

Unit



Introduction to Horticulture

INTRODUCTION

Horticulture is a science, as well as, an art of production, utilisation and improvement of horticultural crops, such as fruits and vegetables, spices and condiments, ornamental, plantation, medicinal and aromatic plants.

Horticultural crops require intense care in planting, carrying out intercultural operations, manipulation of growth, harvesting, packaging, marketing, storage and processing. India is the second largest producer of fruits and vegetables in the world after China. In India, about 55–60 per cent of the total population depends on agriculture and allied activities. Horticultural crops constitute a significant portion of the total agricultural produce in India. They cover a wide cultivation area and contribute about 28 per cent of the Gross Domestic Product (GDP). These crops account for 37 per cent of the total exports of agricultural commodities from India.

SESSION 1: HORTICULTURE AND ITS IMPORTANCE

The term horticulture is derived from two Latin words *hortus*, meaning 'garden', and *cultura* meaning 'cultivation'. It refers to crops cultivated in an enclosure, i.e., garden cultivation.



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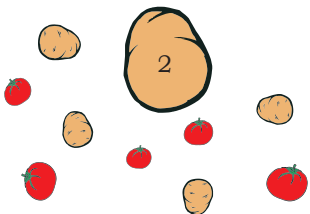
Features and importance

Horticulture crops perform a vital role in the Indian economy by generating employment, providing raw material to various food processing industries, and higher farm profitability due to higher production and export earnings from foreign exchange.

- (a) Horticulture crops are a source of variability in farm produce and diets.
- (b) They are a source of nutrients, vitamins, minerals, flavour, aroma, dietary fibres, etc.
- (c) They contain health benefiting compounds and medicines.
- (d) These crops have aesthetic value and protect the environment.
- (e) The comparative production per unit area of horticultural crops is higher than field crops, e.g., paddy crop gives a maximum yield of only 30 q/ha, while banana crop gives 300–450 q/ha and grapes 90–150 q/ha.
- (f) Fruit and plantation crops can be cultivated in places where the slope of land is uneven or undulating. Mango and cashew nut are cultivated on a large scale in hilly and hill back area of the Konkan region.
- (g) The crops are useful for cultivation in wasteland or poor quality soil.
- (h) Such crops are of high value, labour intensive and generate employment throughout the year.
- (i) Horticultural produce serves as raw material for various industries, such as processing, pharmaceutical, perfumery and cosmetics, chemical, confectionery, oils and paints, etc.
- (j) They have national and international demand and are a good source of foreign exchange.

Present status of horticultural crops in India

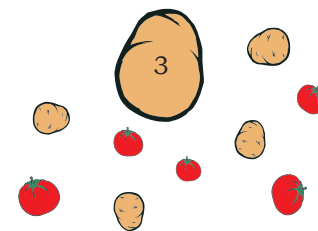
According to the data provided by the Government of India for 2016–17, horticulture crops in India are being cultivated in 24 million hectares, which is about 7 per cent of India's total cropped area. The annual horticultural produce is estimated around 295 million tonnes, which includes 175 million tonnes of vegetables and 92 million tonnes of fruits in



2016–17. India is the largest producer of okra (lady’s finger). Among vegetables, India ranks second in the production of potato, onion, cauliflower, brinjal and cabbage. In fruits, it is the largest producer of banana, mango, guava, lemon and papaya. Mango, walnut, grapes, banana and pomegranate are the major fruits exported, while onion, okra, bitter gourd, green chilly, mushroom and potato have more exotic demand. Fruits and vegetables are mostly exported to the UAE, Bangladesh, Malaysia, the Netherlands, Sri Lanka, Nepal, the UK and Saudi Arabia.

Table 1.1: Important horticultural crops and their growing regions in India

State	Major Horticultural Crop(s)
Northern	
Haryana	Bottle gourd, marigold
Himachal Pradesh	Apple, potato
Jammu and Kashmir	Apple
Punjab	Citrus fruits
Uttarakhand	Potato
Uttar Pradesh	Mango, banana, potato, sweet potato, watermelon, bottle gourd, jasmine
Rajasthan	Pomegranate, onion, jasmine, tuberose
Western	
Chhattisgarh	Bottle gourd, rose
Goa	Coconut, arecanut, cashew nut
Gujarat	Banana, papaya, sapota, pomegranate, potato, onion, tomato, rose, marigold
Maharashtra	Mango, banana, grapes, citrus fruits, sapota, pomegranate, chilli, onion, rose, chrysanthemum, tuberose, marigold
Madhya Pradesh	Citrus fruits, papaya, pomegranate, chilli, potato, sweet potato, onion, bottle gourd, tomato, chrysanthemum, marigold
Southern	
Andhra Pradesh	Mango, banana, grapes, citrus fruits, papaya, sapota, pomegranate, coconut, chilli, watermelon, tomato, jasmine, tuberose, marigold
Karnataka	Mango, banana, grapes, papaya, sapota, pomegranate, coconut, chilli, onion, watermelon, tomato, rose, chrysanthemum, jasmine, tuberose, marigold
Kerala	Banana, coconut, sweet potato, chrysanthemum, jasmine



