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It is the team-work of Lakhmir Singh and Manjit Kaur which has given some of the most popular books in the history of science education in India. Lakhmir Singh and Manjit Kaur both write exclusively for the most reputed, respected and largest publishing house of India : S. Chand and Company Pvt. Ltd.

An Open Letter

Dear Friend,

We would like to talk to you for a few minutes, just to give you an idea of some of the special features of this book. Before we go further, let us tell you that this book conforms to the NCERT guidelines prescribed by the Central Board of Secondary Education (CBSE). Just like our earlier books, we have written this book in such a simple style that even the weak students will be able to understand science very easily. Believe us, while writing this book, we have considered ourselves to be the students of the concerned class and tried to make things as simple as possible.

The most important feature of this book is that we have included a large variety of different types of questions for assessing the learning abilities of the students. This book contains:

(*i*) Objective type questions,

(*ii*) Subjective type questions,

(*iii*) Multiple Choice Questions (MCQs),

(*iv*) Questions based on High Order Thinking Skills (HOTS), and

(*v*) Activities.

Please note that answers have also been given for the various types of questions, wherever required. All these features will make this book even more useful to the students as well as the teachers. “A picture can say a thousand words”. Keeping this in mind, a large number of coloured pictures and sketches of various scientific processes, procedures, appliances, manufacturing plants and everyday situations involving principles of science have been given in this book. This will help the students to understand the various concepts of science clearly. It will also tell them how science is applied in the real situations in homes, transport and industry.

We are sure you will agree with us that the facts and formulae of science are just the same in all the books, the difference lies in the method of presenting these facts to the students. In this book, the various topics

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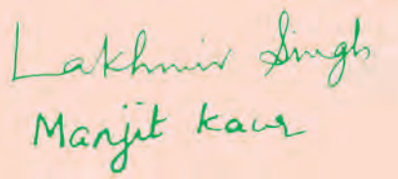
of science have been explained in such a simple way that while reading this book, a student will feel as if a teacher is sitting by his side and explaining the various things to him. We are sure that after reading this book, the students will develop a special interest in science and they would like to study science in higher classes as well.

We think that the real judges of a book are the teachers concerned and the students for whom it is meant. So, we request our teacher friends as well as the students to point out our mistakes, if any, and send their comments and suggestions for the further improvement of this book.

Wishing you a great success,

Yours sincerely,



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CONTENTS

CHAPTER

1

Crop Production and Management

All the living organisms like man, animals and plants need food for their growth and survival. The green plants can synthesise their food by the process of photosynthesis by using inorganic substances like carbon dioxide gas and water in the presence of sunlight energy. Man and other animals cannot make food by photosynthesis from carbon dioxide gas and water by using sunlight energy. They need readymade organic food nutrients like carbohydrates, fats, and proteins, etc., for their growth and development. **Man obtains his food from plants as well as animals.** In other words, man has to grow plants and rear animals (bring up animals) to meet his requirements of food.

Many types of plants are grown on a large scale in vast fields because the food grains produced by them are consumed in large amounts. Wheat and rice are two common examples. These are called food grains. In addition to food grains, pulses, vegetables and fruits are also grown on a large scale because they are an important part of our food. The animals such as cow and buffalo are reared to obtain milk whereas goat, fish and hen are reared to get meat and eggs. In this Chapter, we will study the different practices of obtaining food from both, plants as well as animals. Before we go further, we should know the meaning of the word 'crop'. This is discussed below.

