CLASS VI

1 What is Agriculture?

How are the requirements for food, including fruits and vegetables, of the large population of our country met?

Paheli and Boojho visited *sabjimandi* to buy vegetables and fruits for their daily consumption. There they saw a variety of vegetables and fruits. They asked the fruit and vegetable vendors about where these fruits and vegetables came from. They were told that these were supplied by the fruits and vegetable growers.

Fig. 1.1 Vegetables and fruits in sabjimandi

Can families who do not have farms grow vegetables at home?

Have you or anyone in your family ever grown any vegetables? Will you be able to supply some of your home-grown vegetables to your neighbours? To supply them regularly, one would need to grow them on a larger scale, which would require a large area. Many of you might have seen big fields — may be while travelling in a train or in and around villages.

When one kind of plant species is cultivated on a large scale in a vast field, it is called a **crop**. For example, crop of paddy means that only paddy is grown in the field at one time.

Fig. 1.2 Agricultural farm

You know, I read a very interesting book called *Animal Farm* by George Orwell.

5Fs of agriculture are Food & Fodder; Fibre; Forest; Flower and Fuel.

Does Fig. 1.2 look like a farm? There are many divisions in this farm. In such a farm, different cereals (paddy, corn and wheat), pulses, oilseeds, fruits and vegetables, and other crop plants are grown on a large scale.

Did you know that there are special farms where animals are reared? The produce from these animals are used by humans everyday. Try and complete the table below:

Table 1: Useful supplies of agriculture

Name of the crop cultivated	Useful supplies	Name of the animal reared	Useful supplies
Paddy		Cow and Buffalo	Milk, ghee, butter, cheese
Cotton		Goat	
Tea		Sheep	
Sugarcane		Camel	

The systematic cultivation of plants and rearing of animals on a large scale is known as **agriculture**. We have seen till now that agriculture satisfies most of our needs for food and non-food products.

Table 2

Agricultural Products	
Food	Cereals, pulses, fruits, vegetables, honey, milk, egg, sugar, spices, etc.
Non-food	Fibre, timber, leather, manure, etc.

1.1 Major Crops of India

A large number of crops are grown in India. If you think of the variety of crops grown from Kashmir to Kanyakumari and the western coast of Gujarat to the extreme north-eastern state of Arunachal Pradesh, you will find a huge variation. Try to find out which crop is grown in a particular region and the climatic conditions in that area. Can you relate the growing conditions of the crop with the climatic and soil conditions? You will find that the soil and climatic conditions are favourable for a particular crop. For this reason there is a variation in crops of different regions.

Ask your friends which region of the country they belong to. During the lunch time you might have shared food with them. Did you notice that their food preparation and habits are different? Have you ever thought what can be the reason for that? If you learn about the crops produced in different parts of the country, you will find that some specific crops are grown more there than in the other parts. You will also note that the crops that are grown abundantly in a particular region are generally used as staple food by the people of that area.

Fig. 1.3 Cotton crop

Fig. 1.4 Cereals

Fig. 1.5 Pulses

Fig. 1.6 Oil Seeds

Table 3: Some common crops grown in India

Food crops	
Cereals	Rice, wheat, oats and barley
Millets	Maize, sorghum, pearl millet
Pulses/legumes	Chickpea, pigeonpea, moong
Oilseed crops	Mustard, sunflower, soybean, groundnut
Root crops	Sweet potato, carrot, radish
Tuber crops	Potato, Tapioca
Sugar crops	Sugarcane, beetroot
Fodder crops	Berseem
Fibre crops	Cotton, jute
Plantation crops	Tea, coffee, rubber, banana, coconut

1. Tilling (breaking of soil into smaller pieces) with the help of tiller

2. Soil preparation (adding manure and fertilisers)

3. Soil preparation (ploughing)

4. Sowing of seeds

5. Irrigation

6. Protection—Spraying pesticides/ bio-pesticides

7. Harvesting—Cutting of crops
Threshing—Removal of grains from the chaff

8. Transportation of agricultural commodities

9. Storage—Keeping the crop safe in store

10. Happy and healthy production and high earning

Fig. 1.7 (1–10) Pictorial story of farming

Fibre crops are a source of fibre used in making textiles, for example, cotton, jute, etc.

We get a variety of cooking oils from different oilseed crops like groundnut, mustard, soybean and sunflower. Oil extracted from oilseeds, forms an important component of our diet and serves as raw material for the manufacturing of hydrogenated oils, paints, varnishes, soaps, lubricants, etc. Oil cake is the residue after the oil is extracted, which forms an important cattle feed and manure.

Plantation crop is specifically grown for widespread commercial use such as tea, coffee, cocoa, rubber, coconut, banana, etc. India is a leading tea producing country in the world and is famous for its tea gardens in Assam and Darjeeling in West Bengal. Tea is processed by drying tender leaves of tea plants. Coffee is grown in the hills of Karnataka. There are large coffee estates in the hills of Western Ghats. Did you know that the coffee you drink comes from processing coffee beans?

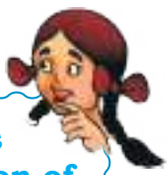
Fig. 1.8 (a) Tea plantation

Fig. 1.8 (b) Coffee plantation

Horticulture includes the small scale gardening of annual and perennial plants for production of flowers, fruits, vegetables, medicinal herbs, etc., under farming.

Fig. 1.9 (a) Orange fruit tree

Fig. 1.9 (b) Medicinal herb (Mentha species)



Does cultivation of different crop plants require different environmental conditions?

Activity 1.1

- Find out any two cereals and pulse crops grown in your area.
- Match the following.

1	Jute	A	Wool
2	Animal	B	Millet
3	Rubber	C	Manufacturing of bags
4	*Ragi*	D	Food crop
5	Wheat	E	Plantation crop

Cotton crop provides fibre as raw material for the textile industry. Cotton seed provides edible oil and is also used as animal feed. I wonder how silk is produced!

1.2 Crop Seasons in India

India is a country of diverse crop seasons. All crops do not grow in the same season. Some crops grow in summer, while others in winter. In India, crops are grown in three different seasons *viz. kharif*, *rabi* and *zaid*.

Let us try to find out the crops grown in different crop seasons.

Table 4

Crop Seasons	Sowing	Harvesting	Crops grown
Rabi	September–October	April	Wheat, mustard, chickpea, barley, gram, pea, linseed, mustard, lentil, potatoes

Kharif	June–July	October–November	Rice, cotton, *moong* bean, *urad* bean, maize, *jowar*, *bajra*, groundnut
Zaid	March–April	May–June	*Cucurbits*, muskmelon, watermelon, cucumber, ladyfinger

Activity 1.2

Fig. 1.10

- Collect various types of grains from a grocery shop and bring in the class.
- Take a wool ball and stick the wool on the boundary of all states in the map of India.
- Use a blindfold one by one and identify grains of various crops by touching, feeling and smelling them.
  (Teacher can facilitate by writing the names of the identified crops on the blackboard.)
- Touch the map of India and identify the state where that particular crop identified by you is grown on a large scale.
- Stick the grains in the concerned state on the map where it grown on a large scale and used as a staple crop.

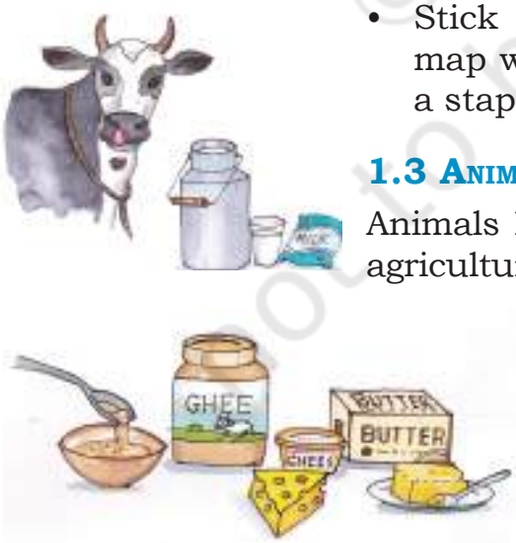


Fig 1.11 Milk and milk products

1.3 Animals in Agriculture

Animals have always been an integral part of Indian agriculture. Many types of animals are reared in the country for various purposes. Animals such as cow, buffalo, goat, sheep, camel, yak and horse constitute the livestock wealth of our country. Animals provide milk, meat, wool, etc., which are essential for humans. Some animals such as bullocks, camels and horses help in land ploughing and transportation.

Also, dung and urine of some animals are used to improve the soil fertility. On the other hand, feed and fodder for animals are obtained from agricultural plants. Thus, animals and farming of edible crops support each other. They play a very important role in providing food material and generating employment and income, especially in rural areas.

1.4 What is Livestock?

The farm animals such as cow, buffalo, pig, elephant, sheep, etc., domesticated and reared for profit, are referred to as livestock. Millions of people depend upon livestock for their livelihood, especially the rural community.

Their products such as milk, butter, curd, cheese, paneer and ghee are sold in the market as they have high nutritional values.

Fig. 1.12 Milking process

Milk giving animals in India are cow, goat, buffalo, camel, etc. Different breeds of these animals are found in different parts of India. There is a variation in the milk production from different breeds. Breeds of animals imported from other countries are known as **exotic breeds**. Here, we will discuss some of the high milk yielding exotic breeds of cows.

Does the milk of Indian breeds provide more nutrients?

Holstein-Friesian is a native cow of Holland. The colour of the skin is generally white and black. It yields up to 7,000 litres of milk per lactation. It is usually selected for dairying.

Jersey is a native cow of Jersey Island (largest of the Channel Islands between England and France). It is generally small. The colour of the skin is black, red

Fig. 1.13 (a) Holstein-Friesian

Fig. 1.13 (b) Jersey

Tharparkar

Sahiwal

Red Sindhi

Gir

Fig. 1.14 Breeds of desi cow

Goat

Camel

Fig. 1.15 Other animals in farming

or white spotted. Each cow yields about 4,500 litres of milk per lactation.

Buffaloes are one-third of the total cattle population in India, but they produce almost three times more milk and contain 50% more fat. Buffaloes have a greater resistance to diseases and have a long lifespan. The skin of buffalo is an important raw material for the leather industry.

Murrah *Jaffrabadi* *Surti*

Fig. 1.16 Breeds of desi buffalo

1.5 Role of Animals in Indian Agriculture

Rearing and breeding of animals to get milk, meat and wool is called **animal husbandry**. In India, a large number of farmers depend on animals for their livelihood. In agriculture, bullocks are the major source of power. They help in ploughing agricultural fields, harvesting of crops and transportation of agricultural produce. The bullocks save a lot of fuel, which is required for the use of tractors, combine-harvesters, etc.

1.6 Other Agricultural Practices

Rearing of domestic chicken, turkey, fowl and ducks for eggs and meat is called **poultry farming**.

Bee-keeping for honey production and rearing of silkworm for production of silk fibres are other practices in agriculture.

Activity 1.3

- Make a visit to an animal farmyard. Talk to the farm manager and get information about the *desi* (indigenous) and foreign breeds of any one livestock in your area.
- Collect information about how they are useful in agriculture.

Fig. 1.17 Animal farmyard

1.7 Importance of Agriculture

In India, agriculture is a major industry creating vast employment opportunities. It helps in maintaining healthy environment by providing food to the human beings, birds, animals (both domestic and wild) and all organisms on the earth. It provides raw materials like leather, lard (fat), etc., for many industries. Our country is a leading producer of many agricultural products in the world such as tea, coffee, pulses, milk, rice, wheat, etc. The diverse geographical conditions of India due to its large area is exceptional for agriculture because it offers numerous favourable conditions for growing different crops. There are plains and fertile areas with long growing seasons and wide variations in climatic conditions. Besides this, India has been steadily making ground-breaking efforts to increase production by using science and technology.

According to the news headlines, heavy and continuous rains affected wheat crop at the time of harvest.

1.8 Constraints in Agriculture

Among various challenges, global climatic change is the recent one faced by agriculture. It has been anticipated that its effect on agriculture would be massive. It is predicted that due to climate change, temperature would increase from normal temperature to 2°C higher, there would be an increase in sea level, and more powerful cyclones, irregular rainfall, etc., may be expected. These changes would badly affect the crop production.

1.9 Effect of Climate Change on Livestock and Animal Husbandry

Climate change affects livestock both directly and indirectly. Change in air temperature, humidity, wind speed and other climate factors affect the growth of animals, milk production, wool production and reproduction of animals. Animals suffer from heat-related diseases, infectious diseases and get disturbed due to extreme weather conditions, which affects the quality of their products.

1.10 Impact of Agricultural Practices on Environment

Due to application of more urea, plants were damaged in the field!

Indiscriminate use of fertilisers and pesticides to enhance crop production leads to pollution of air, water and soil. The pesticide residues in the soil may escape to groundwater or reach rivers and waterbodies by **run-off**. Certain greenhouse gases such as methane emitted from agricultural lands also pollute the air. Deforestation is yet another undesirable practice which may lead to increased pollution, soil erosion and desertification.

To overcome the above problems, good agricultural practices can be implemented. We shall now discuss some exemplary practices.

1. Use organic manure as far as possible or judicious use of chemical fertilisers.
2. Use of pesticides can be minimised by using biological control methods, for example, allowing useful insects to destroy harmful pests.
3. Crop rotation is another environment-friendly practice which restores soil fertility and reduces population of harmful insects.

Glossary

Cattle— Animals kept in a farm to get milk or meat or for carrying heavy loads.

Desertification— Land degradation in which relatively dry area of land becomes increasingly arid, typically losing its bodies of water as well as vegetation and wildlife.

Lactation— A period during which milk is secreted by mammary glands of females of mammals after they give birth.

Livelihood— Source of income.

Pesticides— Synthetic chemicals to kill pests.

Run-off — Draining away of water from the surface of an area of land.

Staple food—Food eaten as main food by large number of people.

Soil erosion— Washing away of top soil.

What have we learnt?

1. Agriculture is the systematic cultivation of useful crops and rearing of animals.
2. In India, agriculture is the major source of livelihood.
3. A crop is one type of plant cultivated on a large scale in a vast field.
4. Crops fall into three categories in India, based on their growing season. These are *kharif*, *rabi* and *zaid*.
5. Livestock play an important role in agriculture and economy of the country.
6. A large number of farmers depend on animals for their livelihood.
7. In India, both indigenous and exotic breeds of cattle are used for agriculture.
8. Climate change affects the health of livestock and makes them vulnerable to various diseases.
9. Global climatic change is one of the major challenges faced by agriculture.
10. Conventional agricultural methods have significant impact on the environment.

