery, statues and bricks. She has seen truck loads of bricks being taken away for construction of buildings. At this rate, she fears, no soil will be left. Are her fears justified? Discuss this problem with your parents, teachers and other experts of your area and prepare a report.
3. Try to find out the moisture content of a soil sample. One method is given here.

**Activity:** Take 100g soil. (Take help from any shopkeepers to weigh the soil.) Place it on a newspaper in the sun and allow it to dry for two hours. This activity is best done in the afternoon. Take care that the soil does not spill outside the newspaper. After drying it, weigh the soil again. The difference in the weight of the soil before and after drying gives you the amount of moisture contained in 100 g of soil. This is called the percentage moisture content.

Suppose your sample of soil loses 10 g on drying. Then

$$\text{Per cent of moisture in soil} = \frac{\text{wt. of moisture (g)}}{\text{Original wt. of soil sample (g)}} \times 100$$

In this example

$$\text{Per cent of moisture in soil} = \frac{10 \times 100}{100} = 10\%$$

### Did you know?

Rivers of north India, which flow from Himalayas, bring a variety of materials including silt, clay, sand and gravel. They deposit their materials called alluvial soil, in the planes of north India. This soil is very fertile and supports nearly half the population of India.

# CROP PRODUCTION AND MANAGEMENT

**P**aheli and Boojho went to their uncle's house during the summer vacation. Their uncle is a farmer. One day they saw some tools like *khurpi*, sickle, shovel, plough, etc., in the field.



I want to know where and how we use these tools.

You have learnt that all living organisms require food. Plants can make their food themselves. Can you recall how green plants synthesise their own food? Animals including humans can not make their own food. So, where do animals get their food from?

But, first of all why do we have to eat food?

You already know that the energy from food is utilised by organisms for carrying out their various body functions, such as digestion, respiration and excretion. We get our food from plants, or animals, or both.



Since we all need food, how can we provide food to a large number of people in our country?

Food has to be produced on a large scale.



In order to provide food for a large population—regular production, proper management and distribution of food is necessary.

## 1.1 Agricultural Practices

Till 10,000 B.C. people were nomadic. They were wandering in groups from place to place in search of food and shelter. They ate raw fruits and vegetables and started hunting for animals for food. Later, they could cultivate land and produce rice, wheat and other food crops. Thus, was born 'Agriculture'.

When plants of the same kind are grown and cultivated at one place on a large scale, it is called a **crop**. For example, crop of wheat means that all the plants grown in a field are that of wheat.

You already know that crops are of different types like cereals, vegetables and fruits. These can be classified on the basis of the season in which they grow.

India is a vast country. The climatic conditions like temperature, humidity and rainfall vary from one region to another. Accordingly, there is a rich

variety of crops grown in different parts of the country. Despite this diversity, two broad cropping patterns can be identified. These are:

**(i) Kharif Crops :** The crops which are sown in the rainy season are called kharif crops. The rainy season in India is generally from June to September. Paddy, maize, soyabean, groundnut, cotton, etc., are kharif crops.

**(ii) Rabi Crops :** The crops grown in the winter season are called rabi crops. Their time period is generally from October to March. Examples of rabi crops are wheat, gram, pea, mustard and linseed.

Besides these, pulses and vegetables are grown during summer at many places.

## 1.2 Basic Practices of Crop Production



Why can paddy not be grown in the winter season?



Paddy requires a lot of water. Therefore, it is grown only in the rainy season.

Cultivation of crops involves several activities undertaken by farmers over a period of time. You may find that these activities are similar to those carried out by a gardener or even by you when you grow ornamental plants in your house. These activities or tasks are referred

to as **agricultural practices**. These activities are listed below.

- (i) Preparation of soil
- (ii) Sowing
- (iii) Adding manure and fertilisers
- (iv) Irrigation
- (v) Protecting from weeds
- (vi) Harvesting
- (vii) Storage

### 1.3 Preparation of Soil

The preparation of soil is the first step before growing a crop. One of the most important tasks in agriculture is to turn the soil and loosen it. This allows the roots to penetrate deep into the soil. The loose soil allows the roots to breathe easily even when they go deep into the soil. Why does the loosening of soil allow the roots to breathe easily?

The loosened soil helps in the growth of earthworms and microbes present in the soil. These organisms are friends of the farmer since they further turn and loosen the soil and add humus to it. But why does the soil need to be turned and loosened?

You have learnt in the previous classes that soil contains minerals, water, air and some living organisms. In addition, dead plants and animals get decomposed by soil organisms. In this way, various nutrients held in the dead organisms are released back into the soil. These nutrients are again absorbed by plants.

Since only a few centimetres of the top layer of soil supports plant growth, turning and loosening of soil brings the nutrient-rich soil to the top so that plants can use these nutrients. Thus,

turning and loosening of soil is very important for cultivation of crops.

The process of loosening and turning of the soil is called **tilling** or **ploughing**. This is done by using a plough. Ploughs are made of wood or iron. If the soil is very dry, it may need watering before ploughing. The ploughed field may have big pieces of soil called crumbs. It is necessary to break these crumbs with a plank. The field is levelled for sowing as well as for irrigation purposes. The levelling of soil is done with the help of a leveller.

Sometimes, manure is added to the soil before tilling. This helps in proper mixing of manure with soil. The soil is watered before sowing.

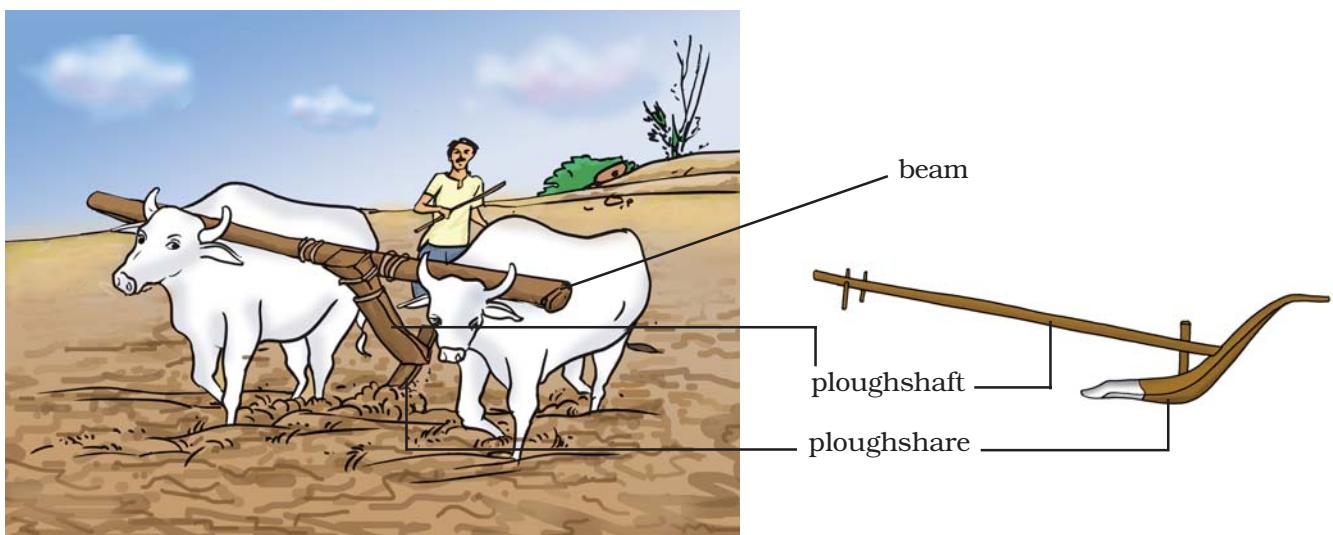
### Agricultural Implements

Before sowing the seeds, it is necessary to break soil to the size of grains to get better yield. This is done with the help of various tools. The main tools used for this purpose are the plough, hoe and cultivator.

**Plough** : This is being used since ancient times for tilling the soil, adding fertilisers to the crop, removing the weeds, scraping of soil, etc. This implement is made of wood and is drawn by a pair of bulls or other animals (horses, camels, etc.). It contains a strong triangular iron strip called ploughshare. The main part of the plough is a long log of wood which is called a ploughshaft. There is a handle at one end of the shaft. The other end is attached to a beam which is placed on the bulls' necks. One pair of bulls and a man can easily operate the plough [Fig. 1.1 (a)].