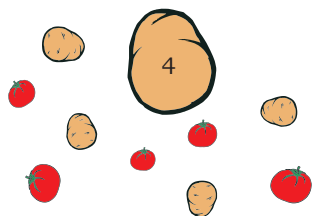
Tamil Nadu	Banana, papaya, sapota, coconut, chrysanthemum, jasmine, tuberose
Telangana	Mango, citrus fruits, tomato
Eastern	
Andaman and Nicobar Islands	Coconut
Bihar	Mango, chilli, potato, onion, bottle gourd
West Bengal	Coconut, potato, sweet potato, watermelon, rose, marigold
Odisha	Coconut, sweet potato, watermelon, bottle gourd
North-eastern	
Arunachal Pradesh	Turmeric, ginger
Assam	Banana, papaya, pomegranate, coconut, tuberose
Meghalaya	Papaya, arecanut, ginger
Sikkim	Ginger
Tripura	Papaya, arecanut, turmeric

Source: *Horticulture Statistics at a Glance 2017*, National Horticulture Board, Government of India

Prospects of horticultural crops in India

Diverse agro-climatic conditions in India ensure the production of all types of fresh fruits, vegetables and medicinal plants in different parts of the country (Table 1.1). Health consciousness among people is increasing. Majority of the population in India is vegetarian. As a result, the demand of fruits and vegetables is also high. The production of horticultural commodities is far less as compared to the existing demand in the country. So, there is a vast scope to produce more horticultural crops. Major areas in the country are suitable only for horticultural crops, like mango, tea, coconut and arecanut, as they are non-arable, rocky, stony, marshy, undulated and sloppy.

There has been an increase in irrigation facilities but there are crops, which even with little watering, can survive. One only needs to ensure adequate water management. Some dry land horticultural crops, like *jamun*, *ber*, tamarind, wood apple, custard apple, *ramphal*, etc., can be grown on rainfed land also. Compared to other countries, agricultural labour and other agricultural inputs are far cheaper and easily



available here, which reduce the cost of production and generate more profit. High return, coupled with government assistance, through various schemes and financial aid, attract the rich and poor, trained and educated people towards horticulture. This leads to the use of intensive methods and improved technology in the production of horticultural crops. Awareness of storage and processing methods also increase the availability of the produce, job opportunity and income generation.

Employment opportunities in horticulture

The horticultural industry offers a variety of jobs, both directly and indirectly. Many jobs require knowledge and training in horticulture. The level of training could be vocational or at the college level. The nature of work may be indoor or outdoor. Intense manual labour or paperwork in office may be involved. The following are the identified categories of jobs that require varying degrees of familiarity with horticulture:

Nursery operation

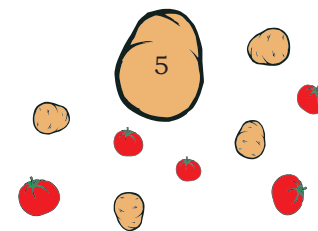
- (a) Nursery manager (coordinates the entire nursery operations)
- (b) Propagator (develops quality planting material)
- (c) Field supervisor (supervises and plans fieldwork)
- (d) Plant technician (advises and provides guidance on plant care)
- (e) Salesperson (works on the promotion and sale of plant material)

Turf grass operation

- (a) Landscape technician (establishes and maintains landscape)
- (b) Golf course architect (designs a golf course)
- (c) Golf course superintendent (supervises the construction and maintenance of the golf course)

Crop production

- (a) Farm manager (manages the horticulture farm)
- (b) Crop grower (produces vegetables, fruits and flowers)



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Florist operation

- (a) Floral designer (creatively arranges flowers)
- (b) Store manager (manages and supervises the store of the farm)
- (c) Plant rental supervisor (manages plants and pots, and does floral arrangements on rent)

Education

- (a) Teacher/trainer (teaches horticulture in formal or informal system)
- (b) Researcher (conducts research to develop new products and varieties)
- (c) Extension person (disperes innovative techniques and methods among people)

Industrial operation

The horticultural industry has spawned a number of supporting or service industries, including the following:

Developer or producer

Agro-chemicals

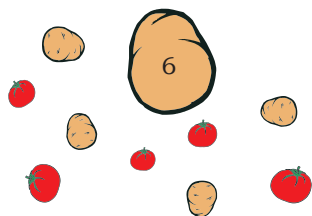
The horticulture industry depends on a variety of chemicals, including fertilisers, pesticides and growth hormones. These chemicals are called agro-chemicals.

Farm machinery

Machinery, tools and implements are required for preparing the land, planting, cultivation, spray, harvest, store and packaging. Engineers design and construct the tools and machinery required for extensive and intensive production of horticultural plants. Home garden versions of some of these machineries and equipment are also available.

Distributors

Horticultural products need to be transported from the areas of production to nearby and distant markets, and ultimately, to consumers. Because of their highly perishable nature and in order to retain their quality for a long duration, horticultural products require special care and handling in transportation. It requires special personnel to look after this aspect.



What have you learned?

Now, I am able to:

- understand what is horticulture and its importance.
- understand the present status and prospects of horticulture in the country.
- know about nutritional value of fruits and vegetables.

Practical Exercises

Activity 1: Prepare a poster or a chart depicting the nutritional importance of horticultural crops.

Material required: Stickers, colour pencils, paper, paper clips, board pins, drawing board and glue

Procedure

- Collect or cut the pictures of fruits and vegetables from a chart purchased from the market.
- Fix the chart paper on a drawing board or a plane surface with the help of board pins.
- Outline the border of the chart.
- A sketch chart consists of cells of different sizes.
- Name the columns on the chart.
- Paste the picture of a fruit or a vegetable in each cell.
- Fill in the information about the fruit or vegetable in the cell opposite to the figure.