Something to think about!

- Can we think of replacing non-degradable plastic cutlery with edible organic cutlery made of cereals?
- Find out how many such things you can replace in your day-to-day life to reduce pollution.
- Make a survey in a marriage and other functions and find out the number of cutlery used and make an average account of how edible organic cutlery may help in reducing pollution.

Exercises

1. Choose the correct option to fill in the blanks.

i. *Rabi* crops are usually sown in _____(October to December/January to March).

ii. The_____ (oilseed/cotton seed) is also used as part of fodder for cattle.

iii. Cotton is a _____ (*kharif*/*rabi*) crop.

iv. _____ is an indigenous breed of cow. (*Sahiwal*/*Jersey*)

2. Read the statements and indicate 'true' or 'false'.

i. Cow provides milk, which in turn provides milk products.

ii. Holstein-Friesian is a native cow of Holland.

iii. Sheep are a rich source of meat and wool in hilly areas.

iv. Jersey is an exotic breed of cow.

3. Complete the following table. Fill the names of the products and their source.

Wool	Sheep	Milk	
	Hen	Silk	
	Camel		Fish
Curd			Goat

4. Give one word for the following.

i. Which exotic breed of cow yields 7,000 litres of milk per lactation?

ii. What is systematic growing of useful plants and rearing of animals called?

iii. What are tea, coffee, rubber and banana crops called?

5. Answer the following questions. (Short answer)

i. What are agricultural products? Name any two.

ii. What are the harvesting months of *zaid* and *kharif* crops? Give five examples for each of them.

iii. In which state of India do you find large coffee plantations?
iv. What is animal husbandry? Why is bullock important in agriculture?

6. Answer the following questions in detail.

i. What is agriculture? What is the importance of agriculture in India?
ii. What is a crop? Differentiate between *rabi* and *kharif* crops.
iii. What do you understand by crop seasons? What are the different crops grown and harvested in these crop seasons?
iv. Describe the common food crops grown by the Indian farmers.
v. Describe plantation or commercial crops giving examples.
vi. What is horticulture? Which type of plants are grown under horticulture? Give some examples.
vii. Differentiate between the features of the two exotic breeds of cow you have learnt.
viii. What is the effect of climate change on livestock and animal husbandry?
ix. Describe how conventional agricultural methods affect the environment.

7. Project Activity

i. Do some research work and find out the geographical conditions such as temperature, rainfall and soil required for growing wheat. Prepare a report on that.
ii. On an outline map of India, indicate the states where rice and wheat are used as staple foods.

8. Group Activity

i. Visit a nearby poultry farm or collect information about poultry using Internet. If you plan to develop a poultry farm in the backyard of your house, how will you go about it?

ii. Divide yourselves into three groups; collect information on any three sections of animal husbandry such as rearing of silkworm, bee keeping and cattle farming. Share your findings in a group discussion.

9. Field Survey

Plan a visit to an agricultural farm and find out which environment friendly methods are being followed by farmers to cultivate their crops. Prepare a report on your visit.

CLASS VII

2 Conventional versus Organic Farming

While coming back from school, Paheli and Boojho saw Himmat Singh, a farmer in the village, who was using spray-on in his crop field. Both of them became curious and wanted to know what Himmat Singh was doing. Boojho asked Himmat Singh about what he was spraying on the crop and why. Himmat Singh waved his hand to the children to keep themselves away from the field and wait till he finishes. After completing his work he came to them after washing hands. Boojho and Paheli together waited curiously. The farmer explained that he was spraying pesticides on plants for controlling insects and pests that spoil the crop, affecting the quality of the produce. Spraying of pesticide on crop fields kills both insects and pests.

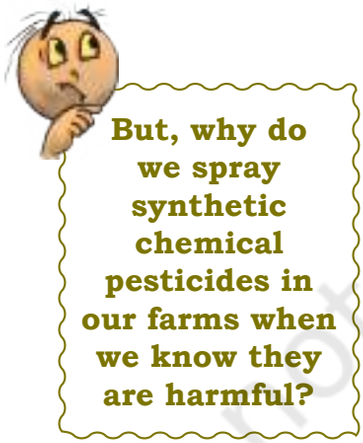


Fig. 2.1 Spraying of pesticides in the crop field

Next day in school, both shared their experience about the incident of the previous day at the field. They asked their teacher why the farmer had asked them to stay at a distance. Were the chemicals harmful? In class, they discussed the use of synthetic chemicals to increase production in agriculture.

Synthetic chemicals used in agriculture are categorised on the basis of their application in agriculture as follows:

I saw the *mali* using urea to enhance growth of plants in the garden. Are these synthetic chemicals 'fertilisers'?

Soil Supplements

- *Synthetic fertilisers*: These are the chemical supplements added to the soil, such as urea. They provide essential nutrients which support plant growth.
- *Growth agents*: These are synthetic, plant growth agents and perform specific functions in the overall development of the plants. For example, Indoli-3 acetic acid (IAA) and 2, 4 diphenoxy-acetic acid (2, 4-D).

Crop Protectors

Pesticides control pests and protect crops in agriculture. These include insecticides, herbicides, weedicides, fungicides, nematicides, etc., to control various harmful organisms in agriculture.

Food Additives for Livestock

Additives are chemicals used as food supplements for farm animals.

By now you must have understood that chemicals are used to improve quality and quantity of the farm produce. They improve plant nutrition and provide protection to the crops resulting in high production.

2.1 Conventional Farming Practices

Prior to 1960s, our country witnessed food crisis due to low crop production. The country had to import foodgrains. This is the reason why agriculturists started getting attracted towards chemical inputs in the

farming practices. The industries in England started producing chemical fertilisers and pesticides in large amounts for use in agriculture to enhance production. Gradually, by the middle of the 20th century, tractors and other infrastructure such as machines, chemical fertilisers and pesticides, etc., came into existence and became rapidly popular in the agricultural practices. Irrigation facilities were improved and high-yielding crop varieties were introduced in Indian agriculture

Green Revolution in India

As a result of new advances in agriculture, the global productivity was increased drastically. This was the time when new chemical fertilisers and synthetic herbicides and pesticides were created. The chemical fertilisers provided extra nutrients; and synthetic herbicides and pesticides controlled weeds, insects and diseases caused by various organisms. This resulted in higher productivity.

In addition to the chemical advances, high-yielding variants of crops were introduced. Implementation of multiple cropping (growing two or more crops throughout the year) during this period led to higher productivity. New farming techniques and advances in agricultural technology were utilised by farmers all over the world, and when integrated, it intensified the results of the Green Revolution. Green revolution led to an increase in foodgrain production, especially in Punjab, Haryana and Uttar Pradesh during the early phase, and this was the period when India became self-sufficient in foodgrain production.

25 March 1914 – 12 September 2009

American biologist, Norman Borlaug was awarded the Nobel Prize in 1970 for his initiatives worldwide that contributed to the extensive increase in agricultural production — termed as the Green Revolution.

Indian plant geneticist, M.S. Swaminathan, also called the father of the Indian Green Revolution, is the pioneering force behind the change.

7 August 1925 – Present

Endosulfan: How did it affect Kerala?

Endosulfan was sprayed in the cashew plantations of Cheemeni estate in Kerala, from 1978 onwards regularly — thrice every year. It was sprayed aerially by using helicopters and small planes. The aerial spraying of Endosulfan was undertaken against the menace of the tea mosquito bug. As the plantations were mostly in mountainous areas, the pesticide drained and got washed down the slopes during the monsoons mixing into drinking water below. The consumption of this water by the people and animals resulted in diseases ranging from physical deformities, cancers, birth disorders and damages to brain and the nervous system. Children were found to be the worst affected having congenital anomalies, mental retardation, physical deformities and cerebral palsy.

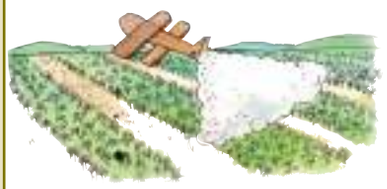


Fig. 2.2 Spraying of endosulfan

during 1967–68. These practices in agriculture brought tremendous increase in production bringing in a revolution in Indian agriculture called the **Green Revolution**.

However, these days, there are many food items available which are grown without the use of synthetic chemicals. The conventional agricultural practices have certainly benefitted the economy of the country but they have resulted in the harmful effects on the environment and on our health.

Harmful Effects of Conventional Farming

1. Use of synthetic chemical fertilisers lowers the quality of soil over a period of time.
2. Chemical pesticide contaminations in water and food affect the environment and our health. The insects which are harmful to crops become more resistant to the environment due to prolonged pesticide use.
3. The continuous use of chemical fertilisers reduces soil fertility as it lowers the content of organic matter (humus) in the soil. Due to low level of organic matter, soil loses the ability to hold small soil particles together and thus can be easily lost by erosion.

I have seen some newspaper reports while surfing the Internet about these chemicals causing many diseases in humans!

See! He is not spraying synthetic chemical pesticides in his fields!

4. Heavy irrigation results in soil erosion and intensive tillage results in reduction of soil flora and fauna which are important for ecological interdependence.
5. Growing a single crop in the field in conventional farming causes problems for nutrient recycling of the soil and thus, reduces diversity of plants and animals.
6. Under conventional farming biodiversity is affected. It lowers the number and activity of earthworms and microbes. The number of pollinators also decreases and results in low production.

Paheli and Boojho are new wondering what alternative methods of farming practices there might be, which will result in safe agricultural production. While walking towards home, their attention was attracted towards a farm where they noticed a cowshed with cattle and many birds moving in the field. They could see various crops in the field along with the main crop. There was a boundary of trees around the field. They entered the field where farmer Gopicharan was spreading cow dung and vermicompost manure in the field. They saw earthworm burrows on the ground. In this field everything seemed natural. There were no chemicals.

Now-a-days, I have seen people prefer to buy food items categorised as 'organic' in the market? Why?

Without any hesitation they entered the field. Gopicharan told them that these are nature-friendly farming practices. The produce would be organic.

Fig. 2.3 Organic farm

2.2 What is Organic Farming?

Organic Farming believes that the plants, animals and human beings stay closely associated with each other, as shown in Fig. 2.3. Therefore, the primary objective of organic farming is to produce safe agricultural products, maintain and improve soil fertility, quality of food, environment and health. Organic farming completely avoids the use of any synthetic chemicals such as fertilisers, growth agents, food additives or pesticides. Organic farming reduces the dependency on external inputs and gives the optimum productivity by making the best use of ecological principles and processes, which eventually leads to the reduced cost of crop cultivation. It is a method of farming where crops are grown by using organic manure, bio-fertilisers and by adopting other nature-friendly practices such as crop rotation, mixed farming, etc. Use of synthetic chemicals and fertilisers is completely prohibited.

Fig. 2.4 Organic produce

The gardner *bhaiya* in the school told me once, that the farmyard manure, green manure, compost, crop residues and vermicompost are organic manure.

2.3 Status of Organic Farming in India

Many states in India including Kerala, Uttarakhand, Sikkim, Gujarat, Rajasthan, Karnataka, Himachal Pradesh, Uttar Pradesh, Odisha and Madhya Pradesh are the major contributors in organic farming. Among all the states, Madhya Pradesh has covered the largest area under organic certification, followed by Himachal Pradesh and Rajasthan. Sikkim was the first state declared as a fully organic state in 2016. It has approximately 75,000 hectares of its land under organic cultivation.

Activity 2.1

Collect seeds of various types of crops grown in a farm near you. Sow these seeds in the kitchen garden of your school. Use only organic methods of farming and closely monitor the progress of the plants.

Sir Albert Howard gave the concept of organic farming in 1940. He is also known as the 'Father of Modern Organic Agriculture'.

Sikkim, the Fully Organic State of India

The Government of Sikkim started the organic initiatives in the year 2003. Sikkim Organic Mission was launched in 2010 for conversion of entire agricultural land into organic management system, following the guidelines outlined in the National Programme in Organic Production (NPOP). The Government of India declared Sikkim as the first organic state on 18 January 2016 and it is celebrated as the **Sikkim Organic Day**. Farmers from all over Sikkim bring their produce such as fruits, vegetables, flowers and cereals to an exhibition. They are also awarded prizes for the best produce in various categories. A token *krishi* loan is also given to the farmers.

Activity 2.2

Locate the states in the map below which are contributing to organic farming. Identify the states with different colours. Take the help of your teacher to make the index.

Organic Farming in Sikkim

Dhanpati Sapkota is an award winning progressive farmer from Sikkim. In the beginning, he cultivated paddy, maize and millets for domestic consumption. When the initiative of organic farming was taken up by the state, he switched over to organic farming practices from conventional farming.

With this, he got an opportunity to attend training as well as exposure visits within the state which helped him a lot in his initial days of organic farming. In the beginning, for at least two years, production was very less which disheartened him. So, he began experimenting in his farming system. In one plot of his land he followed organic method in total, while on the other plot partial organic method was followed where he continued to use chemical fertilisers and pesticides. The immediate results showed a better yield in the latter. However, after a year or two he observed soil deterioration in it. This eventually convinced him to shift his entire farming to organic farming. Along with this, he also began experimenting with the use of bio-fertilisers. To protect plants from diseases, insects and pests, he started preparing his own bio-pesticides, fungicides and insecticides from locally available plants, animal products and discovered that they were very effective. He also focused on animal husbandry and livestock management.

Today, he has milking cows, thus, he sells organic milk also. He gets supply of manure from the cows for his farm. He has established a vermicompost unit also in his farm. He cultivates cherry pepper, cauliflower, broccoli, tomatoes and maize in rotation. He sells his organic products to Sikkim Supreme (food processing factory in Sikkim) and Sikkim State Cooperative Supply and Marketing Federation limited (SIMFED). A large part of his produce is also sold to local households for domestic consumption. He believes that to have a healthy life we all need to adopt organic farming practices.

