



FLOWER CROPS

Floriculture is an important branch of horticultural science. It deals with commercial cultivation of cut flowers, loose flowers, ornamental seasonal flowers, ornamental foliage plants, trees, shrubs, climbers, palms, cacti, succulents and bulbous flower crops along with their value-added products. Landscape gardening is also an essential component of floriculture industry which deals with planning and designing of residential and public gardens with diverse plant materials. We know that production of seasonal flowers and their seeds are established businesses in India. Floriculture has tremendous potential in both domestic and international markets due to their aesthetic value, essential oils, fragrance and perfume industry. Cultivation of flowers is one of the best options for improving farmers' income. It also provides gainful employment opportunities for youth through nursery raising, marketing, making ready to use items for consumers, exports and flower-based industries.



LEARNING OUTCOMES

After studying this lesson, the learner:

- defines floriculture and its prospects in India;
- describes the popular flower species cultivated in India;
- recommends suitable shrubs and climbers for specific purposes; and
- discusses the different components of commercial floriculture.

11.1 IMPORTANCE OF FLORICULTURE

Floriculture is important from aesthetic, social and economic point of view. It has the potential for generating employment opportunities year-round and earning foreign

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exchange. Different flower based value-added products such as flower bouquets, garlands, potpourris, perfumes, essential oils, and edible flowers etc. are the main export items. The commercial floriculture comprises field cultivation of cut flowers and loose flowers. It also covers mass multiplication of ornamental plants in nurseries for sale and beautification of the landscape.

The floriculture crops have huge export potential in countries such as United States, Germany, the United Kingdom, the Netherlands and the United Arab Emirates (UAE). The Agricultural and Processed Food Products Export Development Authority (APEDA) is responsible for the export, promotion and development of floriculture in India. To boost the export of floriculture products, the Government of India has set up six agri-export zones for floriculture in Maharashtra, Sikkim, Tamil Nadu (two zones), Uttarakhand and Karnataka. As per the National Horticultural Database, the major flower producing States are Tamil Nadu, Karnataka, Andhra Pradesh, West Bengal Maharashtra, Madhya Pradesh, Gujarat and Haryana etc. Seasonal flowers and seed production is an established business in Punjab, Karnataka and Maharashtra. The United States, Germany, the United Kingdom, the Netherlands and the United Arab Emirates (UAE) are the major countries, which import floricultural produce to India.

11.2 PROSPECTS OF FLORICULTURE IN INDIA

Since time immemorial, India has a tradition of growing flowers. In our country, it is considered as a high growth industry. Export-oriented flower production has increased due to the government's favourable policies. The scope of floriculture in India lies in:

- The opportunities for floriculture are increasing due to diverse uses of flowers in aesthetic sense, urbanization and substantially increased purchasing power of people.
- The demand for floricultural plants and their produce such as bouquet, garland, flower veni and value-added products like dry flowers and potpourris are increasing by the day. They are required in various functions and celebrations.
- Our country is well located between major flower markets, i.e., Europe and East Asia.
- The diverse agro-climatic conditions in the country enable the growers to produce all type of flowers in one season or the other.
- Landscaping has become an integral component of urban horticulture, which add aesthetic value to a place, reduces air and noise pollution, and improve local environment.



- Lawn grass production, lawn establishment and maintenance have emerged as lucrative enterprises and become an integral part of landscaping.
- In light of climate change and health benefits, the scope of turf or lawn grasses, vertical gardening, roof gardening, etc. is on rise.
- Production and marketing of potted plants also opened avenues for plant rentals for interior decoration in hotels, corporate houses, etc.
- The nursery industry is coming up as a flourishing enterprise, giving high returns. There is a huge demand for high quality flower seeds including hybrids.
- Protected cultivation of cut flowers has a great future in our country due to high returns.
- Extraction of essential oils, natural dyes, and pharmaceutical and nutraceutical compounds from flower plants is also a lucrative business.

**INTEXT QUESTIONS 11.1**

1. Floriculture is an important branch of
2. Number of agri-export zone set up by Govt. of India to promote floriculture
 - a. 10
 - b. 6
 - c. 4
 - d. 8
3. APEDA stands for _____
4. Give three examples of value-added products made from flowers.
5. What is extracted from flowers for use in pharmaceutical industry?