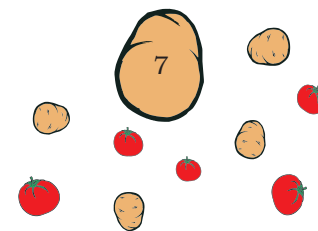
S. No.	Nutrient	Important source	Importance/ deficiency causes	Picture
1.	Vitamin A	Carrot	Night blindness	
2.	Vitamin B ₁	Spinach	Beri beri	
3.	Vitamin B ₂	Cauliflower	Ulcer of the mouth	
4.	.....	.....
5.	.....	.....

Activity 2: Enlist the major horticultural crops grown in your locality.

Material required: Branches or leaves of horticultural crops, sticking tape, A-4 size white paper, newspaper, etc.

Procedure

- Collect the leaves of different fruit and vegetable crops in your vicinity.
- Trace the specimen in the right side on a newspaper.
- Cover it with another newspaper and keep it under a heavy thing for a few days.



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- This will remove moisture from the leaves and they will become partially dry.
- Stick the specimen with the help of a sticking tape on the A-4 sheet.
- Label the specimen.

Check Your Progress

Fill in the Blanks

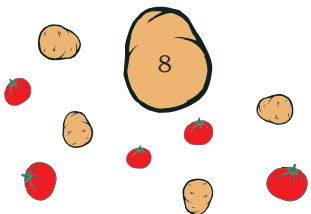
1. India ranks _____ in fruit and vegetable production in the world.
2. Latin word *hortus* means _____ and _____ means 'cultivation'.
3. _____ crops are of high value but labour intensive.
4. _____ is the largest producer of okra.
5. India ranks _____ in the production of bananas.
6. Horticultural crops, like mango, tea and coconut can be grown on _____.

Descriptive Questions

1. Define horticulture.

2. Write the importance of horticulture.

3. Explain the employment opportunities in horticulture.



SESSION 2: BRANCHES OF HORTICULTURE AND SPECIAL HORTICULTURAL OPERATIONS

Horticulture is perhaps the most important branch of agriculture. It is further divided into four different branches as shown in Fig. 1.1.

Pomology

The term is derived from Latin words *poma* and *logus*. *Poma* means 'fruit' and *logus* means 'study, knowledge or discourse'. It can be defined as a branch of horticulture, which deals with the scientific study of fruit crops (Fig. 1.2).

Olericulture

The term is derived from Latin words *olerus* meaning 'vegetables' and *cultura* meaning 'cultivation'. It can be defined as a branch of horticulture, which deals with the scientific study of vegetable crops (Fig. 1.3).

Floriculture

The term floriculture is derived from Latin words *florus* and *cultura*. *Florus* means 'flower' and *cultura* means 'cultivation'. It can be defined as a branch of horticulture, which deals with the scientific study of flowering and ornamental crops (Fig. 1.4). Landscaping is the art of beautifying a piece of land using garden designs, methods and plant material. Professionals who do landscaping are called 'landscape architects'.

Post-harvest technology

It is a branch of horticulture, which deals with the principles and practices of handling, packaging and processing of harvested crops to increase their storage life and availability.

Vegetable crops are different from fruit crops. Some important differences between them are given in Table 1.2.



Fig. 1.1: Branches of horticulture



Fig. 1.2: Fruit cultivation



Fig. 1.3: Vegetable cultivation



Fig. 1.4: Flower cultivation

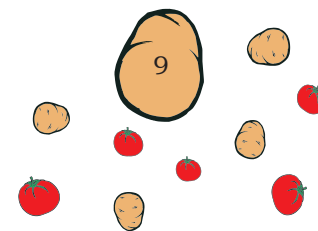


Table 1.2: Difference between fruits and vegetables

S. No.	Fruits	Vegetables
1.	Most fruit plants are perennials.	Most vegetables are annuals.
2.	Fruit plants are generally woody in nature.	Vegetable plants are, generally, herbaceous and succulents.
3.	They are commercially propagated asexually.	They are commercially propagated sexually (by seed).
4.	Fruit plants require special cultural practices, i.e., training, pruning, etc.	Vegetables are seasonal and only staking and pruning are required in some crops.
5.	Fruits are mostly consumed fresh after ripening.	Most vegetables require cooking for consumption.

Classification of vegetable crops

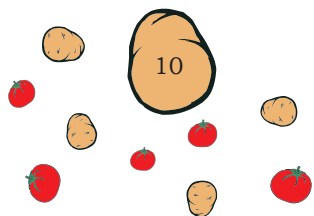
If the growing of each vegetable is dealt with in detail, it will lead to too much repetition. It is, therefore, desirable to classify vegetable crops into certain groups as per their similarities (Fig. 1.5). This will also help in studying them easily.

Based on the nature of plant (stem)

- (a) *Herbaceous and succulents*: Leafy vegetables
- (b) *Shrubs*: Brinjal, chilli, tomato, etc.
- (c) *Trees*: Drumstick, jackfruit, etc.
- (d) *Vines*: Cucurbits, etc.

Based on the life span (from seed-to-seed)

- (a) *Annuals*: The life span of annual plants or annuals is a season or a year, e.g., brinjal, chilli, cabbage, cauliflower, cucurbits, tomato, leafy vegetables, etc.
- (b) *Biennials*: The life span of biennials is of two seasons or two years, e.g. onion, radish, carrot, etc.
- (c) *Perennials*: The life span of perennial plants is more than two years, e.g., drumstick (*moringa*), asparagus (*shatawan*), pointed gourd (*parwal*), etc.