The indigenous wooden plough is increasingly being replaced by iron ploughs nowadays.

**Hoe** : It is a simple tool which is used for removing weeds and for loosening the soil. It has a long rod of wood or iron. A strong, broad and bent plate of iron is fixed to one of its ends and



**Fig. 1.1 (a) : The plough**

works like a blade. It is pulled by animals [Fig. 1.1 (b)].

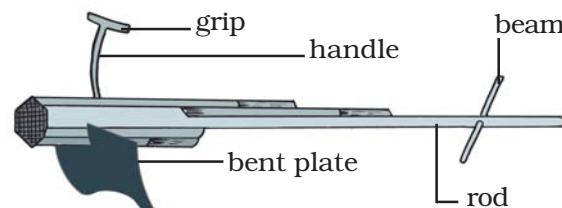


Fig. 1.1 (b) : A hoe

**Cultivator** : Nowadays ploughing is done by tractor driven cultivator. The use of cultivator saves labour and time. [Fig. 1.1 (c)].



Fig. 1.1 (c) : Cultivator driven by a tractor

#### 1.4 Sowing

Sowing is the most important part of crop production. Before sowing, good quality seeds are selected. Good quality seeds are clean and healthy seeds of a good variety. Farmers prefer to use seeds which give a high yield.

#### Selection of Seeds



One day I saw my mother put some gram seeds in a vessel and pour some water on them. After a few minutes some seeds started to float on top. I wonder why some seeds float on water!

#### Activity 1.1

Take a beaker and fill half of it with water. Put a handful of wheat seeds and stir well. Wait for some time.

Are there seeds which float on water? Would those be lighter or heavier than those which sink? Why would they be lighter? Damaged seeds become hollow and are thus lighter. Therefore, they float on water.

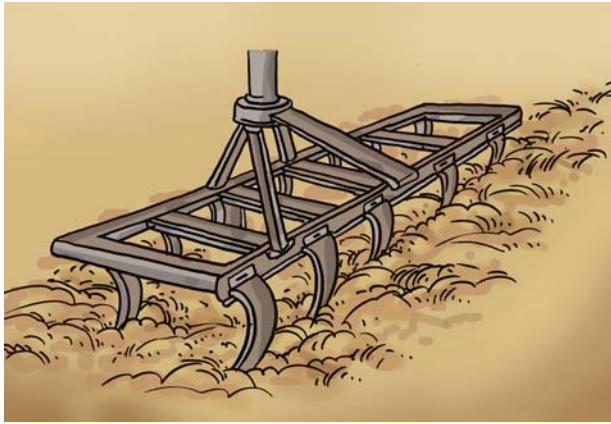
This is a good method for separating good, healthy seeds from the damaged ones.

Before sowing, one of the important tasks is to know about the tools used for sowing seeds [Fig. 1.2 (a), (b)].

**Traditional tool** : The tool used traditionally for sowing seeds is shaped like a funnel [Fig. 1.2 (a)]. The seeds are filled into the funnel, passed down through two or three pipes having sharp ends. These ends pierce into the soil and place seeds there.



Fig. 1.2 (a) : Traditional method of sowing



**Fig. 1.2 (b) : A seed drill**

**Seed drill :** Nowadays the seed drill [Fig. 1.2 (b)] is used for sowing with the help of tractors. This tool sows the seeds uniformly at proper distances and depths. It ensures that seeds get covered by the soil after sowing. This prevents damage caused by birds. Sowing by using a seed drill saves time and labour.

There is a nursery near my school. I found that little plants were kept in small bags. Why are they kept like this?



Seeds of a few plants such as paddy are first grown in a nursery. When they grow into plantlets, they are transplanted in the field manually. Some forest plants and flowering plants are also grown in the nursery.



An appropriate distance between the seeds is important to avoid overcrowding of plants. This allows plants to get

sufficient sunlight, nutrients and water from the soil. Sometimes a few plants have to be removed to prevent overcrowding.

### 1.5 Adding Manure and Fertilisers

The substances which are added to the soil in the form of nutrients for the healthy growth of plants are called **manure** and **fertilisers**.

I saw a healthy crop growing in a farm. In the neighbouring farm, the plants were weak.

Why do some plants grow better than others?



Soil supplies mineral nutrients to the crop. These nutrients are essential for the growth of plants. In certain areas, farmers grow crop after crop in the same field. The field is never left uncultivated or fallow. Imagine what happens to the nutrients?

Continuous growing of crops makes the soil poorer in certain nutrients. Therefore, farmers have to add manure to the fields to replenish the soil with nutrients. This process is called manuring. Improper or insufficient manuring results in weak plants.

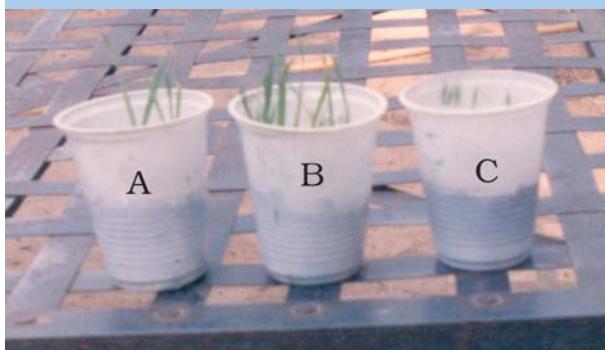
Manure is an organic substance obtained from the decomposition of plant or animal wastes. Farmers dump plant and animal waste in pits at open places and allow it to decompose. The decomposition is caused by some microorganisms. The decomposed matter is used as organic manure. You have already learnt about vermicomposting in Class VI.

## Activity 1.2

Take *moong* or gram seeds and germinate them. Select three equal sized seedlings out of these. Now take three empty glasses or similar vessels. Mark them A, B and C. To glass A add little amount of soil mixed with a little cow dung manure. In glass B put the same amount of soil mixed with a little urea. Take the same amount of soil in glass C without adding anything [Fig. 1.3(a)]. Now pour the same amount of water in each glass and plant the seedlings in them. Keep them in a safe place and water them daily. After 7 to 10 days observe their growth [Fig. 1.3(b)].



**Fig. 1.3 (a) :** Preparation of the experiment



**Fig. 1.3 (b) :** Growing seedlings with manure and fertiliser

Did all the plants in all the glasses grow at the same pace? Which glass

showed better growth of plants? In which glass was the growth fastest?

Fertilisers are chemical substances which are rich in a particular nutrient. How are these different from manure? Fertilisers are produced in factories. Some examples of fertilisers are— urea, ammonium sulphate, super phosphate, potash, NPK (Nitrogen, Phosphorus, Potassium).

The use of fertilisers has helped farmers to get better yield of crops such as wheat, paddy and maize. But excessive use of fertilisers has made the soil less fertile. Fertilisers have also become a source of water pollution. Therefore, in order to maintain the fertility of the soil, we have to substitute fertilisers by organic manure or leave the field uncultivated (fallow) in between two crops.

The use of manure improves soil texture as well as its water retaining capacity. It replenishes the soil with all the nutrients.

Another method of replenishing the soil with nutrients is through crop rotation. This can be done by growing different crops alternately. Earlier, farmers in northern India used to grow legumes as fodder in one season and wheat in the next season. This helped in the replenishment of the soil with nitrogen. Farmers are being encouraged to adopt this practice.

In the previous classes, you have learnt about *Rhizobium* bacteria. These are present in the nodules of the roots of leguminous plants. They fix atmospheric nitrogen.

**Table 1.1 : Differences between Fertiliser and Manure**

S. No.	Fertiliser	Manure
1.	A fertiliser is an inorganic salt.	Manure is a natural substance obtained by the decomposition of cattle dung, human waste and plant residues.
2.	A fertiliser is prepared in factories.	Manure can be prepared in the fields.
3.	A fertiliser does not provide any humus to the soil.	Manure provides a lot of humus to the soil.
4.	Fertilisers are very rich in plant nutrients like nitrogen, phosphorus and potassium.	Manure is relatively less rich in plant nutrients.

Table 1.1 gives the differences between a fertiliser and manure.

