COURSE GUIDE

CRP 506
LANDSCAPE HORTICULTURE AND FLORICULTURE

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INTRODUCTION

CRP 506 is a two (2) unit course on Landscape Horticulture and Floriculture. The course consists of sixteen (16) units in seven (7) modules. The course will give you a good understanding of the fundamental principles upon which landscape horticulture and floriculture are based. This course guide tells you briefly what the course is all about, and how you can work through these units. It suggests some general guidelines for the amount of time you are likely to spend studying each unit in order to complete it successfully. It also gives you some guidance on your tutor marked assignments.

By studying this course, you would be able to understand what landscaping is and distinguish between natural and man-made landscapes, know the scope and historical sketches of landscaping, know the plants for the landscape, understand design principles and practice, differentiate between hard landscaping and soft landscaping, etc.

WHAT YOU WILL LEARN IN THIS COURSE

On successful completion of this course, you will be able to:

i. Understand what landscaping is and distinguish between natural and man-made landscapes.
ii. Know the scope and historical sketches of landscaping
iii. Know the plants for the landscape.
iv. Understand design principles, design practice, basic styles, preparing the plan design, symbols and drawings.
v. Understand landscape construction.
vi. Differentiate between hard landscaping and soft landscaping.
vii. Understand contouring and levelling.
viii. Understand the rudiments of maintaining and managing of established landscapes.
ix. Understand landscape contracts and contractual agreements.
x. Take a good look at the floriculture industry in Nigeria.
xi. Identify and classify cut flowers of commercial importance to export market.

xii. Understand the principles and practices of out-of-door and greenhouse cut-flower production.

xiii. Understand the cultural practices in horticulture

xiv. Understand cut-flower preservation techniques.

COURSE AIMS

The course aims at:

1. Acquainting you with the basic information on landscape horticulture and floriculture
2. Landscape Design principles and practices
3. Maintenance and management of established landscape

   Etc.

COURSE OBJECTIVES

In order to achieve the set aims, certain overall objectives have been set. In each unit specific objectives are set, to which you need to pay attention. These are usually included at the beginning of the unit. You can always refer back to the unit's objectives to check your progress.

The overall objectives of the course include the following:

xv. To understand what landscaping is and distinguish between natural and man-made landscapes.

xvi. To know the scope and historical sketches of landscaping

xvii. To know the plants for the landscape.

xviii. To understand design principles, design practice, basic styles, preparing the plan design, symbols and drawings.

xix. To understand landscape construction.

xx. To differentiate between hard landscaping and soft landscaping.

xxi. To understand contouring and levelling.

xxii. To understand the rudiments of maintaining and managing of established landscapes.

xxiii. To understand landscape contracts and contractual agreements.

xxiv. To take a good look at the floriculture industry in Nigeria.

xxv. To be able to identify and classify cut flowers of commercial importance to export market.

xxvi. To understand the principles and practices of out-of-door and greenhouse cut-flower production.

xxvii. To understand the cultural practices in horticulture

xxviii. To understand cut-flower preservation techniques.

WORKING THROUGH THE COURSE

To complete this course you are required to read the study units and other recommended materials. You will be required to answer some questions based on what you have read in the text to reaffirm the key points. At the end of each unit there are some tutor marked assignments (TMAs) which you are expected to submit for marking. The TMA forms part of continuous assessments. At the end of the course there is a final examination. The course should take you 12 to 13 weeks to complete. You will find listed the component of the course, what you have to do and how you should allocate your time to each unit in order to complete the course successfully on time.

COURSE MATERIALS

The main components of the course are:

1. Course guide

2. Study units

3. References and Further Readings

4. Tutor marked assignments

COURSE GUIDE

The material you are reading now is called the course guide which introduces you the course.

COURSE UNITS

Study units in this course are as follows:

Module 1	**Scope, history and types of landscaping**
Unit 1	Scope and historical sketches of landscaping
Unit 2	Types of landscaping
	Landscape design/garden design
Module 2	
Unit 1	Principles and elements of landscape design
Unit 2	Landscape design styles
Unit 3	Site survey and analysis
Unit 4	Landscape design contracts
Module 3	**Levelling and contouring**
Unit 1	Levelling
Unit 2	Contouring

TUTOR-MARKED ASSIGNMENT (TMA)

There are tutor marked assignments (TMAs) in each unit. You would have to do the TMA as a revision of each unit. This would help you to have broad view and better understanding of the subject. Your tutorial facilitator would inform you the particular TMA you are to submit to him for marking and recording. Make sure your assignment reaches your tutor on or before the deadline given in the presentation schedule and assignment file. If for any reason, you cannot complete your work on schedule, contact your tutor before the assignment is due to discuss the possibility of an extension.

Extensions will not be granted after the due date unless there are exceptional circumstances. You will be able to complete your assignment questions from the materials contained in this course material and references; however, it is desirable to research more

other references, which will give you a broader view point and a deeper understanding of the subject.

FINAL EXAMINATION AND GRADING

The examination will consists of questions which reflect the tutor marked assignments that you might have previously encountered and other questions within the course covered areas. All areas of the course will be covered by the assessment. You are to use the time between finishing the last unit and sitting the examination to revise the entire course. You might find it useful to review your

Tutor-Marked Assignments before the examination. The final examination covers information from all parts of the course.

REFERENCES AND FURTHER READING

References and materials for further reading are provided at the end of each unit.

MAIN COURSE CONTENT

MODULE 1: SCOPE, HISTORY AND TYPES OF LANDSCAPING

UNIT 1: SCOPE AND HISTORICAL SKETCHES OF LANDSCAPING

1.1.1 INTRODUCTION

A landscape is the visible features of an area of land, its landforms, and how they integrate with natural or man-made features. Landscaping is the art and science of developing the outdoor environment using soft landscaping (e.g. ornamental plants) and hardscapes (e.g. non-plant objects) components to serve the needs and desires of people. It serves a number of purposes, such as aesthetic and functional purposes. The outdoor surroundings could be designed with natural or man-made components/materials/objects (i.e. it could be natural or artificial). Landscaping involves design, construction and maintenance of landscapes.

Nowadays, landscaping business is fashionable and there is influx of all sorts of people in to the profession, having seen it as an avenue to make quick money. There is generally, limited concern for landscape planning and management in Nigeria, most importantly from government with the exception of few state governments, who recently seem to brace up to the challenges of creating a beautiful and welcoming environment.

Horticulture is a dynamic industry with great economic global track record. McCaffrey (2012), stated that “horticulturalists provide food to feed the world, beautify our neighbourhoods, decorate our gardens, and give ambience and wellbeing by combining the energy of the sun with soil, seeds, water and ingenuity”. Horticulture has many

components which include vegetables, flowers, fruits, spices and essential oils, turf grasses, edible fungi, nutraceutical plants, landscape and green spaces.

1.1.2 OBJECTIVES

At the end of this unit, you should be able to:

1. Define landscaping
2. Know the scope and history of landscaping
3. Appreciate the reasons for landscaping
4. Differentiate between natural and man-made landscapes

1.1.3 SCOPE AND HISTORICAL SKETCHES OF LANDSCAPING

1.1.3.1 Definition of Landscaping

Landscaping is the art and science of developing the outdoor environment using softscapes (e.g. ornamental plants) and hardscapes (e.g. non-plant objects, components) to serve the needs and desires of people. It serves a number of purposes, including aesthetic and functional purposes. Landscaping involves design, construction and maintenance of landscapes and requires expertise in horticulture and artistic design.

Landscaping modifies the visible features of an area of land, including the following:

- Living elements, such as flora or fauna; or what is commonly called gardening (the art and craft of growing plants with a goal of creating a beauty within the landscape).
- Natural abiotic elements, such as landforms, terrain shape and elevation, or bodies of water.
- Abstract elements, such as the weather and lighting conditions.

1.1.3.2Scope of landscaping

Landscape by its very nature encompasses all other specialist sections of amenity horticulture in one form or the other. It includes the design, construction, maintenance and management of landscape features. Knowledge of floriculture, landscape architecture, and engineering are usually important.

1.1.3.3 History of landscaping

Landscaping is an important sector which has expanded and still expanding in recent years in Nigeria. Despite this development, it is by no means comparable to what is obtainable in the developed countries in terms of development, quality, patronage and boom experienced in the landscape horticulture industry.

People have designed gardens throughout the recorded history. Thousands of years ago in Egypt and Babylon, there were planted architectural structures. The roots of renaissance garden extend back to the tradition of antiquity, especially those of ancient Rome. To the self - conscious revival of the idea of Vitruvius and Pliny, there was added the influence of Islamic world and medieval theory and practice. The use of water and fountains and organization of garden in to geometric quarters were part of wider inheritance.

In Nigeria, from time immemorial, people consciously or unconsciously add physiographic and environmental characteristics to the land around them either for aesthetic gratification and or environmental enrichment and protection. Traditionally, people keep garden and trees around their buildings. Though, the experience of the colonial era did little to influence creation and preservation of beauty in the surroundings as it was in Francophone countries. Nevertheless, the inception of colonialism changed the trends of events as concerted effort were made to formally landscape some public buildings, government reservation areas (GRAs), institutions of higher learning, and sport fields which marked the beginning of organized/formal landscaping in Nigeria. Missionaries (Christian) also established plants in churches and schools. Some individual copied this idea and planted some ornamental plants in their surroundings.

1.1.3.4 Reasons for Landscaping

Basically, if human beings had never altered the natural world, there would be no need for designers. Nature is such a perfect designer that left unchanged by human beings, the earth’s beauty and natural system would never have require improvement. This idea is,

however, not realistic in the modern world. Therefore, some of the reasons why landscaping is important are:

1. Aesthetic/ Beautification of environment which is the primary purpose of landscaping
2. Engineering purpose: e.g. protection of structures against environmental hazards such as rain storms etc.
3. Architectural purpose: e.g. re-integration of structures in to the natural environment
4. Biological purpose: e.g. improves the micro-climate (environment), absorbs dust, noise, pollutants and assist in air purification.
5. Ecological purpose: e.g. some ornamental plants can be used to solve ecological problems such as flooding, to control erosion and absorb chemical from soil (oil spilage).
6. Economic purpose: e.g. creation of job opportunities, add value to property, creates wealth for plant growers and government (taxes, foreign exchange), beautiful environment also attract tourists and investors.
7. Social purpose: e.g. landscaped areas are useful as recreation and relaxation venues (parks), sporting arenas (polo, football fields), and symbols of affluence/wealth.
8. Nutritional/Medicinal purpose: e.g. some plants used primarily for landscaping could also be used for food (fruits and vegetables) and medicines, plants have therapeutic effect on patient etc.
9. Environmental control in prevention of hazards such as wind breaks, shade trees for guide against sun glares, etc.
10. Urban forestry in the integration of forest resources into urban areas by town planners and foresters, provision of shelter belts, and fire woods, etc.

1.1.3.5 Natural versus man-made (artificial) landscaping

The outdoor surrounding of landscaping could be designed with natural or man-made components or materials s i.e. it could be natural or artificial.

Natural landscape

A natural landscape is a landscape that is unaffected by human activities. It may contain components that are living or non-living or both. Natural landscape remains intact if the living and non-living of the natural environment are free to move and change. A natural landscape is made up of a collection of landforms, such as mountains, hills, plains, and plateaus. Lakes, streams, soils (such as sand or clay), and natural vegetation are other features of natural landscapes. A desert landscape, for instance, usually indicates sandy soil and few deciduous trees

Today no place on earth is unaffected by human activities. Thus landscapes tend to vary in their degree of naturalness. Therefore, classification have been made into four types:

1. Natural landscape: a natural landscape is one that is unaffected by human activity.
2. Sub-natural landscape: a sub-natural landscape is one where if human activity was removed it would go back to a normal state.
3. Semi-natural landscape: a semi-natural landscape is one that has been drastically modified by human activity but has some natural elements left intact.
4. Agricultural landscape: an agricultural landscape is one that has been totally altered and arranged by human activity - very little if any naturalness is left.

Examples of natural landscape in Nigeria are; natural surrounding such as forest or desert, rocks (eg Olumo rock, Zuma rock), Erin Ijesa water falls, Ikogusi warm/cold spring, plateau in Jos, Mambila etc.

Artificial landscape

Nowadays, it is common to see large quantities of artificial plants (trees, palms, lawns) being used for landscaping. Though, it will not and cannot replace the natural plants in their effects and functions on the landscape, but could also add to the beauty of the environment. It has the advantage of low maintenance in terms of watering, fertilizer application, mowing in case of lawns and turfs, trimming/pruning and so on. Other items in artificial designs include the use of art works, concrete benches and tables, water bodies such as water fountains, artificial springs, etc.

A man-made landscape once created, needs constant care and maintenance. Some landscape elements get worn out and destroyed over a period of time, and need to be replaced. Weeds should be periodically removed. Proper watering of plants should be done. Cutting and pruning must be carried out periodically. All this involves cost and skill

SELF-ASSESSMENT EXERCISE 1

Identify some natural and/or man-made landscape in your state of residence and, possibly, visit them.

1.1.4 CONCLUSION

Landscaping is an important sector which has expanded and is still expanding in recent years in Nigeria. It involves design, construction and maintenance of landscapes and requires expertise in horticulture and artistic design. Horticulturalists provide food to feed the world, beautify our neighbourhoods, decorate our gardens, and give ambience and wellbeing by combining the energy of the sun with soil, seeds, water and ingenuity.

1.1.5 SUMMARY

In this unit, the word landscaping has been clearly defined **as** the art and science of developing the outdoor environment using softscapes (e.g. ornamental plants) and hardscapes (e.g. non-plant objects) components to serve the needs and desires of people. The scope and history of landscaping are discussed.

Landscaping is important, as it has aesthetic, engineering, architectural, biological, ecological, economic, social, nutritional, medicinal and environmental purposes. The outdoor surrounding of landscaping could be designed with natural or man-made components or materials

TUTOR MARKED ASSIGNMENT (TMA)

1. Why is landscaping important?
2. Differentiate between natural and artificial landscaping.

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UNIT 2: TYPES OF LANDSCAPING

1.2.1 INTRODUCTION

Landscaping allows property owners or users as the case may be to customize the property according to needs and preferences. It can involve more than focusing on the home. The choice of landscaping type depends largely on the goal of the property owner(s) and purpose of the landscaped area. There are different types of landscaping to choose from to beautify your space.

1.2.2 OBJECTIVES

At the end of this unit, you should be able to:

1. Appreciate the different types of landscaping
2. Know the characteristics of different types of landscaping

1.2.3 TYPES OF LANDSCAPING

1.2.3.1 Private property/residential landscaping

Landscaping of personal residential properties like a flat, bungalow, duplex, estate etc. Usually, plants of different good qualities are used as much as possible for the enjoyment of owner(s). It is important to landscape to the taste of the clients even if expensive materials will be used.