11.3 CUT FLOWERS

These flowers are harvested with stalk or cut stems, especially for arrangement in vases and bouquet displays. These cut stems last long if harvested at proper stage of maturity and immediately kept in cold condition to avoid post-harvest losses. Rose, Gerbera, Tuberose, Gladiolus and Chrysanthemum are very popular and widely cultivated cut flowers in India. States, such as Karnataka, Maharashtra, Andhra Pradesh, Orissa, Uttar Pradesh and Gujarat are the leading cut flower producing states. Cut flowers are used in the preparation of floral bouquets, floral baskets,

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corsages, flower arrangements and for decoration of ceremonial vehicles. The botanical name, family origin, cultivation and utility of popular cut flowers have been tabulated in the following Table no. 11.1.

Table 11.1: Popular cut flowers commercially cultivated in India

Sr. No	Common name	Botanical name	Cultivation	Utility
1.	Rose	<i>Rosa hybrida</i>	Open/ Protected	Cut flower, pot plant, petals for garnishing sweets, shrub or bush, climber, hedge, source of essential oil, potpourris.
2.	Chrysanthemum	<i>Dendranthema grandiflora</i>	Open/ Protected	Cut flower, loose flower, garland making, floral bouquets, corsage (unopened flower bud attached over pocket of coat), pot culture, bedding
3.	Gladiolus	<i>Gladiolus grandiflorus</i>	Open	Bouquet, bedding plant, pot plant
4.	Lily	<i>Lilium species</i>	Protected	Cut flower, bouquet pot plant
5.	Gerbera	<i>Gerbera jamesonii</i>	Open/ Protected	Cut flower, floral bouquet, flower arrangement, bedding plant
6.	Carnation	<i>Dianthus caryophyllus</i>	Protected	Cut flower, bouquet, pot plant, garland, flower arrangement
7.	Cymbidium orchid	<i>Cymbidium</i> spp.	Protected	Cut flower, flower arrangement, garland, hanging basket, potted plant

Sr. No	Common name	Botanical name	Cultivation	Utility
8.	Tulip	<i>Tulipa hybrida</i>	Open/ Protected	Cut flower, borders and bedding plant, pot plant, floral bouquets

**INTEXT QUESTIONS 11.2**

- Which of the following is the leading state in producing cut flowers?
 - Rajasthan
 - Karnataka
 - Jammu & Kashmir
 - Assam
- Name two popular cut flower species of India.
- The botanical name of Rose is
- is a species of orchid.
- Unopened flower bud attached over pocket of coat is called

11.4 LOOSE FLOWERS

These flowers are plucked from the plants when the flowers are fully matured and are harvested as loose without stem. These are plucked with hands by giving a gentle twist just below the calyx. Loose flowers are in great demand for making veni, rangoli, bracelets, hair adornments for women and garlands, for garden displays, religious offerings and decorative purposes. Loose flowers include many traditional flowers like Marigold, China Aster, Jasmine, Crossandra, Barleria, etc.

Table 11.2: Popular loose flowers commercially cultivated in India

Sr. No.	Common name	Botanical name	Utility
1.	Marigold	<i>Tagetes species</i>	Garland, home decoration, poultry industry, oil industry, pigment extraction

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2.	Jasmine	<i>Jasminum species</i>	Oil industry, Gajra (flower garland worn by women during festive occasions), veni, garland preparation
3.	Desi Rose	<i>Rosa spp.</i>	Potpourri, Gulkand, oil extraction, incense stick, garland, flower arrangements
4.	Chrysanthemum	<i>Dendranthema grandiflora</i>	Garland, flower arrangements, oil extraction
5.	Tuberose	<i>Polianthus tuberosa</i>	Gajra, veni, oil extraction and garland
6.	China aster	<i>Callistaphu schinensis</i>	Loose flower
7.	Lotus (National flower of India)	<i>Nelumbo nucifera</i>	Garland, flower arrangements, dry flower



INTEXT QUESTIONS 11.3

- The loose flowers are harvested as
 - Without sepal
 - Without petal
 - Without calyx
 - Without stem
- Loose flowers are used for making &
- Give two examples of commercially cultivated loose flower crops.
- Gulkand is made from
 - Marigold
 - Rose
 - Lotus
 - Jasmine
- Which flower is known as national flower of India?