Source: Department of Agriculture, Sikkim

Fig. 2.5 Dhanpati Sapkota in his field

Learning from Dhanpati Sapkota's experience, we see that effective organic farming depends on farm animals like cows, buffaloes, sheep and goat. These animals have many important roles to play in agriculture—cow dung and its urine are used as manure alongwith insect-pest and disease management. They increase soil fertility. These

Fig. 2.6 Common weeds of agricultural farm

animals also help in controlling weeds in the agricultural fields. Besides, they help the farmers in ploughing agricultural lands and in transportation of agricultural goods. The crop residues of the farm are given to the animals as food and fodder. Therefore, in the organic system of farming, there is an interaction and interdependence of animals and plants.

2.4 How Useful is Organic Farming for Us?

Organic farming provides us healthy soil, plant and 5Fs of agriculture (food & fodder, fibre, fuel, forest and flower). The biological activity in soil increases as we add organic manure to it. For example, the population of earthworms and other beneficial organisms increases tremendously under organic soils. These kind of organisms increase availability of food to the plants. Such plants give us healthy food which is free from harmful chemicals. Since organic farming discourages the use of chemicals, pollution of air, soil and water is minimised.

Fig. 2.7 Mulching

The various benefits from organic farming not only improve the lives of the farming community but also help in conserving the precious natural resources and environment. The other benefits of organic farming are as follows:

1. **Improvement of Soil Fertility**
   Organic farming improves soil fertility. It improves the supply and retention of plant nutrients. This in turn keeps agricultural production at a higher level and makes it sustainable.

2. **Reduced Water Usage and Requirement**
   Soil building methods in organic farming like mulching, use of green manure and crop rotation improve the physical condition of soil which helps

in preventing soil erosion. It also improves the water-holding capacity of soil and hence, roots can penetrate easily. Also, farmers require less water to grow different crops.

Mulching is a layer of organic material like straw, dry leaves or compost to prevent evaporation of water, improve soil fertility and reduce weed growth.

3. Safer Working Conditions

Farmers and farm workers enjoy safer working environment and direct health benefits with the adoption of organic farming. It is common knowledge that a large number of people working in the agriculture sector are affected by a number of diseases because of the use of agro-chemicals.

4. Better Quality of Health

The risk of contamination of food and water is substantially reduced, when no pesticides are used. Organic farming reduces human and animal health hazards which in turn lead to better quality of health. It also helps in keeping environment healthy by reducing the level of pollution.

5. Greater Biodiversity

Organic farming provides a safe place for wild plants. Lands around the organic farms have more types of wild plants which provide benefits for wildlife. These plants are important for birds, bees, beetles and butterflies. Ladybirds, a type of beetle, feed on many insects which are harmful for crops. All these species of plants, animals and other living things co-exist in harmony.

Activity 2.3

Observe your local surroundings and make a list of diverse fauna and flora you noticed. Present your observations in your class.

Fauna	Flora

Activity 2.4

Visit an organic and a conventional farm in your area and observe differences in plant and animal species. Present your findings about the differences in biodiversity of flora and fauna in these farms in the form of a poster.

Activity 2.5

Bring two soil samples — one from an organic farm and the other from a conventional farm. Now with the help of your teacher, count the total number of earthworms in each type of soil. Record the life diversity in the soil of an organic farm.

2.5 Significance of Higher Biodiversity at Organic Farms

Biodiversity is an important basis for many processes in our ecosystems to function. Habitats with numerous species are shown to better adapt to environmental changes. Many ecological processes are influenced by higher biodiversity.

Fig. 2.8 Pollination

1. Pollination

Flower-visiting insects such as honeybees, wild bees and bumblebees benefit from the higher coverage and diversity of secondary flora in organic grain fields. Organic agriculture, thus, improves the pollination of flowering plants in the surrounding environment.

Activity 2.6

Visit an organic farm. Sit peacefully and close your eyes and try to hear various sounds of visiting pollinators. Try to identify them. Open your eyes and note the kind of pollinators visiting different flowers. Try to identify these insects with the help of a farmer or your teacher.

Note for teachers: Teachers can use 3D models of these insects. Students may be allowed to touch and feel these models.

Conversation between two Bees

Cheku: Hey! Piku bee, have you heard of vanishing bees in our neighbouring village?

Piku: Oh! Yes Cheku!! I heard few beekeepers talking about it. They were saying that beekeepers from the other village are continuously losing about 30% of their bees every year.

Cheku: But, here we are not facing any such problem. Farmers are doing mixed farming in their mango grove and getting benefits of high production of both mangoes and honey.

Piku: Yes, in fact our population has increased tremendously since last few years. That's why production of mangoes is increasing every year.

Cheku: So, what can be the possible reason for this decline of bee population in the nearby village?

Piku: Farmers in that village still use chemical fertilisers and pesticides in their mango grove which are harmful for us and our environment. I think these chemicals are the reason behind the low number of bees.

Cheku: (Happily) Thank God! We live in this village. Here everyone uses organic farming practices. All are living together in harmony. More mango! More honey!! All are happy!!

I wish someone could guide farmers of that village too.

2. Reduction in soil erosion on arable land

Diverse plants grown on organic farms reduce the loss of soil by erosion. Growing of legumes and other deep-rooted crops help to bind soil particles together and hence reduce soil erosion. Further, microbial activity is high in soils at organic farm, which in turn improves soil structure. The water-holding capacity of soil increases and it absorbs more water and remains moist for a longer time. It results in reduced loss of water by run-off and hence, prevents the loss of soil.

Fig. 2.9 Heap of cow dung

3. Degradation of dung and other organic matter

Organic pastures allow richer fauna to exist in dung than in conventional pastures, as they are not contaminated by chemical veterinary drugs. Dung fauna considerably add to the degradation and recycling of dung and in turn improve the quality of produce.

Activity 2.7

Visit an animal farmyard and discuss with the caretaker—

- How does he/she treat cow dung?
- How long does it take before it can be used as a manure?

4. Natural pest reduction

Fig. 2.10 Natural predatory insect feeding on insect-pest

Organic farming leads to a significantly more balanced number of beneficial insects that reduce pests and yield losses in crops. Certain insects (pests) harmful to crops are controlled by other insects (predators). Such predatory insects are found in more number in organic farms. Some examples are given in Table 1.

Table 1: List of selected pests and their predator insects

Insect Pest	Insect Predator
Aphids	Lacewing, Ladybug, Minute pirate bug, Praying mantis
Cabbage loopers	Parasitic wasp
Caterpillars	Minute pirate bug, Parasitic wasp
Cutworms	Parasitic wasp

Activity 2.8

You can try to make a difference in your home environment. Grow different kinds of flowering plants and use organic manure in your kitchen garden or plants. Do not use any chemical pesticide or synthetic fertiliser. If required, natural means can be used to control the insect-pests or

Fig. 2.11 Organic farming interlinks agriculture, animals and human beings with each other

diseases. When these plants flower, you can find out a number of insects visiting them. Try to identify the species of these pollinators and make a record of it.

Glossary

Arable land—The land which can be ploughed and used to grow crops.

Biodiversity—Diversity of life forms on the earth, such as variety of animals, plants and micro-organisms.

Bio-fertilisers—Substances which contain living micro-organisms that help the plants to grow.

Conventional farming—It is a method of growing plants such as fruits and vegetables using chemical fertilisers and pesticides.

Green manure—Plants or crops which are ploughed back into the soil.

Green revolution— Use of pesticides, artificial fertilisers and high-yielding varieties of crops to meet the increased demand for food products.

Habitat—The natural home or environment of an animal, plant or other organism.

Insect-pest or pest— A destructive insect that attacks crops, food, livestock, etc.

Pasture—Land covered with grass and other low plants suitable for grazing animals, especially cattle or sheep.

Pollinators—A pollinator is an animal or insect that causes plants to make fruit or seeds. Pollinators do this by moving anthers of the flower of a plant to stigma of the pistal of same or another flower. This pollen then fertilises the egg in the ovary of the pistil.

Predatory insects—The predatory insect feeds upon other insects (prey) that are usually smaller and weaker than it, frequently devouring them completely and rapidly.

Run-off— The draining away of water (or substances carried in it) from the surface of an area of land.

Vermicompost— Process of composting using various types of worms/earthworms.

Weed—A plant that grows in an unwanted place, especially in a garden or field where it prevents the cultivated plants from growing freely.

What have we learnt?

1. Synthetic chemicals used in agriculture are categorised as — soil supplements, crop protectors and food additives for livestock.
2. Green revolution due to conventional agricultural practices brought tremendous increase in the agricultural production.
3. Synthetic chemicals used in agriculture contaminate food and have negative impact on our health and environment.
4. Organic farming means adopting nature-friendly farming practices.
5. In India, Sikkim has been declared as the first fully organic state by NPOP.

6. Farm animals play an important role in organic farming.
7. Organic farming increases the soil fertility and reduces soil erosion and water requirement.
8. Organic farming provides safer working conditions and better quality of health.
9. Organic farms are rich in biodiversity.
10. Biodiversity helps in the functioning of nature in many ways.

Exercises

1. Answer the following questions.

i. What type of synthetic chemicals are used in agriculture and why?
ii. Explain the conventional farming practices. What could be the long-term effects of using conventional methods of farming?
iii. What is organic farming? How does organic farming improve soil fertility?
iv. Why are organic farms more diverse in terms of flora and fauna, in comparison to conventional farms?
v. How does organic farming help in reducing soil erosion?
vi. How does organic farming help in controlling pests and insects? Give two examples of predatory insects.
vii. "Animals have an important role to play in organic farming". Elaborate.

2. Provide one word for the following sentences.

i. Synthetic chemical used to control weeds.
ii. A layer of organic material like straw or compost to protect evaporation of water in fields.
iii. An organism that helps in pollination.
iv. Beneficial insects that control harmful insects.

3. Fill in the blanks.

i. In organic farming practices, use of _____ is completely prohibited.

ii. Biodiversity is greater in _____ farms.

iii. Sikkim Organic Day is celebrated on _____ every year.

4. Tick (✓) the correct answer.

i. Organic farming does not use

a) organic waste b) pesticides c) animal manure

ii. Which state of India was declared as the first fully organic state?

a) Gujarat b) Himachal Pradesh c) Sikkim

iii. Which one of the following products is largely exported from India?

a) Tea b) Pulses c) Oilseeds

5. Match Column A with Column B.

Column A	Column B
(a) Father of modern organic agriculture	grazing on pastures
(b) Weed management	largest area under organic certification
(c) Madhya Pradesh	Sir Albert Howard

6. Read the statements and write true or false.

i. Cow dung and urine are used as manure alongwith insect-pest and disease management in organic farming. _____

ii. Compost is a synthetic chemical used in conventional farming. _____

iii. In an organic farm, the number of pollinators is less than a conventional farm. _____

7. Project Activities

i. Visit a farm near you and find out —

a) Location of the farm.

b) Name of the farmer.

c) What type of farming he/she does?
d) What kind of manure does he/she use on his/her farm?
e) What are the type of crops grown in the farm?
(Besides the questions given above, prepare more questions with the help of your teacher and friends.)

ii. Prepare a picture chart showing various types of organic manure.

iii. Prepare a collage of animals useful for organic farming.

3 Pillars of Organic Farming

May be we can make the soil chemical free even after a long time of conventional practices.

The field visit and conversation with farmer Himmat Singh and farmer Gopichand provided many insights to Paheli and Boojho about different types of farming practices. After comparing the conventional and organic farming practices, Paheli and Boojho wanted to spread the awareness about the advantages of organic farming to the community for a sustainable living. They wanted to know more about organic farming so that they could follow those practices in the school where they were allotted small piece of land and big earthen pots for growing vegetables and flowers. They were happy that the produce will be organic. They wanted to know more about how a farmer adhering to conventional practices can switch over to organic farming practices. They went to the office of *Utkrisht Krishi Cooperative Society* of their area — a society formed by all the organic growers of that area. The aim of the society was to strictly follow the organic farming practices so that only organic produce would reach the consumers. Thus, all children went to meet the Chief of the Cooperative Society, Maina Devi to know more about the organic farming practices.

Fig. 3.1 Children at the office of Utkrisht Krishi Cooperative Society

Maina Devi discussed the factors which help in the sustainability of organic farming. She called these components 'the pillars of organic farming'.

Organic farming prospers on the following core pillars, absence of even one may cause this farming method to crumble.

1. Organic standards
2. Technology packages
3. Certification and Regulatory mechanism
4. Market network

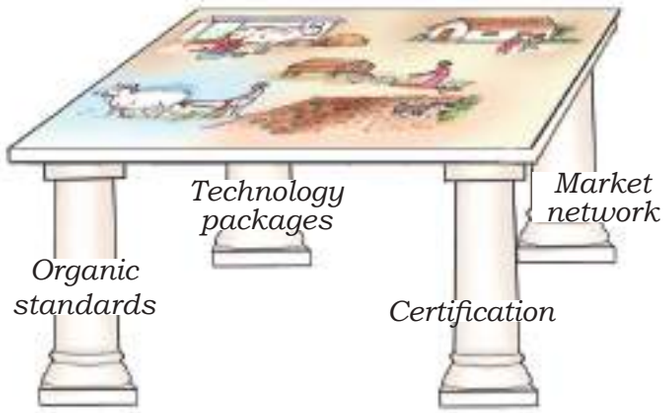


Fig. 3.2 Pillars of organic farming

3.1 Organic Standards and Norms

Organic produce needs to be safe and have high nutritional quality. All farming operations on an organic farm must interact with each other in an effective manner. All natural systems and cycles, involving micro-organisms, soil flora and fauna, plants and animals would have interdependence.

The **organic standards** and norms ensure authenticity of organic products and practices. Regulations for packaging and labelling need to be followed for certification. It is a quality control mechanism for operation of the organic farming and its products.

Is it necessary for an organic farmer to follow these norms?

Conversion Requirements

The time between the start of organic management and certification of crops and/or animal husbandry is known as the conversion period. It is also known as transition period. The whole farm, including livestock, should be converted according to the National Standards for Organic Farming Practices provided by NPOP over a period of three years, in general.

For fulfillment of the principles of organic farming there are legal aspects that ensure safety of food, health and environment. Some important national standards for organic production practices provided by National Programme on Organic Production (NPOP), Government of India and the certification procedure are discussed here.