**Advantages of Manure :** The organic manure is considered better than fertilisers. This is because

- it enhances the water holding capacity of the soil.
- it makes the soil porous due to which exchange of gases becomes easy.
- it increases the number of friendly microbes.
- it improves the texture of the soil.

## 1.6 Irrigation

All living beings need water to live. Water is important for proper growth and development of flowers, fruits and seeds of plants. Water is absorbed by the plant roots. Along with water, minerals and fertilisers are also absorbed. Plants contain nearly 90% water. Water is essential because germination of seeds does not take place under dry conditions. Nutrients dissolved in water get transported to

each part of the plant. Water also protects the crop from both frost and hot air currents. To maintain the moisture of the soil for healthy crop growth, fields have to be watered regularly.

The supply of water to crops at different intervals is called **irrigation**. The time and frequency of irrigation varies from crop to crop, soil to soil and season to season. In summer, the frequency of watering is higher. Why is it so? Could it be due to the increased rate of evaporation of water from the soil and the leaves?

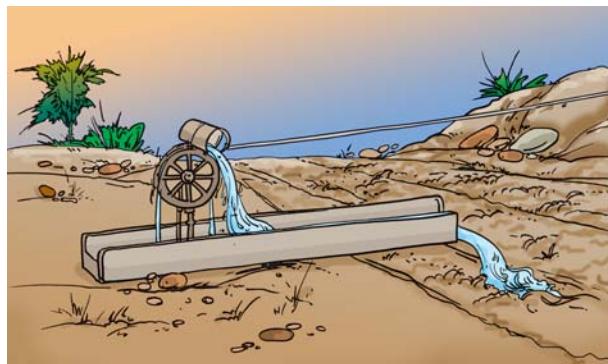


I am very careful this year about watering the plants. Last summer my plants dried up and died.

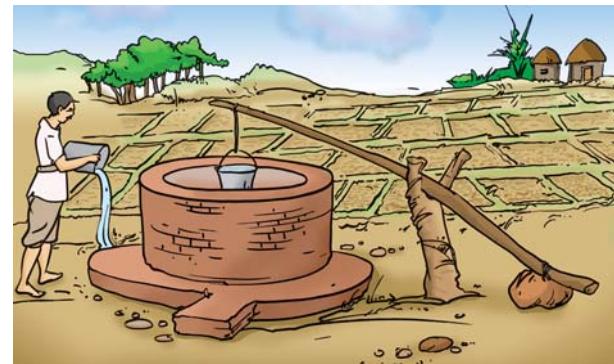
**Sources of irrigation :** The sources of irrigation are— wells, tubewells, ponds, lakes, rivers, dams and canals.



**Fig. 1.4 (a) : Moat**



**Fig. 1.4 (b) : Chain pump**



**Fig. 1.4 (c) : Dhekli**



**Fig. 1.4 (d) : Rahat**

### Traditional Methods of Irrigation

The water available in wells, lakes and canals is lifted up by different methods in different regions, for taking it to the fields.

Cattle or human labour is used in these methods. So these methods are cheaper, but less efficient. The various traditional ways are:

- (i) moat (pulley -system)
- (ii) chain pump

- (iii) dhekli, and
  - (iv) rahat (Lever system)
- [Figs. 1.4 (a)- (d)].

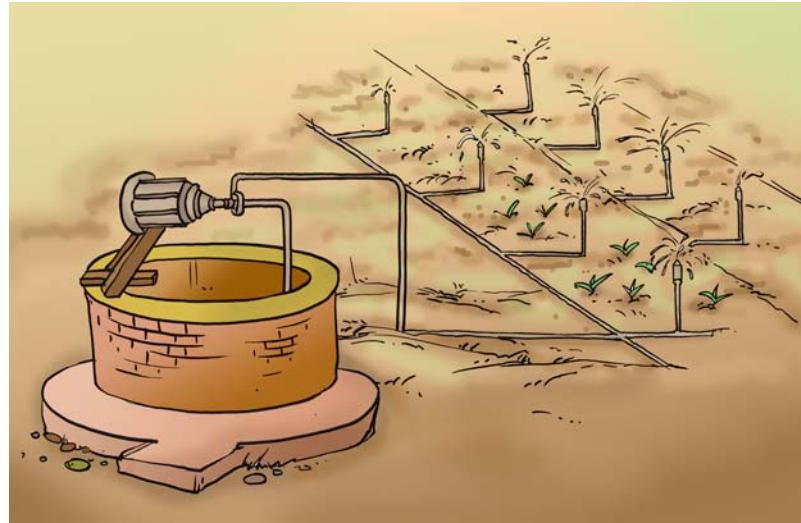
Pumps are commonly used for lifting water. Diesel, biogas, electricity and solar energy is used to run these pumps.

## **Modern Methods of Irrigation**

Modern methods of irrigation help us to use water economically. The main methods used are as follows:

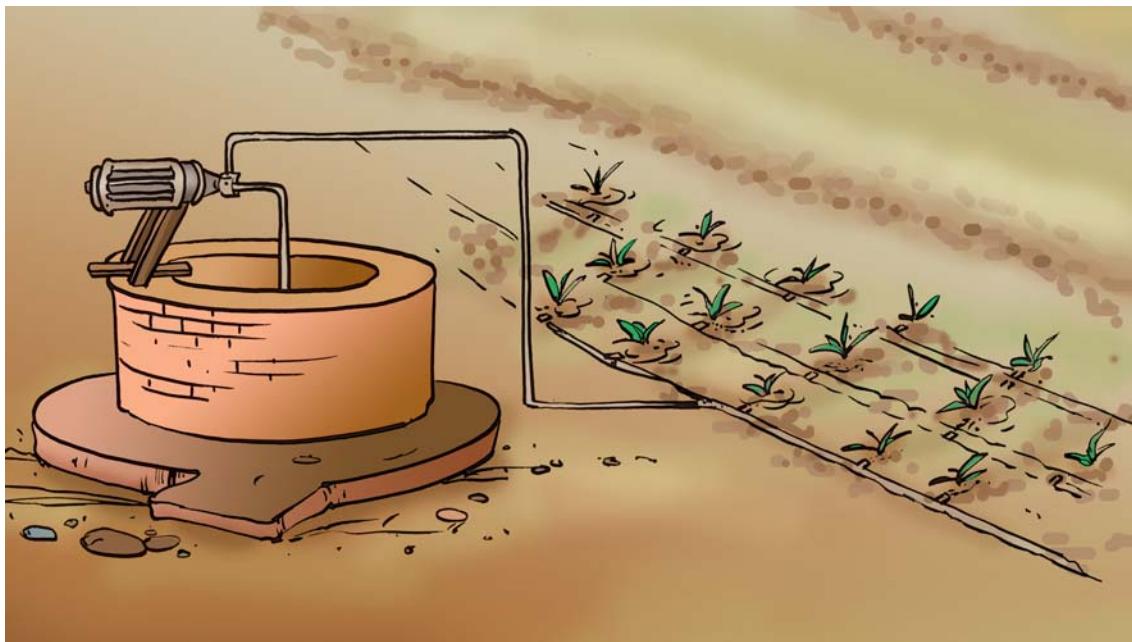
**(i) Sprinkler System:** This system is more useful on the uneven land where sufficient water is not available. The perpendicular pipes, having rotating nozzles on top, are joined to the main pipeline at regular intervals. When water is allowed to flow through the main pipe under pressure with the help of a pump, it escapes from the rotating nozzles. It gets sprinkled on the crop as if it is raining. Sprinkler is very useful for sandy soil [Fig. 1.5 (a)].

**(ii) Drip system :** In this system, the water falls drop by drop just at the



**Fig. 1.5 (a) : Sprinkler system**

position of the roots. So it is called drip system. It is the best technique for watering fruit plants, gardens and trees. The system provides water to plants drop by drop [Fig. 1.5(b)]. Water is not wasted at all. It is a boon in regions where availability of water is poor.



**Fig. 1.5 (b) : Drip System**

## 1.7 Protection from Weeds

Boojho and Paheli went to a nearby wheat field and saw that there were some other plants in the field.

Have these other plants been planted purposely?



In a field many other undesirable plants may grow naturally along with the crop. These undesirable plants are called **weeds**.