Notes



Fig. 11.1: Loose flower and cut flower of chrysanthemum

11.5 SHRUB & SHRUBBERY BORDER

A shrub or bush is a small to medium-sized perennial woody foliage and/or flowering plant producing single or multiple stems from the base with profuse branches and leaves forming a low crown. These shrub plants are used for making beautiful live borders in gardens or roadsides. A wide border made in a garden where shrubs are thickly planted according to their height, foliage and flower colour for mass display to enhance the beauty of a garden is called a shrubbery border.

Classification based on landscape use

1. **Beautiful flowers:** *Hibiscus rosa-sinensis*, *Bougainvillea* spp., *Ervatamia* spp. etc.
2. **Oil Extraction:** *Jasminum* spp., *Plumeria* spp., *Pandanus tectorius* and *Rosa* spp.
3. **Loose flower:** *Jasminum*., *Crossandra* spp. and *Rosa bourboniana* etc.



INTEXT QUESTIONS 11.4

1. A small to medium sized perennial woody foliage or flowering plant producing multiple stems from base is known as
2. The shrub which is used for oil extraction
 - a. *Hibiscus rosa-sinensis*
 - b. *Rosa* spp.
 - c. *Jasminum* spp.
 - d. Both b & c

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3. What is shrubby border?

11.6 CLIMBER PLANTS

Climbers are important component of landscape gardening. Climbers are defined as the group of plants possessing weak stem and have the ability to climb up the support with the help of modified organs to receive sunlight and air. Nature has equipped these climbers with different modified organs such as tendrils, thorns, hooks, root exudates, claws etc.

Classification of climbers

- **Sunny situation:** *Pyrostegia venusta*, *Quisqualis indica*, *Antigonon leptopus*, *Adenocalymma alliaceum*, *Bougainvillea spp.*, *Campsis grandiflora* etc.
- **Partial shade:** *Clerodendrum splendens*, *Petrea volubilis*, *Lonicera japonica*, *Trachelospermum jasminoides* etc.
- **Climbers for pots:** Certain plants can be planted in pots and made to train over a support like climbers e.g. *Bougainvillea spp.*, *Clitoria ternatea*, *Clerodendrum thomsoniae* etc.
- **Indoor decoration:** Shade loving climbers like *Scindapsus aureus*, *Monstera deliciosa*, *Philodendron spp.*, *Asparagus spp.* etc. can be grown in pots and kept for indoor decoration.
- **Screening purpose:** Climbers with hanging growth habit form an effective screen. These are planted on ground and tied at the top of a building with sufficient space for the branches to hang down. e.g. *Vernonia elaeagnifolia*, *Pyrostegia venusta* etc.
- **Annual climbers:** Certain climbers are seasonal in nature and can be grown in pots or placed alongside the fence by directly sowing their seeds e.g. Sweet peas, trailing nasturtium. There are semi-woody climbers, which can also be grown as annual climbers like *Ipomea purpurea*, *Clitoria ternatea* etc.



INTEXT QUESTIONS 11.5

1. The modified organs of climbers are
 - a. Tendril
 - b. Hooks
 - c. Claws
 - d. All of these

2. The climbers have strong woody stem (True/False).
3. Sweet pea and trailing nasturtium are the examples oftype climber.
4. Which type of climbers is preferred for indoor decoration?

11.7 CUT GREENS (FRESH LEAVES AND STEMS)

Cut greens are used as fillers in bouquets along with cut flowers in flower arrangements and elsewhere for increasing aesthetic value. These floral produces have various other uses in making attractive fresh floral designs and floral arrangements, such as bouquets, wreaths, decoration of house interiors etc. Some of the cut foliage in demand are Asparagus, Ferns, Thuja, Cupressus, Eucalyptus etc.



Fig. 11.2: Cut greens in flower bouquets.