- A clear separation between organic and conventional production — a buffer zone or a natural barrier — should be maintained.
- A sufficient conversion or transition period (more than three years) be provided to convert conventional production to organic production.
- All the standard requirements for organic production must be applied on the relevant aspects from the beginning of the conversion period.
- Switching back and forth between organic and conventional farming is not allowed.
- All seeds and plant material used in the farming practices must be certified as organic.
- The use of the Genetically Modified (GM) crop varieties or animal breeds for food production in the farm is not allowed.
- Organic farming must maintain and improve the soil structure, organic matter, fertility and biodiversity.
- Only biodegradable organic products of plants, animals and microbial origin, may be used.
- Use of manure or fertilisers with relatively high heavy metal content and other unwanted substances, e.g., basic slag, rock phospate and sewage sludge, human excreta, etc., may be restricted.
- Interrelated natural processes and mechanism for controlling pests, diseases and weeds should be followed extensively.
- Sustainable use of soil and water resources must be ensured.

How much time does it take to convert a conventional farm into an organic farm?

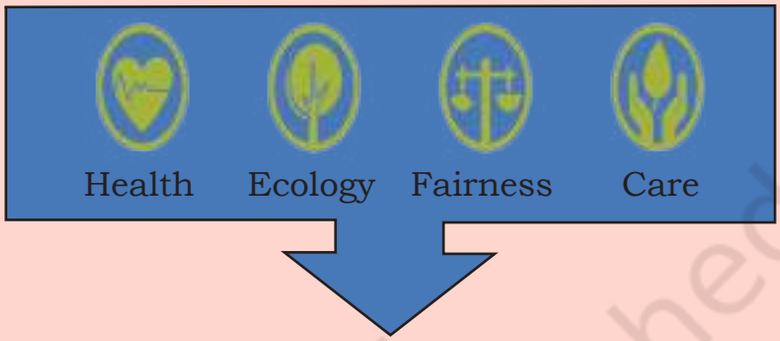
- Farming operations may be encouraged not to use any synthetic feed rations in animal husbandry. Livestock should be fed 100 per cent organically grown feed of good quality.
- Crop diversity and indigenous animal breeding within the farming could be followed.
- Organic farming practices need to contribute beneficially to the ecosystem and create a harmonious balance between crop production and animal husbandry.
- Cultivation of terrestrial crops may be integrated with the soil-based system only.
- Only biological and physical processes that use only additives, processing aids, etc., in organic products' processing, should be used.
- It requires strictly avoiding contamination of chemicals in each step of production and processing of organic material.
- It must use only organic ingredients in organic processing.
- It is important to ensure that while packaging and storage and transportation, containers do not contaminate the organic product they contain.
- Use of socially just and ecologically responsible farming operations towards an entire production, processing and distribution chain, must be ensured.

3.2 Technology Packages

The 'technology package' includes a bunch of guidelines and practices that are adopted for growing crops organically at a farm. These are based on national organic standards and norms. The technology packages for growing organic crops are still evolving in different parts of the country. Here, we will discuss some of the key practices adopted to grow crops at an organic farm.

Principles of Organic Farming by IFOAM

To promote organic farming in the world, the International Federation of Organic Agriculture Movements (IFOAM) was set up in 1972 in France. Presently, the headquarters of IFOAM is in Germany. Its aim is to bring all the countries to work together for an organic world. It has laid down four principles of organic farming.



Principle of Health

This principle points out that the health of individuals and communities cannot be separated from the health of ecosystems—healthy soils produce healthy crops that foster the health of animals and people.

Principle of Ecology

Organic agriculture should be based on ecological systems and cycles, and help sustain them. It states that production is to be based on ecological processes, and recycling.

Principle of Fairness

This principle emphasises that those involved in organic agriculture should ensure fairness at all levels and to all parties—farmers, workers, processors, distributors, traders and consumers. Organic agriculture should provide everyone involved in it a good quality of life, food for all and reduction of poverty.

Principle of Care

Organic agriculture should be managed in a precautionary and responsible manner to protect the health and well-being of current and future generations and the environment.

Source: Luttikholt, L.W.M. 2007. Principles of Organic Agriculture as Formulated by the International Federation of Organic Agriculture Movements. *NJAS*, Vol. 54, No. 4, pp. 347–60. Available at:

http://www.ifoam.bio/en/principles-organic-agriculture/principle health

Seeds and Plant Material

Organic seeds, plants or plant parts/materials such as tubers, rhizomes, germinated plants, etc., of *desi* (indigenous) varieties should be used for growing crop plants. When certified organic seeds and plant materials are not available, chemically untreated conventional materials may also be used. The use of genetically engineered seeds, transgenic plants or plant materials is not allowed. Under organic farming, we do not use any genetically modified crop variety.

Rearing of Indigenous Animal Breeds

We are all aware that India has huge variety of indigenous animal breeds. These animal breeds are well adapted to Indian agricultural conditions just like indigenous crop varieties. Their dung and other waste materials can be used as manure for crops and for enriching the soil.

Fig. 3.4 Cow dung

Activity 3.1

Visit a cow shed in your area. Talk to the cattle farmer and find out the names of *desi* breeds of cow and buffalo.

Mixed Farming

When more than one farming practices are allowed together in one piece of land, it is called mixed farming. Organic farming encourages growing of crops and rearing of animals on the same piece of farmland. This helps in efficient resource management too. As we know, the animal waste can be recycled for growing crops and waste plant-parts such as husk, is fed to animals. Thus, a holistic system is established at the farm.

Fig. 3.5 Mixed farming

Traditional mixed farming of the rice–fish–millet by a Tribe of Arunachal Pradesh

A tribal community named 'Apatanis' living in Ziro valley in the Lower Subansiri district of Arunachal Pradesh can surely be considered as a role model for Organic Farming, not only in India but all over the world. The Apatanis are dependent on agriculture for their livelihood. The popular traditional organic mixed farming practices of paddy-cum-fish culture are their indigenous agronomic practices. Apatanis develop strong bunds around their paddy fields and grow millets on the bunds. This way the system utilises the available limited agricultural paddy field judiciously to produce rice–fish–millet simultaneously and this is considered as one of the best utilisation of land in the world of agricultural practices. The paddy fields are enriched with the traditional manure such as animal excreta like *Paro pai* (poultry dropping), *Alyi ekha* (pig excreta), *Sii ekha* (cow dung) and plant wastes like *Piina* (rice husk), *Poi* (local beer) and *Muyu* (ashes from household burnt). Moreover, after harvesting of paddy, the crop residue is also recycled by burning of the stump, straws and natural decomposition of weeds as well as remaining stump and straws. Thus, the paddy fields are free from agro-chemicals such as weedicides and pesticides. The Apatanis farmers through the indigenous practices of rice–fish–millet culture not only conserve biological diversity but also manage sustainable utilisation of the available resources in agriculture and get triple benefits.

Source: Rai, S.C. 2005. Apatani Paddy-cum-fish cultivation: An indigenous hill farming system of North East India. Indian Journal of Traditional Knowledge. Vol. 4(1), pp. 65-71.

Fig. 3.5 Intercropping

Intercropping

Intercropping is the practice of growing two or more crops in close proximity in the same field. The crops may be sown and harvested at the same time or they may be sown and harvested at different times. Intercrops can be a combination of two or more species, including both annuals and perennials or a mixture. It improves crop production and environmental quality under organic production. Intercropping increases biodiversity, which facilitates better biological control of pests and reduced soil erosion, resulting in reduced pest and disease incidence. Thus, intercropping is a very important practice for successful crop production under organic farming.

Activity 3.2

Visit an organic farm and observe how many crops are grown on a piece of land and how they are useful to each other. Record your observations in a notebook.

Does the nutritional requirement of different crops vary?

Crop Rotation

Different crops are grown season after season in the same field. This practice to alter the crops grown in the same field year after year is called crop rotation. Crop rotation helps to improve soil by changing flora, fauna, crop residue and rooting patterns. A range of crops encourage more diverse and healthy soil microbial community. Similarly, the microbial community is supported by rotating crops with a high carbon to nitrogen ratio (such as corn) with low carbon to nitrogen ratio crops (such as soybeans), thus crop rotation maintains nutrients in the soil. Introduction of both grain and fodder legumes in crop rotation and application of all available organic sources of manure, including animal waste and compost, increase the yield.

Activity 3.3

- Make a survey of various fields. Note the crops grown in those fields after every three months.
- Find out which crop is grown and alternated after which crop by farmers. This data will provide a pattern of crop rotation popular among farmers of a particular region.
- Make a report of crop rotation process and share with the peers.

Use of Organic Manure

The farm soil may be considered as a live platform where we grow plants. It harbours diversified living organisms including flora and fauna along with sensual microbes. These living organisms make the soil live which in turn provides nourishment to the crops. Therefore, favourable farming practices may be adopted keeping in view the maintenance

Fig. 3.6 Compost (organic manure)

Fig. 3.7 Dhaincha (Sesbania aculeata)— an important common green manuring crop

Fig. 3.8 Sannhemp (Crotalaria juncea)— a common green manuring crop in India

of farm for the survival and sustainable living for all. Under organic farming, the soil is kept healthy so that the plants get necessary nutrients. Organic manure or organic inputs are used to increase the soil fertility. Compost, vermicompost, green manuring, bio-fertilisers, natural oil cakes, etc., are used as organic manure to maintain the soil fertility, which may last longer. Use of organic manure increases soil biodiversity as it acts as a source of food for living organisms in the soil. Organic farming also avoids eutrophication of waterbodies caused by the oversupply of highly soluble chemical fertilisers, manure and slurry, as organic farms depend highly on the use of organic manure.

Biological Insect-pest and Disease Management

Bio-pesticides are an important component of organic farming. They build a robust system of managing the insect-pests by other parasites and predators in the ecosystem. Unlike conventional farming where chemical pesticides kill all insects, bio-pesticides do not kill the insects but drive them away from the crop field. Thus, the population of predators and parasites remains maintained which in turn, naturally manages the population of harmful insects. This way over a period, a permanent system of biological pest management is established on the farm. Similarly, the diseases are also managed and controlled in an organic farm.

Maa told me to pluck *neem* leaves for use in storing grains for protection from insects.

Products prepared at the farm from local plants, animals and micro-organisms are used for pest, disease and weed management. Certain extracts from seeds and other plant parts can be used as pesticides. For example, *neem* seed extract can be used to control some insect-pests of crops.

All equipment from conventional farming systems need to be properly cleaned and free from residues before being used on organically managed areas.

Yes, *nimboli* (*neem* fruits) are used to kill lices.

On-farm Resource Management

Under organic farming, on-farm available resources are managed and recycled. For example, the agro-wastes, such as crop plants residues, leaves and animal dung can be converted into compost using earthworms. This is known as vermicomposting. Thus, under organic farming, a permanent on-farm resource management system can be established.

Fig. 3.9 Vermicompost

3.3 Certification and Regulatory Mechanism

Organic certification is a certification process that ensures that the food and other agricultural products are organic. It generally involves the inspection of farming practices, processing, packaging, shipping, etc., of organic products according to a set of standards. These include avoidance of synthetic chemical inputs (e.g., fertiliser, pesticides, antibiotics, food additives, synthetic preservatives, colours, etc.), irradiation, and the use of sewage sludge; avoidance of genetically modified seeds; use of farmland that has been free from prohibited chemical inputs at least for a fixed number of years (often, three or more); for livestock, it is important to adhere to specific requirements for feed, housing and breeding; keeping detailed written production and sales records; maintaining strict physical separation of organic products from non-certified products; undergoing periodic site inspections, etc.

Does the certification process include thorough inspection?

Organic certification assures quality of food and produce, prevents fraud and promotes business.

Why is certification necessary?

3.4 Marketing Network

Are the organic certified products costly?

The emerging demand for organic products is both a constraint as well as an opportunity for farmers, suppliers and traders of agricultural products.

The attributes of organic products most likely to influence consumers are:

1. health (i.e., minimal artificial chemical residues in the product and high nutritional value)
2. environment (i.e., environment-friendly production and processing)
3. taste
4. animal welfare
5. minimal processing
6. novelty
7. fashion

Fig. 3.10 Organic products available at a shop

Conversely, the attributes most likely to limit consumption of organic products are:

1. high price
2. limited availability
3. skepticism about the credibility of product claims
4. poor appearance
5. non-awareness of organic
6. contentment with existing products

Promoting Input Market for Organic Farming

The Government of India is promoting the production and use of bio-fertilisers to make them popular. The government has initiated a project, 'National Project

on Development and Use of Biofertilisers', for this purpose. The main objectives of this project are—

- Production and distribution of Bio-fertilisers (BFs).
- Developing standards for different BFs and quality control.
- Releasing of grants for setting up bio-fertiliser units.
- Training and publicity.

Activity 3.4

Make a project for spreading awareness about the organic farming processes, organic products and their health benefits, keeping in mind the following points:

- The farming techniques.
- Availability of organic food.
- Benefits for maintaining environment.
- How to recognise an organic product?
- Scope of marketing of organic products.
- Examples of processed organic products.

The report can then be discussed in the class.

Challenges in Marketing of Organic Inputs

Though there are positive signs for organic farming in India, but it is not growing at a fast enough pace to enhance its market value. Major problems that hinder the growth of the marketing of organic inputs in India are—

- Some climatic regions and soil conditions are not suitable for organic production.
- Use of bio-fertilisers and bio-pesticides is considered as less yielding than the use of chemical enhancers.
- Some bio-fertilisers have limited shelf-life — about 4–6 months.
- A long span (about three years) is required for a conventional farm to become an organic farm.
- The benefits perceived by small and marginal farmers, in particular, tend to be limited as they always need higher yield and income. As a result, they are hesitant to switch over to organic agricultural practices.

- More efforts are required for orientation of all involved in agriculture, to spread awareness of organic agriculture inputs, practices, etc.
- Changing the cropping and cultivation patterns is slow and a time-consuming process. High levels of illiteracy and large number of small and marginal farmers result in unwilingness to accept the change easily.
- Subsidies on chemical fertilisers and pesticides slow down the growth of organic agriculture.

Activity 3.5

Organise an organic input and practices awareness campaign in various localities.

Organic Produce Market

The market for organic products is expanding continuously, but at a slow pace in India. Do you find organic products at departmental stores and food *bazaars* near your area? Some farmers sell their organic products directly to the consumers. But still, most of the marketing of organic products is not well organised. Before going into the details of marketing of organic products, we need to try and gauge the perception of people about organic products. Why do some people want to buy organic products and others do not?

There are certain limitations in the expansion of organic markets. These are—

- Lack of information about organic market is the biggest drawback in the Indian agriculture scenario. Marketing network, specifically for organic products, has not yet been developed both in the domestic and export markets.
- Consistency in quality of Indian food industry has always been a constraint for growth. Contamination in food products is a setback in capturing the available market, especially the international market.