Characteristics of private property/residential landscaping

a. There is no need for plant nursery- it is small in scope and very expensive to keep a personal nursery

b. No green or glass houses are required

c. There is only one garden for family members and their friends

1.2.3.2 Industrial landscaping

It involves the establishment of plants and hardscapes within the industrial estate/area e.g Agbara industrial estate, Nigeria Breweries Ltd, Portland/Lafage cement company, etc. Most areas are planted to grasses, trees and hedges along the walkways. It is not necessary to use exotic or expensive items compared to private property landscapes. When landscaping for factories/industrial centres, study kind of activities in each section e.g manufacturing area with many peoples, vehicles and materials-grassing the whole area dotted with spot planting will be appropriate. Near administrative block, use beautiful materials because it is the focus and should be at it best. Inside the offices; a number of indoor plants may be introduced.

Characteristics of industrial landscaping

a. There may be need to have a plant nursery within the industrial estate, particularly for big industrial estate.

b. No green or glass house is required

c. It has at least two gardens depending on the size

Though, hotels can also be regarded as industrial landscaping because it is not meant for a single family, but for the general public and for commercial purpose. However, in actual execution of the project it treated like private property because of requirement for high taste.

1.2.3.3 Institutional landscaping

Landscaping that involves all sorts of institutions universities, colleges, polytechnics, hospitals, research institutes, barracks etc. Usually it is meant for all categories of users, i.e. general public of all age category- children, adolescents, adults, women, men, students, lecturers, non-academic staff, scientist etc. Institutional landscaping must be different from others because it is not only for recreation, picnic but also for instructional purpose (educational)

Characteristics of **institutional landscaping**

a. There should be a plant nursery, particularly for replacement of dead plants and planting of new areas.

b. Presence of green and glass houses is also important

c. There are many and usually large gardens.

1.2.3.4 Recreational landscaping

It involves landscaping recreational arenas (polo ground, parks and gardens, football pitches, game villages etc) for adults and children. It has special inclusions such as restaurants, water fountains, focal plants, green lawns and other areas for social activities like picnics, marriages, honey moons, film shooting. Nowadays, ICT and photocopy centres have been added.

SELF-ASSESSMENT EXERCISE 2

1. The following are characteristics of institutional landscaping except:

a. There should be a plant nursery, particularly for replacement of dead plants and to plant new areas.

b. Presence of green and glass houses is also important

c. There are many and usually large gardens.

d. There is only one garden for family members and their friends

1.2.4 CONCLUSION

Property owners landscape their properties according to needs and purposes.

1.2.5 SUMMARY

Landscaping types include private property/residential landscaping, industrial landscaping, institutional landscaping and recreational landscaping. Each type has its unique characteristics and serves peculiar purposes.

1.2.6 TUTOR MARKED ASSIGNMENT (TMA)

1. Why should institutional landscaping be different from other types of landscaping?

2. What are the characteristics of an industrial landscape?

1.2.7 REFERENCES AND FURTHER READINGS

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MODULE 2: LANDSCAPE DESIGN/GARDEN DESIGN

UNIT 1: PRINCIPLES AND ELEMENTS OF LANDSCAPE DESIGN

2.1.1 INTRODUCTION

Landscape design/garden design is the science and art of organizing and enriching outdoor space through the placement of plants and structures in agreeable and useful relationship with natural environment. It involves the qualitative and functional arrangement and spacing of plants and non-plants garden features on a parcel of land set aside in the planning process that gives an overall pleasing effect. Design essentially entails manner in which objects are artificially arranged in order to attain a particular objective, usually may be not always, a functional and a visibly pleasing arrangement.

The design process begins by determining the needs and desires of the user and the conditions of the site. With this information, the designer then organizes the plants and hardscape materials, which are collectively referred to as the features. The features can be physically described by the visual qualities of line, form, color, texture, and visual

weight—the elements of design. The principles are the fundamental concepts of composition—proportion, order, repetition, and unity—that serve as guidelines to arrange or organize the features to create an aesthetically pleasing or beautiful landscape.

Knowledge of the elements and principles of design is essential to designing a landscape and working through the design process. This unit describes each of the elements and explains the principles and their application.

2.1.2 OBJECTIVES

At the end of this unit, you should be able to:

1. Outline the principles of landscape design
2. Outline the elements of landscape design

2.1.3 PRINCIPLES AND ELEMENTS OF LANDSCAPE DESIGN

2.1.3.1 Principles of landscape design

The goal in developing a landscape plan is to design a plan that will achieve unity and harmony. The principles of landscape design are the building blocks used by designers to create beautiful and functional landscapes. Landscape design principles are the same for all types of landscapes. They are in many different ways, depending on the site, the clients' wishes, and designer's knowledge and preferences. Similar to elements of art, these principles represent the primary concert that influence landscape design. Design principles are not rules that require precise adherence, but instead reflect a framework of universal concepts that prove effective in creating designs.

Therefore the following principles should be considered in designing the plan;

1. **Simplicity**

Regardless of the scale of a landscape, simplicity should be an overriding design consideration. This is obtained by repeating the plantings. A few well-arranged forms, colours or textures should be used. Too many different things in a small area produces a restless quality which will leave the onlooker dissatisfied. Simplicity in a landscape can

be created both physically and visually. Physical simplicity refers to a design in which the actual shapes are simple e.g house dominate a residential landscape design, use simple bold rectilinear lines that mimic the house or a strong audacious curves rather than thin, wiggly bedlines that resemble snake lying in the grass. Visual simplicity can be achieved when plants are grouped or massed together.

2. **Order**

Order can be achieved by using consistent design theme such as formal, informal or structured informality. Grouping plants and hardscapes so that there are physical connections between the elements will enhance order and create a cohesive whole. Order can be further reinforced by grouping plants together in masses, rather than scattering individual plants around the landscape.

3. **Repetition**

There is need for reappearance of attractive materials in several locations in the landscape. It results in a sense of unity between the different plant species that make up the design. Too much repetition leads to boredom while too little leads to visual choas. Repeat one or more basic art element (form, colour, texture, size) e.g planting of red flowers at all entrances to the house.

4. **Rhythm and line**

It addresses the factors of time and movement within a landscape. Landscapes are seldom experienced in an instant, but rather through time as a person explores the space. Rhythm in a landscape may be visual or physical, and it can be observed in both vertical or horizontal planes of a design. For example, vertical visual rhythm is gradual progression of plants from short to tall. Horizontal visual rhythm is often generated for bedlines or hardscapes. How a person moves through the landscape and physically interacts with it can be determined, in part, by the design rhythm e.g pathway width and route, dimensions, spacing of interlocking blocks, location of seating or resting elements.

5. **Unity**

It is the principle that creates link between the plants, hardscapes and house. It creates a sense of interconnectedness within the design composition. A successful landscape

design ties the house and landscape together and creates an outdoor living space that is an extension of the house. Unity can be reinforced by using consistent bedlines, single ground cover, massing plants together and repeating these masses throughout the landscape.

6. **Balance**

The design should include a focal point or centre of interest around which the landscape plants, structures, and open spaces are grouped or balanced. The arrangement of plants and other objects should be in a sequence leading to or away from a focal point. The front entrance of the home is usually the focal point. A sense of balance is created by designing a real or imaginary point and by using mass, colour, line or texture in equal quantities on each side of the point. The types of balance in landscapes are symmetrical, asymmetrical and radial. Symmetrical is common in formal landscapes. This landscape has an obvious central axis, and everything on one side of the axis is mirrored on the other side. Asymmetrical balance combines different objects on each side of a discrete axis or balance point, resulting in a similar visual mass on both sides of the axis or point. The bed lines in asymmetrical design tends to be curvilinear, and the overall feel tends to be informal than a symmetrically balance design. Radial balance is created by equally spacing objects around a centre point, creating a strong focus in the middle of the pattern. It can be used effectively in patios and paved areas or in large areas that integrate plantings and hardscapes.

7. **Proportion and scale**

This refers to size relationship between the different components within the landscape. It could be relative or absolute. Relative scale is the relation of one part of the design to the others. The house is often the dominant element of a residential design, and it requires that at least some elements of the design be sufficiently sized, e.g. height of building may influence size of plants. Absolute scale is the relation of a particular design element to human. Plant materials help to define size relationship within a landscape. The major relationship that involve plant materials are; plants to buildings, plants to other plants and

plants to people. Because plants are living and dynamic entities, these proportional relationships will change as the landscape mature and even season to season if the plants are deciduous or herbaceous. To attain correct proportion, the landscape design should be based on mature height and spread of the plant.

8. **Emphasis**

Focal points draw the eye to specific landscape locations when a person is viewing the landscape as a whole. Emphasis on specific areas and create a contrast between memorable, vivid or exciting landscape elements and the rest of the landscape. A focal point may be a specimen plant, garden accessory or water feature. It captures attention by it unusual line, shape texture or colour. Each major area in a landscape should have one focal point, multiple point is acceptable if the area is large.

2.1.3.2 Developing the landscape plan

The development of landscape plan be it private, public or institutional merges the arrangement of

plants and other materials with the graphic skills necessary to symbolize them. A well developed

landscape plan provides an orderly means of landscaping a site and prevents waste of labour, money and possibly plants. It requires that the principles of design be applied to an entire property, not just sections and that the final design possess a unity which integrates all use areas in to a total plan. The time spent in analyzing a site and developing the plan is a good investment that can prevent frustration, save time and provide the appearance desired. The preparation of landscape plans requires a lot of work, considerable thought and planning.

The following procedures are suggested as a guide to initial design and planning of garden and landscape plan:

A. Site analysis

The first step in the development of a landscape plan is the site analysis which is divided in to the on-site and off-site analysis. One or more visits to the site may be necessary to analyze or evaluate the site.

i. **On-site analysis:** Landscape designer should draw the site features and the proposed building plan on graph paper. Normally, a prepared checklist should be completed on the site. At least two peoples are required to carry out site analysis. A number of factors or condition should be considered in making site evaluation and should be accurate and in detail. Highlights of some of these factors are; climate of the site, soil conditions, location, existing structures, existing vegetation, rock outcropping, utilities, and presence of water bodies.

ii. **Off-site analysis:** The purpose of this part of site analysis is to consider the site in relation to distant views and neighbouring areas which has a distinct influence upon the needs of the site. Features like trees, adjourning backyard, mountains, valleys, bodies of water e.g lakes, sea etc, forests, towns, cities etc located within the adjourning site becomes part of the site landscape. If a good view is spoilt by an untidy building, plant to hide the building, not the whole view. If the outlook from a property is not very good, a view can be created within the landscape by suitable screen planting on the boundary and attractive planting inside this screen-planting. Off-site factors that may present problems in landscaping are pedestrian traffic, noise, dust, bright lights, bill board, utility lines, roods, and neighbouring properties. It may be desirable to use screens to eliminate unfavourable factors.

B. Analysis of clients/family needs

C. Match the client needs and site capabilities as closely as possible.

D. Area layout plan: There are three principal areas that are usually considered in landscape plans.

These are:

i. The public area which generally is the area in front of the house. However it could be on the side of the house if this is the approach owner wishes the visitors to use.

ii. The service area is the area in which trash cans, cloth lines, dog runs, and work areas are located. It is often screened from view.

iii. The private: This is the area normally used by the family for outdoor entertainment and lawn grasses. It is usually located at the rear of the house, but it may be on the side. Screening may be used to provide privacy in the area. The vegetable and flower garden may be located in this area.

After these three areas have been designated on the tracing paper, rough sketches of the organization of these areas should be drawn.

E. Select a scale that allows the site to be reproduced on paper, including lot, building and existing

structures/features.

F. Assign use areas to appropriate region of the property.

G. Select focal points and locate them within the use areas

H. Shape each use areas in a way that directs attention to the focal point and relates it to adjoining

use areas.

2.1.3.3 Basic elements of landscape design

Knowledge of the elements and principles of design is essential to designing a landscape and working through the design process. The elements of composition are the visual qualities that people see and respond to when viewing a space. Visual qualities can illicit many different emotions and feelings, and the more positive those feelings, the more likely people are to enjoy and use a space. Perhaps the most

An aesthetic landscape design incorporates five key elements: line, form, texture, color and scale. The perfect balance of these design features appeals to the eye and brings harmony to a space.

1. **Line**

In landscaping, lines can be used to control movement, such as a walkway, path or flower bed. They can also highlight a design feature like a pond, pool or fire pit. Lines add visual interest because they can take various shapes – straight, curved, horizontal, diagonal. Straight lines tend to create a more formal design, while curved lines fit well with an informal landscape. They can be created with hardscape materials (pavers, natural stone) or vegetation.

Line in the landscape is created by the edge between two materials, the outline or silhouette of a form, or a long linear feature. Lines are a powerful tool for the designer because they can be used to create an infinite variety of shapes and forms, and they control movement of the eye and the body. Landscape designers use lines to create patterns, develop spaces, create forms, control movement, establish dominance, and create a cohesive theme in a landscape. Landscape lines are created several ways: when two different materials meet on the ground plane, such as the edge of a brick patio meeting an expanse of green turf; or when the edge of an object is visible or contrasts with a background, such as the outline of a tree against the sky; or by the placement of a material in a line, such as a fence. Lines can have one or more properties, such as those described below, but they typically serve different purposes. The properties of lines determine how people respond to the landscape, both emotionally and physically.

Properties of lines

a. **Straight lines**

Straight lines are structural and forceful; they create a formal character, are usually associated with a symmetrical design, and lead the eye directly to a focal point. Diagonal lines are straight lines with an intentional direction. Straight lines are most often found in hardscape edges and material.

b. Curved lines

Curved lines create an informal, natural, relaxed character that is associated more with nature and asymmetrical balance. Curved lines move the eye at a slower pace and add mystery to the space by creating hidden views.

c. Vertical lines

Vertical lines move the eye up, making a space feel larger. An upward line can emphasize a feature and has a feeling of activity or movement. Vertical lines in the landscape include tall, narrow plant material, such as trees, or tall structures, such as an arbor or a bird house on a pole.

d. Horizontal lines

Horizontal lines move the eye along the ground plane and can make a space feel larger. Low lines are more subdued and create a feeling of rest or repose. Horizontal lines can spatially divide a space or tie a space together. Low lines are created by low garden walls, walkways, and short hedges.

Primary line types that create form in the landscape

Lines are used to draw forms on a plan. In plan view, they define plant beds and hardscape areas. Lines are also created by the vertical forms of built features and plant material. There are three primary line types that create form in the landscape: (i) bedlines, (ii) hardscape lines, and (iii) plant lines.