11.8 POTTED PLANTS

The potted plants are used with the purpose to decor homes, offices, commercial complexes, corporate offices, hotels, malls and other sites for various functions and events. These can be easily carried to places for immediate beautification and decoration of landscape of places. Some examples of potted plants are Aglaonema, Aralia, Azalea, Begonia, Calathea, Chlorophytum, Croton, Diffenbachia, Dracaena, ferns, Ficus, Kalanchoe, Maranta, Money plant etc.



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11.9 FLOWER SEED PRODUCTION AND BULBOUS ORNAMENTALS

There is a high demand for quality flower seeds, especially annuals and ornamental plants. The varied agro-climatic conditions of India have enabled the cultivation of seed production of practically all type of flowers of winter, summer and rainy season. Seasonal flowers and seed production is an established business in Punjab, Karnataka and Maharashtra. Planting materials of bulbous ornamentals such as Gladiolus, Tuberose, Amaryllis, Dahlia, Lilies, Freesia, Tulip, Calla Lily etc., are also cultivated, multiplied and marketed in India.

11.10 ANNUALS

The annuals are classified based on season of growing and height at full maturity. These can also be classified for different purpose for beautification of a landscape depending upon their growth and flowering characteristics as mentioned below:

Classification of Annuals Based on Season:

Season	Time (Months)			Examples
	Sowing	Transplanting	Flowering	
Summer annuals	Last week of February	End March-April	May-July	Kochia, Portulaca, Zinnia, Sunflower, Gaillardia, Gomphrena, etc.
Rainy annuals	First week of June	First week of July	August -October	Balsam, Cock's comb, Amaranthus, Tithonia, etc.
Winter annuals	First week of October	Last week of October to November	December-March	Aster, Sweet William, Petunia, Clarkia, California poppy, Nemasia, Gazania, Salvia, Statice, Candytuft, Calendula, Phlox etc.

Classification of Annuals Based on Landscape Use:

- Bedding:** Calendula, Phlox, Verbena, Dahlia, Petunia, Nemasia, Sweet Sultan, Antirrhinum, Acroclinum, Aster, Marigold, Balsam, Zinnia, Sunflower, Gaillardia, Gomphrena etc.



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2. **Pot growing:** Aster, Petunia, Gazania, Cineraria, Salvia, Nemasia, Brachycome, Pansy, Mesembryanthemum etc.
3. **Fragrant flowers:** Sweet William, Sweet Sultan, Sweet Pea, Sweet Alyssum, Mignonette etc.
4. **Shady situation:** Salvia, Cineraria and Nasturtium.
5. **Dry decoration:** Nigella, Briza, Bells of Ireland, Statice, Helichrysum, Acroclinum, Brumus, Lagurus, Gomphrena.



Fig. 11.3: Various annual flowers for landscape use

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1. Which are used as fillers in bouquets along with cut flowers?
2. Which types of plants are gaining popularity for ornamental purpose due to decreasing open spaces?
3. Potted plants are easily carried to different places for decoration (True/False).
4. Give any two examples of bulbous ornamentals.
5. Sowing time of rainy season annuals is
6. What is the flowering time of summer annuals?

11.11 NURSERY

Ornamental nurseries are meant for multiplication and sale of planting materials, besides providing guidance and landscape consultancy in planning, execution and maintenance of gardens. Ornamental plant nursery is a lucrative retail or wholesale business for the supply of various type of saleable plants such as annual flower seedlings or rooted saplings of trees, shrubs, climbers, foliage plants, bulbous plants, cacti and succulents, palms, indoor plants, grasses, bulbs, etc.

11.12 LAWN

Lawn is a well-mown turf maintained either in the sports field, in residential garden, or in a public park. Lawn is an integral part of the garden, providing a lush green open space and a beautiful environment. It is a green carpet for landscape also referred to as 'heart of garden'. Lawn has aesthetic and recreational value too. It also provides a suitable background for flower beds, shrubbery border and specimen tree. It improves the monetary value of a property. Different types of grasses are used in the landscape designing and establishment of lawns in sports fields like cricket, golf, hockey, tennis, etc.

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Fig. 11.4: A rose garden lawn

11.13 ARBORICULTURE

It is the practice of establishing and managing growth and development of woody perennials such as ornamental trees, generally for the purpose of attractiveness.