The removal of weeds is called weeding. Weeding is necessary since weeds compete with the crop plants for water, nutrients, space and light. Thus, they affect the growth of the crop. Some weeds interfere even in harvesting and may be poisonous for animals and human beings.

Farmers adopt many ways to remove weeds and control their growth. Tilling before sowing of crops helps in uprooting and killing of weeds, which may then dry up and get mixed with the soil. The best time for the removal of weeds is before they produce flowers and seeds. The manual removal includes physical removal of weeds by uprooting or cutting them close to the ground, from time to time. This is done with the help of a *khurpi*. A seed drill [Fig. 1.2(b)] is also used to uproot weeds.

Weeds are also controlled by using certain chemicals, called **weedicides**, like 2,4-D. These are sprayed in the fields to kill the weeds. They do not damage the crops. The weedicides are diluted with water to the extent required and sprayed in the fields with a sprayer. (Fig. 1.6).



**Fig. 1.6 :** Spraying weedicide

Do weedicides have any effect on the person handling the weedicide sprayer?



As already mentioned, the weedicides are sprayed during the vegetative growth of weeds before flowering and seed formation. Spraying of weedicides may affect the health of farmers. So they should use these chemicals very carefully. They should cover their nose and mouth with a piece of cloth during spraying of these chemicals.

## 1.8 Harvesting

Harvesting of a crop is an important task. The cutting of crop after it is mature is called **harvesting**. In harvesting, crops are pulled out or cut close to the ground. It usually takes 3 to 4 months for a cereal crop to mature.

Harvesting in our country is either done manually by sickle (Fig. 1.7) or by a machine called harvester. In the harvested crop, the grain seeds need to be separated



**Fig. 1.7 :**  
Sickle

from the chaff. This process is called **threshing**. This is carried out with the help of a machine called 'combine' which is in fact a combined harvester and thresher (Fig. 1.8).



**Fig. 1.8 : Combine**



After harvesting, sometimes stubs are left in the field, which are burnt by farmers. Paheli is worried. She knows that it causes pollution. It may also catch fire and damage the crops lying in the fields.

Farmers with small holdings of land do the separation of grain and chaff by **winnowing** (Fig. 1.9). You have already studied this in Class VI.



**Fig. 1.9 : Winnowing machine**

### Harvest Festivals

After three or four months of hard work there comes the day of the harvest. The sight of golden fields of standing crop, laden with grain, fills the hearts of farmers with joy and a sense of well-being. The efforts of the past season have borne fruit and it is time to relax and enjoy a little. The period of harvest is, thus, of great joy and happiness in all parts of India. Men and women celebrate it with great enthusiasm. Special festivals associated with the harvest season are Pongal, Baisakhi, Holi, Diwali, Nabanya and Bihu.

### 1.9 Storage

Storage of produce is an important task. If the crop grains are to be kept for longer time, they should be safe from moisture, insects, rats and microorganisms. The fresh crop has more moisture. If freshly harvested grains (seeds) are stored without drying, they may get spoilt or attacked by organisms, losing their germination capacity. Hence, before storing them, the grains are properly dried in the sun to reduce the moisture in them. This prevents the attack by insect pests, bacteria and fungi. Farmers store



I saw my mother putting some dried neem leaves in an iron drum containing wheat.  
I wonder why?



**Fig. 1.10 (a)** : Silos for storage of grains



**Fig. 1.10 (b)** : Storage of grains in granaries

grains in jute bags or metallic bins. However, large scale storage of grains is done in **silos** and **granaries** to protect them from pests like rats and insects [Fig. 1.10 (a) and (b)].

Dried neem leaves are used for storing food grains at home. For storing large quantities of grains in big godowns, specific chemical treatments are required to protect them from pests and microorganisms.

## 1.10 Food from Animals

### Activity 1.3

Make the following Table in your note book and complete it.

S.No.	Food	Sources
1.	Milk	Cow, Buffalo, She-goat, She-camel . . .
2.		
3.		
4.		

After completing this Table, you must have seen that, like plants, animals also provide us with different kinds of food. Many people living in the coastal areas consume fish as a major part of their diet. In the previous classes you have learnt about the food that we obtain from plants. We have just seen that the process of crop production involves a number of steps like selection of seeds, sowing, etc. Similarly, animals reared at home or in farms, have to be provided with proper food, shelter and care. When this is done on a large scale, it is called **animal husbandry**.



Fish is good for health.  
We get cod liver oil from fish  
which is rich in vitamin D.

**KEYWORDS****AGRICULTURAL PRACTICES****ANIMAL HUSBANDRY****CROP****FERTILISER****GRANARIES****HARVESTING****IRRIGATION****KHARIF****MANURE****PLOUGH****RABI****SEEDS****SILO****SOWING****STORAGE****THRESHING****WEEDS****WEEDICIDE****WINNOWING****WHAT YOU HAVE LEARNT**

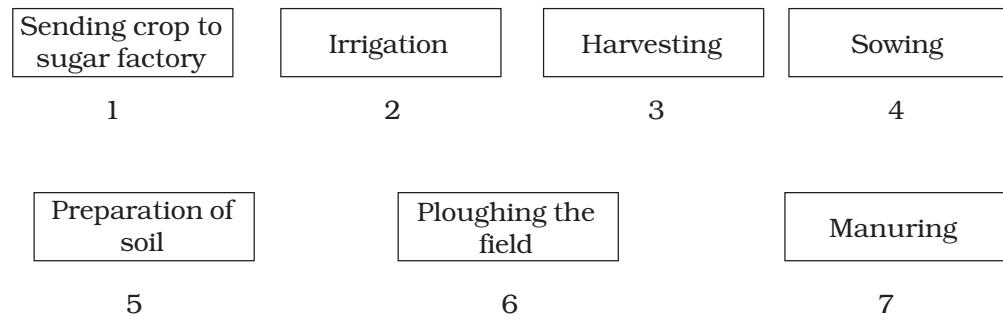
- ⦿ In order to provide food to our growing population, we need to adopt certain agricultural practices.
- ⦿ Same kind of plants grown and cultivated at a place constitute a crop.
- ⦿ In India, crops can be broadly categorised into two types based on seasons - rabi and kharif crops.
- ⦿ It is necessary to prepare soil by tilling and levelling. Ploughs and levellers are used for this purpose.
- ⦿ Sowing of seeds at appropriate depths and distances gives good yield. Good variety of seeds are sown after selection of healthy seeds. Sowing is done by seed drills.
- ⦿ Soil needs replenishment and enrichment through the use of organic manure and fertilisers. Use of chemical fertilisers has increased tremendously with the introduction of new crop varieties.
- ⦿ Supply of water to crops at appropriate intervals is called irrigation.
- ⦿ Weeding involves removal of unwanted and uncultivated plants called weeds.
- ⦿ Harvesting is the cutting of the mature crop manually or by machines.
- ⦿ Separation of the grains from the chaff is called threshing.
- ⦿ Proper storage of grains is necessary to protect them from pests and microorganisms.
- ⦿ Food is also obtained from animals for which animals are reared. This is called animal husbandry.

**Exercises**

1. Select the correct word from the following list and fill in the blanks.  
float, water, crop, nutrients, preparation
  - (a) The same kind of plants grown and cultivated on a large scale at a place is called \_\_\_\_\_.
  - (b) The first step before growing crops is \_\_\_\_\_ of the soil.

**EXERCISES**

- (c) Damaged seeds would \_\_\_\_\_ on top of water.  
(d) For growing a crop, sufficient sunlight and \_\_\_\_\_ and \_\_\_\_\_ from the soil are essential.
2. Match items in column **A** with those in column **B**.
- | <b>A</b>                   | <b>B</b>   |
|----------------------------|--|
| (i) Kharif crops           | (a) Food for cattle                                |
| (ii) Rabi crops            | (b) Urea and super phosphate                       |
| (iii) Chemical fertilisers | (c) Animal excreta, cow dung urine and plant waste |
| (iv) Organic manure        | (d) Wheat, gram, pea                               |
|                            | (e) Paddy and maize                                |
3. Give two examples of each.  
(a) *Kharif* crop  
(b) *Rabi* crop
4. Write a paragraph in your own words on each of the following.  
(a) Preparation of soil    (b) Sowing  
(c) Weeding    (d) Threshing
5. Explain how fertilisers are different from manure.
6. What is irrigation? Describe two methods of irrigation which conserve water.
7. If wheat is sown in the *kharif* season, what would happen? Discuss.
8. Explain how soil gets affected by the continuous plantation of crops in a field.
9. What are weeds? How can we control them?
10. Arrange the following boxes in proper order to make a flow chart of sugarcane crop production.