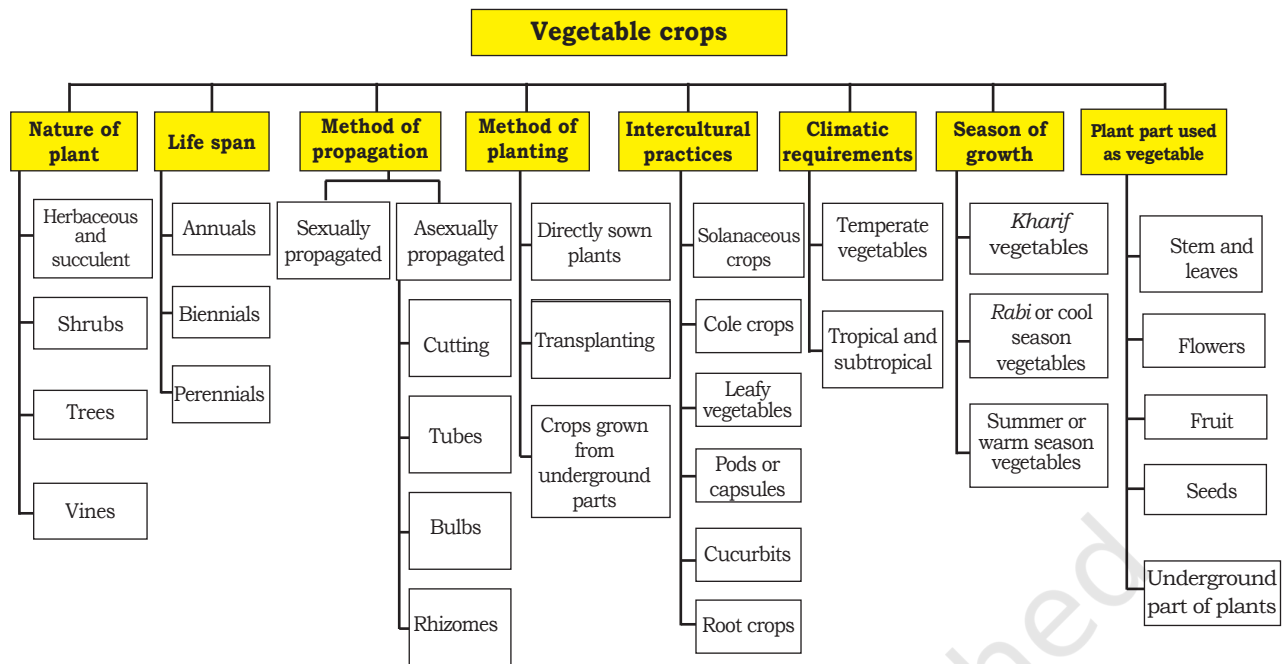


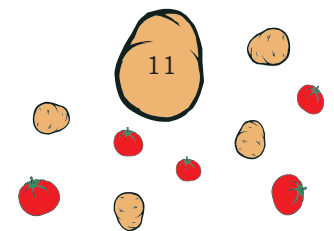
Fig. 1.5: Classification of vegetable crops

Based on the method of commercial propagation

- (a) *Sexually propagated (by seed)*: Brinjal, chilli, cauliflower, cabbage, cucurbits, tomato, leafy vegetables, etc.
- (b) *Asexually propagated (vegetative parts)*: Asparagus, dioscorea, potato, sweet potato, onion, garlic, taro, yam, etc.
 - *Cuttings*: Asparagus
 - *Bulbs*: Onion, garlic
 - *Rhizomes*: Colocasia, ginger, coleus
 - *Tubers*: Potato, sweet potato

Based on the method of planting

- (a) *Directly sown plants*: Okra, leafy vegetables, carrot, radish, peas and beans
- (b) *Transplanting*: Tomato, brinjal, chilli, cauliflower, cabbage, onion, potato, sweet potato, cassava, pointed gourd, etc.
- (c) *Crops grown from underground parts*
 - *Root vegetables*: Radish, carrot, turnip, beetroot
 - *Rhizome*: Colocasia, ginger
 - *Bulb*: Onion, garlic
 - *Tuber*: Potato, sweet potato, cassava and yam



Based on intercultural practices

- (a) *Solanaceous crops*: Tomato, brinjal, chilli, bell pepper, potato
- (b) *Cole crops*: Cabbage, cauliflower, *knol-khol*, broccoli and Brussels sprouts
- (c) *Leafy vegetables*: Spinach, *methi*, lettuce and *chaulai* (*amaranthus*)
- (d) *Pods or capsules*: Pea, cowpea, cluster bean, okra
- (e) *Cucurbits*: Gourds, melons, cucumber, pumpkin
- (f) *Root crops*: Carrot, radish, turnip, beetroot

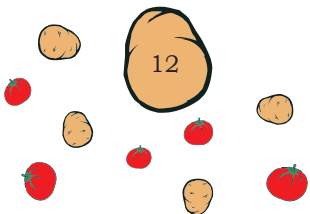
Based on climatic requirements

- (a) *Temperate vegetables*: Radish, potato, carrot, cabbage, cauliflower, *knol-khol*, broccoli, etc.
- (b) *Tropical and subtropical vegetables*: Watermelon, musk melon, cucumber, tomato, brinjal, chilli, etc.

Based on the season of growth

In India, seasonal or annual vegetables can be classified according to their season of growth. Season of growth is the period in which the climatic conditions are favourable for the growth and production of a crop.