Classification of ornamental trees based on adaptability:

- a) **Drought prone sandstone rocky sites:** *Albizia lebbek*, *Butea monosperma*, *Tecomella undulate*, *Casurina equisetifolia*, *Melia azedarach*.
- b) **Saline areas:** *Acacia* spp., *Azadirachta indica*, *Prosopis* spp, *Chorisia* spp., *Phoenix dactylifera*, *Phyllanthus emblica*.
- c) **For normal sites:** *Ficus benjamina*, *Ficus lacor*, *Polyalthia longifolia*, *Bauhinia* spp.

11.14 PERFUMES

The demand for natural floral extracts like perfumes from flowers is increasing by the day. Some flowers, such as Rose, Jasmine, Screwpine (kewra) and Tuberose are used for the extraction of essential oils for the preparation of perfumes or attar.

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11.15 COLOURING PIGMENTS

Flowers are used to extract natural pigments. Carotenoids extracted from flowers are used commercially in the pharmaceutical industry, and as food supplements, animal feed additives and food colourants. Marigold petals (processed for lutein extraction) are used as an important feed additive for poultry birds to add to the yellow colour of egg yolk. A yellow coloured dye extracted from chrysanthemum is also used in food products and cosmetics. Orange-red edible dye is extracted from the arils (soft coating of seeds) of *Bixa orellana* (sinduri) is used in cosmetics and medicines for coating.

11.16 DRIED FLOWERS

The dry flowers can be easily dried, preserved and processed to retain their beauty and everlasting character. To dry the flowers and foliage there are different techniques used. The most common technique is air drying. The flowers such as Dahlia, Larkspur, Paper Flower, Annual Chrysanthemum, Marigold, Straw Flower, Lotus Pods are highly valued as dry flowers etc.

11.17 BONSAI

Bonsai is a technique of growing trees and shrubs in miniature form by dwarfing often up to a height of 15-20 cm. It is a Japanese art having origin in China. Some most commonly used trees and shrubs for bonsai preparation include Ficus species such as Banyan, Chikan and Pilkan. Hardy and drought tolerant shrubs such as Bougainvillea, Adenium, Tecoma can also be planted for bonsai establishment etc. Preparation of Bonsai requires proper knowledge and skill for training, watering and nutrient management to maintain the plant in miniature forms.



Fig. 11.5: Bonsai

*Notes***11.18 TERRARIUM**

A terrarium represents a garden in an enclosed glass container. Terrarium culture is a delightful way to grow a collection of small plants well adapted to grow in an enclosed glass jars. With proper care ensuring adequate bright light, a terrarium will create a humid atmosphere that will enable growth of certain plants which normally don't survive under low humidity conditions. A terrarium culture also builds up a favourable environment for plant propagation. Suitable plants for terrarium are variety of succulents (*Echeveria*, *Crassula*, *Kalanchoe*, *Sedums* etc.)



Fig. 11.6: Terrarium

INTEXT QUESTIONS 11.7

1. Places where multiplication and sale of planting materials are done is known as
 - a. Lawn
 - b. Green house
 - c. Nursery
 - d. Terrarium
2. What is called as 'heart of garden'?
3. The science of establishing and managing growth and development of woody perennials is known as
4. Name any two plants from where perfume/attar is prepared.
 - a.
 - b.

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5. Lutein is extracted from the petals of
6. Why flowers are dried?
7. The technique of growing miniature form of trees are termed as
8. What is terrarium?