Crops

When the same kind of plants are grown in the fields on a large scale to obtain foods like cereals (wheat, rice, maize), pulses, vegetables and fruits, etc., it is called a crop. For example, a crop of wheat means that all the plants grown in the fields are that of wheat (see Figure 1). A crop

Figure 1. The wheat crop in fields.

is called *'fasal'* in Hindi. Crops are grown in the soil in the fields by farmers (*kissan*). Some of the examples of crops are given below :

(*i*) Cereal crops (Grain crops) : Wheat, Paddy (Rice), Maize, Millet (*Bajra, Jawar*), Barley
(*ii*) Pulses : Gram (*Chana*), Peas, Beans
(*iii*) Oil seeds : Mustard, Groundnut, Sunflower
(*iv*) Vegetables : Tomato, Cabbage, Spinach
(*v*) Fruits : Banana, Grapes, Guava, Mango, Orange, Apple

Types of Crops

Different crops grow well in different seasons of the year. For example, a crop may grow well in rainy season during summer but it may not grow well in winter season. Similarly, another crop may grow well in winter season but not in rainy season. Based on the seasons (in which they grow well), all the crops are categorised into two main groups :

1. **Kharif crops**, and
2. **Rabi 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. The sowing for kharif crops starts in June–July at the beginning of south-west monsoon because these crops (particularly paddy) need substantial amount of water. The kharif crops are harvested at the end of monsoon season during September (or October). **Some of the examples of kharif crops are : Paddy, Maize, Millet, Soyabean, Groundnut and Cotton.** The kharif crops are sometimes also called 'summer crops'. Please note that 'paddy' is 'rice still in the husk'. So, paddy crop gives us rice. In other words, paddy is rice crop. Paddy is grown only in the rainy season because it requires a lot of water. Paddy cannot be grown in the winter season because water available in winter is much less. On the other hand, if wheat is sown in the kharif season, it will not grow well. This is because wheat plants cannot tolerate too much water of the rainy season.

The crops grown in the winter season are called rabi crops. The time period of rabi crops is generally from October to March. The sowing for rabi crops begins at the beginning of winter (October–November) and the crops are harvested by March (or April). **Some of the examples of rabi crops are : Wheat, Gram (*Chana*), Peas, Mustard, and Linseed.**

The people who have no permanent homes and continuously move from one place to another are called 'nomads' (or wanderers). Till about 10000 B.C., people were nomadic. They were continuously moving (or wandering) in groups from place to place in search of food and shelter. These nomadic people ate raw fruits and vegetables found in nature and started hunting animals for food. Later, they settled near the sources of water such as rivers and cultivated land to produce wheat, paddy (rice) and other food crops. This is how agriculture was born. **The growing of plants (or crops) in the fields for obtaining food (like wheat, rice, etc.) is called agriculture.** Agriculture is called *'khetibari'* or *'krishi'* in Hindi. We will now describe the various agricultural practices.

BASIC PRACTICES OF CROP PRODUCTION

In order to raise a crop (or cultivate a crop) successfully and profitably for food production, a farmer has to perform a large number of tasks in a sequence (one after the other). **The various tasks performed by a farmer to produce a good crop are called agricultural practices.** The various agricultural practices which are carried out at various stages of crop production are :

1. **Preparation of soil,**
2. **Sowing,**
3. **Adding manure and fertilisers,**
4. **Irrigation,**

5. **Removal of weeds,**
6. **Harvesting,** and
7. **Storage of food grains.**

In addition to these regular agricultural practices, one more agricultural practice called '**Rotation of crops**' is undertaken sometimes to improve the fertility of soil and increase the crop yield. The various agricultural practices require certain tools or implements which are called agricultural implements. We will now describe all the agricultural practices in detail to know how food is produced on a large scale.

1. PREPARATION OF SOIL

The upper layer of earth is called soil. The crop plants are grown in soil. Soil provides minerals, water, air, humus and anchorage (fixing firmly), to the plants. Preparation of soil is the first step in cultivating a crop for food production. **The soil is prepared for sowing the seeds of the crop by (*i*) ploughing, (*ii*) levelling, and (*iii*) manuring.** Each one of these steps has its own significance. This is described below.

The process of loosening and turning the soil is called ploughing (or tilling). Ploughing (or tilling) of fields is done by using an implement called plough. Ploughs are made of wood or iron, and they have an iron tip for easy penetration into the soil. The ploughs are pulled by a pair of bullocks or by a tractor (see Figures 2 and 3). Actually, the ploughing of small fields is done with the help of animals like bullocks

Figure 2. Ploughing the fields with the help of bullocks.