- (a) *Kharif season vegetables*: These may also be called rainy season crops. These vegetables require hot and humid climate. The season tentatively starts from 7 June and lasts till 6 October every year. The sowing of seeds may be undertaken from mid-May to late July. Vegetables, like okra, cowpeas, cluster beans, etc., are examples of *Kharif* vegetables.
- (b) *Rabi or cool season vegetables*: These may also be called cool or winter season crops as these vegetables require low temperature for growth. The season tentatively starts from 7 October and lasts till 6 February. The sowing of seeds may be undertaken from mid-September to late October. Vegetables, like peas, radish, carrot, cauliflower, cabbage, *knol-khol*, leafy vegetables, etc., are examples of *Rabi* vegetables.
- (c) *Summer or warm season vegetables*: The season tentatively starts from 7 February and lasts till 6 June. The sowing of seeds may be undertaken



from mid-January to late February. These crops require hot and dry climatic conditions for better growth and maximum production. Cluster bean, musk melon, cucumber, watermelon, etc., are summer season vegetables.

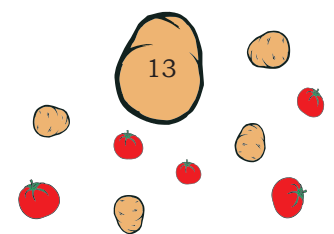
Based on plant part used as vegetable

- (a) *Stem and leaves*: Cabbage, lettuce, spinach, *methi*, coriander, amaranthus, etc.
- (b) *Flowers*: Broccoli (head 'flower buds'), cauliflower (curd 'pre-floral stage'), etc.
- (c) *Fruits*: There are various stages where the fruits of vegetable crops can be harvested for consumption, such as
 - *Ripened fruits*: Watermelon, musk melon, tomato, etc.
 - *Immature and tender fruits*: Cucumber, bottle gourd, bitter gourd, ridge gourd, okra, brinjal, green chilli, cowpea, French beans, dolichos beans, etc.
- (d) *Seeds*: Peas, etc.
- (e) *Underground parts of plant*
 - *Taproot*: Tapering root growing vertically downward, e.g., carrot, radish, etc.
 - *Bulb*: A fleshy leaved storage organ in some vegetables sending adventitious roots downward and leaves upward, e.g., onion, garlic, etc.
 - *Tuber*: Thick, short and rounded underground stem with modified nodes and buds, e.g., potato, sweet potato, etc.
 - *Rhizome*: Underground root-like stem having roots and shoots, e.g., colocasia, ginger, etc.

Important horticultural operations

Training

When a plant is made to grow with or without support, in a desired fashion by removing or fastening some of its parts with a view to give it a better framework or shape, the operation is called 'training'.



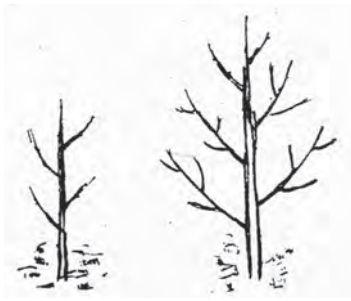


Fig. 1.6: Central leader system

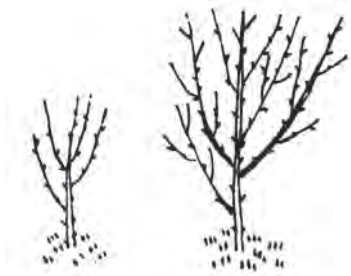


Fig. 1.7: Open centre system

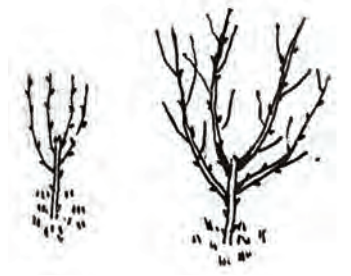


Fig. 1.8: Modified leader system

System of training

There are three systems of training in fruit trees:

Central leader system

In this system, the main stem of a tree is allowed to grow straight from the ground level to the top, which is called the central axis of the tree. The smaller side branches grow from this central axis in various directions (Fig. 1.6). Such a tree grows tall and bear fruits mostly near the top. The lower branches, gradually, become less vigorous and bear less fruits.

Open centre system

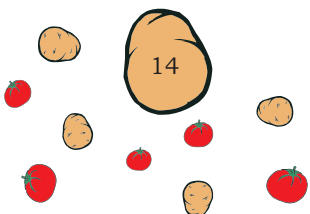
In this system, the main stem of a tree is allowed to grow up to a desired height and the top is headed to induce lateral branches, resulting in a low-headed and open at the centre tree. In this system, the sunlight reaches all branches and the crop is borne closer to the ground (Fig. 1.7). It facilitates harvesting and thinning of fruits, as well as, plant protection operations.

Modified leader system

This system is the modification of the central leader system and the open centre system (Fig. 1.8). The main stem grows for a few years, and after some time, lateral branches are induced to grow, which are widely spaced and spread on all sides not as in the open centre system. Thus, the tree is fairly strong and moderately spread, allowing easy orchard management operations.

Precautions taken during the training of fruit trees

- First, remove the branches arising from the main or scaffold limbs after maintaining only one vigorous branch, which is developed at a wider angle.
- Remove the branches turning towards the central axis from their bases.
- Remove suckers, which arise from the roots or underground parts of the stem or are very close to the crown. This is commonly observed in guava and pomegranate trees.
- Remove certain loop side growth to maintain the balance and framework of the tree.