(i) **Bedlines:** are created where the edge of the plant bed meets another surface material, such as turf, groundcover, gravel, or patio pavers. Bedlines connect plant material to the house and hardscape because the eye follows the line, moving the gaze through the landscape.

(ii) **Hardscape lines:** are created by the edge of the hardscape, which delineates the built structure. Line can also be created by long and narrow materials, such as a fence or wall.

(iii) **Plant lines:** Arbors, trees and upright plants can add vertical elements to the landscape.

2. Form

Form refers to the shape of the plant or hardscape feature. Plants are available in many forms – upright, groundcover, round, freeform. Hardscape forms can be in various heights and shapes: think stone paths, retaining walls, and pergolas. A balanced landscape design carefully considers use of form. For example, a more formal garden could include more structured, trimmed shrubs, while an informal yard would feature more natural and flowing plants. The combination of forms is what helps lay the foundation for the landscape design.

Shape is created by an outline that encloses a space, and form is the three-dimensional mass of that shape. Form is found in both hardscape and plants, and it is typically the dominant visual element that spatially organizes the landscape and often determines the style of the garden. The form of structures, plant beds, and garden ornaments also determines the overall form theme of the garden. Formal, geometric forms include circles, squares, and polygons. Informal, naturalistic forms include meandering lines, organic edges, and fragmented edges. Plants create form in the garden through their outlines or silhouettes, but form can also be defined by a void or negative space between plants.

a. Geometric forms

i. Circular form

Circles can be full circles, or they can be divided into half circles or circle segments and combined with lines to create arcs and tangents. Figure 2 shows the use of circle segments for hardscape and lawn panels. Circles can also be stretched into ovals and ellipses for more variety and interest. Circles are a strong design form because the eye is always drawn to the center, which can be used to emphasize a focal point or connect other forms.

ii. Square form

Squares are used for a variety of features, including stepping stones, bricks, tiles, and timber structures, because they are an easy form to work with for construction. The

square form can also be segmented and used repeatedly to create a grid pattern. Unlike circles, squares are stronger on the edges, which can be lined up or overlapped to create unique patterns and more complex forms.

iii. Irregular polygons

Polygons are many-sided forms with straight edges. Triangles, for example, are three-sided polygons. The angled edges of polygons can make interesting shapes, but they should be used cautiously because the forms can become complex; simplicity is best.

b. Naturalistic forms

i. Meandering lines

Meandering lines often mimic the natural course of rivers or streams and can be described as smooth lines with deeply curved undulations. Meandering lines work well for pathways, plant bedlines, and dry stream beds. Meandering lines can add interest and mystery to a garden by leading viewers around corners to discover new views and spaces.

ii. Organic edges

Organic edges mimic the edges of natural material, such as foliage, plant forms, and rocks, and can be described as rough and irregular. Organic lines can be found in rock gardens and along dry creek beds or purposely created on hardscape edges.

iii. Fragmented edges

Fragmented edges resemble broken pieces scattered from the edge, such as stones or pavers, and are often used to create a gradually disappearing edge on patios or walkways.

c. Plant forms

Form is the most enduring quality of a plant. Common plant forms are well established and standardized, as form is the most consistent and recognizable characteristic of plants. Form can also be created through the massing of plants, where the overall mass creates a different form than an individual plant. A strong form that contrasts with the rest of the composition will have greater emphasis within the composition. A highly contrasting form must be used with care—one or two work well as a focal point, but too many create chaos. Natural plant forms, rather than over-trimmed forms, should establish the bulk of the composition. The relevance of overall form is more or less dependent on the viewing perspective—the form of a tree can appear quite different to a person standing under the

canopy versus viewing the tree from a distance in an open field. Vertical forms add height; horizontal forms add width. Plant forms also create and define the void or open spaces between the plants, creating either convex or concave forms in the voids. High-arching tree branches typically create a concave open space under the branches, and a round canopy with low branches fills the space to create a convex form in the open space under the tree.

i. Tree forms

Common tree forms include round, columnar, oval, pyramidal, vase shaped, and weeping. Different tree forms are used for visual appeal, but the form is also important for function. Creating a shady area in the garden requires a round or oval tree, while a screen usually requires a more columnar or pyramidal form, and a weeping tree form makes a good focal point.

ii. Shrub forms

Shrub forms include upright, vase shaped, arching, mounding, rounded, spiky, cascading, and irregular. Choosing shrub forms often depends on whether the shrub will be used in a mass or as a single specimen. Mounding and spreading shrubs look best in a mass, and cascading and vase-shaped shrubs do well as specimen plants.

iii. Groundcover forms

Groundcover forms include matting, spreading, clumping, sprawling, and short spikes. Almost all groundcovers look better in masses because they are typically small, ground-hugging plants that have very little impact as individual plants.

Properties of form

Form is very powerful because people can often recognize and identify a feature based on an outline or silhouette. People can often perceive a form when only a portion of it is visible. Familiarity and the suggestion of a form is enough for the eye to fill in the rest. Repetition of form is essential to the creation of pattern, which is the basic organizational structure of the landscape.

Form is also the primary determinant of a formal or informal garden. Geometric forms with straight edges are typical of formal gardens that are based on an established style,

such as contemporary or Italian gardens. An informal garden has more naturalistic, organic forms that are normally found in gardens that mimic nature. Form compatibility is also a major component of unity in design—one or two strikingly different forms are good for contrast and emphasis, but generally all other forms should have some similarities for a unified look.

3. Colour

As color tends to truly capture the eye, it is a key element in landscape design. When incorporating color, it is important to consider the four seasons. While flowers and plants in varying hues make a wonderful summer garden, you will also want to be sure to include vegetation that will offer color during the other seasons, such as evergreens, conifers and holly. The color of hardscape also plays a role in the design. Are you looking for something that stands out like a crystal blue pool or something more subtle such as natural stepping stones?

Color in plant material and hardscape adds interest and variety to the landscape. Color is the most conspicuous element in the landscape and is usually the focus of most homeowners; however, it is also the most temporary element, usually lasting only a few weeks a year for individual plants. The use of color is guided by color theory (use of the color wheel) to create color schemes. A simple description of the color wheel includes the three primary colors of red, blue, and yellow; the three secondary colors (a mix of two primaries) of green, orange, and violet; and six tertiary colors (a mix of one adjacent primary and secondary color), such as red-orange.

Colour schemes

Color theory explains the relationship of colors to each other and how they should be used in a composition. The basic color schemes are monochromatic, analogous, and complementary.

i. Monochromatic scheme

A monochromatic color scheme uses only one color. In landscaping, this usually means one other color besides the green color in the foliage. A garden that is all green depends more on form and texture for contrast and interest. One color can have many light and dark variations, which can add interest. An example of a monochromatic scheme is a white garden with white flowers, white variegated foliage, and white garden ornaments.

ii. Analogous scheme

Analogous (sometimes called harmonious) color schemes are any three to five colors that are adjacent on the color wheel, such as red, red-orange, orange, yellow-orange, and yellow, or blue, blue-violet, and violet. The colors are related to each other because they typically include two primary colors mixed to form a secondary and two tertiary colors, which means they share common properties.

iii. Complementary scheme

Complementary colors are those that are opposite each other on the color wheel. They tend to have high contrast between them. The most common sets are violet and yellow, red and green, and blue and orange. Complementary colors are often found naturally in flowers; a common pair is yellow and violet.

Color in plants and hardscape

Color is found in the flowers, foliage, bark, and fruit of plants. Foliage typically provides the overall background color for flower colors. Green foliage in all its various shades is the dominant color by quantity, but other colors capture attention more readily because of their high contrast to the color green.

Color is also found in buildings, rocks, pavers, wood, and furniture. Most colors in natural materials, such as stone and wood, are typically muted and tend to be variations of brown, tan, and pale yellow. Bright colors in the hardscape are usually found in man-made materials, such as painted furniture, brightly colored ceramic containers or sculptures, and glass ornaments.

Properties of color

Color is an important element for creating interest and variety in the landscape. Colors have properties that can affect emotions, spatial perception, light quality, balance, and emphasis. One property of color is described relative to temperature—colors appear to be cool or warm and can affect emotions or feelings. Cool colors tend to be calming and should be used in areas for relaxation and serenity. Warm colors tend to be more exciting and should be used in areas for entertaining and parties. The "temperature" of colors can also affect the perception of distance. Cool colors tend to recede and are perceived as being farther away, making a space feel larger. Warm colors tend to advance and are perceived as being closer, making a space feel smaller.

Color can also be used to capture attention and direct views. Focal points can be created with bright colors. For example, bright yellow, which has the highest intensity, also has a high contrast with all other colors (often described as a "pop" of color) and should be used sparingly. A small amount of intense color has as much visual weight as a large amount of a more subdued or weaker color. Color schemes in the garden can change with the seasons. Summer colors are usually more varied and bright with more flowers, while winter colors tend to be monochromatic and darker with more foliage. Color is also affected by light quality, which changes with the time of day and time of year. Brighter, more intense summer sun makes colors appear more saturated and intense, while the filtered light of winter makes colors appear more subdued. When choosing a color scheme, consideration should be given to the time of day the yard will be used. Because color is temporary, it should be used to highlight more enduring elements, such as texture and form. A color study (Figure 9) on a plan view is helpful for making color choices. Color schemes are drawn on the plan to show the amount and proposed location of various colors.

4. Texture

Texture refers to how coarse or fine the surface of the plant or hardscape material feels and/or looks. Texture is used to provide variety, interest, and contrast. The plant's foliage,

flowers, bark, and overall branching pattern all have texture. The size and shape of the leaves often determines the perceived texture of the plant. A plant can generally be described as having a coarse, medium, or fine texture. Coarse texture is more dominant than fine and also tends to dominate color and form, while fine texture is more subordinate to other qualities and tends to unify compositions. Coarse-textured plants attract the eye and tend to hold it because the light and dark contrasts of the shadows provide more interest. Fine texture exaggerates distance and gives the feeling of a larger, more open space. Rough texture minimizes distance—plants appear closer and the space feels smaller, or enclosed. Texture is also found in the hardscape, including on buildings, patios, walls, and walkways.

Texture applies to both softscape and hardscape. By texture we mean whether the plant or design feature is hard, soft, fine, course, heavy, light, rough, smooth, etc. Leaf structure, flowers, bark, and stone surface all have texture. Incorporating a variety of plant and hardscape textures adds a layer of dimension to the design.

i. Coarse texture

Plant characteristics that create coarse texture include large leaves; leaves with very irregular edges; bold, deep veins; variegated colors; thick twigs and branches; leaves and twigs with spines or thorns; and bold, thick, and/or irregular forms. Each leaf of a coarse-textured plant breaks up the outline, which gives the plant a looser form. Examples of plants with coarse texture include philodendrons, agaves, bromeliads, hollies, palms, and hydrangeas. Hardscape with coarse texture includes rough-cut stone, rough-finished brick, and unfinished wood with knots and a raised grain. Aged or old construction material that maintains a weather-beaten surface is often coarse in texture.

ii. Fine texture

Characteristics that create fine texture include small foliage; thin, strappy leaves (grasses) or tall, thin stems; tiny, dense twigs and small branches; long stems (vines); and small, delicate flowers. They are often described as wispy and light or with a sprawling, vining form. Fine-textured plants sometimes have a stronger form because the small individual leaves are densely packed (e.g., boxwoods) to create a solid edge. Plants with a fine

texture include grasses, ferns, Japanese maples, many vines, and junipers with fine needles. Hardscape with fine texture includes smooth stone, wood or ceramic pots, and glass ornaments. Smooth water, such as that found in a reflecting pool, or water with a very fine spray is considered fine textured.

iii. Medium texture

Most plants are medium texture, in that they cannot be described as having either coarse or fine texture. They are characterized by medium-sized leaves with simple shapes and smooth edges. The average-sized branches are not densely spaced nor widely spaced, and the overall form is typically rounded or mounding. Medium-textured plants act as a background to link and unify the coarse- and fine-textured plants. Plants with medium texture include agapanthus, ardisia, camellia, euonymus, pittosporum, and viburnum. Hardscape with a medium texture includes standard flagstone pavers, broom-brushed concrete, and finished woods.

Properties of texture

Texture affects the perception of distance and scale. To make a space feel larger, locate plants so that the fine textures are along the outer perimeter, the medium textures are in the middle, and the coarse textures are closest to the viewer. The small size of the fine texture recedes in the landscape and is perceived as being farther away. To make a space feel smaller, place the coarse textures along the outer perimeter and the fine textures closest to the viewer. The detail of the coarse texture makes the plants appear closer and makes the space feel smaller. The perceived texture of plants can also change with the distance from the plant. Plants that are coarse close-up can look fine textured from a distance. Bold colours increase the contrast and make the texture appear coarser, while muted colours can flatten texture. Hardscape with a coarse texture—such as very rough rocks and bold, large timbers—tends to make all plant material appear more medium textured. Designers often develop a texture study (Figure 8) on paper to help decide the arrangement of plant materials. The drawing mimics texture by using different line weights and spacing to represent fine, medium, and coarse textures.

5. **Scale**

The principle of scale refers to the size of landscape elements in relation to their surroundings. There are two factors to consider; (i) the size of the house, and (ii) the size of the objects in the larger landscape (existing trees in the community, size of neighbours's house, etc.

Varying heights and widths enhances the overall design composition. The scale of your hardscape and softscape additions must also complement and fit with the size of your home, yard and existing landscape features.

SELF-ASSESSMENT EXERCISE 3

Tick true (T) or false (F):

T	F	Landscape design process begins by determining the needs and desires of the user and the conditions of the site
T	F	Knowledge of the elements and principles of design is essential to designing a landscape and working through the design process
T	F	The elements of composition are the visual qualities that people see and respond to when viewing a space
T	F	An aesthetic landscape design incorporates ten key elements

2.1.4 CONCLUSION

A determination of the needs and desires of the user and the conditions of the site is key in the landscape process, as this information helps the designer to organize the plants and hardscape materials (the features). The principles of landscape design serve as guidelines to arrange or organize the features to create an aesthetically pleasing or beautiful landscape.

2.1.5 SUMMARY

Landscape design is more than just a cosmetic treatment to be applied to indifferent or insensitive architectural or engineering in order to soften the harsh edges or disguise an awkward layout. It is to integrate structures in to the environment by reducing the visual

intrusiveness, by repairing damage to the existing vegetation and more positively by providing a setting that is attractive and welcoming.

2.1.6 TUTOR MARKED ASSIGNMENT (TMA)

1. What is the goal in developing a landscape plan?
2. List the principles that should be considered in designing a landscape plan.
3. What are the basic elements of landscape design?
4. Discuss site analysis a first step in the development of a landscape plan

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UNIT 2: LANDSCAPE DESIGN STYLES

2.2.1 INTRODUCTION

Landscape design styles are divided based on specific features in form and space conceptualization, build features and use of materials. The typologies may include cultural and historic gardens such as Japanese, Spanish, English and few new age styles like minimalistic and modern. Another way to identify styles is to base it on forms which can be regular or naturalistic.