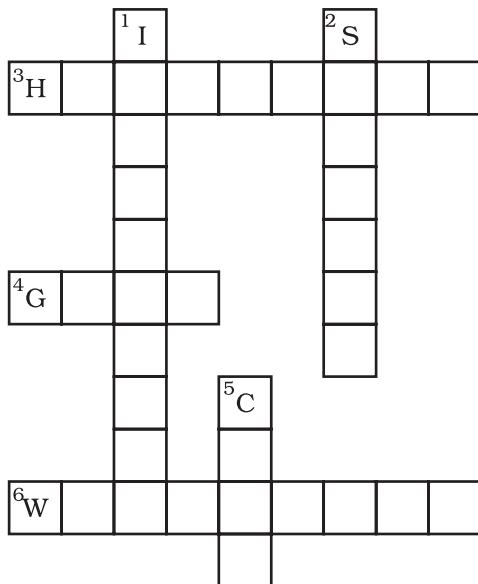
11. Complete the following word puzzle with the help of clues given below.

**Down**

1. Providing water to the crops.
2. Keeping crop grains for a long time under proper conditions.
5. Certain plants of the same kind grown on a large scale.

**Across**

3. A machine used for cutting the matured crop.
4. A *rabi* crop that is also one of the pulses.
6. A process of separating the grain from chaff.



### Extended Learning — Activities and Projects

1. Sow some seeds in the soil and arrange to water them by drip irrigation. Observe daily.
  - (i) Do you think it can save water?
  - (ii) Note the changes in the seed.
2. Collect different types of seeds and put them in small bags. Attach these bags in a herbarium file and label them.
3. Collect new agricultural machine pictures and paste in a file with their names and uses.
4. Project Work  
Visit a farm, nursery or a garden nearby. Gather information about
  - (i) importance of seed selection.
  - (ii) method of irrigation.

- (iii) effect of extreme cold and extreme hot weather on the plants.
- (iv) effect of continuous rain on the plants.
- (v) fertilisers/manure used.

For more information, visit :

- [www.krishiworld.com/html/balanced fertiliser.htm](http://www.krishiworld.com/html/balanced_fertiliser.htm)
- [www.ikis.com/links/ap.cultivation.html](http://www.ikis.com/links/ap.cultivation.html)

### **An Example for Field Trip Work**

Himanshu and his friends were very anxious and curious to go to Thikri village. They went to Shri Jiwan Patel's farmhouse. They had taken bags to collect some seeds and other things.

Himanshu : Sir *namaskar*, I am Himanshu. Here are my friends Mohan, David and Sabiha. We want some information about crops. Please guide us.

Shri Patel : *Namaskar* and welcome all of you. What are your queries?

Sabiha : When did you start this work and what are the main crops that you grow?

Shri Patel : About 75 years ago, my grandfather started this work. The main crops that we grow are wheat, gram, soyabean and *moong*.

David : Sir, can you tell us the difference between traditional and modern agricultural practices?

Shri Patel : Earlier we used traditional tools like sickle, bullock plough, trowel, etc., and depended on rain water for irrigation. But now we use modern methods of irrigation. We use implements like tractors, cultivators, seed drill and harvester. We get good quality seeds. We carry out soil testing and use manure and fertilisers. New information about agriculture is obtained through radio, T.V. and other sources. As a result we are able to get good crops on a large scale. This year we got 9 to 11 quintals of gram crop/acre and 20 to 25 quintals of wheat/acre. In my opinion awareness of new technology is important for better crop yield.

Mohan : Sabiha, come here and see some earthworms. Are they helpful to the farmers?

Sabiha : Oh Mohan! we learnt about it in Class VI.

Shri Patel : Earthworms turn the soil and loosen it for proper aeration, so they help the farmer.

David : Can we have some seeds of the crops you grow here?

[They put some seeds, fertilisers and soil sample in the bags.]

Himanshu : Sir, we are thankful to you for making this visit pleasant and for providing useful information.

# Chapter 15

## IMPROVEMENT IN FOOD RESOURCES

We know that all living organisms need food. Food supplies proteins, carbohydrates, fats, vitamins and minerals, all of which we require for body development, growth and health. Both plants and animals are major sources of food for us. We obtain most of this food from agriculture and animal husbandry.

We read in newspapers that efforts are always being made to improve production from agriculture and animal husbandry. Why is this necessary? Why we cannot make do with the current levels of production?

India is a very populous country. Our population is more than one billion people, and it is still growing. As food for this growing population, we will soon need more than a quarter of a billion tonnes of grain every year. This can be done by farming on more land. But India is already intensively cultivated. As a result, we do not have any major scope for increasing the area of land under cultivation. Therefore, it is necessary to increase our production efficiency for both crops and livestock.

Efforts to meet the food demand by increasing food production have led to some successes so far. We have had the green revolution, which contributed to increased food-grain production. We have also had the white revolution, which has led to better and more efficient use as well as availability of milk.

However, these revolutions mean that our natural resources are getting used more intensively. As a result, there are more chances of causing damage to our natural resources to the point of destroying their balance completely. Therefore, it is important that we should increase food production without degrading our environment and disturbing the balances maintaining it.

Hence, there is a need for sustainable practices in agriculture and animal husbandry.

Also, simply increasing grain production for storage in warehouses cannot solve the problem of malnutrition and hunger. People should have money to purchase food. Food security depends on both availability of food and access to it. The majority of our population depends on agriculture for their livelihood. Increasing the incomes of people working in agriculture is therefore necessary to combat the problem of hunger. Scientific management practices should be undertaken to obtain high yields from farms. For sustained livelihood, one should undertake mixed farming, intercropping, and integrated farming practices, for example, combine agriculture with livestock/poultry/fisheries/bee-keeping.

The question thus becomes – how do we increase the yields of crops and livestock?

### 15.1 Improvement in Crop Yields

Cereals such as wheat, rice, maize, millets and sorghum provide us carbohydrate for energy requirement. Pulses like gram (*chana*), pea (*matar*), black gram (*urad*), green gram (*moong*), pigeon pea (*arhar*), lentil (*masoor*), provide us with protein. And oil seeds including soyabean, ground nut, sesame, castor, mustard, linseed and sunflower provide us with necessary fats (Fig. 15.1). Vegetables, spices and fruits provide a range of vitamins and minerals in addition to small amounts of proteins, carbohydrates and fats. In addition to these food crops, fodder crops like *berseem*, *oats* or *sudan grass* are raised as food for the livestock.



**Fig. 15.1:** Different types of crops

## Q uestion

1. *What do we get from cereals, pulses, fruits and vegetables?*

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 1960 to 2004 with only 25% increase in the cultivable land area. How has this increase in production been achieved? If we think of the practices involved in farming, we can see that 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.

### 15.1.1 CROP VARIETY IMPROVEMENT

This approach depends on finding a crop variety that can give a good yield. Varieties or strains of crops can be selected by breeding for various useful characteristics such as disease resistance, response to fertilisers, product quality and high yields. One way of incorporating desirable characters into crop varieties is by hybridisation. Hybridisation refers to crossing between genetically dissimilar plants. This crossing may be intervarietal (between different varieties), interspecific (between two different species of the same genus) or intergeneric (between different genera). Another way of improving the crop is by introducing a gene that would provide the desired characteristic. This results in genetically modified crops.

For new varieties of crops to be accepted, it is necessary that the variety produces high yields under different conditions that are found in different areas. Farmers would need to be provided with good quality seeds of a particular variety, that is, the seeds should

all be of the same variety and germinate under the same conditions.