- The certification process for organic farming is very lengthy and complex.
- High transaction costs for getting farm produce certified as organic product is also unaffordable for small farmers.
- Cost of the end products is higher than the cost of products from conventional farming.
- Lack of proper infrastructure in terms of roads from remote villages, cold storage facilities and slow transportation infrastructure affect the cost, quality and reach of producers.
- Indian organic agriculture is very fragmented and there are no organisations for managing the entire value chain of organic products.

Strategies for Efficient Marketing of Organic Products

All over the world, standards are developed to monitor and control organic trade. The choice of the most appropriate organic certification standard depends mainly on the final market of the organic product. The products must be certified based on the standards required by the importing countries in order to label and market them as 'organic'.

In order to promote organic products in the market, the following issues need to be adressed—

- *Pricing:* Keeping the price reasonably low and affordable would remove the barrier in sales of organic food products.
- *Visibility:* Introduction of organic foods in the markets has increased their visibility. The appearance and packaging of products may be improved.
- *Labelling:* National and international certified organic labels may increase the trust of consumers in the authencity of organic claims.
- *Availability:* The supply and quality of organic products must be consistent enough to ensure that buyers are not tempted to substitute them with conventional products.

The organic farming has been growing with rising demand and consumer awareness. There is a need to promote organic products from health and sustainability point of view. Support for inspection and certification and market-oriented services are necessary to provide equal opportunities to the growers.

Cardamom Plantation

Large cardamom is cultivated in almost all parts of Sikkim, especially West Sikkim. Entrepreneurs from different parts of the world visit to see the organic cardamom plantations. Heegaon, in West Sikkim, has the most suited climate and is a vibrant cardamom cluster. Almost all the farmers are cardamom growers, with an area of around 450 hectare. They have beautiful cardamom nurseries. Nursery raising has been adopted as a profession and large cardamom cultivators from within the state as well as from outside the state demand materials in advance during winters. Nursery owners supply planting material to Nagaland, Bhutan and DRDA (District Rural Development Agency).

Laxmi Bista is one of the most enterprising cardamom growers of the area. He is a young and educated progressive farmer and is a guiding force for his peers. In 2016, his income generation was about ₹26 lakhs per season through sales with more than seven lakhs of it being from the DRDA, Nagaland.

Source: Revolution in Horticulture: Sikkim's 22 Years of Achievement, published by Horticulture and Cash Crop Development Department, Government of Sikkim, August 2016.

Fig. 3.11 Fields of cardamom

Fig. 3.12 Farmers harvesting cardamom in the field

Improved *desi* variety of Brinjal crop developed by traditional methods

A progressive farmer of Dhuma Kurda village of district Dhamtari in Chhattisgarh, Leela Ram Sahoo, has conserved good quality *desi* variety of brinjal, growing by a traditional method of mass selection year after year. He has been able to maintain the purity of the variety. The variety of brinjal is known for its fruit quality and also it is resistant to major pests and diseases. He devotes his full time to farm experiments and he hopes that one day his variety would be known in all parts of the country.

Mass selection is a traditional method of crop improvement, in which large number of plants of similar phenotype are selected and their seeds are harvested and sown again. Same practice is followed year after year for an improved variety of the crop.

Fig. 3.13 Leela Ram Sahoo with his developed traditional variety of brinjal

Source: Personal interview with the farmer in the Festival of Innovation — India and Entrepreneurship 2018 organised by National Innovation Foundation at Rashtrapati Bhawan.

Glossary

Crop rotation—It is a planned sequence of growing different crops in the same field. It is opposite of continuous cropping, which is growing the same crop in the same field year after year.

Eutrophication—When a waterbody becomes over enriched with minerals and nutrients which induce excessive growth of plants and algae and results in oxygen depletion in the waterbody.

Irradiation—Exposure to radiation for partial or complete sterlisation; the application of radiation such as X-rays or gamma rays for therapeutic purpose or for sterlisation.

Natural predators—These beneficial anthropods (insects) prey on other insects and spider mites that are critical for *natural* biological control. Lady beetles are natural enemies of aphids and other sap feeders. A single lady beetle may eat as many as 5,000 aphids in its lifetime.

Organic agriculture—A system of farm design and management to create an ecosystem, which can achieve sustainable productivity without the use of

artificial external inputs such as chemicals, fertilisers and pesticides.

Phenotype—Set of observable characteristics of an individual resulting from the interaction of its genes with the environment.

Processed products—Processing of a product includes a series of chemical or mechanical operations in order to preserve its originality for long time or to increase the shelf-life.

Slurry—A semi-liquid mixture, typically of fine particles of manure.

Soil fertility—This refers to the ability of the soil to supply essential nutrients and water in adequate amounts for plant growth.

What have we learnt?

1. Organic farming prospers on four pillars—standards and norms, technology packages, certification and market network.
2. Organic standards and norms ensure safety of food, health and environment.
3. Technology packages include natural input and nature-friendly processes to follow in organic farming.
4. Certification ensures safety of food products.
5. The emerging demand for organic products is both a constraint as well as an opportunity.

Exercises

1. Answer the following questions.

i. What are the four pillars of organic farming? Write a brief note on each of them.

ii. What are the requirements for a successful conversion of a conventional farm to an organic farm?

iii. Explain in brief the four principles of organic farming given by IFOAM.

iv. What is the difference between intercropping and crop rotation? How do these practices strengthen organic agriculture?

v. How different is the pest and disease management under organic farming *vis-à-vis* conventional farming?

vi. What do you understand by organic certifications? What are their benefits?

vii. Discuss the limitations and challenges in the expansion of organic markets in India. What strategies could be adopted to promote organic products?

2. Read the statements and indicate 'True' or 'False'.

i. Crop rotation means growing the same crop in the same field year after year.

ii. Intercropping is the practice of growing two or more crops in close proximity in the same field.

iii. Organic farming can lead to eutrophication of waterbodies.

iv. Corn is a low carbon to nitrogen ratio crop.

v. Exotic varieties of crops and animals are used in organic farming.

3. Activities

i. Find out what technology packages have been followed in the farm of your school.

ii. Trace the marketing networks for any organic product.

iii. Make composting in your kitchen garden using earthen (terracotta) pots. Segregate the biodegradable kitchen waste. Start adding the kitchen waste to the composter 'Pot A'. When it is filled three-fourth, start adding in 'Pot B' and so on. Find out how much time it takes in composting. Use the compost in your kitchen garden and observe the growth and health of the plants. Record your specific observations and share with your peers and teachers in school.

Pot A

Pot B

Pot C

4 Organic Product and Certification

When we go to the market to buy some organic material, how can we ensure that the product is genuinely organic?

Paheli and Boojho were enthusastic about participating in the Organic Fest to be organised in the school next month. They wanted to put up a stall of '*Organic Fruit Chat Corner*'. They planned to use the fruits that they had grown organically in their school garden. People from nearby villages and school children from nearby schools were likely to visit the 'Organic Fest'.

They needed to find out how the people and children visiting their stall would be assured that the fruits used in the *chat* they were selling are the product of organic farming.

4.1 What is an Organic Product?

Any produce of organic farming is called organic product. Organic farming follows certain government approved standards and norms for ensuring the hygiene and safety of the products from synthetic chemicals.

There are some symbols on the packets of organic products which ensure that the product is organic.

Paheli and Boojho went to Chaudhary Chacha's shop to ask him about the symbols.

Fig. 4.1 Paheli and Boojho at the shop of organic products

The packet of organic products has two logos on it. The first one is the India Organic logo and the other one is the logo of the certifying agency. The presence of 'India Organic Logo' indicates that the organic products have been produced following the government approved standards and norms or production under organic farming. The logo of the certifying agency provides the information about the certifying agency. Thus, in case of any biases or doubts, the consumers can trace back the entire certification process by contacting the certifying agency. Now-a-days, barcode is also being used on packets to help consumers trace the chain of activities involved in the production and processing of organic products.

4.2 India Organic Logo

The India Organic logo (Fig. 4.2) is the government approved logo which can be used only by those farmers and producers who have obtained the certificate for their organic production from the certifying agency. The logo has three colours — blue, green and golden brown. The design of the logo represents nature. The cosmic forces in blue symbolise the universal purity. The golden brown colour of the logo represents the richness of soil. The blue background is the symbol for the environment of earth which is free from harmful chemicals and pollution. The green plant appearing on the one end of the wave is the resultant of synergic relationship between cosmic and earth forces which use the colour of the nature and the natural products untouched by synthetic chemicals.

Fig. 4.2 India Organic logo

Like our own national organic logo, there are logos representing specific countries. For example, National Organic Programme (NOP) of USA and Japanese Agricultural Standards (JAS). The International Federation of Organic Agriculture Movements (IFOAM) also has its own logo (Fig. 4.3).

Do all countries have same organic standards?

Many more countries have their organic standards. You may go through the relevant websites for further details.

Agricultural and Processed Food Products Export Development Agency (APEDA) is the head agency under the Ministry of Commerce and Industry in

Logo of National Organic Programme (NOP) of USA

Japanese Agricultural Standards (JAS)

Logo of IFOAM

Fig. 4.3 Some other logos for organic standards

The standards and norms ensure the purity of the product as organic. It ensures that its production is as per the guidelines provided by NPOP for organic farming. It also ensures that the product is organic and free from synthetic chemicals. Certification agencies are given license by the accreditation body to carry out certification process of organic products. Once the agency is satisfied with the process and products of the farmer or processor (whoever produces organic products), certification is granted. Once the certification is granted to the farmer or the processor, he/she can use the India Organic logo on the packets of their products. Certification is essential to authenticate the genuineness of the products.

I wonder how are the certifying agencies formed?

our country. It monitors production, processing and export of organic products. The Government of India had formulated the National Programme on Organic Production (NPOP) in the year 2000 through APEDA. The NPOP provides the national standards and norms for organic production. These are accepted in other countries also. It means that any organic product if produced according to the NPOP standards is accepted as genuine organic product, and thus can be exported. APEDA provides accreditation to certification bodies under NPOP norms and standards.

The details of the certification agencies are available on the APEDA website (www.apeda.gov.in). The process of certification standards and norms are prescribed for the production, processing, packaging and transportation of food and non-food products.

Presently, several organic non-food items such as cloth (fibre), non-timber forest products such as herbs, medicinal plants, honey, etc., are also available. The cultivation of crops, rearing of animals and processing of food and non-food items are being carried out as per the norms and standards of organic farming. Safety of food and environment is ensured through the process of certification in different ways.

As you have already learnt in the previous classes, soil fertility is the most important consideration in organic farming. All natural substances and their safe derivatives are permitted in the production and processing of organic food and non-food items. You will learn about processing of organic products later in the chapter.

Can the non-food items also be produced organically?

Activity 4.1

Visit an organic product section of any departmental store. Make a list of both food and non-food organic products.

4.3 Important Organic Food Products

Presently, almost every food product is available as organic. For example, organic rice, organic pulses, organic sugar, organic spices, organic turmeric, organic honey, organic fruits and vegetables, organic milk and milk-based products, and many more.

The food products obtained under organic farming are nutritious, healthy and safe.

Fig. 4.4 Organic Apples

4.4 Process of Certification

There are a number of steps in the process of certification. The farmers need to submit a list of documents during the process. The organic food production, processing and value addition are carried out by following standards prescribed in NPOP and or other international standards.

Steps of Certification

- Identification of certification agency by the farmer or processor.

I wonder how much time does the process take?

- Filling up of information by the farmer in the prescribed format of the identified certification agency.
- Information and document submission by the farmer or processor to the certification agency.
- Review of information submitted by the farmer or processor by officials of the certification agency as per NPOP norms and standards.
- Inspection of farm or processing unit by officials of the certification agency.
- Approval by officials of the certification agency.
- Providing certification and seal.

1. Filling up of information by the farmer

2. Submission of documents by the farmer to the officer of the certification agency

3. Review of information submitted by the farmer

4. Award of certification to the farmer

Activity 4.2

Perform *nukkad natak* in the annual function of your school or any organic fest organised by the school for awareness of the process of organic certification.

Important documents that a farmer should provide to the certifying agency for certification are—

i. Field map
ii. Field history
iii. Activity register
iv. Input records
v. Harvest records
vi. Storage records
vii. Sales records
viii. Pest control records
ix. Labelling records
x. Soil testing report

What all documents do I need to provide to the certifying agency?

4.5 Checklist for Certification

Under the organic certification system, there is a need to prepare checklists for submission of information by the farmer to the inspection and certification agency. The checklist ensures fair conduct of the certification process. The types of checklist depend upon the operations to be inspected. Few of the important operations are as follows—

- Farm under cultivation
- Wild harvest
- Livestock operation
- Processing and handling operation

4.6 Types of Certificate

As you know, certification is a process in which a certificate is provided to the operator (farmer/ processor), certifying that the farm or the processing unit is complying with the standards and norms for organic production system as per NPOP or other standards. There are three types of certificate issued to the operator depending upon the business.

1. Scope certificate

This is issued by the certification agency annually when an operator (farmer/processor) complies with the standards of production or processing.

2. Transaction certificate

This certificate is issued for individual operation, i.e., production, processing and handling.

3. Group certificate

This certificate is issued to a group of farmers who join together for organic farming.

4.7 Certification Agencies

From where can a farmer get information about the certifying agency?

There are many agencies designated as certification agencies in the country. Some are government owned and others are franchise of international certification agencies. All the certifications whether they are done by a government or by a non-government organisation are accredited as per the NPOP and APEDA recommendations. The number of agencies keep on changing due to addition and deletion in the list as per the approval from APEDA. The updated list of certification agencies is available on the APEDA website (www.apeda.gov.in).

4.8 Participatory Guarantee System (PGS)

Can we form a participatory guarantee system in school for certifying our products?

Participatory Guarantee System (PGS) is a quality assurance initiative implemented by the Ministry of Agriculture and Farmers Welfare, Government of India through National Centre for Organic Farming (NCOF).

In PGS, people in similar situations (in case of small producers) assess, inspect and verify the production practices of each other and take decision on organic certification.

PGS has a number of basic elements which embrace a participatory approach, a shared vision, transparency and trust. Participation is an essential and dynamic part of PGS.