2.2.2 OBJECTIVES

At the end of this unit, you should be able to:

i. Outline the different landscape design styles
ii. Choose designs best suited to your taste.

2.2.3 LANDSCAPE DESIGN STYLES

2.2.3.1 Regular landscaping style

This is most often observed in the classical landscape designs. Such gardens are best fit for homes done in a luxurious classical style. There is use of pure geometry in the layout of the space. The pathways are well defined and if you would like to add drama to the space, sculptural water feature can be used. The arrangements of the soft scape follows the format of straight, axial or circular patterns. Additional elements like ceramic pots arranged in symmetry add grandeur.

2.2.3.2 Naturalistic landscaping style

This type of design blends into its surrounding environment. So if you like an informal set up this format is something that you should opt for. The geometry of the layout will have meandering lines and organic forms. Naturalistic style is quite often seen in Contemporary large estates. Water body is seen as small ponds with irregular borders along with beach of grasses. Use of materials are quite close to nature, for example bricks, mosaic and terra-cotta.

2.2.3.3 Classical landscape styles

English garden

The roots of this garden originate from Early Roman type .It is a blend of formal and informal settings. They can be considered as a relaxation of highly symmetrical and ordered style of the French Renaissance. The typical features of such a style are straight or gently winding pathways, stone elements like benches, walls in the quintessential classical style, columns or statues from the classically derived character.

Mediterranean formal garden

Quite like Mediterranean food, the garden style is also mix of two other types. This look is inspired from southern Italy and more arid areas of Spain. The basic criteria is gravel pathways and shaded seating area. The styles could further be distinguished as formal and informal.

Formal look: The guiding features of such a setting are defined pathways, trellis, statuary, fountains and beds at different levels.

Informal look: The following are informal looks**:**

Mediterranean informal garden

The organization is more curvilinear and gentle. The planting is more soft and relaxed yet coordinated. The overall attempt is to be closer to nature.

Spanish garden

This garden style was influenced by the Islamic, Moorish and Persian gardens .This style is quite popular in regions with similar climate conditions like that of Spain. The Spanish mastered the art of having separate spaces within their garden layout. Patios were created by walled sections, there were terraces offering view into the landscape and fountains were central features of the courtyard. In this garden too one notices use of ceramic tiles. Symmetry has been the basic of this style but you might see that changing now.

Moorish garden

This style has emerged from a mix of Muslim and English garden style. The typical features of this style are ponds, fountains, basins and water channels. Usually the garden is right in front of the house and further spreads out on either sides cutting across water bodies allowing a beautiful silhouettes of the building on the water body. The planting palette breathes luxury combined with luxurious elegant architectural style.

Japanese garden

This is the most famous style as of now. Not many adapt it but definitely like to view it. Japanese garden style is based on the concept of spirituality. Design should maintain over all calmness and appeasement observed in nature. They imitate nature at a smaller scale by various means. An important characteristic is to create enclosure by offering refuge from very day life .The common elements are rocks, lanterns, more of evergreen planting and use of water to realize the importance of the same in your life.

Modern Style

One of the most widely used design type is the Modern garden style. The layout is driven by lines. All the zones in the garden flow into one another yet maintain clarity of the

space. The entire design is driven by simplicity and sleekness in form. Colour palette is usually white, grey or black. Materials include concrete and pebbles for paving.

SELF-ASSESSMENT EXERCISE 4

T	F	One of the most widely used design type is the Modern garden style
T	F	Japanese garden style is quite popular in regions with similar climate conditions
T	F	Naturalistic landscaping **style does not** blends into its surrounding environment.

2.2.4 CONCLUSION

Landscape design styles are divided based on specific features in form and space conceptualization, build features and use of materials.

2.2.5 SUMMARY

There are various landscape designs styles depending on the country they originated from. They include regular landscaping style, naturalistic landscaping style and **c**lassical landscape styles. Another way to identify styles is to base it on forms, which can be regular or naturalistic.

2.2.6 TUTOR MARKED ASSIGNMENT (TMA)

1. List three (3) landscape design styles and discuss any of them.
2. What are the typical features of Moorish garden style?

2.2.7 REFERENCES AND FURTHER READINGS

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UNIT 3: SITE SURVEY AND ANALYSIS

2.3.1 INTRODUCTION

Gathering accurate information ensures the success of landscape plans. A comprehensive site survey is necessary to gather information about the garden size, shape and soil type. This unit discusses issues like understanding the measurable quantities and qualities on a survey site, knowing the sources data collection and the type of data to be collected, the information to be taken from site analysis and how to present information taken from site analysis.

2.3.2 OBJECTIVES

At the end of this unit, you should be able to:

1. Understand the measurable quantities and qualities on a survey site
2. Know the sources data collection
3. Know the type of data to be collected
4. Know the information to be taken from site analysis
5. Know how to present information taken from site analysis

2.3.3 SITE SURVEY AND ANALYSIS

2.3.3.1 The objects of survey

The objects of survey refer to measurable quantities and qualities on the site. They fall into 3 primary areas:

1. Collection of data
2. Site analysis or survey
3. Visual characteristics of the site

1. Collection of data

Data is collected from 3 sources i) site, ii) recorded data and iii) information from client, e.g. composition of the family, hobbies and special interests, and frequency and style of outdoor entertainment

Data to be collected include the following:

i. Maps- large or small scale maps, land capability maps, climatological maps,

ii. Photographic survey- area oblique

iii. Recorded data- from geographical maps, town planners,

iv. Restrictions from local government authorities- certificate of occupancy (C of O), set backs on lands, etc.

v. Road types- Trunk A, B or C roads, desire lines, etc.

2. Site analysis or survey

Information from site analysis include the following:

i. Take a dimension of the plot

ii. Look at the topography

iii. Rock formation

iv. Hydrography (surface and underground water)

v. Existing vegetation

vi. Existing structure (if any)

vii. Location of facility

viii. Directional orientation

ix. Historical importance of site

x. Proximity to roads

xi. Views towards and from the site

xii. Problem areas on the site

xiii. Know the prevailing wind direction

These information can be summarized into natural factors, man-made factors and cultural factors.

3. Visual characteristics of the site

- Triangulation methods- measurements

- Visual survey- visual observations

- Ecological survey- involves all flora and fauna available in the site, use quadrants or a square for ecological studies and frequency of occurrence.

- Soil Survey- engineering qualities of the site, soil type, soil fertility, soil depth, etc.

2.3.3.2 Presentation of Information

After getting the measurable quantities and qualities on the site, the information can be presented in form of drawings, diagrams, photographs, written documents, 3-dimensional model. Also present the bill of quantities. Present your information using:

1. Location plan

2. Base plan- working plan for information gathering and records puposes.

3. Topography- hilly, sloppy, level lands, etc.

4. Geology and soil types

5. Services- utility lines, above or underground cables and pipes, etc.

6. Access and circulation- roads, water bodies, etc.

7. Micro-climate, vegetation, bare or covered.

8. Ecology- flora and fauna, dominant, co-dominant or recessive species

9. Visual characters, bad views, good views, etc.

10. Written reports

SELF-ASSESSMENT EXERCISE 5

T	F	Information from site analysis include taking a dimension of the plot, looking at the topography, rock formation and existing vegetation
T	F	After getting the measurable quantities and qualities on the site, the information can be presented in form of drawings, diagrams, photographs, written documents and 3-dimensional models.
T	F	Visual characteristics of the site is not an important quality for consideration in site survey

2.3.4 CONCLUSION

In landscaping it is necessary to carry out a site survey in order to ascertain the measurable quantities and qualities of the site to be landscaped.

2.3.5 SUMMARY

Measurable quantities and qualities of a site to be landscaped fall into 3 primary areas, namely collection of data, site analysis or survey and visual characteristics of the site. The information gathered can be summarized into natural factors, man-made factors and cultural factors.

2.3.6 TUTOR MARKED ASSIGNMENT (TMA)

1. Measurable quantities and qualities on the site fall into 3 primary areas. List the three (3) primary areas.

2. In site survey, it is necessary to get information from the client. List ten (10) pieces of information that should be collected from site analysis.

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UNIT 4: LANDSCAPE DESIGN CONTRACTS

2.4.1 Introduction
2.4.2 Objectives
2.4.3 Landscape design contracts
2.4.4 Conclusion
2.4.5 Summary
2.4.6 Tutor Marked Assignment (TMA)
2.4.7 References and Further Readings

2.4.1 INTRODUCTION

Landscaping contractors perform extensive work that extends far beyond, and typically establish relationships with their clients with a landscaping contract. These creative professionals may grade the land, install irrigation fixtures, and design aesthetically-pleasing lawns and gardens. As such, it is vital that landscaping contractors not only understand how to negotiate a contract but also have a reliable, enforceable document in place.

A landscaping contract, also known as a landscaping services contract , is a legal instrument entered into by a landscaping contractor and a client. The agreement specifies payment terms, party contact information, types of services provided, and how to handle legal disputes. When both parties sign a landscaping contract, it becomes legally enforceable and mutually agreed upon.

2.4.2 OBJECTIVES

At the end of this unit, you should be able to:

1. Appreciate the benefits of landscape design contracts
2. Know the essential elements of a landscaping contract
3. Understand the nitty-gritty of a written landscape contract

2.4.3 LANDSCAPE DESIGN CONTRACTS

2.4.3.1 Benefits of a landscaping contract

The benefits of a landscaping contract include:

1. Descriptions of specific services to be performed so that there is no disagreement later

2. Terms and conditions related to payments so that contractors know what to expect and when to expect it
3. Guarantees and warranties so that clients know that your craftsmanship is backed by promises to replace, repair, or refund
4. Existence of a legally binding landscaping contract demonstrates that a real relationship existed
5. Prevents unnecessary legal disputes by having everything in writing and understood by both parties

2.4.3.2 Essential elements of a landscaping contract

A landscaping contract should include several essential elements in order to make it enforceable and lawful. Rather than having complicated legal language, the more easily clients and contractors understand the agreed-upon terms, the fewer disputes may arise in the future. The following elements can be incorporated into landscaping contract:

1. The names and contact information of the landscaping contractor and client
2. A statement that acknowledges both parties mutually consent to the terms and conditions
3. The contract's start and end date along with the terms of payment
4. A Statement of Work that lists the services being provided to the customer, including ongoing maintenance and site inspections
5. What to do in the event that the contract needs to be amended or terminated
6. How you will handle non-payment claims, including the use of a lien
7. A completed copy of your invoice template to present at the time of accepting payment or signing
8. Limitation of liability with regard to third-parties
9. The local, state, or federal laws that govern the agreement
10. A dated signature from both parties acknowledging the agreement

2.4.3.3 Essential elements of a written landscaping contract

A written landscaping contract should include the following:

1. Identification of the two parties

There is the need to clearly state who's involved with and responsible for the project. This section should come at the beginning and include the date, client's name and the name of the contractor (or business name). Addresses should be included.

2. Services being offered

Landscaping contracts should include a detailed description of the project and what exactly the contractor will be doing. The basic services that will be performed should be clearly written and also additional ones, those that will be provided for an added cost if desired. The materials needed and stages in which the features will be installed should be written out.

The contractor should also state what is not included in the contract so clients don't have unrealistic expectations. If there is need to change something later on, it should be added as a revision to the contract and the client be made to sign the change order.

3. What it will cost

Something all landscaping contracts need to have is how much the contractor will be compensated and what type of payment plan the client will follow. Payments need to be tied to work completed. It should be unambiguous, as payment amounts and schedules often cause the most customer issues.

Having a timely payment plan in place not only keeps you in the black, but it can also help customers better manage their budgets. Clients should be made to understand the contractor's invoicing and collection procedures. The contract should state how the client can pay (checks, credit cards or cash) and the payment policy. If there will be transaction fees for credit card payments, that information should also be included.

4. Project deadlines

Another important element of a sound landscaping contract is a statement on the timeframe for performing the work. An estimated start and end date should be put.

Within this section, a force majeure condition should be added, which means neither party is responsible for delays or issues caused by acts of God or other uncontrollable events.

Also, the contractor should add a method to modify the time constraints in place within the contract. That will allow him to alter the deadline if the client wants to make changes or have you install additional features.

5. Problem preventer

While it is hoped that everything goes smoothly, there is need to think ahead to avoid issues. To be proactive, here are examples of things that could be included in this section:

i. A change order is needed if the project goes beyond the original scope of services.

ii. The landscaper retains ownership of any drawings or designs until the services have been paid in full.

iii. The landscaper will pay a penalty of X dollars every day the project is late, past an X-day grace period.

A statement can also be included saying the landscaper is not responsible for the project if the client breaks any part of the contract.

2.4.3.4 Lawn care contracts vs landscaping contracts

The difference between lawn care contracts and landscaping contracts includes the types of services involved, the payment or subscription services offered, or if one is working as part of a roofing contractor, construction contract already in existence.

While lawn care contracts address specific services, such as mowing, mulching, and pest control, landscaping contracts are different. Landscapers may engage in land grading, irrigation, and material work, meaning that the work is more complicated. as such, you will want to note a few differences as listed below:

1. A detailed description of all materials and parts being used on the project
2. Who is responsible for maintenance and inspection of newly installed systems

3. An agreement that the client allows the landscaping contractor on the premises as needed or with specific notification requirements
4. A more in-depth list of current and ongoing services being provided
5. Offset costs by allowing a customer to keep a logo or signage posted in the landscaped area
6. Other matters that need to be tackled as relevant

SELF-ASSESSMENT EXERCISE 6

List five (5) essential elements of a written landscaping contract and discuss any two (2) of them.

2.4.4 CONCLUSION

In a written landscaping contract, it is important to identify the parties involved, state the service(s) being offered, state what such service(s) will cost, stipulate project deadlines and include problem preventer such as "a change order is needed if the project goes beyond the original scope of services".

2.4.5 SUMMARY

A landscaping contract should include several essential elements in order to make it enforceable and lawful. Rather than having complicated legal language, the more easily clients and contractors understand the agreed-upon terms, the fewer disputes may arise in the future.

2.4.6 TUTOR MARKED ASSIGNMENT (TMA)

1. Define a landscaping contract.
2. List five (5) benefits of a landscaping contract.
3. Give (a) Two (2) examples of lawn care services and (b) two (2) examples of landscaping services.
4. Why is it advisable to write a landscaping contract in a simple language?

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MODULE 3: LEVELLING AND CONTOURING

UNIT 1: LEVELLING

3.1.1 INTRODUCTION

The art of determining relative altitudes of points on the surface of the earth or beneath the surface of earth is called levelling. Level ground can also reduce the risk of flooding, as this enables water to distribute away from a property more consistently. In turn, this can allow for easier maintenance of your lawn. Levelling can encourage better water management in a garden, but they do so in very different ways.