Cultivation practices and crop yield are related to weather, soil quality and availability of water. Since weather conditions such as drought and flood situations are unpredictable, varieties that can be grown in diverse climatic conditions are useful. Similarly, varieties tolerant to high soil salinity have been developed. Some of the factors for which variety improvement is done are:

- Higher yield: To increase the productivity of the crop per acre.
- Improved quality: Quality considerations of crop products vary from crop to crop. Baking quality is important in wheat, protein quality in pulses, oil quality in oilseeds and preserving quality in fruits and vegetables.
- Biotic and abiotic resistance: Crops production can go down due to biotic (diseases, insects and nematodes) and abiotic (drought, salinity, water logging, heat, cold and frost) stresses under different situations. Varieties resistant to these stresses can improve crop production.
- Change in maturity duration: The shorter the duration of the crop from sowing to harvesting, the more economical is the variety. Such short durations allow farmers to grow multiple rounds of crops in a year. Short duration also reduces the cost of crop production. Uniform maturity makes the harvesting process easy and reduces losses during harvesting.
- Wider adaptability: Developing varieties for wider adaptability will help in stabilising the crop production under different environmental conditions. One variety can then be grown under different climatic conditions in different areas.
- Desirable agronomic characteristics: Tallness and profuse branching are desirable characters for fodder crops. Dwarfness is desired in cereals, so

that less nutrients are consumed by these crops. Thus developing varieties of desired agronomic characters help give higher productivity.

## Questions

1. *How do biotic and abiotic factors affect crop production?*
2. *What are the desirable agronomic characteristics for crop improvements?*

### 15.1.2 CROP PRODUCTION MANAGEMENT

In India, as in many other agriculture-based countries, farming ranges from small to very large farms. Different farmers thus have more or less land, money and access to information and technologies. In short, it is the money or financial conditions that allow farmers to take up different farming practices and agricultural technologies. There is a correlation between higher inputs and yields. Thus, the farmer's purchasing capacity for inputs decides cropping system and production practices. Therefore, production practices can be at different levels. They include 'no cost' production, 'low cost' production and 'high cost' production practices.

#### 15.1.2 (i) NUTRIENT MANAGEMENT

Just as we need food for development, growth and well-being, plants also require nutrients for growth. Nutrients are supplied to plants by air, water and soil. There are sixteen nutrients which are essential for plants. Air supplies carbon and oxygen, hydrogen comes from water, and soil supplies the other thirteen nutrients to plants. Amongst these thirteen nutrients, six are required in large quantities and are therefore called macro-nutrients. The other seven nutrients are used by plants in small quantities and are therefore called micro-nutrients (Table 15.1).

**Table 15.1: Nutrients supplied by air, water and soil**

Source	Nutrients
Air	carbon, oxygen
Water	hydrogen, oxygen
Soil	(i) <i>Macronutrients:</i> nitrogen, phosphorus, potassium, calcium, magnesium, sulphur (ii) <i>Micronutrients:</i> iron, manganese, boron, zinc, copper, molybdenum, chlorine

Deficiency of these nutrients affects physiological processes in plants including reproduction, growth and susceptibility to diseases. To increase the yield, the soil can be enriched by supplying these nutrients in the form of manure and fertilizers.



## Questions

1. *What are macro-nutrients and why are they called macro-nutrients?*
2. *How do plants get nutrients?*

## MANURE

Manure contains large quantities of organic matter and also supplies small quantities of nutrients to the soil. Manure is prepared by the decomposition of animal excreta and plant waste. Manure helps in enriching soil with nutrients and organic matter and increasing soil fertility. The bulk of organic matter in manure helps in improving the soil structure. This involves increasing the water holding capacity in sandy soils. In clayey soils, the large quantities of organic matter help in drainage and in avoiding water logging.

In using manure we use biological waste material, which is advantageous in protecting

our environment from excessive use of fertilizers. Using biological waste material is also a way of recycling farm waste. Based on the kind of biological material used, manure can be classified as:

- (i) Compost and vermi-compost: The process in which farm waste material like livestock excreta (cow dung etc.), vegetable waste, animal refuse, domestic waste, sewage waste, straw, eradicated weeds etc. is decomposed in pits is known as composting. The compost is rich in organic matter and nutrients. Compost is also prepared by using earthworms to hasten the process of decomposition of plant and animal refuse. This is called vermi-compost.
- (ii) Green manure: Prior to the sowing of the crop seeds, some plants like sun hemp or guar are grown and then mulched by ploughing them into the soil. These green plants thus turn into green manure which helps in enriching the soil in nitrogen and phosphorus.

## FERTILIZERS

Fertilizers are commercially produced plant nutrients. Fertilizers supply nitrogen, phosphorus and potassium. They are used to ensure good vegetative growth (leaves, branches and flowers), giving rise to healthy plants. Fertilizers are a factor in the higher yields of high-cost farming.

Fertilizers should be applied carefully in terms of proper dose, time, and observing pre- and post-application precautions for their complete utilisation. For example, sometimes fertilizers get washed away due to excessive irrigation and are not fully absorbed by the plants. This excess fertilizer then leads to water pollution.

Also, as we have seen in the previous chapter, continuous use of fertilizers in an area can destroy soil fertility because the organic matter in the soil is not replenished and micro-organisms in the soil are harmed by the fertilizers used. Short-term benefits of using fertilizers and long-term benefits of

using manure for maintaining soil fertility have to be considered while aiming for optimum yields in crop production.

## Q uestion

1. *Compare the use of manure and fertilizers in maintaining soil fertility.*

Organic farming is a farming system with minimal or no use of chemicals as fertilizers, herbicides, pesticides etc. and with a maximum input of organic manures, recycled farm-wastes (straw and livestock excreta), use of bio-agents such as culture of blue green algae in preparation of biofertilizers, neem leaves or turmeric specifically in grain storage as bio-pesticides, with healthy cropping systems [mixed cropping, inter-cropping and crop rotation as discussed below in 15.1.2.(iii)]. These cropping systems are beneficial in insect, pest and wheat control besides providing nutrients.

### 15.1.2 (ii) IRRIGATION

Most agriculture in India is rain-fed, that is, the success of crops in most areas is dependent on timely monsoons and sufficient rainfall spread through most of the growing season. Hence, poor monsoons cause crop failure. Ensuring that the crops get water at the right stages during their growing season can increase the expected yields of any crop. Therefore, many measures are used to bring more and more agricultural land under irrigation.

#### More to know

Droughts occur because of scarcity or irregular distribution of rains. Drought poses a threat to rain-fed farming areas, where farmers do not use irrigation for crop production and depend only on rain. Light soils have less water retention capacity. In areas with light soils, crops get adversely affected by drought conditions. Scientists have developed some crop varieties which can tolerate drought conditions.

India has a wide variety of water resources and a highly varied climate. Under such conditions, several different kinds of irrigation systems are adopted to supply water to agricultural lands depending on the kinds of water resources available. These include wells, canals, rivers and tanks.

- **Wells:** There are two types of wells, namely 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:** This is usually an elaborate and extensive irrigation system. In this system canals receive water from one or more reservoirs or from rivers. The main canal is divided into branch canals having further distributaries to irrigate fields.
- **River Lift Systems:** In areas where canal flow is insufficient or irregular due to inadequate reservoir release, the lift system is more rational. 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.

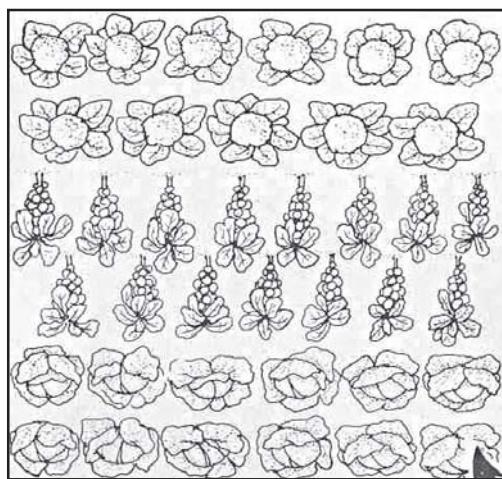
Fresh initiatives for increasing the water available for agriculture include rainwater harvesting and watershed management. This involves building small check-dams which lead to an increase in ground water levels. The check-dams stop the rainwater from flowing away and also reduce soil erosion.

### 15.1.2 (iii) CROPPING PATTERNS

Different ways of growing crops can be used to give maximum benefit.