**WHAT YOU HAVE LEARNT**

- Floriculture is an important branch of horticulture, which deals with commercial cultivation of cut, loose flowers, ornamental, seasonal plants, perennials (trees, shrubs, climbers and palms), foliage plants, cacti, succulents, dried flowers, bulb production along with their value-added products.
- Landscape gardening is also an essential component of floriculture industry with aesthetic and functional value. It deals with the planning and designing of residential and public gardens with diverse plant material.
- Strategically and geographically, our country is well located between major flower markets, i.e., Europe and East Asia.
- The diverse agro-climatic conditions in the country enable the growth of all type of flowers in one season or the other.
- Flowers like Rose, Gerbera, Tuberose, Gladiolus and Chrysanthemum are very popular cut flowers and widely cultivated in India.
- Traditional flowers like Marigold, China Aster, Jasmine, Crossandra, Barleria are used as loose flowers for making Veni, Rangoli, Bracelets, Hair adornments and garlands.
- Aglaonema, Aralia, Azalea, Begonia, Calathea, Chlorophytum, Croton, Diffenbachia and Dracaena are important indoor potted plants for beautification.
- Asparagus, Ferns, Thuja, Cupressus, Eucalyptus are used as cut foliage or cut green plants for making bouquets and floral decorations.

**TERMINAL QUESTIONS**

1. Describe the following with suitable examples.
 - I. Floriculture
 - II. Cut flowers
 - III. Cut greens
 - IV. Landscape gardening
2. Describe the prospects of floriculture in India.
3. Describe the importance of lawn in a public park.
4. What is indoor gardening? Give suitable examples.
5. Give two examples of the following ornamentals:
 - I. Shrubs
 - II. Annuals
 - III. Trees
 - IV. Climbers
 - V. Indoor plants
6. Describe the term 'Bonsai' with suitable examples of tree species.
7. What is arboriculture? Briefly explain the landscape use of ornamental trees.
8. What are the climber plants? Give suitable examples.
9. Describe classification of annual flowers with suitable examples.
10. Enlist the value added products made from flower crops.
11. What is Terrarium? Write importance of it in beatification of interior design.

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1. List the requirements and prepare a plan for developing a lawn in open space in your vicinity.
2. Write the different activities involved in growing of annual flowering plants.
3. What are the employment generating activities you find in floriculture.
4. Collect all the requirements and prepare a beautiful bouquet for presenting to the chief guest visiting to your area.

**ANSWERS TO INTEXT QUESTIONS****11.1**

1. Horticulture
2. 6 (option b)
3. Agricultural and Processed Food Products Export Development Authority (APEDA)
4. Flower bouquets/garlands/potpourris
5. Essential oils

11.2

1. Karnataka (option b)
2. Rose, Gerbera
3. Rosa hybrida
4. Cymbidium
5. Corsage

11.3

1. Without stem (option d)
2. Rangoli and garland



3. Marigold and Jasmine
4. Rose (option b)
5. Lotus

11.4

1. Shrub
2. Both b & c (option d)
3. A wide border made in a garden where shrubs are thickly planted to enhance the beauty of a garden is called a shrubbery border.

11.5

1. All of these (option d)
2. False
3. Annual climbers
4. Shade loving

11.6

1. Cut greens/fresh leaves and stems
2. Potted plants
3. True
4. Gladiolus and Tuberose
5. 1st week of June
6. May – July

11.7

1. Nursery (option c)
2. Lawn
3. Arboriculture
4. Rose and Jasmine

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5. Marigold
6. To retain their beauty and everlasting character
7. Bonsai
8. Terrarium is a garden in an enclosed glass container.

GLOSSARY

Arboriculture: Science of cultivation of woody plants and their management in diverse landscapes.

Cut flower: Flowers that are harvested at appropriate stage of maturity with cut stems attached to their base.

Dry flowers: Flowers that are dried physically (partial shade) or chemically (using desiccants) for decoration of interiors.

Floriculture: Floriculture is an important branch of horticulture, which deals with commercial cultivation of cut flowers, loose flowers, ornamental seasonal flowers, ornamental foliage plants, trees, shrubs, climbers, palms, cacti, succulents and bulbous flower crops along with their value-added products.

Landscaping: Landscape gardening is also an essential component of floriculture industry with aesthetic and functional value. It deals with the planning and designing of residential and public gardens with diverse plant material.