3.1.2 OBJECTIVES

At the end of this unit, you should be able to:

1. Know how to establish a level grade line for landscaping
2. Know how to level a garden
3. Understand some planning tips to help level a garden slope

3.1.3 LEVELLING

3.1.3.1 How to establish a level grade line for landscaping

Tools and materials

Tape measure

Ground flags

Nylon string and stakes

Small sledge hammer

Line level

Clear plastic tubing

Self-leveling laser level

Steps:

1. Push wire ground flags into the lawn to mark the four corners of the building project.
2. Pound wooden grade stakes into the ground about 2 feet away from each ground flag.
3. Tie a nylon line to one corner stake, then stretch the line to the next stake.
4. Have a helper hang a line level onto the middle of the string.
5. Raise or lower the string until it's perfectly level. Tie off the string to the second stake.

6. To determine the slope of the grade, measure the distance from the level string down to the ground in three places: at each stake and in the middle of the string.
7. Add red food dye to a jug of water, then siphon the colored water into a length of clear plastic tubing.
8. Once the water flows from the opposite end of the tubing, let it drain for about 30 seconds to clear out any air bubbles.
9. Have a helper hold one end of the tubing against one stake. Take the opposite end of the tubing and hold it against the second stake.
10. Raise or lower your end of the tubing until the water level at the first stake is even with the desired height, then mark the water level at your end onto the second stake.
11. Without moving the water level from the first stake, carry your end to each of the remaining stakes. Repeat Step 10 to mark level lines onto the stakes.
12. Mount a laser level to a tripod and set it up in the middle of the four corner stakes.
13. Attach a receiver to a transit rod.
14. Stand the transit rod at a corner stake, then raise or lower the receiver until it emits a steady, audible beeping sound, indicating that it's level with the laser level.
15. Mark the bottom end of the transit rod on the stake, and repeat to mark the remaining ground stakes.

3.1.3.2 Planning tips to help level a garden slope

The following are top seven planning tips to help level a garden slope:
1. Understand the space you're working with
One of the golden rules of landscape gardening is to be aware of the ground you're going to mould. A full inspection should be done before you pick up your shovel or any other tool. Are you sure that you won't be disturbing any pipes or wires? And are any changes you are hoping to make in-line with local building regulations?
2. It is a mistake to think flat is always best

Many new horticulturists don't realize that it is both healthy and desired for your turf to have a bit of a slope. A gentle slope away from your home can lead to just the right amount of drainage.

3. Work out the run and rise of your garden

Using a board and level is the easiest way to measure the slope in your garden. You will be able to work out the rise of your garden by measuring the vertical distance from the top of a slope to the bottom, while the horizontal distance is known as a run.

Start by driving a stake into the ground at both the top and bottom of your slope. Next, tie a string around the first stake at ground level, and tie it to the second stake in a place where the string is completely level. The length of the string is the run of your garden and the distance between the string's place on the second stake and the ground is its rise.

4. Prioritize any low spots

For low spots, the depth of such eyesores will help you to work out the best method of recovery for them. Shallow low spots of up to 2cm or 3cm could mean a do-it-yourself (DIY) job is pretty easy, and you could top dress a lawn yourself. To do this, you will simply need to fill out chosen areas with a combination of around two parts sand, two parts topsoil and one part compost.

5. Timing is everything

Ideally, you will want to start your improvement works in spring, so that your grass seeds have enough time to grow. This time of year should give enough moisture for the soil to settle. About a week before you level your lawn, water it so that the soil is not too hard or dry. Be careful not to over-water the soil though, as damp turf can be just as hard to work with as dry soil. To help make sure you'll have good conditions for digging, dampen the soil again a day before you get to work.

6. Build solid foundations for the future

Once you are set on a plan for how to level your garden, it can be a good idea to find some deep-rooted plants or trees, as this essentially means you will future-proof your landscaping. If you're unsure where to start, take a trip to your local garden centre and ask them which plants or trees are native to your area and so will grow well. Finally – be

sure to keep on top of your gardening, as a garden that is not well maintained could suffer from fallout erosion, caused when layers of soil under the topsoil shift and wash away.

7. Ask yourself if the job is too big for you

There's no shame in seeking landscape gardening advice from a professional, especially if your garden has more complex needs. For example, if there are low spots near water pipes. Sometimes the unsteady ground is caused due to damaged water pipes themselves. If you have more severe low spots then you may need to install an underground drainage system. Steeper slopes can also prove to be complex to deal with alone, which can erode quickly and cause major challenges to the foundation of your home when left unattended. Adding a single wall or terracing such as with breeze blocks or natural stone is one of the best ways to solve this problem.

Don't forget that each garden is unique, and your requirements may be very different from those of your neighbour. An expert could give your direction that saves you both time and money in the long run.

SELF-ASSESSMENT EXERCISE 7

Walk into your garden (or locate one in the event that you don't have your own) and carry out the following exercises:

a. Measure the "run" of the garden
b. Measure the "rise" of the garden.

3.1.4 CONCLUSION

Levelling, the art of determining relative altitudes of points on the surface of the earth or beneath the surface of earth is can encourage better water management in a garden.

3.1.5 **SUMMARY**

Having a consistent surface to work on is a foundation for much great art. A flatter plot of grass can decrease soil erosion, while allowing for a better spread of water to be absorbed into the soil. The tips discussed in this unit will help your garden to look fresh all the time.

3.1.6 TUTOR MARKED ASSIGNMENT (TMA)

1. List five (5) tools and materials needed for establishing a level grade line for landscaping.

2. The following are steps in establishing a level grade line for landscaping except (tick the correct answer):

a. Push wire ground flags into the lawn to mark the four corners of the building project.

b. Pound wooden grade stakes into the ground about 2 feet away from each ground flag.

c. Dig a hole in the middle of the four corner stakes

d. Tie a nylon line to one corner stake, then stretch the line to the next stake.

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UNIT 2: CONTOURING

3.2.6 Tutor Marked Assignment (TMA)
3.2.7 References and Further Readings

3.2.1 INTRODUCTION

A contour is defined as an imaginary line of constant elevation on the ground surface. It can also be defined as the line of intersection of a level surface with the ground surface. The process of locating these contour lines on the surface of the earth is known as contouring.

Understanding the soil type and land contours will help you to bring together a landscape plan that will make the best use of your (or your client's) garden.

3.2.2 OBJECTIVES

At the end of this unit, you should be able to:

1. Know the methods of contouring
2. Know the methods of interpolation of contours
3. Understand the principal characteristics of contour lines
4. Understand the meaning of contour interval and the factors that govern it
5. Know the types of contour lines found on a topographical map

3.2.3 CONTOURING

3.2.3.1 Methods of Contouring

The method of establishing / plotting contours in a plan or map is known as contouring. It requires planimetric position of the points and drawing of contours from elevations of the plotted points. Contouring involves providing of vertical control for location of points on the contours and horizontal control for planimetric plotting of points. Thus, contouring depends upon the instruments used (to determine the horizontal as well as vertical position of points). In general, the field methods of contouring may be divided into two classes: (1) Direct methods and (2) Indirect methods

1. **Direct Method:**

In the direct method, the contour to be plotted is actually traced on the ground. Points which happen to fall on a desired contour are only surveyed, plotted and finally joined to obtain the particular contour. This method is slow and tedious and thus used for large scale maps, small contour interval and at high degree of precision. It consists of (i) vertical control and (ii) horizontal control.

i. Vertical control: In this method, a benchmark is required in the project area. The level is set up on any commanding position and back sight is taken on the bench mark. Let the back sight reading on the bench mark be 1.485 m. If the reduced level of the bench mark is 100 m, the height of instrument would be 100 + 1.485 = 101.485 m.

To locate the contour of 100.5 m value, the staff man is directed to occupy the position on the ground where the staff reading is 101.485 -100.500 = 0.985 m. Mark all such positions on the ground where the staff reading would be 0.985 m by inserting pegs. Similarly locate the points where the staff reading would be 101.485 -101 = 0.485 m for 101m contour.

The contour of 101.5 m cannot be set from this setting of the instrument because the height of instrument for this setting of the instrument is only 101.485 m. Therefore, locating contours of higher value, the instrument has to be shifted to some other suitable position.

Establish a forward station on a firm ground and take fore sight on it. This point acts as a point of known elevation, for shifting the position of the instrument to another position, from where the work proceeds in the similar manner till the entire area is contoured.

ii. Horizontal control: The horizontal control is generally provided by method of plane table surveying or locating the positions of points.

2. **Indirect method of contouring**

In this method, the spot levels of selected guide points are taken with a level and their levels are computed. The horizontal positions of these points are measured or computed

and the points are plotted on the plan. The contours are then drawn by a process called interpolation of contours from the levels of the guide points. The following are the indirect methods that are commonly used for locating contours: (i) Squares or Grid method and (ii) Cross section method

i. Square or grid method: In this method, the area to be surveyed is divided into a grid or series of squares. The grid size may vary from 5 m x 5 m to 25 m x 25 m depending upon the nature of the terrain, the contour interval required and the scale of the map desired. Also, the grids may not be of the same size throughout but may vary depending upon the requirement and field conditions. The grid corners are marked on the ground and spot levels of these comers are determined by leveling. The grid is plotted to the scale of the map and the spot levels of the grid corners are entered. The contours of desired values are then located by interpolation. Special care should be taken to give the spot levels to the salient features of the ground such as hilltops, deepest points of the depressions, and their measurements from respective corners of the grids, for correct depiction of the features. The method is used for large scale mapping and at average precision.

ii. Cross section method: In these sections, a base line, centre line or profile line is considered. Cross sections are taken perpendicular to this line at regular intervals. After this points are marked along the cross sections at regular intervals. A temporary bench mark is set up near the site. Staff readings are taken along the base line and the cross sections. The readings are entered in the level book the base line and the cross sections should also be mentioned. The RL of each of the points calculated. Then the base line and cross sections are plotted to a suitable scale. Subsequently the RLs of the respective points are noted on the map, after which the required contour line is drawn by interpolation

This method is suitable for route survey, when cross sections are taken transverse to the longitudinal section.

3.2.3.2 Methods of interpolation of contours

The process of locating the contours proportionately between the plotted points is termed interpolation. Interpolation may be done by: (1) Arithmetical calculation and (2) The graphical method

1. **By arithmetical calculation**

Let A and B be two corners of the squares. The RL of A is 98.75 m, and that of B 100.75 m. the horizontal distance between A and B is 10m.

Horizontal distance between A and B = 10m

Vertical difference A and B = 100.75-98.75=2m

Let a contour of 99.00 m be required. Then,

Difference of level between A and 99.00m contour = 99.00-98.75=0.25m

Therefore, distance of 99.00 m contour line form A= 10/2 *0.25=1.25m

This calculated distance is plotted to the same scale in which the skeleton was plotted to obtain a point of RL of 99.00 m.

Similarly, the other points can be located.

2. **By graphical method**

On a sheet of tracing paper, a line AB is drawn and divided into equal parts. AB is bisected at C and a perpendicular is drawn at this point. A point O is selected on this perpendicular line and then radial lines are drawn from O to the divisions on AB. After this lines 1-1, 2-2, 3-3….are drawn parallel to AB. These lines serve as guide lines. Boundary line and every fifth the line is marked with a thick or red line.

Suppose we have to interpolate a 2m contour between two points a and b of RLs 92.5 and 100.75m.

Let us consider the lowest radial line OB to represent an RL of 90.00. So, every fifth line will represent 95,100,105, etc. The tracing paper is moved over the plan until ‘a’ lies at

92.5 and ‘b’ at 100.25. Line ‘ab’ should be parallel to AB. Now the points 94, 96, 98,100 are picked through to obtain the positions of the required contours.

3.2.3.3 Characteristics of contour lines

The principal characteristics of contour lines which help in plotting or reading a contour map are as follows:

1. The variation of vertical distance between any two contour lines is assumed to be uniform.
2. The horizontal distance between any two contour lines indicates the amount of slope and varies inversely on the amount of slope. Thus, contours are spaced equally for uniform slope
3. The steepest slope of terrain at any point on a contour is represented along the normal of the contour at that point. They are perpendicular to ridge and valley lines where they cross such lines.
4. Contours do not pass through permanent structures such as buildings.
5. Contours of different elevations cannot cross each other (caves and overhanging cliffs are the exceptions).
6. Contours of different elevations cannot unite to form one contour (vertical cliff is an exception).
7. Contour lines cannot begin or end on the plan.
8. A contour line must close itself but need not be necessarily within the limits of the map.
9. A closed contour line on a map represents either depression or hill. A set of ring contours with higher values inside, depicts a hill whereas the lower value inside, depicts a depression (without an outlet).
10. Contours deflect uphill at valley lines and downhill at ridge lines. Contour lines in U-shape cross a ridge and in V-shape cross a valley at right angles. The concavity in contour lines is towards higher ground in the case of ridge and towards lower ground in the case of valley
11. Contours do not have sharp turnings.

3.2.3.4 Contour interval

The vertical distance between any two consecutive contours is known as a contour interval. For example, if the various consecutive contours are 100m, 98m, 96 m etc., then the contour interval is 2m. Contour interval depends upon:

1. The nature of the ground
2. The scale of the map and
3. The purpose of survey

Contour intervals for flat country are generally small, e. g. 0.25m, 0.5m, 0.75m etc. For a steep slope in hilly area it is greater, e. g. 5m, 10m, 15m etc. Again, for a small-scale map, the interval may be of 1m, 2m, 3m etc. and for large scale map, it may be of 0.25m, 0.50m, 0.75m etc. Note that the contour interval for a particular map is constant.

3.2.3.5 Types of contour lines found on a topographical map

Topographical maps are maps that show the shape and features of the surface of the earth of any particular area. They are maps of relatively smaller areas but with very detailed and extensive information about it. These maps use contour lines to show places with the same elevation.

As mentioned earlier, contour lines are used in topographical maps to connect all the places with the same elevation. Sometimes it is also used to show places with the same temperature or pressure. But the way the lines are drawn are the same. Whether the contours represent altitude or some other parameters is clearly stated in the key. The different kinds of contour lines are instead used to show different aspects of the same parameter (most commonly the altitude).

Contour lines are of three different kinds. They are the (1) Index lines, (2) Intermediate lines and (3) Supplementary lines.

Index lines: show the elevation of a place above sea level. They are the thickest contour lines and are usually labelled with numbers.

Intermediate lines: are thinner lines between the index lines. Usually, there are five intermediate lines after each index line.