Mixed cropping is growing two or more crops simultaneously on the same piece of land, for example, wheat + gram, or wheat + mustard, or groundnut + sunflower. This reduces risk and gives some insurance against failure of one of the crops.

Intercropping is growing two or more crops simultaneously on the same field in a definite pattern (Fig. 15.2). A few rows of one crop alternate with a few rows of a second crop, for example, soyabean + maize, or finger millet (*bajra*) + cowpea (*lobia*). The crops are selected such that their nutrient requirements are different. This ensures maximum utilisation of the nutrients supplied, and also prevents pests and diseases from spreading to all the plants belonging to one crop in a field. This way, both crops can give better returns.



**Fig. 15.2 : Intercropping**

The growing of different crops on a piece of land in a pre-planned succession is known as crop rotation. Depending upon the duration, crop rotation is done for different crop combinations. The availability of moisture and irrigation facilities decide the choice of the crop to be cultivated after one harvest. If crop rotation is done properly then two or three crops can be grown in a year with good harvests.

### 15.1.3 CROP PROTECTION MANAGEMENT

Field crops are infested by a large number of weeds, insect pests and diseases. If weeds and pests are not controlled at the appropriate time then they can damage the crops so much that most of the crop is lost.

Weeds are unwanted plants in the cultivated field, for example, Xanthium

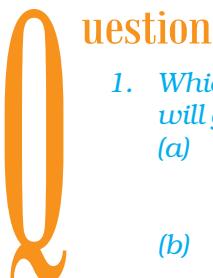
(*gokhroo*), Parthenium (*gajar ghas*), Cyperinus rotundus (*motha*). They compete for food, space and light. Weeds take up nutrients and reduce the growth of the crop. Therefore, removal of weeds from cultivated fields during the early stages of crop growth is essential for a good harvest.

Generally insect pests attack the plants in three ways: (i) they cut the root, stem and leaf, (ii) they suck the cell sap from various parts of the plant, and (iii) they bore into stem and fruits. They thus affect the health of the crop and reduce yields.

Diseases in plants are caused by pathogens such as bacteria, fungi and viruses. These pathogens can be present in and transmitted through the soil, water and air.

Weeds, insects and diseases can be controlled by various methods. One of the most commonly used methods is the use of pesticides, which include herbicides, insecticides and fungicides. These chemicals are sprayed on crop plants or used for treating seeds and soil. However, excessive use of these chemicals creates problems, since they can be poisonous to many plant and animal species and cause environmental pollution.

Weed control methods also include mechanical removal. Preventive methods such as proper seed bed preparation, timely sowing of crops, intercropping and crop rotation also help in weed control. Some other preventive measures against pests are the use of resistant varieties, and summer ploughing, in which fields are ploughed deep in summers to destroy weeds and pests.



### Question

1. Which of the following conditions will give the most benefits? Why?
  - (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 protection measures.

**Table 15.2: Nutritional values of animal products**

<b>Animal Products</b>	<b>Per cent (%) Nutrients</b>					
	<b>Fat</b>	<b>Protein</b>	<b>Sugar</b>	<b>Minerals</b>	<b>Water</b>	<b>Vitamins</b>
Milk (Cow)	3.60	4.00	4.50	0.70	87.20	B1, B2, B12, D, E
Egg	12.00	13.00	*	1.00	74.00	B2, D
Meat	3.60	21.10	*	1.10	74.20	B2, B12
Fish	2.50	19.00	*	1.30	77.20	Niacin, D, A

\*Present in very small amounts

### Activity 15.1

- Visit a weed-infested field in the month of July or August and make a list of the weeds and insect pests in the field.

### STORAGE OF GRAINS

Storage losses in agricultural produce can be very high. Factors responsible for such losses are biotic— insects, rodents, fungi, mites and bacteria, and abiotic— inappropriate moisture and temperatures in the place of storage. These factors cause degradation in quality, loss in weight, poor germinability, discolouration of produce, all leading to poor marketability. These factors can be controlled by proper treatment and by systematic management of warehouses.

Preventive and control measures are used before grains are stored for future use. They include strict cleaning of the produce before storage, proper drying of the produce first in sunlight and then in shade, and fumigation using chemicals that can kill pests.



### Questions

- Why should preventive measures and biological control methods be preferred for protecting crops?
- What factors may be responsible for losses of grains during storage?

### Activity 15.2

- Make a herbarium of cereals, pulses and oil seeds and identify the seasons of their sowing and harvesting.

## 15.2 Animal Husbandry

Animal husbandry is the scientific management of animal livestock. It includes various aspects such as feeding, breeding and disease control. Animal-based farming includes cattle, goat, sheep, poultry and fish farming. As the population increases and as living standards increase, the demand for milk, eggs and meat is also going up. Also, the growing awareness of the need for humane treatment of livestock has brought in new limitations in livestock farming. Thus, livestock production also needs to be improved.

### 15.2.1 CATTLE FARMING

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, *Bos indicus*, cows, and *Bos bubalis*, buffaloes. Milk-producing females are called milch animals (dairy animals), while the ones used for farm labour are called draught animals.

Milk production depends, to some extent, on the duration of the lactation period, meaning the period of milk production after



**Fig. 15.3:** Indigenous milch breed of cattle

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.

## Question

- Q 1. Which method is commonly used for improving cattle breeds and why?

## Activity \_\_\_\_\_ 15.3

- Visit a livestock farm. Note the following:
  - (1) Number of cattle and number of different breeds.
  - (2) The amount of daily milk production from the different breeds.

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. Animals require regular brushing to remove dirt and

loose hair. They should be sheltered under well-ventilated roofed sheds that protect them from rain, heat and cold. The floor of the cattle shed needs to be sloping so as to stay dry and to facilitate cleaning.

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. Animal feed includes: (a) roughage, which is largely fibre, and (b) concentrates, which are low in fibre and contain relatively high levels of proteins and other nutrients. Cattle need balanced rations containing all nutrients in proportionate amounts. Besides such nutritious food material, certain feed additives containing micronutrients promote the health and milk output of dairy animals.

Cattle suffer from a number of diseases. The diseases, besides causing death, reduce milk production. A healthy animal feeds regularly and has a normal posture. The parasites of cattle may be both external parasites and internal parasites. 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. Infectious diseases are also caused by bacteria and viruses. Vaccinations are given to farm animals against many major viral and bacterial diseases.

### 15.2.2 POULTRY FARMING

Poultry farming is undertaken to raise domestic fowl for egg production and chicken meat. Therefore, improved poultry breeds are developed and farmed to produce layers for eggs and broilers for meat.

The cross-breeding programmes between Indian (indigenous, for example, Aseel) and foreign (exotic, for example, Leghorn) breeds for variety improvement are focused on to develop new varieties for the following desirable traits—

- (i) number and quality of chicks;

- (ii) dwarf broiler parent for commercial chick production;
- (iii) summer adaptation capacity/tolerance to high temperature;
- (iv) low maintenance requirements;
- (v) reduction in the size of the egg-laying bird with ability to utilise more fibrous cheaper diets formulated using agricultural by-products.



Aseel



Leghorn

**Fig. 15.4**



## Question

1. *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 (which is unfit for human consumption) into highly nutritious animal protein food."*

### EGG AND BROILER PRODUCTION

Broiler chickens are fed with vitamin-rich supplementary feed for good growth rate and better feed efficiency. Care is taken to avoid mortality and to maintain feathering and carcass quality. They are produced as broilers and sent to market for meat purposes.

For good production of poultry birds, good management practices are important. These include maintenance of temperature and hygienic conditions in housing and poultry feed, as well as prevention and control of diseases and pests.

The housing, nutritional and environmental requirements of broilers are somewhat different from those of egg layers.

The ration (daily food requirement) for broilers is protein rich with adequate fat. The level of vitamins A and K is kept high in the poultry feeds.

Poultry fowl suffer from a number of diseases caused by virus, bacteria, fungi, parasites, as well as from nutritional deficiencies. These necessitate proper cleaning, sanitation, and spraying of disinfectants at regular intervals. Appropriate vaccination can prevent the occurrence of infectious diseases and reduce loss of poultry during an outbreak of disease.