Producers, consumers, retailers, traders and others such as NGOs, Societies, Gram panchayats, State/Central government organisations/agencies, farmers, etc., are involved in the initial design and decision-making for the operation of the PGS. In addition to this, stakeholders such as producers, consumers, retailers, etc., are engaged in a structured ongoing learning process. This helps them improve upon step by step process of organic farming. This process of certification is facilitated by the group itself or in some situations supportive NGOs, Societies, Gram panchayats, State/Central government organisations/agencies facilitate the process.

The PGS is effective for small farmers. It has distinct logos. The PGS-India Green logo is used for the products obtained from fields under conversion and PGS-India Organic logo is used for the fully certified organic products. The validity of the certificate is up to12 months from the date of decision taken by the group.

Fig. 4.5 Logos of Participatory Guarantee System

Activity 4.3

Organise an awareness campaign with your peers for village organic growers about the process of certification of organic products.

What are the government initiatives to promote organic farming in the country?

4.9 Organisations Involved in Organic Farming

Government of India has recognised the importance of organic agriculture and the need to strengthen the sector through putting rules and regulations in place. This includes creating national organic standards and inspection and certification bodies. There are presently two bodies which regulate the policies, production and training in organic farming. These are—

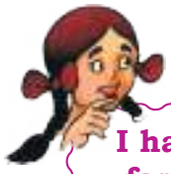
- The Agricultural and Processed Food Products Export Development Authority (APEDA)
- National Centre for Organic Farming (NCOF)

The Agricultural and Processed Food Products Export Development Authority (APEDA)

The main functions of APEDA are—

- Promoting the export-oriented production and development of organic agri-products.
- Fixing the standards and specifications for the scheduled products for the purpose of export.

APEDA provides licence to certification agencies operating in the country. It also monitors them as and when required. The agricultural products are allowed to be exported as 'organic' only if they fulfil the norms and standards prescribed for them.



I have seen farmers of our village assembled at one place and sharing their experiences regarding organic production.

National Centre for Organic Farming (NCOF)

This is a training institute under the Ministry of Agriculture and Farmers Welfare, Government of India. There are six regional centres at Bengaluru, Bhubaneswar, Hisar, Imphal, Jabalpur and Nagpur. The main functions of NCOF are—

- Promotion of organic farming in the country through technical capacity building of all stakeholders including human resource development, transfer of technology, promotion and production of quality organic and biological inputs.
- Certification of organic products.

NCOF is also involved in awareness generation, capacity building, training and demonstrations, providing financial support to organic inputs and market development for farmers.

Apart from these two bodies, research institutions and extension bodies also play an important role in strengthening organic agriculture.

Do these institutions share their research findings with the farmers?

Research Institutions

Research institutions include universities, research centres, Indian Council of Agricultural Research (ICAR) institutions, Central Research Institutes, etc. These institutes are involved in the research on the inputs of organic farming and improvement of organic production technologies.

Activity 4.4

Visit a research laboratory nearby and collect information about the new researches and developments going on for the improvement of organic production.

Extension bodies

These include Agricultural Extension Institutes, Krishi Vigyan Kendras (KVKs), State Departments, Regional Agricultural Extension Organisations (RAEOs), Non-governmental Organisations (NGOs), etc. The role of these bodies is to make the technology and knowledge available to the producer (farmer). They also compare the production costs, yields and income in organic and conventional farming systems and make the results available to the producers, scientists and policy-makers.

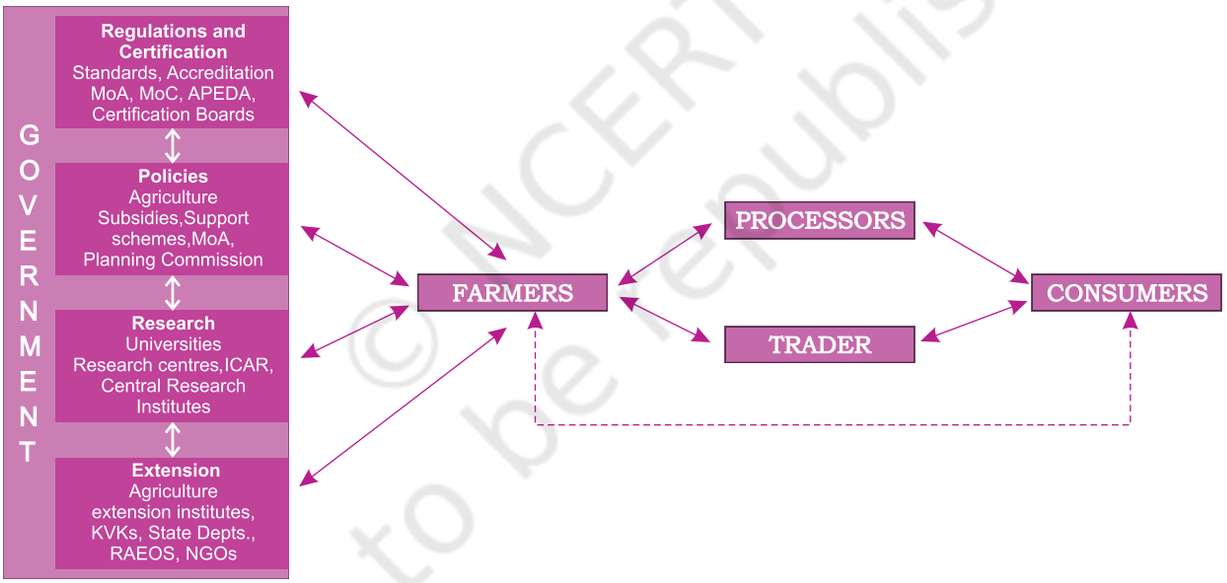


Fig. 4.6 Understanding government framework for organic farming

Activity 4.5

- Identify the agricultural research institute in your state.
- Locate National Centre of Organic Farming (NCOF) and Regional Centres of Organic Farming (RCOFs) on the map of India.

- Plan a visit to an organic agri-farm nearby. Ask the farmer about his/her association with regulation and certification agency, research institute and extension bodies. Make a report on how the farmer is associated with them and how these agencies are helping him/her.

4.10 Promoting Organic Farming

Government Initiatives

The Government of India is promoting organic farming through various schemes and programmes.

1. **National Mission for Sustainable Agriculture (NMSA) (2014)**

   The National Mission for Sustainable Agriculture is Government of India's mission under the Ministry of Agriculture and Farmers Welfare. Some of the schemes to encourage organic farming, as resourced from the website of NMSA (http://nmsa.dac.gov.in), are given here.

   - Financial assistance up to 50 per cent of the cost, subject to a limit of ₹5,000 per hectare and ₹10,000 per beneficiary is provided for promotion of organic input use in the cultivation.
   - Further, the scheme envisages financial assistance of ₹20,000 per hectare subject to maximum of ₹40,000 per beneficiary for a three-year term, provided for adoption of organic farming through cluster approach as well as through adoption of organic village under Participatory Guarantee System (PGS) certification.
   - Financial assistance of ₹10 lakh per village is provided for organic village adoption (maximum 10 villages per annum/state).

2. **Mission for Integrated Development of Horticulture (MIDH) (XII Plan, Operational Guidelines, April 2014)**

   This is a centrally sponsored scheme under the Ministry of Agriculture and Farmers Welfare, Government of India for the holistic growth of

horticulture. The details about this scheme are mentioned below and are also available at http://midh.gov.in.

- The government provides financial assistance for adoption of organic farming — ₹10,000 (maximum) for 4 hectare land (50% of total cost) while ₹300 per hectare up to 4 hectare (limited to 50% of cost) — for promotion of use of liquid bio-fertilisers.
- For adopting organic farming for perennial and non-perennial fruit crops, vegetables, aromatic plants, spices, etc., additional assistance is given of 50% of cost over and above the area expansion programme for a maximum area of 4 hectare per beneficiary, spread over a period of three years.
- For organic cultivation of vegetables, assistance is limited to ₹10,000 per hectare spread over a period of three years. Financial assistance is provided for establishing vermicompost units and High Density Polyethylene (HDPE) vermi-beds at 50% of cost subject to a maximum of ₹50,000 per beneficiary for a unit having size of 30′ × 8′ × 2.5′. For smaller units, assistance is given on prorate basis.

3. *Paramparagat Krishi Vikas Yojana (PKVY)* (Revised Guidelines as on 10 December 2015)

Paramparagat Krishi Vikas Yojana has been launched by the Government of India to support and promote organic farming and thereby improving soil health. This scheme encourages farmers to adopt eco-friendly methods of cultivation and reduce their dependence on fertilisers and agricultural chemicals to improve yield. Organic farming is promoted through adoption of organic village by cluster approach and PGS certification. Organic farming is promoted in hilly, tribal and rainfed areas where utilisation of chemical fertilisers and pesticides is less.

The main objectives of the programme are—

- Farmers and the local people are motivated to form cluster for adoption of organic farming through cluster approach and they are provided certification. Assistance is provided for a three-year term.
- Meetings and discussions with farmers are conducted in targeted areas to form organic farming cluster.
- Exposure visits for members are arranged by the State Government to create more practical knowledge and awareness about organic farming.
- The State Government identifies one lead resourceful person (LRP) from the cluster who represents the cluster and becomes Trainer of Trainer (TOT).
- The State Government in association with experts of NCOF/RCOF/ICAR/State Agricultural Universities (SAUs) organise three trainings for the members of the cluster within 6 months of the project period.

Under this scheme there is a provision for organisation of the training programme for the farmers on the following issues—

- Raising seedlings and plants in nurseries.
- Organic seed production.
- Green manure plantation and bund planting.
- Production and use of compost and vermicompost.
- Production and use of *Panchagavya*, *Beejamruth*, *jeewanamrutha*, etc.
- Use of bio-fertilisers (seed/seedling treatment, drip irrigation, spraying/ handling of bio-fertilisers and bio-pesticides).

Training is also given to the farmers in the following areas—

- How to get registered under the scheme.
- Organic production and process documentation.
- Preparation of annual action plan.
- Maintenance of meeting and training register, data management.

11. Administration, roles and responsibilities of cluster in promotion of PGS certified organic farming.
12. Soil sample collection and quality control .
13. Packaging, labelling, branding and marketing of organic produce.
14. Community infrastructure required for preparation of bio-pesticides and bio-fertilisers.

More details about this scheme are available at http://nmsa.dac.gov.in

4. Mission Organic Value Chain Development for North-eastern Region (MOVCD NER) (January 2016)

The Ministry of Agriculture and Farmers Welfare has launched a central scheme called Mission Organic Value Chain Development for North-eastern Region (MOVCD NER) in the twelfth plan.

The objective of this scheme is to bring about development of certified organic production and develop link between growers and consumers and support the whole system of organic production.

Various capacity building programmes for farmers and for the development of skilled manpower are organised from time to time by MOVCD NER. Farmers are provided support and training on ICS management, documentation and certification of crop production through service providers.

Activity 4.6

Make awareness campaign in various localities about all the schemes for promotion of Organic Farming initiated by the Government of India.

Glossary

Accredited certification body for organic farming— An organisation with legal entity complying with NPOP accreditation criteria and recognised by the National Accreditation Body for certifying organic products and for

granting the right to use the Certification Trade Mark to the operators on behalf of the Accreditation Body.

Beejamrutha — It is a traditional preparation for seed treatment using cow dung, cow urine, handful of soil in water and lime.

Certification for Organic Farming—The procedure by which the accredited certification body by way of a Scope Certificate assures that the production or processing system of the operator has been methodically assessed and it conforms to the specified requirements as envisaged in the National Programme for Organic Production.

Conversion period— This is the time between the start of organic management and the certification of crops as organic.

Cosmic— Relating to the universe.

Franchise— An authorisation granted by a government or company to an individual or group enabling them to carry out specified commercial activities, for example, acting as an agent for a company's products.

Jeewanamrutha— It is a traditional manure preparation using water, cow dung, cow urine, jiggery, flour of any pulse and one handful of soil from the same land.

Labelling— Written, printed or graphic representation depicted on the label of the certified organic product for the purpose of promoting its sale.

National Programme for Organic Production (NPOP)—This programme by the Government of India provides an institutional mechanism for implementation of the National Standards for Organic Production.

National Standards for Organic Production (NSOP)— This body sets out the standards to be followed in the cultivation, harvest, production, processing and trading of organic products.

Operator—A farmer, processor, trader, handler or exporter who is under organic certification.

Panchagavya— It is a mixture of five cow products. The three direct constituents are cow dung, urine and milk. The two derived products are curd and ghee. These are mixed in proper ratio and are then allowed to ferment.

Producer—A producer shall mean an individual farmer or group of farmers and business enterprise practising organic farming or organic processing.

Synergic— Working together.

What have we learnt?

1. Organic farming follows certain government approved norms and standards.
2. These norms and standards ensure hygiene and safety of the products from synthetic chemicals.
3. Packets of organic products have two logos on it. One is the India Organic logo and the other one is the logo of the certifying agency.
4. Design of the India Organic logo represents nature.
5. There are logos representing specific country.
6. Packaging and labelling of organic food is very important for marketing.
7. Agricultural and Processed Food Products Export Development Agency (APEDA) is the head agency under the Ministry of Commerce in our country. It monitors production, processing and export of organic products. The NPOP provides the national norms for organic production.

Exercises

1. Answer the following questions in detail.

i. What is the significance of the India Organic logo? Describe the elements of the logo and what they signify.

ii. What are the steps involved in the certification procedure of an organic product?

iii. What are the roles and functions of APEDA and NCOF?

iv. What do you understand by participatory guarantee system? What are the basic elements and benefits of this system?

v. Write briefly about the schemes launched by the Government of India for the implementation of organic farming.

vi. What are the various types of assistance provided to the farmers under Mission Organic Value Chain Development for North-eastern Region?

vii. What are the objectives of *Paramparagat Krishi Vikas Yojana*?

2. Project Activities

i. Prepare a project on any one of the following schemes launched by the Government of India for the adoption and implementation of organic farming in India.
   - Mission Organic Value Chain Development for North-eastern Region (MOVCD NER)
   - *Paramparagat Krishi Vikas Yojana* (PKVY)
   - Mission for Integrated Development of Horticulture (MIDH)
   - National Mission for Sustainable Agriculture (NMSA)

ii. Visit a nearby farm. Take an interview of the farmer and make a list of assistance that s/he gets for organic farming.

iii. Visit the department of agriculture of your state and discuss with the officials responsible for implementing various agricultural schemes, e.g., MOVCD, PKVY, about the activities done under each scheme. Prepare a report on them.

iv. Design an invitation to an Organic Festival in your school.