Pruning

Judicious removal of any part of a plant to divert sap towards its producing areas, leading to an improvement in the quality of yield is called 'pruning'. It is done during the later stage of plant life when it becomes ready to produce flowers and fruits. Decayed parts can also be pruned off (Fig. 1.9).

Objectives of pruning

- to maintain flowering and fruiting balance
- to obtain regular bearing in fruits
- to remove pest-infected branches
- to ensure adequate sunlight for plant growth
- to maintain a balance between vegetative and reproductive growth stages

Types of pruning

Thinning out

When a shoot or a branch is removed entirely without leaving any stub is called 'thinning out'.

Heading back

When the terminal portion of a branch or a shoot is removed partially, leaving the basal portion intact, it is called 'heading back'.

Extent of pruning

If a small portion of a terminal of a branch or shoot is removed, it is called 'light pruning'. When a longer terminal portion is removed, it is called 'medium pruning', and depending upon its severity, it can be described as 'heavy pruning'.

Staking

Staking in tomato crop

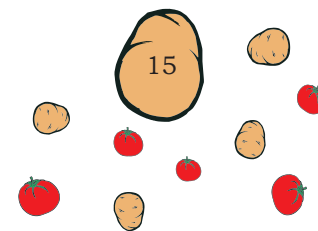
As shown in Fig. 1.10, staking is a practice of supporting tomato plants, especially of indeterminate type, to keep the plants and fruits off ground.



Fig. 1.9: Pruning in a rose plant



Fig. 1.10: Staking in tomato crop



NOTES

Advantages of staking

- It provides support to a plant.
- It keeps fruits above the ground and helps in maintaining the health of the plant.
- There are lesser chances of plants getting infested with pests and diseases.
- It facilitates spraying and dusting of pesticides and fungicides.

Practices for inducing flowering

Bending

In this operation, erect growing branches of guava trees are bent towards the ground without breaking them.

Notching

A small notch of bark, particularly, just above the bud is removed to accumulate nitrogen and induce vegetative growth from the bud. The branches are notched below the bud to accumulate carbohydrate and induce an individual bud to turn into a fruitful one. This practice is followed on a large scale in fig plants.

Topping and pinching

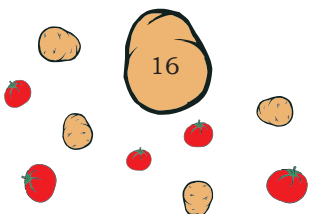
It includes the removal of succulent terminal shoots or just pinching of the last small terminal portion of a shoot. It is practised in fruit plants or vines, which throw shoots that are fast growing, thus, diverting the sap flow to the terminal ends.

Bahar treatment

Some fruiting plants have vegetative and reproductive growth 3–4 times a year. This behaviour of plants in an orchard is not desirable. One good crop at a required time is more desirable for decent economic returns. Fruits developing and maturing at one time facilitate orchard fertilisation, irrigation, harvesting and other such operations.

Transplanting

It is an agronomical practice, in which seedlings are moved and planted in growing places. In solanaceous crops, seedlings are ready after 4–5 weeks of sowing or



when they attain the 4–5 leaf stage. Seedlings should be hardened (it is a process of withholding watering for 4–5 days to reduce the moisture content and develop a water stress condition) before transplanting them. Solanaceous crop seedlings are transplanted on one side of the ridge bed or in flat beds, depending upon the crops or the facilities a grower can provide.

What have you learned?

Now, I am able to:

- differentiate between the different branches of horticulture.
- explain the classification of vegetable crops.
- understand the growing regions of horticultural crops.

Practical Exercises

Activity 1: Prepare a chart for major horticultural crops in your locality.

Material required: Colour pencils, notebook, pen, scale and eraser.

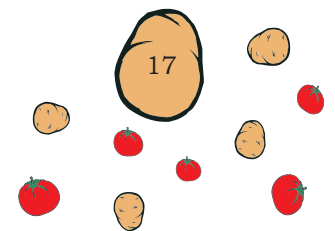
Procedure: Prepare the chart with crops available in your locality in the following way:

S. No.	Name of the crop	Nature of the crop	Part used as food
1.	Tomato	Shrub	Fruits
2.	Radish	Herbaceous	Taproot
3.	Cucumber	Vine	Fruit
4.	.....	.....	.....
5.	.....	.....	.....

Check Your Progress

Fill in the Blanks

1. Based on the life span, onion is a _____ crop.
2. The edible part of cauliflower is known as _____.
3. Plants having a life span of one year or one season are called _____.
4. In India, *Rabi* season starts from _____.
5. Watermelon is a _____ season crop.



NOTES

Multiple Choice Questions

- _____ is a crop that belongs to cucurbits.
(a) Chilli (b) Cucumber
(c) Drumstick (d) Asparagus
- Cabbage grows well in _____.
(a) winter (b) summer
(c) rainy (d) all through the year
- We consume _____ part of radish.
(a) rhizome (b) bulb
(c) tuber (d) taproot
- Drumstick is an example of _____ vegetable.
(a) annual (b) biennial
(c) perennial (d) none of the above
- The Latin word *olerus* means _____.
(a) fruit (b) vegetable
(c) flowers (d) root
- The removal of succulent terminal shoots from a plant is called _____.
(a) bending (b) notching
(c) pinching (d) bahar treatment

Descriptive Questions

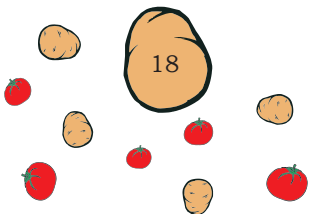
- What are the different branches of horticulture?