## Questions

- 1. *What management practices are common in dairy and poultry farming?*
- 2. *What are the differences between broilers and layers and in their management?*

## Activity \_\_\_\_\_ 15.4

- Visit a local poultry farm. Observe types of breeds and note the type of ration, housing and lighting facilities given to them. Identify the growers, layers and broilers.

### 15.2.3 FISH PRODUCTION

Fish is a cheap source of animal protein for our food. Fish production includes the finned true fish as well as shellfish such as prawns and molluscs. There are two ways of obtaining fish. One is from natural resources, which is called capture fishing. The other way is by fish farming, which is called culture fishery.

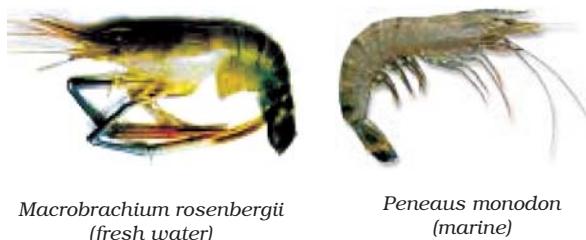
The water source of the fish can be either seawater or fresh water, such as in rivers and ponds. Fishing can thus be done both by capture and culture of fish in marine and freshwater ecosystems.

#### 15.2.3 (i) MARINE FISHERIES

India's marine fishery resources include 7500 km of coastline and the deep seas

beyond it. Popular marine fish varieties include pomphret, mackerel, tuna, sardines, and Bombay duck. Marine fish are caught using many kinds of fishing nets from fishing boats. Yields are increased by locating large schools of fish in the open sea using satellites and echo-sounders.

Some marine fish of high economic value are also farmed in seawater. This includes finned fishes like mullets, *bhetki*, and pearl spots, shellfish such as prawns (Fig. 15.5), mussels and oysters as well as seaweed. Oysters are also cultivated for the pearls they make.



**Fig. 15.5 :** Fresh water and marine prawns

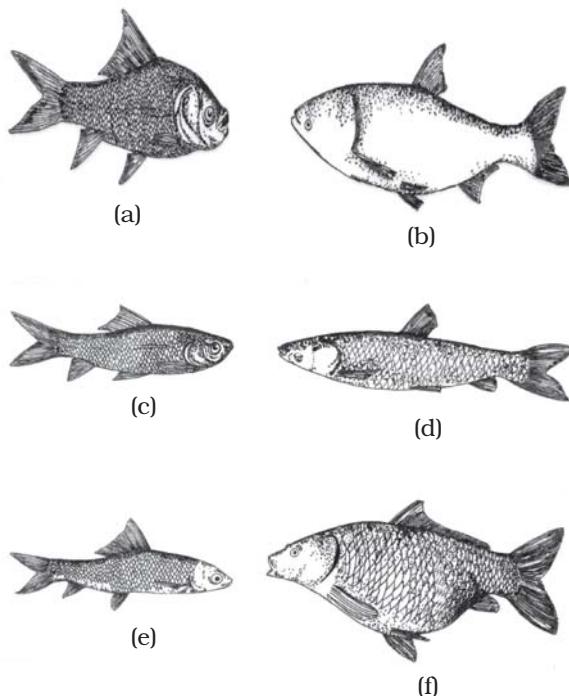
As marine fish stocks get further depleted, the demand for more fish can only be met by such culture fisheries, a practice called mariculture.

### 15.2.3 (ii) INLAND FISHERIES

Fresh water resources include canals, ponds, reservoirs and rivers. Brackish water resources, where seawater and fresh water mix together, such as estuaries and lagoons are also important fish reservoirs. While capture fishing is also done in such inland water bodies, the yield is not high. Most fish production from these resources is through aquaculture.

Fish culture is sometimes done in combination with a rice crop, so that fish are grown in the water in the paddy field. More intensive fish farming can be done in composite fish culture systems. Both local and imported fish species are used in such systems.

In such a system, a combination of five or six fish species is used in a single fishpond. These species are selected so that they do not compete for food among them having 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, Rohus feed in the middle-zone of the pond, Mrigals and Common Carps are bottom feeders, and Grass Carps feed on the weeds, together these species (Fig. 15.6) can use all the food in the pond without competing with each other. This increases the fish yield from the pond.



**Fig. 15.6:** (a) Catla (b) Silver carp (c) Rohu (d) Grass Carp (e) Mrigal (f) Common Carp

One problem with such composite fish culture is that many of these fish breed only during monsoon. Even if fish seed is collected from the wild, it can be mixed with that of other species as well. So, a major problem in fish farming is the lack of availability of good-quality seed. To overcome this problem, ways have now been worked out to breed these fish in ponds using hormonal stimulation. This has ensured the supply of pure fish seed in desired quantities.

# Q uestions

1. How are fish obtained?
2. What are the advantages of composite fish culture?

## Activity \_\_\_\_\_ 15.5

- Visit a fish farm in fish breeding season and note the following:
  - (1) Varieties of fish in the ponds
  - (2) Types of ponds
  - (3) Feed ingredients being used in the farm
  - (4) Find out what the production capacity of the farm is

### 15.2.4 BEE-KEEPING

Honey is widely used and therefore bee-keeping for making honey has become an agricultural enterprise. Since bee-keeping needs low investments, farmers use it as an additional income generating activity. In addition to honey, the beehives are a source of wax which is used in various medicinal preparations.

The local varieties of bees used for commercial honey production are *Apis cerana indica*, commonly known as the Indian bee, *A. dorsata*, the rock bee and *A. florea*, the little bee. An Italian bee variety, *A. mellifera*, has also been brought in to increase yield of honey. This is the variety commonly used for commercial honey production.



(a)



(b)

**Fig. 15.7:** (a) Arrangement of beehive in an apiary  
(b) honey extractor

The Italian bees have high honey collection capacity. They sting somewhat less. They stay in a given beehive for long periods, and breed very well. For commercial honey production, bee farms or apiaries are established.

The value or quality of honey depends upon the pasturage, or the flowers available to the bees for nectar and pollen collection. In addition to adequate quantity of pasturage, the kind of flowers available will determine the taste of the honey.

# Q uestions

1. What are the desirable characters of bee varieties suitable for honey production?
2. What is pasturage and how is it related to honey production?



## What you have learnt

- There are thirteen nutrients essential for crops. Of these, six are required in large quantities and are known as macro-nutrients whereas seven nutrients are required in small quantities and are known as micro-nutrients.
- Manure and fertilizers are the main sources of nutrient supply to crops.

- Organic farming is a farming system with minimal or no use of chemicals as fertilizers, herbicides, pesticides etc. and with a maximum input of organic manures, recycled farm wastes, and bio-agents, with healthy cropping systems.
- Mixed farming is a system of farming on a particular farm which includes crop production, raising of livestock etc.
- Mixed cropping is growing of two or more crops simultaneously on the same piece of land.
- Growing two or more crops in definite row patterns is known as inter-cropping.
- The growing of different crops on a piece of land in pre-planned succession is called crop rotation.
- Varietal improvement is required for higher yield, good quality, biotic and abiotic resistance, shortening the maturity duration, wider adaptability and desirable agronomic characteristics.
- Farm animals require proper care and management such as shelter, feeding, breeding and disease control. This is called animal husbandry.
- Poultry farming is done to raise domestic fowls. Poultry production includes egg production and broiler production for poultry meat.
- To enhance poultry production, cross breeding is done between Indian and exotic breeds for variety improvement.
- Fish may be obtained from marine resources as well as inland resources.
- To increase production of fish, they can be cultured in marine and inland ecosystems.
- Marine fish capture is done by fishing nets guided by echo-sounders and satellites.
- Composite fish culture system is commonly used for fish farming.
- Bee-keeping is done to get honey and wax.

## Exercises



- Explain any one method of crop production which ensures high yield.
- Why are manure and fertilizers used in fields?
- What are the advantages of inter-cropping and crop rotation?
- What is genetic manipulation? How is it useful in agricultural practices?

5. How do storage grain losses occur?
6. How do good animal husbandry practices benefit farmers?
7. What are the benefits of cattle farming?
8. For increasing production, what is common in poultry, fisheries and bee-keeping?
9. How do you differentiate between capture fishing, mariculture and aquaculture?