Supplementary lines: are drawn as dotted lines. They are used to show flatter surfaces

SELF-ASSESSMENT EXERCISE 8

Enumerate the characteristics of a contour line

3.2.4 CONCLUSION

A contour map of a land is very useful since it provides valuable information about the land, especially noticeable differences in elevation in it.

3.2.5 SUMMARY

There are direct and indirect methods of contouring. In the direct methods, contours to be located are directly traced out in the ground by locating and making a number of points on each contour, which are then surveyed and plotted on the plan and the contours drawn through them.

In the indirect method of contouring, levels are taken at some selected points and their levels are reduced. Thus in this method, horizontal control is established first and then the levels of those points found.

3.2.6 TUTOR MARKED ASSIGNMENT (TMA)

1. In general, the field methods of contouring may be divided into two classes, namely …… and ……

2. Contour lines are of three different kinds. They are:

a. …….

b. …….

c. ……..

3. Which of the following is not an indirect method of contouring?

a. Square or Grid method

b. Cross section method

c. Vertical control method

4. Index lines show the elevation of a place above sea level **T/F ……..**

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MODULE 4: PLANTS FOR LANDSCAPING

UNIT 1: GUIDE TO MAKING APPROPRIATE CHOICES OF PLANTS TO USE

4.1.1 INTRODUCTION

Horticulturalists provide food to feed the world, beautify our neighbourhoods, decorate our gardens, and give ambience and wellbeing by combining the energy of the sun with soil, seeds, water and ingenuity. Horticulture has many components which include vegetables, flowers, fruits, spices and essential oils, turf grasses, edible fungi, nutraceutical plants, landscape and green spaces.

Plants are the foundation of our outdoor environment. The diversity of plant species and the multitude of cultivars, hybrids and varieties make for creative and appealing landscape compositions. There are a number of reasons for choosing plants for the

landscape. We may be attracted to their ornamental appeal or need them to serve a specific function or purpose in the landscape, such as providing a screen, blocking unwanted views, or stabilizing a soil bank. Others may be selected because of their ability to adapt to poor soils or simply for the ease of subsequent care.

Generally, when horticulturists are asked about plants, responding is not as simple as blurting out a few names. Plant selection is an organized process that examines several factors: function, aesthetics, site adaptability and management. The priority placed on each category varies with the individual. The freedom to choose from a wide variety of plants depends on the flexibility or restrictions imposed by the individual, the site, or in some cases the local availability of plants. Viewing plant selection as a process may at first seem cumbersome, but in time the process can make it easier to make decisions and provide more choices than first thought.

Function or purpose defines the reason for using a plant. Looking good certainly justifies a selection, but the value of a plant may go far beyond aesthetic appeal. Function guides the selection of a plant type, such as tree, shrub, or perennial for a specific space. Plants are packaged in many ways – their aesthetic qualities are as diverse as the species we have to choose from. Plant aesthetic qualities include the overall habit or shape of the plant and its foliage, flowers, fruit, and bark. The combinations of plant forms, foliage, flowers, fruit and bark can result in creative, artistic displays.

Once we have identified the potential aesthetic qualities, the next question is to determine whether or not the plant will truly perform in the soil and environmental conditions on your property. A helpful adage is “Don’t fight the site.” If you test or challenge Mother Nature and pick a plant that does not match your site conditions, there is a good chance that it will fail. Factors related to site adaptability – such as the plant’s cold hardiness and tolerance for site conditions such as soil type, exposure and light levels – will define whether your aesthetic selections will perform to your expectations.

The final consideration in plant selection is management. Landscape management or maintenance guides the development of plants in the landscape. After initial establishment, accent plants start to show off their qualities, plant masses begin to integrate, and border plantings achieve their intended shape. It is the feasibility and quality of maintenance that ensures the long-term aesthetic appeal of any plant and certainly highlights its contribution to the overall appeal of the landscape. Horticultural practices such as pruning, fertilization, irrigation and pest management need to be considered in making our final plant choices.

4.1.2 OBJECTIVES

At the end of this unit, you should be able to:

1. Understand the criteria for selecting the plants for landscaping
2. Have examples of plants for use in various landscaping situations

4.1.3 GUIDE TO MAKING APPROPRIATE CHOICES OF PLANTS TO USE

The following is an approach to selecting plants and identifies specific information that will be useful in making appropriate choices.

4.1.3.1 Plant selection approach

1. Function

"Function" refers to the purpose that the plant serves in the landscape. The shade of a tree canopy, the filtered screen from a hedge, or the erosion control of a ground cover addresses the specific objectives of the planting.

Plants serve three major functions in our landscapes:

i. Architectural function
ii. Engineering function
iii. Environmental functio

Individually or in concert, plants are the foundation of the landscape and reinforce the intended use of our outdoor space, whether the use is active or passive. We can liken the

development of our landscape to the development of rooms in our homes – each room is shaped for its intended use and is accessorized accordingly.

i. Architectural functions of plants

Plants serve an architectural function by defining the floors, walls and ceilings of our outdoor rooms. Floors direct our movement into and around the rooms. They are defined by colours and textures of turf, ground covers, creeping perennials and other interesting materials. Several ground cover plants have been promoted for their ability to withstand foot traffic. These in combination with more traditional turf have certainly changed our definition of living carpets. Walls establish boundaries and set the mood in our outdoor space. They can allow or limit visual and physical access. The characteristics of a wall are defined by height, depth and density. In combination these dimensions can provide an open, filtered or enclosed feeling. Screens of evergreen trees, clusters of multi-stemmed trees, masses of intermediate shrubs and low masses of herbaceous perennials all contribute to the characteristics of a wall and its influence on the mood or feeling the room projects. Ceilings are usually formed by our canopy trees and are characterized by their height and density. The branching height of a tree can contribute to the openness or intimacy of a room. Density influences light, whether it is blocked, filtered, dappled or bright. The location of the canopy can also contribute to changes in the atmosphere of the room through the day or season. Deciduous trees offer a wide array of seasonal characteristics that contribute to the artistic appeal of our ceilings.

Plants can also serve an architectural function by highlighting or masking architectural features of a house or building. Framing with plants can emphasize features or downplay an unwanted view. Plants also serve a very important role in shaping the rooms in our landscape. Their form provides the structural framework, and their foliage, flowers and branches provide the wallpaper and decorative appeal.

ii. Engineering functions of plants

Plants serve an engineering function by: influencing how we walk through the landscape; blocking objectionable views on or off the property; establishing buffers between divergent activities; and minimizing drainage or erosion issues. Bordering a sidewalk with small shrubs may help direct people along the walk. Screens between patios and utility areas separate leisure from work space. Ground cover shrubs can hold soil on a slope or prevent excessive erosion during seasonal rains. The engineering role of plants tends to be more utilitarian in addressing site issues or irregularities but nonetheless contributes significantly to the overall success of the plantings.

iii. **Environmental functions of plants**

When we speak of an environmental role for plants, our attention focuses on their influence on microclimates within the landscape. “Microclimate” refers to temperature, wind and light in a relatively small area. Plants can modify microclimates in our landscapes and thus contribute to human comfort. The positive contribution of plants to energy conservation has been well documented. Plants can reduce heat loss in the winter and minimize heat gain in the summer. Windbreaks are designed to intercept and deflect prevailing winds and reduce wind speed in the protected area. Plants along a foundation can form an insulating layer between the building and the outside wind. Plants provide benefits in the summer by intercepting direct and reflected rays of the sun. Canopy trees intercept the direct rays, providing a shade pattern, while shrubs can intercept reflected rays from pavement and the sides of buildings.

Aesthetics

Aesthetics or curb appeal tends to be the most notable quality of a landscape. The success or failure of a landscape is often judged on the visual quality of the plants.

Aesthetics starts with the plant type and the size of the designated planting area. All plants will take up space, some more so than others. To ensure the integrity of the planting we must plan accordingly and identify the amount of space we want or will allow the plants to cover. The size of the available space influences the type of plant we select. Each plant type sparks an image, some large, some small. “Shade tree” implies large canopy; “evergreen tree” usually suggests dense foliage and a conical shape; an

ornamental/flowering tree could be a small, delicate threadleaf Japanese maple or a wide-spreading crabapple. Shrubs offer a diverse array of sizes from dwarf barberries to massive viburnums. Ornamental grasses and perennials offer seasonal changes in colour and texture as well as in size. “Ground cover” implies a carpet-like growth habit.

Looking first at plant type allows us to match the plant with the space and leads us to consider shape. Shape adds another dimension to the ornamental quality of a plant composition. It also aids in characterizing the relationship between or among plants in the composition. Selecting for shape will give us plants for overhead, underneath as well as side by side. Many of our landscape compositions have several layers of plants, each contributing to the aesthetic appeal of its own layer and that above or below.

Flowers, foliage, fruit and stems/ branches/bark add to the aesthetic appeal of our landscape by providing colour and texture. The impact, duration and seasonality of these characteristics vary. Spring flower colours, the textural qualities of the foliage, fall colour and winter displays of fruit, branches and barks contribute to the four-season appeal of the landscape.

A summary of aesthetic considerations for plant selection include**:**

Growth habit, i.e. pyramidal, columnar, spreading, etc.
Season and colour of bloom
Foliage colour, texture, and shape
Winter interest of bark, fruit, or structure
Benefits to wildlife
Fall colour
Longevity

3. Site adaptability

Site adaptability is the relationship between the needs of the plant and the environmental and soil conditions on the property and/or the designated planting area. It ultimately

determines whether a plant will perform to expectations. If the plant is unable to establish and resume vigorous growth after planting, it is not likely to exhibit the aesthetic qualities that led to its selection. “Don’t fight the site” – either let the site conditions guide selection or be prepared to modify the site (soils, drainage, microclimate) to accommodate the plant introductions.

Soil type influences aeration, water retention, drainage and nutrient-holding capacity. Sandy soils are noted for their drainage and low nutrient-holding capacity. Loams are often considered the best soils for plant growth and development because of their adequate aeration, drainage and nutrient levels. Clays are suspect for poor aeration and drainage problems. Knowing your soil type and its benefits and liabilities will aid in identifying the right plant for your site.

Soil pH is another soil parameter influencing plant growth. Soil pH regulates the availability of micronutrients in the soil. For example, iron is relatively unavailable in soils with high pH (above 7.0). Acid-loving plants find it difficult to extract iron in adequate amounts from high pH soils. The result is a deficiency called iron chlorosis. Chelated iron applications are necessary to correct the problem. Knowing your soil pH will help you avoid pH sensitive plants.

Hardiness refers to the plant’s ability to withstand cold temperatures. USDA hardiness zones are based on the average minimum cold temperature. It is critical to base your plant selection on its ability to withstand the lowest expected temperature.

“Light exposure” refers to the amount of light available in the designated planting area. Knowing daily light patterns and their changes with the season again help tailor selections. Available light can also change with the maturity of the planting. As plants grow, what once was considered full sun can now be classified as partial shade. It may be necessary to change plants in a composition as time influences light levels.

Compass orientation refers to exposure to the north, east, south and west. Orientation may subject plants to prevailing winds or seasonal sun patterns that may have a negative

influence on their development. Prevailing winds in the winter come from the north-northwest. The wind direction shifts in the summer to south-southwest. As a rule, broadleaf evergreens should not be placed in north-northwest exposures unless they are protected from the direct influence of the wind. Winter sun patterns can also be a problem for broadleaf evergreens and thin-barked trees. The sun is in the southern portion of the sky in winter. Late afternoon sun warms plants in southwest exposures. Late afternoon warming followed by the abrupt temperature change when the sun sets causes frost cracks (splitting bark on trunks). Exposure to drying sun and wind can cause sunscald and dessication of broadleaf evergreens.

Other environmental considerations that influence plant performance include sensitivity to air pollution, exposure to and tolerance of deicing salt, and tolerance to light reflected off pavements and buildings.

3. Management

Maintenance practices within the landscape contribute to its overall appeal. The visual quality of the landscape can fall short if horticultural practice does not fall in line with plant needs. We must be realistic in determining the level of maintenance that we are willing to administer and adjust our plant selection accordingly. There is no such thing as a maintenance-free landscape, but low-maintenance landscapes are possible.

Pruning can be minimal if plants are picked to fit their allotted space. Pruning may be necessary to minimize encroachment of one plant into another's space. If a formal hedge is an integral part of the design, intensive pruning becomes more of a priority. Sanitation is a necessary part of plant management. Leaves, fruit and stems are normal plant litter. Some plants litter more frequently than others; some produce larger amounts of litter than others. Sanitation can be limited to the fall or a constant chore throughout the growing season. Supplemental irrigation can be a weekly requirement in some landscapes. Some plants require more water at regular intervals. Understanding the water requirements of certain plants will ensure long-term aesthetic quality.

Once established, most landscape plants do not need regular fertilization. Micronutrient deficiencies may require special treatments but in most cases this is not a major consideration in selection. Pest management, however, is another case. In plant selection we need to consider the susceptibility and/or tolerance to major insects and diseases. Major problems are those that reduce plant quality and must be controlled on a regular basis. Plant selection can focus on resistant species or cultivars to avoid the need for preventative or curative control applications. One pest that has to be considered in plant selection is deer. We must either focus on deer-resistant plants or provide the necessary protection from feeding.

Plant selection follows an organized process. The criteria used in the process integrate function, aesthetic preferences, adaptability of a species to the site, and the management required to ensure establishment and subsequent performance. The process may be simple or complex, depending on your priorities, flexibility, and restrictions. In any event, following the process, giving thought to the criteria and filtering through the possible selections will reward you with an aesthetically pleasing and functional landscape composition.

5. Insect and disease resistance

A major factor to consider when selecting woody ornamentals is insect and disease resistance. If two plants have similar form, function, and aesthetic qualities but one has an insect or disease problem and the other has none, it makes sense to choose the resistant species. For example, European birch (*Betula pendula*) is often used as a landscape tree but the bronze birch borer significantly impacts it. River birch (*Betula nigra*) offers the same form and function but is resistant to this pest. The cultivar Heritage™ has the desired lighter coloured, exfoliating bark and is the preferred species to use in the landscape.

Plants that have no significant disease or insect problems

The following lists of plants have no significant disease or insect problems.