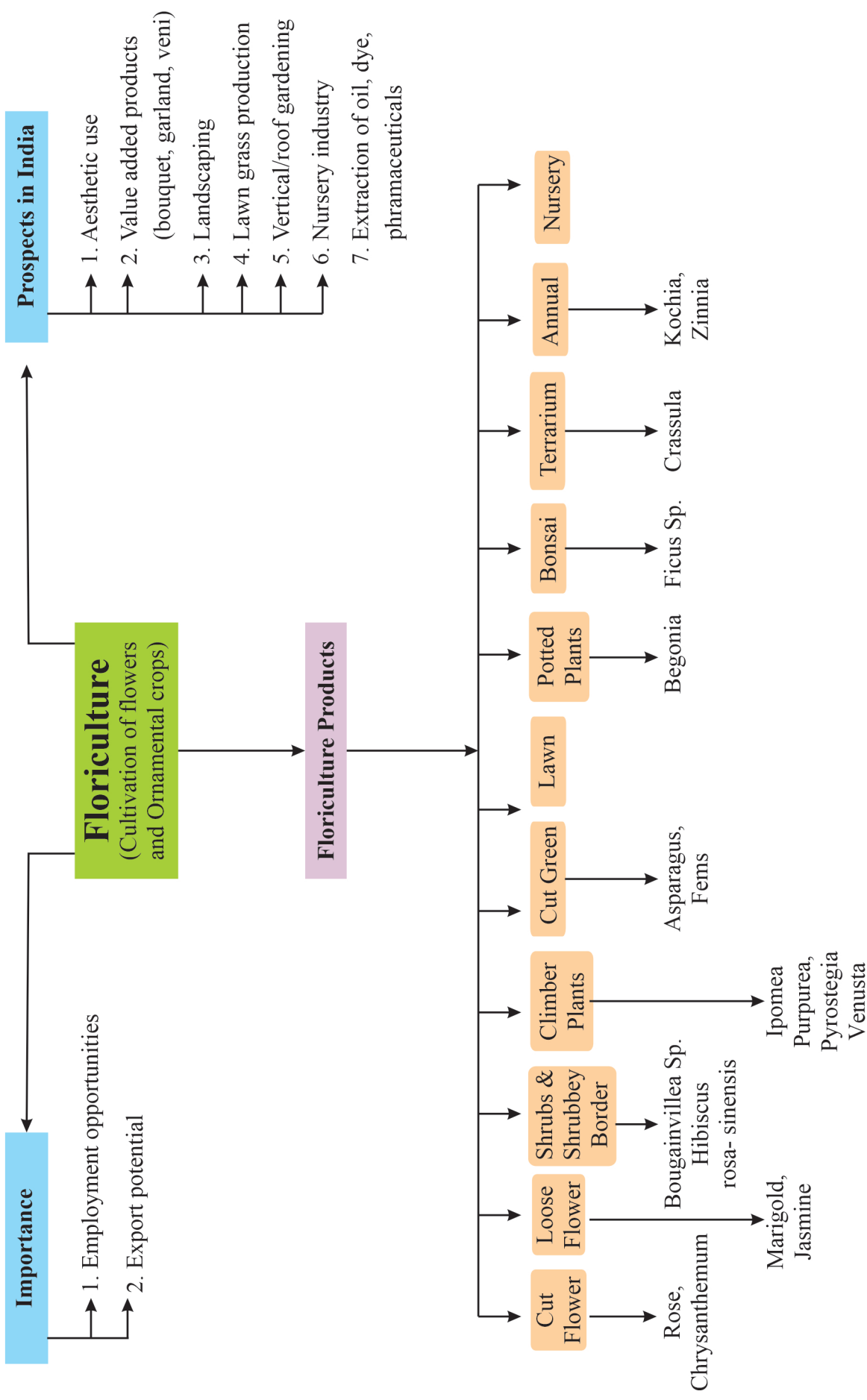
Loose flower: Flowers that are harvested when these are fully mature and they do not possess cut stems underneath their base.

Value addition: Process of adding a value to raw produce to make attractive and useful products.

SUGGESTED READINGS

1. Arora, J. S. (2016). *Introductory Ornamental Horticulture*, Kalyani Publishers, Ludhiana.
2. Randhawa, G. S. and Mukhopadhyay, A. (1998). *Floriculture in India*, Allied Publishers, New Delhi,

WHAT YOU HAVE LEARNT



MODULE -3

Post-harvest Management

- 12. Need and Importance of Post harvest Management
- 13. Processes in Postharvest Management System
- 14. Storage and Warehousing