- Classify vegetable crops based on the plant part used as a vegetable.

- Distinguish between fruit and vegetable.

- Describe *Kharif* and *Rabi* vegetables.

- With examples, name the underground part of plants used as vegetable.



6. What is training? What are different systems of training?

7. What do you mean by pruning? Explain the different types of pruning.

8. Explain the following:

(a) Bending: _____

(b) Notching: _____

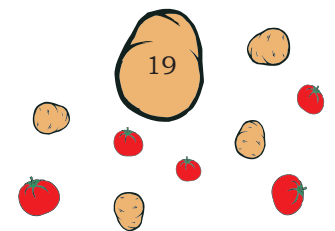
(c) Pinching: _____

Match the Columns

Plant parts	Vegetables
1. Stem and leaves	(a) Cowpeas, French beans
2. Curd	(b) Peas
3. Ripened fruits	(c) Gourds
4. Tender fruits	(d) Tomato, melons
5. Seeds	(e) Cauliflower
6. Immature pods	(f) Leafy vegetables

SESSION 3: OLERICULTURE AND ITS IMPORTANCE IN HUMAN NUTRITION

Olericulture is a branch of horticulture, which deals with the study of cultivation of vegetable crops. The term vegetable is applied to edible herbaceous plants or parts, commonly used for culinary purposes. It may be grains as in maize cobs (sweet corn, baby corn), peas, bulbs, corms, rhizomes, roots and tubers, leaves, pods, fruits or curds, mushroom, etc.



Possibilities of vegetable cultivation in India

More crops per year

Vegetable crops grow fast and require only a few months to mature. Therefore, a number of crops can be cultivated in a year.

Profitability

The yield of vegetables per unit area is higher than cereals. In some cases, it is reported 4–6 times high, so vegetables can profitably grow on small and marginal holdings. This enables increase in the income of small and marginal farmers.

Utilisation of land

Vegetables can be cultivated on a small scale and for a family even in the backyard of a house. It ensures the utilisation of wasteland, household waste and wastewater.

Growing crops in uncertainty of weather

Due to global warming and increase in pollution, there are sudden changes in climatic conditions. Short duration vegetables can be grown effectively because a crop standing for long period will suffer more from climatic adversities.

Employment

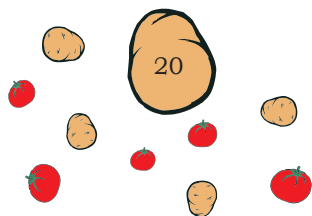
Vegetables are labour-intensive crops and can be grown throughout the year. This provides employment opportunity to agricultural labourers in rural areas.

Advanced techniques of cultivation

Polyhouse and shade-net house techniques of vegetable cultivation enable to get quality produce with maximum returns from a small area. Exotic vegetables with special cultural practices can be grown in such structures and more income can be generated.

Seed industry

Seed is an important factor governing the production of vegetables. Quality seed production is a technical



matter, which requires specific environmental conditions and technical knowledge. Quality seeds increase the crop yield, and subsequently, the income of farmers. Exporting vegetable seeds to countries in South East Asia and Africa helps in foreign exchange.

Increasing irrigation facilities

Awareness about water conservation and construction of dams, canals, ponds and other water bodies to be used as sources of irrigation are increasing by the day. Adequate irrigation facility ensures growing vegetable crops throughout the year.

Better transport facilities

The country's transport infrastructure is improving, and interior and remote areas are gradually getting connected with highways and railways. This ensures early and better transportation of the produce to urban and remote markets.

Skilled manpower

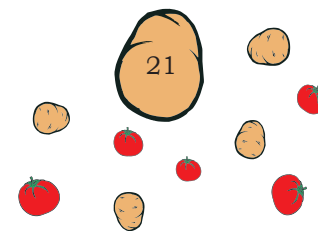
Cultivators, these days, are more skilled. Farmers are educated and trained in innovative practices and new scientific techniques. Their problems are effectively solved through various agencies, such as universities, radio, television, mobile phones, extension workers and other digital means.

Government assistance

The government is emphasising on the development of horticulture. Several schemes and financial assistance regarding infrastructure, irrigation, greenhouse and other farm inputs are being provided to farmers through National Horticulture Mission (NHM), National Horticulture Board (NHB), etc.

Importance of vegetables in human diet

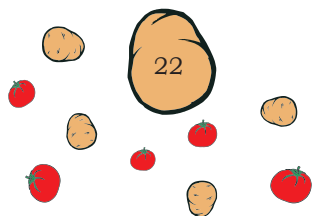
Vegetables constitute an important component of the human diet. They are natural sources of vitamins and minerals, like calcium, phosphorus and iron, carbohydrates and proteins (Table 1.3). These nutrients



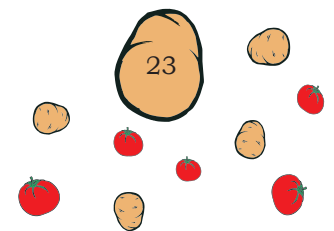
are necessary for growth and build resistance against diseases. Hence, vegetables are termed as 'protective foods'. Vegetables increase the palatability of food and eliminate acidity developed due to the consumption of non-vegetarian foods. They are a valuable source of roughages, have a higher digestibility coefficient and remove constipation. Dieticians recommend that the balanced diet of an adult should consist of 300 g of vegetables per day.