Figure 3. Ploughing the fields by using tractor.

while large fields are ploughed by using tractors. **The loosening of soil by ploughing is beneficial because of the following reasons :**

(*i*) The loose soil allows the plant roots to penetrate freely and deeper into the soil so that plants are held more firmly to the ground.

(*ii*) The loose soil allows the roots of plants to breathe easily (even when the roots are deep). This is because loose soil can hold a lot of air in its spaces.

(*iii*) The loose soil helps in the growth of worms and microbes present in the soil who are friends of the farmer since they help in further turning and loosening the soil. They also add humus to the soil.

(*iv*) Ploughing also uproots and buries the weeds (unwanted plants) standing in the field and thereby suffocates them to death.

(*v*) The loosening and turning of soil during ploughing brings the nutrient rich soil to the top so that the plants can use these nutrients.

If the soil is very dry, it breaks into large mud 'crumbs' during ploughing. The mud crumbs are then broken down by using a soil plank called 'crumb crusher'.

The ploughed soil is quite loose so it is liable to be carried away by strong winds or washed away by rain water. The removal of top soil by wind and water is called soil erosion. **The ploughed soil is levelled by pressing it with a wooden leveller (or an iron leveller) so that the top soil is not blown away by wind or drained off by water (and soil erosion is prevented)**. The levelling of ploughed soil is beneficial because of the following reasons :

(*i*) The levelling of ploughed fields (by pressing) prevents the top fertile soil from being carried away by strong winds or washed away by rain water.

(*ii*) The levelling of ploughed fields helps in the uniform distribution of water in the fields during irrigation.

(*iii*) The levelling helps in preventing the loss of moisture from the ploughed soil.

The levelling of ploughed soil in the fields is done by using an implement called leveller. The soil leveller is a heavy wooden plank or an iron plank. The soil leveller can be pulled by bullocks or by tractor.

'Manuring' means 'adding manure to the soil'. Sometimes, manure is added to the soil before ploughing. Addition of manure to soil before ploughing helps in the proper mixing of manure with the soil. Manure is first transported to the fields. It is then spread out in the fields. When this field is ploughed, the manure gets mixed in the soil properly. Manure contains many nutrients required for the growth of crop plants. So**, manuring is done to increase the fertility of the soil before seeds are sown into it.** Once the soil is ploughed, levelled and manured, it is ready for the sowing of seeds. The soil is watered before sowing.

Agricultural Implements

Before sowing the seeds, it is necessary to loosen and turn the soil in the fields so as to break it to the size of grains. The loosening and turning of soil in the fields is done with the help of various agricultural implements (or tools). The main agricultural implements (or tools) used for loosening and turning the soil are : Plough, Hoe and Cultivator.

(*i*) PLOUGH. Plough is a large agricultural implement which is used for ploughing (or tilling) the soil in the fields. The traditionally used wooden plough is shown in Figure 4. The wooden plough consists of a long log of wood which is called plough shaft (see Figure 4). There is a handle at one end of the ploughshaft. Below the handle is a strong triangular iron strip called ploughshare. The other end of ploughshaft can be attached to a wooden beam which is fixed at right angles to the ploughshaft (see Figure 4). This beam is placed over the neck of two bullocks (or oxen) so as to pull the plough. Thus, the plough is drawn by a pair of bullocks (or other animals such as buffaloes, camels, etc.) (see Figure 2). When the plough is pulled by the bullocks, the farmer holds the handle of the plough and presses down the handle due to which the ploughshare digs into the soil, loosens it and turns it. Nowadays, the traditional wooden plough is increasingly being replaced by the iron plough.

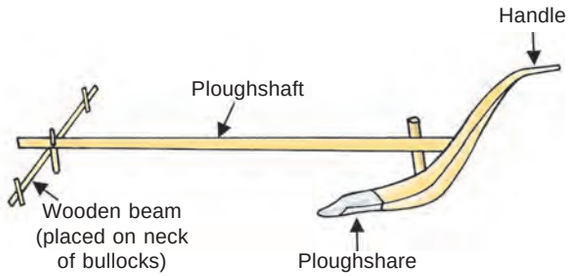

Figure 4. A wooden plough.