Small shade trees (< 35')

Acer buergerianum	Trident maple
Acer campestre	Hedge maple
Acer ginnala	Amur maple
Acer griseum	Paperbark maple
Acer japonicum	Fullmoon maple
Acer palmatum	Japanese maple
Acer tartaricum	Tartarian maple
Acer triflorum	Three-flower maple
Acer truncatum	Shantung maple
Acer truncatum	Shantung maple
Betula nigra	Fox Valley™ River birch
Carpinus	American hornbeam
caroliniana	American Smoke tree
Cotinus obovatus	Hophornbeam
Ostrya virginiana	Persian Parrotia
Parrotia persica	

Medium shade trees (35' – 45')

Acer x *freemanii*	Freeman hybrid maple
Acer rubrum	cultivars
Aesculus carnea	Red maple cultivars
Carpinus betulus	Red horsechestnut
Cercidiphyllum	European hornbeam
japonicum f. *pendula*	Weeping katsura
Corylus colurna	Turkish filbert
Sassafrass albidum	Sassafrass
Sorbus alnifolia	Korean mountain ash

Ulmus parvifolia	Athena™ lacebark elm

Large shade trees for landscapes and public grounds (> 45')

Acer saccharum	Sugar maple cultivars
Betula nigra	Heritage™ River birch
Betula nigra	Dura-heat™ River birch
Cercidiphyllum japonicum	Katsura
Cercidiphyllum japonicum	*Weeping katsura*
Ginkgo biloba	Ginkgo
Liquidambar styraciflua	Sweet gum
Liriodendron tulipifera	Tulip tree
Nyssa sylvatica	Black gum
Platinus x *acerifolia*	London planetree
Quercus bicolor	Swamp white oak
Quercus palustris	Pin oak
Quercus phellos	Willow oak
Quercus robar	English oak
Ulmus americana	'New Harmony'
Ulmus parvifolia	Lacebark elm cultivars
Zelkova serrata	Zelkova

Small flowering trees (> 25')

Amelanchier arborea	Juneberry
Amelanchier laevis	Allegheny serviceberry
Amelanchier x grandiflora	Apple serviceberry
Cercis canadensis	Redbud
Cornus alternifolia	Pagoda dogwood

Cornus florida	Flowering dogwood (anthracnose resistant)
Cornus kousa – Kousa dogwood	Kousa dogwood
Cornus mas	Corneliancherry dogwood
Magnolia x *loebneri*	'Leonard Messel'
Magnolia stellata	Star magnolia
Malus cultivars)	Crabapple (disease resistant)
Styrax japonica	Japanese snowbell
Syringa reticulata	Tree lilac
Viburnum sieboldii	Siebold viburnum

Medium flowering trees (25' – 35')

Cladrastis kentuckea	Yellowwood
Evodia daniellii	Korean evodia
Halesia tetraptera	Silverbells
Koelreuteria paniculata	Goldenrain tree
Magnolia virginiana	Sweetbay magnolia
Oxydendrum arboretum	Sourwood, Sorreltree
Stewartia monodelpha	Tall stewartia
Stewartia pseudocamellia	Japanese stewartia

Large flowering trees (>35')

Magnolia acuminata	Cucumber magnolia
Prunus sargentii	Sargent cherry
Styphnolobium japonicum	Japanese pagoda tree (formerly Sophora japonica)

Trees/shrubs tolerant of moist/wet soils

Acer rubrum	Red maple
Amelanchier spp.	Shadbush, Juneberry
Betula nigra	River birch
Calycanthus florida	Carolina allspice
Cephalanthus occidentalis	Buttonbush
Chamaecyparis thyoides	Atlantic white cedar
Cornus alba	Tatarian dogwood
Clethra alnifolia	Sweet pepperbush
Cornus sericea	Redosier dogwood
Cornus amomum	Silky dogwood
Ilex glabra	Inkberry
Ilex verticillata	Winterberry
Itea virginica	Virginia sweetspire
Lindera benzoin	Spicebush
Liquidambar styraciflua	Sweetgum
Magnolia virginiana	Sweetbay magnolia
Metasequoia	Dawn redwood
glyptostroboides	Tupelo
Nyssa sylvatica	Swamp white oak
Quercus bicolor	Pinkshell azalea
Rhododendron vaseyi	Swamp azalea
Rhododendron viscosum	Elderberry
Sambucus canadensis	Bald cypress
Taxodium distichum	Eastern arborvitae
Thuja occidentalis	Western arborvitae
Thuja plicata	Blueberry
Vaccinium angustifolium	
Viburnum cassinoides	Witherod viburnum

Plants that can Tolerate Dry Soils and Short Periods of Droughts

The plants listed below will tolerate dry soils and short periods of drought. They may perform better when planted in more moisture retentive soils. However, any plant, regardless of how drought tolerant it may be, will require supplemental watering during its period of establishment in the landscape.

Deciduous trees:

Acer griseum	Paperbark maple
Carpinus caroliniana	American hornbeam
Cornus kousa	Kousa dogwood
Cotinus obovatus	American smoke tree
Ginkgo biloba	Ginkgo
Halesia tetraptera	Silverbells
Koelreuteria	Goldenrain tree
paniculata	American sweetgum
Liquidambar	Loebner hybrid magnolia
styraciflua	Crabapple
Magnolia x *loebneri*	London plane tree
Malus spp	Oak, many species
Platanus x *acerifolia*	Japanese pagoda tree
Quercus spp.	(formerly Sophora japonica)
Styphnolobium	Japanese tree lilac
japonica	Lacebark elm
	Japanese zelkova
Syringa reticulata	
Ulmus parvifolia	
Zelkova serrata	

Shrubs:

Aesculus parvifolia	Bottlebrush buckey
Arctostaphylos uva-ursi	Bearberry
Aronia spp	Chokeberry
Calluna spp	Heather
Chaenomeles x *superba*	Japanese flowering quince
Clethra alnifolia	Sweet pepperbush
Comptonia peregrine	Sweetfern
Cornus mas	Corneliancherry dogwood
Physocarpus opulifolius	Ninebark
Potentilla fruticosa	Bush cinquefoil
Rhus aromatica	Fragrant sumac
Rhus copallina	Flameleaf sumac
Rhus typhina	Staghorn Sumac
Rosa rugosa	Saltspray rose
Rosa virginiana	Virginia rose
Spirea spp.	Spirea, many species
Syringa spp.	Lilac
Vaccinium angustifolium	Lowbush blueberry
Viburnum dentatum	Arrowwood

Trees/shrubs for narrow areas/ vertical interest (fastigiate)

Acer x *freemanii*	Armstrong
Acer saccharum	Newton Sentry
Carpinus betula	Columnaris
Cephalotaxus	Fastigiata
Fagus sylvatica	Dawyck
Fagus sylvatica	Dawyck Purple
Ginkgo biloba	Princeton Sentry

Ilex crenata	Sky Pencil
Juniperus scopulorum	Sky Rocket
Liquidambar styraciflua	Slender Silhouette
Pinus strobus	Fastigiata
Quercus palustris	Green Pillar
Quercus robar	Fastigiata
Taxus baccata	Fastigiata
Xanthocyparis nootkatensis (formerly *Chamaecyparis nootkatensis*)	Green Arrow

Trees/shrubs for hedges and screening

Abies spp.	Fir
Acer campestre	Hedge maple
Acer ginnala	Amur maple
Carpinus betula	European hornbeam
Hibiscus syriacus	Rose of Sharon
Ilex x *meserveae*	Meserve hybrid
Ilex opaca	holly
Metasequoia glyptostroboides	American holly Dawn redwood
Picea spp.	Spruce
Rhododendron spp	Rhododendron
Taxus spp.	Yew
Thuja occidentalis	Eastern arborvitae
Thuja plicata	Western arborvitae
Cupressocyparis leylandii	Leyland cypress

Trees/shrubs with interesting bark/stem colour (winter interest)

Acer griseum	Paperbark maple
Acer triflorum	Three flower maple
Acer triflorum	Three flower maple
Cornus kousa	Kousa dogwood
Cornus sericea, C. alba	Red twig dogwood
Kerria japonica	Kerria
Heptacodium miconioides	Seven-son flower
Salix alba 'Flame'	Red twig willow
Stewartia monodelpha	Tall stewartia
Stewartia pseudocamellia	Japanese stewartia

Woody shrubs for ground cover

Arctostaphylos uva-ursi	Bearberry
Comptonia perigrina	Sweet fern
Deutzia gracilis	'Nikko' Deutzia
Hypericum spp.	St. John's wort
Itea virginica	Little Henry
Juniperus conferta	Shore juniper
Juniperus horizontalis	Creeping juniper
Juniperus procumbens	Japanese garden juniper
Microbiota decussata	Russian arborvitae
Rhus aromatica	'Gro-low' fragrant sumaci
Spirea spp.	Spirea
Stephanandra incisa	Cut leaf Stephanandra
Weigela florida	Midnight Wine' weigela
Xanthorhiza simplicissama	Yellowroot

Flowering shrubs

Spring:

Calycanthus florida	Carolina allspice
Chionanthus virginicus	Fringetree
Corylopsis paucifolia	Buttercup winterhazel
Deutzia gracilis	Nikko' Deutzia
Enkianthus campanulatus	Redveined enkianthus
Exochorda racemosa	Pearlbush
Forsythia suspensa	Forsythia
Fothergilla gardenii	Dwarf fothergilla
Fothergilla major	Fothergilla
Hydrangea arborescens	Smooth hydrangea
Pieris floribunda	Mountain pieris
Rhododendron atlanticum	Coast azalea
Rhododendron calendulaceum	Flame azalea
Rhododendron schlippenbachii	Royal azalea
Rhododendron vaseyi	Pinkshell azalea
Rhododendron spp.	Rhododendron
Syringa meyeri	Meyer lilac
Syringa microphylla	Little leaf lilac
Syringa patula	Miss Kim' Korean lilac
Syringa vulgaris	Common lilac
Viburnum x *burkwoodii*	Burkwood viburnum
Viburnum carlesii	Koreanspice viburnum
Viburnum dentatum	Arrowwood
Viburnum sargentii	argent viburnum
Viburnum sargentii	Sargent viburnum
Viburnum trilobum	American cranberrybush
Weigela florida	Weigela

Summer:

Aesculus parviflora	Bottlebrush buckeye
Caryopteris x *clandonensis*	Bluemist shrub
Clethra alnifolia	Sweet pepperbush
Cotinus coggygria	Smokebush
Hibiscus syriacus	Rose of Sharon
Hydrangea macrophylla	Bigleaf hydrangea
Hydrangea paniculata	Panicle hydrangea
Hydrangea quercifolia	Oakleaf hydrangea
Physocarpus opulifolius	Ninebark
Rhus coppalina	Flameleaf (Shining) sumac
Rhus typhina	Staghorn sumac
Rosa spp.	Landscape roses
Sambucus spp.	Elderberry
Spirea spp.	Spirea
Viburnum cassinoides	Witherod viburnum
Viburnum plicatum var. tomentosum	Doublefile viburnum

Fall:

Abelia grandiflora	Glossy abelia
Heptacodium miconioides	Seven-son flower
Hamamelis virginiana	Witchhazel

Winter:

Hamamelis vernalis	Vernal witchhazel

Hamamelis x intermedia	Hybrid witchhazel
Lonicera fragrantissima	Winter honeysuckle

Fruiting trees/shrubs for winter interest/wildlife

Amelanchier arborea	Juneberry
Amelanchier canadensis	Shadbush
Arctostaphylos uva-ursi	Bearberry
Aronia arbutifolia	Red Chokeberry
Aronia melanocarpa	Black Chokeberry
Betula nigra cultivars	River birch
Cornus alternifolia	Alternate leaf dogwood
Cornus amomum	Silky dogwood
Cornus florida	Flowering dogwood
Cornus kousa	Kousa dogwood
Cornus mas	Corneliancherry dogwood
Cornus sericea	Red twig dogwood
Cornus racemosa	Grey dogwood
Ilex glabra	Inkberry
Ilex x *meserveae*	Meserve hybrid holly
Ilex opaca	American holly
Ilex verticillata	Winterberry holly
Juniperus virginiana	Eastern red cedar
Lindera benzoin	Spicebush
Liquidambar styraciflua	Sweet gum
Malus spp	Crabapple (disease resistant)
Morella pensylvanica	Bayberry (formerly *Myrica*)
Nyssa sylvatica	Tupelo

Picea glauca	White spruce
Pinus strobus	White pine
Quercus spp.	Oak species
Sassafrass albidum	Sassafrass
Symphoricarpos	Coralberry
orbiculatus	Fragrant sumac
Rhus aromatica	Flameleaf (Shining) sumac
Rhus coppalina	Smooth sumac
Rhus glabra	Staghorn sumac
Rhus typhina	Blueberry species
Vaccinium spp.	Arrowwood
Viburnum dentatum	Linden viburnum
Viburnum dilatatum	Nannyberry
Viburnum lentago	American cranberrybush
Viburnum triflorum	Tea viburnum
Viburnum setigerum	

Needled evergreens:

Small:

Cephalotaxus harringtonia	Japanese plum yew
Juniperus conferta	Shore juniper
Juniperus horizontalis	Creeping juniper
Juniperus procumbens	Japanese garden juniper
Microbiota decussata	Russian arborvitae
Various dwarf conifers	Various dwarf conifers

Medium:

Chamaecyparis obtusa cultivars	Hinoki falsecypress
Juniperus virginiana	Eastern red cedar
Pinus cembra	Swiss stone pine
Pinus parvifolia	Japanese white pine
Taxus baccata	English yew
Taxus cuspidata	Japanese yew
Taxus media	Anglojap yew

Large:

Abies concolor	White/Concolor fir
Abies koreana	Korean fir
Cedrus atlantica 'Glauca'	Blue Atlas cedar
Chamaecyparis pisifera	Sawara falsecypress
Chamaecyparis thyoides	Atlantic whitecedar
Cupressocyparis leylandii	Leyland cypress
Larix spp.	Larch
Metasequoia glyptostroboides	Dawn redwood
Picea spp. – Spruce	Spruce
Pinus strobus	White pine
Pseudolarix amabilis	Golden larch
Pseudotsuga menziesii	Douglas fir
Sciadopitys verticillata	Japanese umbrella pine
Taxodium distichum	Bald cypress
Thuja spp.	Arborvitae
Xanthocyparis nootkatensis 'Pendula'	Alaskan falsecypress

Broadleaf evergreens

Small:

Arctostaphylos uva-ursi	Bearberry
Ilex crenata	Japanese holly
Pieris floribunda	Mountain pieris

Medium:

Ilex glabra	Inkberry
Ilex x *meserveae*	Meserve hybrid holly
Ilex pedunculosa	Longstalk holly
Kalmia latifolia	Mountain laurel
Rhododendron spp.	Rhododendron

Large:

Ilex opaca	American holly

Vines

*Aristolochia macrophyll*a	Dutchman's pipe
Campsis radicans	Trumpet vine
Clematis montana	Anemone clematis
Hydrangea anomela subsp.	Climbing hydrangea
Lonicera sempervirens	Trumpet honeysuckle
Parthenocissus quinquefolia	Virginia creeper
Wisteria frutescens	American wisteria

Alternatives to invasive plants

Invasive species:

Acer platanoides	Norway maple

Alternatives:

Acer x *freemanii*	Freeman maple cultivars

Acer rubrum	Red maple
Acer saccharum	Sugar maple
Ginkgo biloba	Ginkgo
Liriodendron tulipifera	Tulip tree
Oxydendrum arboreum	Sourwood

SELF-ASSESSMENT EXERCISE 9

Tick true (T) or false (F)

T	F	In landscapes, plants serve 3 major functions, which are architectural function, engineering function and environmental function
T	F	Aesthetics is not a notable quality of a landscape.
T	F	Insect and disease resistance is not a major factor to consider when selecting woody ornamentals
T	F	Whether or not a plant will truly perform in the soil and environmental conditions on your property does not matter in choosing plants for landscaping
T	F	Once established, most landscape plants do not need regular fertilization
T	F	When we speak of an environmental role for plants, our attention focuses on their influence on microclimates within the landscape.