Table 1.3: Importance of vegetables in human diet

S. No.	Nutrients	Vegetables	Importance	Deficiency symptoms
1.	Vitamin A (β -carotene)	carrot roots, leaves of turnip, beetroot, sweet potato, <i>methi</i> , spinach, lettuce, green onion, cabbage, tomato, green chilli	essential for the growth of body, healthy eyes and skin	retardation of growth, dry and flaky skin, drying of tear glands, night blindness, conjunctivitis, kidney stones, etc.
2.	Vitamin B ₁ (thiamine)	cabbage, cowpea, onion, carrot, lettuce, etc.	essential for growth and reproduction, normal functioning of nervous and digestive systems	beri beri, paralysis, loss of appetite, weight loss, fall of body temperature, heart failure, nerve disorder, etc.
3.	Vitamin B ₂ (riboflavin)	all green leafy vegetables	useful for skin, digestibility and growth	pellagra, ulcer of the mouth, cracked lips, loss of appetite, glossy tongue, fatigue, skin disorders
4.	Vitamin C (ascorbic acid)	cabbage, <i>methi</i> , spinach, cauliflower, tomato, green chillies, bitter gourd, sweet potato, etc.	essential for healthy veins and blood circulation	scurvy, bleeding of gums, tooth decay, heart attack, pain in the gum and joint pain, delay in healing of wounds, weak bones
5.	Vitamin D (calciferol)	all green vegetables	essential for healthy bones and teeth, helps in calcification	rickets, dental disease
6.	Vitamin E (tocopherol)	cabbage, lettuce, germinated beans, peas, etc.	anti-ageing vitamin, essential for reproduction, fertility and hair	sterility, hair fall and baldness, anaemia in infants



7.	Calcium	carrot, cauliflower, cabbage, cowpeas, tomato, onion, peas, spinach and other green vegetables	essential for building resistance against diseases, growth and strength of teeth and bones, helps in blood clotting	rickets, osteoporosis, irritability, retardation of growth, trouble in child birth
8.	Phosphorus	potato, carrot, spinach, <i>methi</i> , tomato, beans, cowpeas, cucurbits, etc.	essential for different intra-cellular activities, helps in cell division and multiplication, oxidation of carbohydrates and growth of bones	weakness, retardation of normal growth
9.	Iron	spinach, cabbage, cowpeas, peas, beans, tomato, etc.	important constituent of red blood corpuscles, carries oxygen to various parts of the body	anaemia, lip, eye and nail diseases
10.	Carbohydrates	radish, carrot, sweet potato, potato, tapioca, watermelon, musk melon, beetroot, etc.	provide energy for normal functioning of body and aid different biochemical activities in a cell	weakness due to reduced biochemical activities in the cell
11.	Proteins	spinach, cabbage, radish, peas, beans	constitute the chief solid matter of organs and muscles and are the main constituent of skin, hair, nails, bones, blood cells and serum; contain amino acid, which is necessary for the formation and maintenance of body tissues, and help in the neutralisation of acids produced during digestion, thereby, improving digestibility	retardation of growth, indigestibility, diseases of skin, hair and bones
12.	Fats	seeds of chilli, brinjal, coriander, tomato, radish, cucurbits, etc.	reserved food material, and help in the lubrication of various tissues and organs	weakness, hinder joint mobility



NOTES

What have you learned?

Now, I am able to:

- understand the concept of olericulture.
- appreciate the importance of vegetables in human diet.

Practical Exercises

Activity 1: Prepare a chart depicting the nutritional importance of vegetable crops.

Material required: Colour pencils, notebook, pen, scale and eraser

Procedure: Prepare the chart in the following way:

S.No.	Name of the crop	Nutrient(s)	Importance	Deficiency symptoms
1.				
2.				
3.				

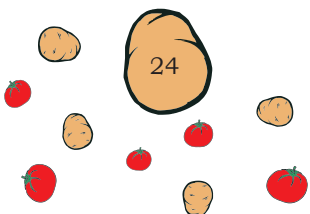
Check Your Progress

Fill in the Blanks

1. The branch of horticulture that deals with the scientific study of vegetable crops is known as _____.
2. The element, which is essential for building resistance against diseases, growth and strength of teeth and bones is _____.
3. Carrot, beetroot, *methi*, spinach and green chilli are sources of vitamin _____.
4. Pea and broad bean are the sources of _____ nutrient.

Multiple Choice Questions

1. _____ is the branch of horticulture dealing with the study of the cultivation of vegetable crops.
(a) Olericulture (b) Floriculture
(c) Pomology (d) Preservation
2. _____ is essential for different intra-cellular activities.
(a) Calcium (b) Phosphorus
(c) Iron (d) Iodine
3. _____ nutrient is a reserved food material.
(a) Carbohydrates (b) Proteins
(c) Fats (d) Vitamin



Descriptive Questions

1. Define olericulture. Explain its importance.

2. What are the possibilities of vegetable cultivation in India?

3. Give the dietary importance of vitamin A.

4. What are important minerals supplied by vegetables?

Match the Columns

Nutrients	Causes of deficiency
1. Vitamin A	(a) Anaemia
2. Vitamin B ₁	(b) Osteoporosis
3. Vitamin B ₂	(c) Rickets
4. Vitamin C	(d) Pellagra
5. Vitamin D	(e) Scurvy
6. Vitamin E	(f) Beri beri
7. Calcium	(g) Conjunctivitis
8. Iron	(h) Sterility