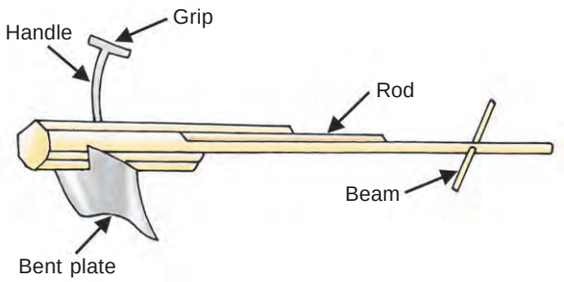

Figure 5. A hoe.

(*ii*) HOE. Hoe is an agricultural implement (or tool) which is used for removing weeds, and loosening and turning the soil (see Figure 5). Hoe consists of a long rod of wood or iron. There is a handle (having

grip) at one end of the hoe. A strong, broad and bent plate of iron is fixed below the handle and acts like a blade. The other end of hoe has a beam which is put on the neck of bullocks. Thus, a hoe is also pulled by animals such as a pair of bullocks. The hoe is a kind of modified plough.

(*iii*) CULTIVATOR. The cultivator is a tractor driven agricultural implement which is used for loosening and turning the soil in the fields quickly (see Figure 6). A cultivator has many ploughshares which can dig into a considerable area of soil at the same time, loosen it and turn it. Due to this, many fields can be ploughed (or tilled) in a short time by using a cultivator. In this way, the use of cultivator saves labour and time. Nowadays, ploughing of large fields is done by using the tractor driven cultivators (see Figure 3).

Figure 6. A tractor driven cultivator (or tractor driven plough).

2. SOWING

Once the soil in the field has been prepared by ploughing, levelling and manuring, etc., seeds of the crop can be sown in it. **The process of scattering seeds (or putting seeds) in the ground soil for growing the crop plants is called 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 free from infection and diseases.** Farmers prefer to use seeds which give high yield of food grains.

Selection of Seeds

ACTIVITY

We can select good, healthy seeds for sowing as follows : Put all the seeds in a bucket containing water and stir well. Most of the seeds will settle down at the bottom whereas some seeds will float on top. **The seeds which sink at the bottom of the bucket are the healthy seeds.** On the other hand, **the seeds which float on water are the spoiled seeds.** This can be explained as follows : Healthy seeds are heavy, so they sink in water. The seeds which have been partially eaten by pests or damaged by disease become hollow and light, and hence float on water. The seeds may also be treated with fungicide solutions before sowing to prevent the seed-borne diseases of crops.

Methods of Sowing Seeds

Seeds are sown in the soil either by hand or by seed drill. Thus, there are two methods of sowing the seeds in the soil. These are :

(*i*) Sowing by hand, and

(*ii*) Sowing with a seed drill.

The sowing of seeds by hand (or manually) is called broadcasting. In the sowing with hand or manually, the seeds are taken in hand and gradually scattered in the entire ploughed field. This method is, however, not very good because there is no proper spacing or proper depth at which the seeds are sown by hand. Moreover, the seeds scattered on the surface of the soil for sowing can be picked up and eaten by the birds.

The implement used for sowing is a seed drill. A seed drill is a long iron tube having a funnel at the top (see Figure 7). The seed drill is tied to back of the plough and seeds are put into the funnel of the seed drill. And as the plough makes furrows in the soil, the seeds from the seed drill are gradually released and sown into the soil furrows made by the plough. Thus, by using a seed drill for sowing, the seeds are sown at the correct depth and correct intervals (or spacings). The seeds sown with a seed drill are in regular rows. Moreover, when the seeds are sown in furrows by a seed-drill, the seeds get covered by soil. Due to this,