Invitation for Organic Festival
You are cordially invited to join us in the organic festival organised by _____.
Date :
Venue:
Students of Class VIII

v. Hold an inter-house competition on organisation of organic farming practices.

vi. Organise a seminar in your school on various schemes launched by the Government for promoting organic farming. It can be done individually in each topic or in a group. Try to give presentation on maximum number of schemes.

vii. Write an article on importance of various schemes for the promotion of organic farming.

viii. Write a slogan for organic farming and put it on the school display board.

5 Livelihood Opportunities and Organic Agriculture

Fig. 5.1 Paheli and Boojho at the Krishi Mela

Paheli and Boojho went to a *Krishi Mela*. They saw many stalls where farmers were showcasing their agricultural products. Both Paheli and Boojho were excited to see so many stalls and agricultural products at one place.

Agriculture is the most important livelihood option in India. Most of the farmers are small farmers cultivating areas of less than one hectare. While incomes in urban areas have risen, farm incomes have declined in many parts of India. India has traditionally been a country

Fig. 5.2 A farmer selling organic products at a local market.

Is the organic food expensive?

of organic agriculture, but the growth of modern scientific, input intensive agriculture has influenced farmers to use synthetic fertilisers and pesticides in order to achieve higher productivity. However, with the increasing awareness about the safety and quality of food, people now prefer organic products as an alternative.

5.1 Organic Agriculture and Farmers' Livelihood

I bought organic rice and it was more expensive!

Organic products not only address the quality and sustainability concerns, but also ensure a debt-free and profitable livelihood option for the farmers. From the year 2002, a number of farmers have adopted organic agriculture to improve the economic viability of farming and combat negative social and environmental effects of conventional farming. Organic agriculture industry in India still has a long way to go.

Income Generation

In countries like India, where majority of the rural people are engaged in agriculture, organic agri-practices could contribute substantially to increase farmers' income. It supports sustainable yield increases in low input systems through agro-ecological methods like agro-forestry, integrated pest management, or the use of leguminous green manure. Farmers cultivating organic crops tend to get relatively higher prices than the conventional ones. Farmers cultivating cash crops, medicinal crops, aromatic crops, etc., also fetch premium prices even with conventional methods.

The increasing demand for organic products has created new export opportunities and APEDA (under Ministry of Commerce) is already looking to tap lucrative export markets for organic products.

Food Processing

Organic food processing could help the rural population, especially women in India.

Many women are already involved in processing rice and making snack items, generating their own income. Women could increase their household income by processing their organically produced local resources and Non-timber Forest Products (NTFPs).

Preservation of food stretches the utility and productivity of the farm produce, which is often wasted during peak seasons but is scarce during lean seasons. Processing technology helps to make food available during lean seasons and also helps to stabilise household income. It can serve several developmental objectives for households, such as increased income, greater savings, food security and better nutrition.

How can we prevent food from spoilage?

Fruits and vegetables are the most important supplements to human diet as they provide the essential minerals, vitamins and fibre required for a balanced diet. India's climatic and soil conditions favour the cultivation of a wide variety of fruits and vegetables. However, nearly 20–30% of the total produce is wasted, as most of the fruits and vegetables are seasonal and highly perishable. Following are the reasons for spoilage of fruit and vegetables—

- Lack of knowledge of proper storage conditions
- Lack of storage facilities
- Lack of transport facilities
- Poor road conditions
- Poor availability of packaging materials
- Lack of local cold storage to store the surplus

I have seen Maa and Grandmaa preparing pickles of chillies and lemons. Maybe that is a way of preservation!

Activity 5.1

Imagine you have a big farm. The climate is very suitable for growing chillies and lemon. You have cultivated chillies and lemon in your farm. You have a very good harvest. But you could sell only one-fourth of your farm produce in the local market. What do you think you will do with the rest, since you cannot consume all at home?

Think and discuss with your teacher and friends.

Food processing converts the excess fruits and vegetables into the food which can be used for a long

time. It increases its shelf-life. The food product can then be marketed and easily consumed.

Activity 5.2

Ask your Maa and Grandmaa to prepare pickles and help them in the preparation.
You may also discuss the following in the class—

1. Why do we add more salt and sugar in pickles and *murabbas*?
2. Why do we keep the pickle in sunlight?

Since organic produce is more prone to spoilage, on-farm handling, storage and processing becomes an essential component of organic farming. To control the post harvest losses, the available food processing technologies provide a large platform for the future prospects of food industry.

Handling and processing of organic products should maintain the quality and integrity of the product.

Some components of organic processing are mentioned here.

Pest control

Organic standards and norms are followed even during processing.

Pest control is one of the most important aspects of organic food processing. It is meant for storage of raw material such as grains, cereals, etc. Organic produce is more susceptible to pests. Therefore, a set of precautions, such as maintaining cleanliness and hygiene, use of baits and traps are required for the same. If required, biological pesticides may also be used. Baking soda, canola oil, *neem* leaves are some examples of bio-pesticides.

Use of chemical pesticides is ofcourse strictly prohibited for an organic product.

Ingredients

Each and every ingredient that is used in processing must be organic. Permissible non-organic ingredients may be used to a minimum extent— in the permissible limits and necessarily be authorised by the certification body. Water and salt can be used

in organic products. Preparations of micro-organisms and enzymes may be used in food processing. Food additives of natural origin (plants or animals) can also be used as per the standards.

Ascorbic acid in citrus fruits, agar gel in sea weed, pectin in papaya and apple, xanthium gum produced by bacterial fermentation and oil are some examples of food additives.

Processing methods

Processing of organic food can be done by mechanical, physical and biological processes. No chemical method is used.

The popularly followed organic processing methods are—

- Mechanical and physical (crushing, mixing, grinding, etc.)
- Biological (use of microbes or enzymes)
- Smoking (with the help of smoke, e.g., smoked fish)
- Distillation (evaporation and subsequent condensation of liquid)
- Precipitation
- Filtration

Tejpratap is a farmer. He has a very big farm where he grows lots of fruits and vegetables. Most of the farm products are sold in the local market. But some are left over. He does not know what to do with this unsold product. The distance between his village and town is too long to take it there. The money which he gets from selling his product is not enough for him to transport the product.

Tejpratap's wife is intelligent and does not let the vegetables go waste. She uses them to make pickles and then sells them. She dries the ginger and turmeric, grinds them into powder and makes small packets to sell. Everybody in the family helps her in processing the product. In this way, nothing goes waste from Tejpratap's farm. In fact, they have adequate income which they use for educating their children.

Oh! That means processing of food helps to generate income.

Packaging

When the foods are processed they need to be packaged in a manner that they do not spill and help in a longer shelf-life. Keeping in league with the organic fervour, the packaging material chosen could be biodegradable, recyclable and eco-friendly, wherever possible. Care must be taken to ensure that the material used for packaging does not contaminate food. Some additives, such as lactic acid, ascorbic acid, natural gums, etc., can be used for manufacturing of packaging films for packaging of organic food.

The packages need to be sealed in such a manner that any adulteration is not possible without manipulation or damage of the seal.

Labelling

Look at the pictures given below. Three pictures of packed organic rice — Picture A shows packed food with adequate and required labels; Picture B shows packed food with incomplete labels and Picture C shows packed food without proper labels, only organic rice is written.

Which packed food would you like to buy? Give reasons for your choice.

So, why do we need labelling of organic products? Labelling gives clear and accurate information about the organic status of the product. When the complete

A B C

Fig. 5.3 Packed organic rice with different labels

standards and requirements are fulfilled, products would be sold as 'produce of organic agriculture'.

The name and address of the person or company legally responsible for the production or processing of the product would be mentioned on the label.

When 95% of the ingredients are of certified organic origin, the product may be labelled as 'Certified Organic' with a certification logo.

When the product has 70% to 90% of the ingredients which are of certified organic origin, those products may not be called organic. Such products may be labelled as 'Made with Organic Ingredients'.

When the product has less than 70% of the ingredients of certified organic origin, the organic ingredients may appear in the list, but such products cannot be called 'organic'.

Added water and salt are not standards for percentage calculation of organic ingredients.

Fig. 5.4 Certification logo for organic products

Activity 5.3

Visit a shop selling packed organic items. Observe and read the labels of five items which you might be using frequently in your day-to-day life. Notice the difference in the labelling. Discuss and share with your peers in class.

Storage and transportation

When we store organic products we have to maintain certain conditions like—

- Controlled temperature
- Cooling
- Freezing
- Drying
- Humidity regulation (moisture control)

Storage areas and transport containers for organic products need to be cleaned using methods and materials permitted for organic production only.

In addition to these points, there are some additional rules and regulations by NPOP. The production and handling plan of organic products must include—

(i) Description of practices and procedures to be performed.

(ii) List of each substance and input used during production, storage and handling indicating its composition, source, locations where it will be used and documentation of commercial availability as applicable.

(iii) Description of the monitoring practices and procedures followed and maintained to verify the above plan.

(iv) Description of the record-keeping system implemented to comply with the requirements of NPOP.

(v) Description of the management practices and separation measures established to prevent contamination of organic and non-organic products during parallel processing and handling.

(vi) Pollution sources must be identified to avoid contamination.

(vii) Processing and handling of organic products should be done at different times and place and it should be kept isolated from handling and processing of non-organic products.

Activity 5.4

- Make a visit to a nearby small scale food processing unit. Record the details of the procedures and protocols followed by them. Make a list of chemicals and preservatives they are using.
- Make a list of 10 additives and agents permissible for organic food processing.
- Study the labels on bottles and packets for ingredients.

5.2 Employment Generation

Agriculture is the main source of employment for those living in the rural areas. Specialised and mechanised practices reduce rural employment. Sustainable agriculture, as witnessed through organic farming system, being labour-intensive helps in overcoming such problems.

Organic farming requires over 15 per cent more labour than conventional farming and therefore provides rural job opportunities. Some of the commonly used organic farming techniques such as strip farming, non-chemical weeding, collection, value addition and transportation of organic supplements require significant involvement of labour.

5.3 Food Security

Sustainable organic agriculture ensures food security by increasing yield in low input areas and improving the quality and nutritional value of food. It conserves biodiversity and natural resources on the farm that favour greater range of crop varieties and edible produce. Organic management can improve soil structure and therefore reduce the crop's susceptibility both to drought and waterlogging. Improved ecological balance and organic preventive measures hinder pest population and hence healthy yields are possible. A farmer can thus become self-sufficient in terms of food quality.

5.4 Social Sustainability

Local Acceptance

Organic farming is designed with a bottom-up approach, on the basis of ecological and social awareness of practising farmers using natural resources in a sustainable manner. Since organic agriculture practices consider long traditions and customs, the local acceptance helps in promoting sustained growth and yield.

Indigenous Knowledge

Our country has a vast treasure of tribal diversity and a rich heritage of traditional farming practices based on long practical experiences of the farmers. Many good practices in farming are a result of the repeated exercises to meet the requirement of food, fibre and shelter, and have thus contributed a pool of locally adapted solutions for environmentally safe and

sustainable farming practices. Some of these practices such as crop rotation, mixed farming, intercropping, etc., are being promoted over the time in organic agriculture. Organic agriculture focuses on traditional knowledge and local innovations, e.g., locally adapted crop varieties can support and strengthen stability in climate resilient agriculture. Modern organic farming practices are now embedded in a complex of practical knowledge, social acceptability, system of beliefs and global view due to proven scientific researches. A balanced use of indigenous knowledge with appropriate information added from new scientific technologies would drive sustainable agriculture to enrich itself.

Gender Equity

Organic farming provides equal work and employment opportunities to men as well as women. There are improvements seen in the health, food security and economic conditions of women involved in organic farming. Organic farming offers great opportunities for women in value addition practices which is gradually leading to more equality and empowerment and also ensures that the workload and benefits are shared equitably between men and women.

Bridging the Gap in Social Divide

From social point of view, sustainable agriculture involves full participation of rural as well as urban communities and ensures safe and sustained food supply for everyone.

5.5 Case Study

Here is a case study which will show how the use of chemicals ruins the farming system and how gradually after conversion to organic farming, things improved at a farm. The study was commissioned by Natural Resources and Ethical Trade programme, managed by Natural Resources Institute and conducted by the Soil Association in the context of the Department for International Development Natural Resources

Advisors Conference in July 1998. The aim of the case study was to assess whether the expected results of such projects are achieved.

The Ambootia Tea Estate, Darjeeling, West Bengal, India

It is one of the 83 gardens which constitute the Darjeeling tea industry and dates back to the estates established by the British in 1856. In the 1980s and 90s, the estate, like many others, had suffered declining yields. The total production of Darjeeling tea had fallen from 14.5 million kg in 1990 to 11 million kg in 1995. Production on this estate itself slid from 206 tonnes in 1989 to 171 tonnes in 1991 despite optimum use of chemical fertilisers and pesticides. Deforestation had led to serious soil erosion culminating in a landslide that took many workers' houses with it. In 1986, the workers invited a former manager to take over ownership in an attempt to revive the estate's fortune. A commitment to long term sustainability led the management to adopt organic and finally bio-dynamic systems.

Organic Agricultural Impact

By switching to organic methods of farming like use of leguminous green manure and compost production, soil fertility is achieved. Soil erosion is reduced by contour planting, maintaining soil cover, and cutting rather than eradicating weeds. The emphasis on ecological diversity has helped the natural predator population. An increase in the number of ladybirds which feed on aphids, thrips and red spider mite has meant that the regular problems associated with these pests are a thing of the past. The soil is more moisture retentive than it was under conventional management, which has led to a more stable yield in dry weather.

Environmental Impact

As part of the management plan to increase diversity, providing more habitats for predators and reducing

soil erosion, 50,000 trees are planted each year. The management and workers believe that the discontinuation of the use of agro-chemicals has led to a healthier environment due to less water contamination and a better air quality. Respiratory diseases are reported to have reduced since the use of chemicals was stopped. The premiums obtained through organic and fair trade status have enabled the estate to undertake a systematic landslide rehabilitation programme which had previously been put off due to lack of funds. In addition, the estate has gained approval from the government for two hydroelectricity schemes of 100 kilowatts which when operational will provide up to 70 per cent of the seasonal requirement of electricity. This development will reduce dependence on polluting fossil fuels, having a positive impact on the environment.