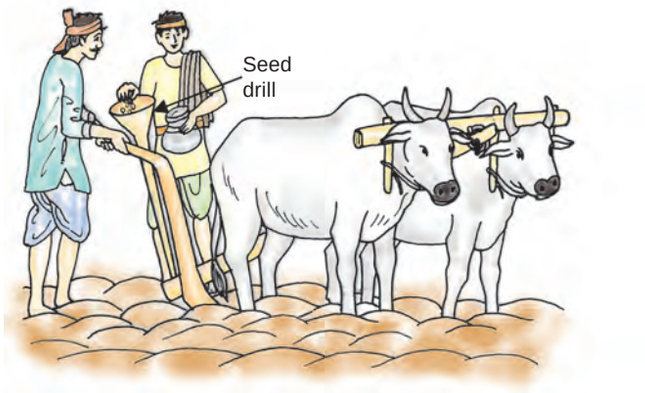

Figure 7. Sowing the seeds by using a traditional seed drill (attached to a plough)

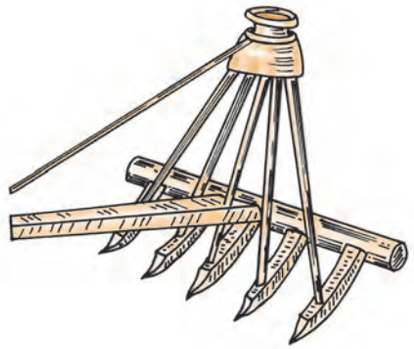

Figure 8. A tractor driven modern seed drill.

these seeds cannot be picked up and eaten by the birds. It is obvious that **the sowing with seed-drill is much better than sowing by hand.** A bullock driven seed-drill has just one long iron tube with a funnel. The tractor driven seed-drill has 5 to 6 iron tubes joined together with a common funnel at the top (see Figure 8). When the seeds are put into the funnel of such a seed drill, the seeds are released through all the tubes and get sown into 5 or 6 furrows of soil simultaneously. By using such tractor driven seed-drills, the sowing of seeds can be completed quickly. Most of the **crops like wheat, gram (*chana*), maize and millet etc, are grown (or cultivated) by sowing the seeds directly into soil**.

Precautions for Sowing Seeds

The following precautions should be taken while sowing seeds in the soil.

(*i*) The Seeds Should be Sown at Right Depth in the Soil Suitable For Germination. If the seeds are just spread on the surface of the soil, then the seeds will be eaten up by the birds. And if the seeds are sown too deep, then they may not germinate because they cannot breathe (cannot get sufficient air) at greater depth. So, the seeds should be sown at right depth in the soil which is suitable for germination. This right depth is learnt by experience.

(*ii*) The Seeds Should be Sown at Right Intervals or Spacings. The seeds should neither be placed too close nor too far apart. This is because if the seeds are sown too close, then plants formed from them will also be too close, and will not get enough sunlight, water, and other nutrients. Thus, an appropriate distance between the seeds is important to avoid overcrowding of plants. This allows the plants to get sufficient sunlight, nutrients and water from the soil. On the other hand, if the seeds are sown too far apart, then it will be a wastage of field space.

(*iii*) The Seeds Should Not be Sown in a Dry Soil. Moisture in the soil is necessary for the germination of seeds. So, if seeds are sown in a dry soil, they may not germinate at all.

(*iv*) The Seeds Should Not be Sown in a Highly Wet Soil. If the seeds are sown in a highly wet soil, then on drying, the soil surface becomes hard and because of this hard surface of soil, the germinating plumule will be unable to come out of ground. Moreover, the seeds are not able to respire properly due to lack of air under these conditions of hard surface of soil.

Advantages of Sowing with a Seed Drill

The sowing of seeds with a seed drill has the following advantages :

(*i*) By using a seed drill for sowing, the seeds are sown at correct depth and correct intervals (or spacings).

(*ii*) The seeds sown with a seed drill are in regular rows.

(*iii*) When the seeds are sown in furrows by a seed drill, the seeds get covered by soil and hence these seeds cannot be picked up and eaten by birds. This prevents damage caused by birds.

(*iv*) Sowing by using a tractor-driven seed drill saves time and labour.

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