Economic Impact

The move from a high to a low external input system has meant an increase in labour requirements of 35 per cent with an increased income to the workers. The emphasis on developing a largely closed system has led to the production of herbs required in the production of the bio-dynamic preparations. The collection of biomass and cow dung for compost making involves a large number of workers. The estate makes and applies 2,100 tonnes of compost every year, mostly unmechanised. The workload is spread more evenly over the year leading to an increase in full-time as opposed to part-time work.

In order to produce more compost, the estate has encouraged workers to keep cows. The milk provides an additional source of income to the workers. No figures could be obtained about the overall economic performance of the estate, but it continues to thrive having recently developed a new range of exotic teas including 'white', 'green', 'oolong' and 'souchong'.

Social Impact

As a result of the decline of the estate, the workers suffered a number of lockouts between 1981–86 causing disruptions to their livelihood. The cooperation between management and workers, in rebuilding the estate, has brought about a combined commitment and respect and a sense of stability hitherto unknown in the tea industry in India. This has been stimulated by the fair trade registration. The fair trade and organic evaluations set out guidelines, make suggestions and monitor implementation of issues from compost systems to worker involvement in efficient management of the estate. All statutory labour requirements are met and a joint body of workers and management decide upon welfare schemes using the product premia.

Sports and recreation centres have been built to foster community spirit and investments in education have seen a reduction in the student–teacher ratio, an increase in the availability of computers and the introduction of a scholarship scheme. An efficient garbage collection scheme has also been introduced to maintain hygiene around the estate.

Institutional Impact

The estate is owned by workers and management and runs on a cooperative basis, which has led to it becoming a strong organisation. The manager of the estate is the Founding Chairman of the Bio Organic Tea Association in India which has assisted in promoting the message of organic farming to the government. Agricultural and Preserved Food Products Export Development Authority (APEDA) recently attended the Bio Fach in Nuremberg, Germany from 14–17 February 2018, to promote India's ever widening production of organic products.

Problems and Obstacles to Development

The main problem has been in surviving the conversion, as on top of the bad state of the estate before 1986, heavy investment was required in the

early years. The first step involved rejuvenation and pruning of the tea plants, increased planting and increasing temporary and permanent shade trees. During the years subsequent to the adoption of the organic system, yields fell from 487 kg per ha in 1994 to a low of 404 kg per ha in 1996, a 17 per cent reduction. This drop, along with the increased costs put pressure on the estate but was balanced by the improved market access and premium prices achieved by the organic and fair trade status. Fair and assured prices kept the estate viable.

Organic Village

In North Sikkim there is a cluster of small villages— Lum, Gor, Sangtok, Sagyong and Tarang which fall under Lum, Gor, Sangtok Gram Panchayat Unit. Many progressive farmers in these villages grew cereals and pulses and adopted vegetable cultivation also. Most of the big farmers made their major earnings through large cardamom plantations. However, a disease outbreak led to a reduction in cardamom productivity. Not knowing what to do, there arose an urgent need to look for an alternative crop production to revive the earnings. The farmers eventually considered Sikkim mandarin (oranges) as an option. This is a highly paying crop which stood a good chance for a successful cultivation. The success of innovative farmers in their orchard yield encouraged others, and eventually a group of interested farmers were selected for an exposure tour to other orange growing belts of the state by the government.

Today, the most popular place for production of oranges in Sikkim is Jeel Hathidunga in West Sikkim. Farmers in this village have a good productive orchard every year. To increase orange production in the area, massive drive campaigns were launched by the government to revive the old orchards through rejuvenation programmes. At the same time, there was also a plantation of new orchards. The plantation drive was initiated in 2008–09 and continued year after year covering more areas. The government provided a majority of the support to each individual farmer by providing organic pesticides, manure, incentives and technology for rejuvenation.

Fig. 5.5 Oranges after harvest in a Sikkim village

For new plantations, support was given through a variety of plant material, organic manure, bio-pesticides and technology through training and exposure.

All these efforts finally resulted in plenty of fruits in both revived and newly planted orchards. The whole Gram Panchayat Unit has now been converted into an orange belt. The farmers started to earn a steady income through sale of these fruits. To celebrate this success, an Organic Fair and Orange Festival is celebrated annually during the peak orange season where a large number of visitors come to celebrate the occasion.

Source: Revolution in Horticulture: Sikkim's 22 Years of Achievement, published by Horticulture and Cash Crop Development Department, Government of Sikkim, August 2016.

Gerbera Plantation

Basilakha is a small village located in East Sikkim. Farmers of this village were engaged in traditional agriculture. They used to cultivate paddy, maize, pulses and some vegetables. This village had turned from ordinary to extraordinary by hardwork of progressive farmers. Their zeal, enthusiasm and hardwork to do something new and great have completely changed the economic scenario of that village. Exploration towards alternate avenues for income generation led to the change in cropping pattern.

Knowing that besides crops and vegetables, flowers too have a large market and they can be sold not only in Sikkim but also in other parts of India, such as Delhi, Mumbai and Bengaluru, they became more interested in growing flowers.

Noticing their interest in flowers, gerbera cultivation was introduced by MIDH, Sikkim in 2009 at Basilakha with a single unit. The most enthusiastic and progressive farmer was selected and made to grow the flowers. The result was outstanding and this encouraged other farmers and the government officials. It had a very positive impact on the village. More farmers were encouraged towards growing flowers. At present, the total number of farmers growing gerbera is more than 60 in that small village itself.

In the beginning, they started growing gerbera at a low-cost polyhouse. The number of flowers grown in each polyhouse is 600–800 respectively. Besides the polyhouse, farmers are supported with tissue culture planting material, organic fertilisers, training and marketing.

Fig. 5.6 Gerbera plantation in polyhouse

The flowers are sold to local markets and Siliguri. Marketing is done by the progressive growers who collect the produce from other growers and then send to markets. Each farmer earns an average of ₹40,000 to ₹50,000 per annum. The total income of the village from gerbera cultivation alone is around ₹28 lakhs per annum.

Source: Revolution in Horticulture: Sikkim's 22 Years of Achievement, published by Horticulture and Cash Crop Development Department, Government of Sikkim, August 2016.

Off-season Vegetable Cultivation

Tashi Sherpa, one of the progressive vegetable growers of Sikkim, was into conventional farming of potatoes and other cereal crops. After attending many awareness programmes, he got an opportunity for an exposure visit to vegetable growing states of India. This encouraged him to become more interested in trying out commercial vegetable cultivation. With support from the department he started cultivating off-season vegetables like cabbage, cauliflower and radish. Due to his zeal and enthusiasm, he was provided a good variety of seeds and training on the scientific method of cultivation by the Government of Sikkim. Today, he is one of the most progressive vegetable growers of his area. He has motivated more than hundred farmers of his surrounding areas. Today, all the farmers are taking up cultivation of off-season vegetables like carrot, broccoli and peas. The profitable aspect of the business has been the main source of motivation for all. The farmers now plan to develop the total area as off-season vegetable model cluster and produce off-season vegetables throughout the year.

Today, off-season vegetable cultivation is a booming business for many small and marginal farmers of the state.

Source: Revolution in Horticulture: Sikkim's 22 Years of Achievement, published by Horticulture and Cash Crop Development Department, Government of Sikkim, August 2016.

Fig. 7.8 Vegetable cultivation in the farm of Tashi Sherpa

Glossary

Biodegradable— Decomposed by micro-organisms thereby avoiding pollution.

Eco-friendly— Not harmful to the environment.

Fair Trade Certification— FTC is a certification process that sets standards for the way product is produced and how much a farmer/farming cooperative earns. The criteria are fair price for farmers and decent working and living conditions for workers.

Recyclable— Substance that can be recycled or made suitable for reuse.

Shelf-life— The length of time for which an item remains usable/fit for consumption.

Perishable— Likely to decay or get spoilt quickly.

Susceptibility— Liable to be influenced or affected by external factors.

What have we learnt?

1. Agriculture is the most important livelihood option in India.
2. Agri-practices have contributed a lot to increase farmers' income.
3. Farmers cultivating organic crops tend to get relatively higher prices than the conventional ones.
4. Organic agriculture focuses on traditional knowledge and local innovations, e.g., locally adapted crop varieties, crop rotation, mixed farming, intercropping, etc.
5. Organic farming provides equal work and employment opportunities to men as well as women.
6. Organic food processing helps in generating and increasing income of rural farmers.
7. Processing technology helps in making the food available during the lean season.

Exercises

1. Answer the following questions.

i. How are organic products helpful in income generation of a farmer?

ii. What is food processing? Why is it important in organic farming?

iii. Describe the methods of organic food processing.

iv. State reasons for the spoilage of agricultural products. What measures can be taken to avoid the spoilage?

v. What precautions must be taken while packaging of organic material?

vi. What is the significance of labelling packed organic material?

vii. Write a short note on social sustainability of organic farming.

viii. How does organic agriculture ensure food security?

2. Read the following statements and write 'True' or 'False'.

i. Organic products are more susceptible to pests.

ii. Conventional farming does not have negative social and environmental effects.

iii. APEDA comes under Ministry of Commerce.

iv. Organic farming system is more labour-intensive than conventional method of farming.

v. Organic farming ensures equal work and benefits to men and women.

3. Project

Make a survey in your town to find out what preservation practices are being followed by individual homes of a community and make a report to share in the class for discussion.

Organic Farming

For Classes VI to VIII

विद्यया ऽ मृतमश्नुते

एन सी ई आर टी
NCERT

राष्ट्रीय शैक्षिक अनुसंधान और प्रशिक्षण परिषद्
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Foreword

The National Council of Educational Research and Training (NCERT) has been developing learner-friendly textbooks as per the recommendations of the *National Curriculum Framework (NCF), 2005*. The NCF 2005 proposes a new approach to infuse subject knowledge with the children's self-learning from their daily life experiences. In an agrarian country like India, agriculture is an important means of livelihood for a large population. The children also get associated with this occupation in one way or the other. As a result, the students may opt for it in early stages of vocational education. Agriculture has, thus, emerged as one of the most important areas to be learnt and practised in all stages of education.

The changes in agricultural practices in the last century have led to significant risk to the sustainability of various components of the environment, for example, the excessive use of chemicals in agriculture has adversely affected the soil quality. It has not only affected the food quality and health but the whole environment. We cannot separate health of individuals, communities, etc., from the health of the ecosystem. Sustainable agricultural practices are the need of the hour.

However, in India, organic farming was being practiced extensively before these changes took place. There are several established approaches to eco-friendly farming systems. Organic farming has now once again become the most widely recognised alternative farming system to the chemical-based agriculture. A common requisite in all schools is, therefore, to emphasise the principles and concepts of organic farming and inculcate them in the coming generations.

The present text material has been developed for use at the upper primary level of school education with an objective to make students aware of various aspects of organic farming and to encourage eco-friendly farming practices. It is expected that the introduction of this material in school education will create a healthy environment in the modern day agriculture and inculcate the principle and concepts of organic farming among the students of upper primary level.

This material gives priority and space to opportunities for contemplation and out-of-box thought process, discussion in small

groups, and activities requiring hands-on experiences. It follows the basic criteria of NCF 2005 in respect of content, cognitive process, historical, environmental and ethical validities. The effort made by the Development Team is highly appreciated.

As an organisation committed to systemic reform and continuous improvement in the quality of teaching-learning materials, NCERT welcomes comments and suggestions to enable us to bring further revision in the text.

Hrushikesh Senapaty
Director
National Council of Educational
Research and Training

New Delhi
24 August 2017

Preface

Agriculture is an instinct of human kind on the earth. There are evidence from the ancient times that it is one of the basic activities for procuring food, fibre and shelter. Hence, it is also one of the important skills that are covered during capacity building of life skills. Children residing in the rural areas are familiar with common farming practices. In urban areas too, the concept might not be entirely new. Learners are somewhat familiar with the kitchen garden developed on small piece of land or even using big earthen pots in the balcony of their residences. Involvement of the community to resolve the curiosity of children in all facets of agriculture has been suggested throughout the book.

It caters to the need of the students at the upper primary stage—Classes VI to VIII. The book has three sections, one for each class. The section for Class VI has only one chapter, i.e., Chapter 1. It focuses on general agriculture with reference to organic agriculture. Here, the goal is to familiarise the students with preliminary information about cultivation of indigenous (*desi*) varieties of various crops and rearing of *desi* breeds of animals and also to provide glimpses of crop seasons, crops of India and environmental impact of various cultivation practices, etc.

The second section of the book is for the students of Class VII and has two chapters. Chapter 2 introduces organic farming as an alternative to the conventional farming. It focuses on how conventional farming affects the survival and sustainability of an ecosystem. In Chapter 3, learners are exposed to the core pillars of organic farming, which help organic farming to survive and sustain. It includes the methods to systematise farming, right from cultivation to production practices, certifying the product for its authenticity as an organic product and addition of value to the product, and finally, the marketing of the produce.

The third section of the book, having two chapters, is meant for the students of Class VIII. Chapter 4 apprises the learners not only with the certification procedure for organic products but also the institutions, offices, organisations and people involved in the

process such as — researchers, policy-makers, extension bodies, accreditation bodies for certification, intermediate manpower, farmers, traders; consumers and their feedback to traders and farmers and other stakeholders; and ultimately to conducting new researches so as to come up with new methods for sustainability. Finally, Chapter 5 deals with informing the learners about livelihood opportunities. Some success stories are also given so that a link between the classroom and everyday life is maintained.

Two characters from the Science textbooks — *Paheli* and *Boojho* — continue to poke the students' brain with their witty humour, promoting scientific temper. The book follows a child-centred approach where students are provided ample opportunities to explore, perform activities, conduct surveys, study projects, etc. They are also encouraged to visit the library, surf Internet, watch TV channels and read newspapers to resolve queries on their own. The book also provides learners an opportunity to reap benefits from the experiences of people from the community — right from the vegetable vendors to farmers, traders and societies/agencies. Learners have been encouraged to visit organic fests and *melas*, etc., and also to organise such programmes at the school level. There is an ample opportunity for the reader to interact and share experiences with others through various pedagogies, such as survey-based learning, project-based learning, etc. It also provides pedagogical inputs for teachers as facililator, specifically, for differently abled in an inclusive set up.

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