4.1.4 CONCLUSION

Function or purpose defines the reason for using a plant. Looking good certainly justifies a selection, but the value of a plant may go far beyond aesthetic appeal.

4.1.5 SUMMARY

Plant selection is an organized process that examines several factors such as function, aesthetics, site adaptability and management. The priority placed on each category varies with the individual, as the freedom to choose from a wide variety of plants depends on

the flexibility or restrictions imposed by the individual, the site, or (in some cases) the local availability of plants.

4.1.6 TUTOR MARKED ASSIGNMENT (TMA)

1. Give a summary of aesthetic considerations for plant to be selected for landscaping.

2. list five (5) common and botanical names of plants suitable for landscaping.

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UNIT 2: SELECTION CHECKLIST OF PLANTS FOR LANDSCAPING

4.2.1 INTRODUCTION

Deciding which plant to use for your landscape can be a challenge. Many factors must be considered, besides just choosing the plants you consider to be the most attractive. You will need to consider the climate, the amount of time you want to devote to maintenance, the plants suitable for exposure conditions, etc.

Trees form the main framework of the garden. Some trees produce attractive and beautiful flowers including fragrant flowers, few trees are noted for their attractive foliage and few more trees are known for their peculiar shape or form which are used as specimen trees. Shady trees are planted in chosen spots of large public garden which provides place for picnic and relaxation. Such trees are also planted along the borders of roads as avenue for giving shade. In selecting ornamental trees, the purpose should be decided first and then the place of its culture should be finalized.

Trees have immense beauty from aesthetic view point. They bring the change in sky line on account of variation in their height, shapes, foliage texture and flower color. They are

used in landscape plan for aesthetic and functional purposes. Trees are used in garden as specimen, avenue plantation, wind breaks and screening.

Landscaping the backyard with trees and other plants can help to minimize the bad effects of pollution. In addition to purifying the air, plants can help disperse fog, reduce wind speeds, reduce noise effects, control erosion and influence snow deposition. This unit presents a selection checklist and some major tips for selecting plants for landscaping.

4.2.2 OBJECTIVES

At the end of this unit, you should be able to:

1. Have a selection checklist of plants for landscaping
2. Know how to choose the right plant for the right place

4.2.3 SELECTION CHECKLIST OF PLANTS FOR LANDSCAPING

4.2.3.1 Checklist

The following selection checklist can be used in identifying the most appropriate choices of plants for landscaping.

1. Ability to fill the role assigned it in the design
2. Ability to survive the growing conditions of the site
3. Availability and affordability by clients
4. Plant size at maturity
5. Flowering qualities
6. Foliage and tree back colour
7. Presence or absence of thorns
8. Plant rate of growth and length of life
9. Deciduous or evergreen
10. Susceptibility to pests and diseases
11. Frequency of pruning required

12. Soil preference
13. Attractive appearance
14. Ability to keep out intruders, including animals

etc

4.2.3.2 Choosing the right plant for the right place

Choosing the "right plant for the right place" is an important consideration for all types of landscaping. Ignoring this guideline may lead to increased maintenance, a failure of plants to thrive, and sometimes the death of installed plant material. Careful planning and site evaluation are the first steps in applying this concept. Trees and shrubs vary considerably in their ability to tolerate different site conditions and it is critical to select plants to match the existing growing conditions of the site in addition to their ornamental value. Even the best planting practices will not help a plant to thrive if it is poorly suited for a particular site. It is also important to know the mature height and width of selected plants so that they will not outgrow the space allotted to them.

Some site conditions to keep in mind when selecting landscape plants include:

i. Light availability, intensity and duration (full sun to deep shade)
ii. Water availability, both quantity and quality
iii. Exposure to wind and temperature extremes
iv. Soil type, drainage, compaction
v. Hardiness zone
vi. Competition from existing vegetation
vii. Below ground conditions in urban sites
viii. Above ground wires or obstructions

SELF-ASSESSMENT EXERCISE 10

Provide a selection checklist that can be used in identifying the most appropriate choices of plants for landscaping.

4.2.4 CONCLUSION

Choosing the right plant for the right place is an important consideration for all types of landscaping. Ignoring this consideration may lead to increased maintenance, failure of plants to thrive, and sometimes the death of installed plant material.

4.2.5 SUMMARY

Besides just choosing the plants you consider to be the most attractive, many factors must be considered, including the climate, the amount of time you want to devote to maintenance, the plants suitable for exposure conditions, etc. Even the best planting practices will not help a plant to thrive if it is no suited for a particular site.

4.2.6 TUTOR MARKED ASSIGNMENT (TMA)

1. The following are site conditions to keep in mind when selecting landscape plants, except:

i. Light availability (intensity and duration)

ii. Water availability (both quantity and quality)

iii. Exposure to wind and temperature extremes

iv. Building blocks

3. Choosing the "right plant for the right place" is an important consideration for all types of landscaping. Ignoring this guideline may lead some consequences. List three (3) of such consequences.

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MODULE 5 LANDSCAPE CONSTRUCTION

UNIT 1: TYPES OF LANDSCAPE CONSTRUCTION SERVICES

5.1.1 INTRODUCTION

Landscape construction is a process in which a barren land or visibly not affected land is changed into a beautiful land of garden consisting of different types of trees, flowers, fruits, vegetables, shrubs etc turning the land green. It contains canopies, gazebos, latticework, pergolas, ponds, and irrigation equipment etc. It is mainly divided into two broad categories, namely hard scrapes and soft scrapes. Both soft and hard components are employed to realize a beautiful and functional landscape.

5.1.2 OBJECTIVES

At the end of this unit, you should be able to:

1. Understand the c**ategories of landscape construction**
2. Understand the condition(s) under which each category of landscaping can be used

5.1.3 TYPES OF LANDSCAPE CONSTRUCTION SERVICES

5.1.3.1 Soft landscaping

Soft landscaping refers to the plant component of landscaping. It entails the use of plants of all categories (palms, trees, shrubs, grasses, herbaceous plants etc) that are natural in a landscape. The plantings of especially indigenous plant species ensure integration of structures in to the natural environment thus appearing natural in nature, among other many uses of plants in our surroundings.

This kind of landscape construction is mainly setting up and sowing of plants, trees, herbs, shrubs and different small ornamental grasses, colourful trees etc. Installing these plants in the garden makes it look beautiful. It includes analyzing the architecture,

planning, and determining a suitable landscape design with the help of flower bed installations, a lawn, yard or garden for residences and estates.

Soft landscaping features

Some of the features include the following:

Lawn and yard

Trees, shrubs, and vines

Accent plants and flowering plants

Garden and flower beds

5.1.3.1 Hard landscaping

This is the use of any non-plant materials in the development of a landscape. Examples include walkways, driveways, patio, decks, walls, ponds, fences, pergolas, steps, landscape lightings, water fountains, furniture, containers for potted plants etc. These features, individually and in combination, make up the ground, vertical, and overhead planes within a landscape and define outdoor living spaces. Hardscapes should be used to compliment the plants component to meet a client's need.

In this kind of landscape construction**,** the main construction is of setting hard stones, pavements around the garden, fences around the area, barbeque area made of stones in the garden etc. In addition to this, it also encompasses water features such as fountains, dry riverbeds, and waterfalls.

This kind of landscape construction is very common these days.

Hardscape materials have several effects on the environment. The porous materials used allow water to soak into the soil. Pavement and retaining walls help reduce water runoff and prevent contaminants from flowing into streams.

Hard landscape features

Some popular hardscape features include the following:

Retaining walls: You can hire experts for landscape construction to create and install beautiful and functional retaining walls. They can be made of natural stone, wood, and concrete wall blocks.

Interlocking driveway: They are durable and aesthetically pleasing. Specialists offering landscaping services can help create creative designs for your driveway and ensure it matches the look and architecture of the property.

Stonework: High-quality stonework enhances the appearance and functionality of a property. It is low maintenance, long-lasting, and helps improve the curb appeal.

Sod installation: Installing sod on a property helps smooth the surface and create a beautiful space. You can install it anywhere to enjoy an outdoor area for games and activities.

SELF-ASSESSMENT EXERCISE 11

Define the following:

a. Soft landscaping
b. Hard landscaping

5.1.4 CONCLUSION

Although landscape construction is an easy process, it requires a lot of patience and time. A barren land can be turned into a beautiful garden.

5.1.5 SUMMARY

Landscaping is much more than merely planting shrubs and trees and mowing lawns. It consists of a variety of services such as sod work, installing retaining walls, driveway interlocking, etc that can enhance your curb appeal and increase the value and functionality of your property if done correctly.

5.1.6 TUTOR MARKED ASSIGNMENT (TMA)

1. Landscape construction is mainly divided into two broad categories, namely …….. and ……

2. …… is the plant component of landscaping.

3. The following are soft landscaping features except:

i. Lawn and yard

ii. Beautifully carved stones

iii. Accent plants and flowering plants

iv. Garden and flower beds

4. List four (4) popular hardscape features

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UNIT 2: LANDSCAPE CONSTRUCTION PROCESS, BENEFITS AND SKILLS

5.2.1 Introduction
5.2.2 Objectives
5.2.3 Landscape construction process, benefits and skills

5.2.4 Conclusion
5.2.5 Summary
5.2.6 Tutor Marked Assignment (TMA)
5.2.7 References and Further Readings

5.2.1 INTRODUCTION

Landscape construction is an easy process, but it requires a lot of patience and time. There are few steps that must be followed while doing landscape construction**.** Nature has given us immense resources for our benefits but we are destroying these resources by not using them in the correct way. Landscaping is the best way to restore the greenery of the earth.

5.2.2 OBJECTIVES

At the end of this unit, you should be able to:

1. Know the steps in landscape construction process
2. Appreciate the benefits of landscape construction
3. Know the skills required for landscape construction

5.2.3 LANDSCAPE CONSTRUCTION PROCESS, BENEFITS AND SKILLS

5.2.3.1 Steps in landscape construction process

The steps are as follows:

i. The very first step of landscape construction is designing the landscape. For that, the owner needs to contact an interior designer or a constructor who builds a landscape and get the design approved.
ii. Take the estimation of the entire raw materials and things that are required for building the landscape.
iii. The unwanted surfaces that are already built in the garden area must be removed.
iv. If a swimming pool has been planned, then proper excavation of land must be started.
v. The next step is to create a proper drainage system so that the unwanted waters from the landscape can be removed easily after the construction has been completed.

vi. A proper system must be made for irrigation of plants in the area.

vii. Sprinkler and other essential materials must be installed within the landscape.

viii. The surrounding walls must be made so that trespassers do not peep into the landscape.

ix. Thereafter, if an outdoor kitchen of barbeque is planned, the construction of those should be completed.

x. Finally, the area that is left must be covered with topsoil and the trees and plants must be planted there.

5.2.3.2 Benefits of landscape construction

Landscape construction:

i. Helps connect with nature
ii. Enhances quality of life
iii. Balances natural and artificial elements
iv. Create functional areas
v. Defines entertainment areas
vi. Boosts the value of property

5.2.3.3 Skills required for landscape construction

Some of the skills associated with the construction aspect of landscaping a property include the following:

i. Ability to come up with reliable landscape designs and ideas.

ii. Ability to work with professionals, interpret the plans made by a landscape architect, and carry out the necessary work.

iii. Ability to estimate the cost and prepare quotations for a variety of projects.

iv. Horticultural skills that are required to come up with beautiful ideas associated with softscapes.

v. Possession of construction knowledge and skills, including the ability to build retaining walls, lay pavers for driveways and walkways, and other structures.

5.2.3.4 Things to consider before landscape construction

i. Examine your landscape, recognize any potential problems such as inadequate soil conditions and plan accordingly.

ii. Consider the purpose of landscaping. It could be anything from entertaining guests, creating a play area, having a private space for relaxing, and more.

iii. Identify any natural pathways already present in your landscape and consider including them in your plans as is.

iv. Consider your needs, expectations, and budgetary concerns up-front to save time and money.

v. Think about the ongoing maintenance and ask if you can meet the requirements to keep the structures in excellent condition.

v. Work with a reputable landscaping construction company having professionals who can understand your needs and offer reliable advice.

SELF-ASSESSMENT EXERCISE 12

Tick true (T) or false (F)

T	F	Before landscape construction, it is not necessary to consider the purpose of landscaping
T	F	Ability to come up with reliable landscape designs and ideas is a necessary skill required in landscaping.
T	F	Landscaping does not help to connect with nature
T	F	Landscaping does not boost the value of property
T	F	Landscaping does boosts the value of property
T	F	Before landscape construction, it is necessary think about the ongoing maintenance and ask if you can meet the requirements to keep the structures in excellent condition.

5.2.4 CONCLUSION

Apart from restoring the greenery of the earth, landscaping also helps in reducing pollution. It is thus an efficient way of reducing global warming.

5.2.5 SUMMARY

Landscape construction is very beneficial, as it helps connect with nature, enhances quality of life, balances natural and artificial elements etc. A proper consideration of the purpose of landscaping and identification of any natural pathways already present in your landscape and consider including them in your plans are some key points of note before embarking on landscape construction.

5.2.6 TUTOR MARKED ASSIGNMENT (TMA)

1. The following are steps involved in landscaping process except:
   i. The unwanted surfaces that are already built in the garden area must be removed.
   ii. If a swimming pool has been planned, then proper excavation of land must be started.
   iii. Accent plants and flowering plants
   iv. Create a proper drainage system so that the unwanted waters from the landscape can be removed easily after the construction has been completed.
2. **Which of the following is not a benefits of landscape construction?**
   i. Helps connect with nature
   ii. Enhances quality of life
   iii. Promotes global warming
   iv. Balances natural and artificial elements
3. Which of the following is a skill associated with the construction aspect of landscaping a property?

i. Ability to come up with reliable landscape designs and ideas.
ii. Ability to work with professionals, interpret the plans made by a landscape architect, and carry out the necessary work.
iii. Ability to estimate the cost and prepare quotations for a variety of projects.
iv. None of the above
v. All of the above

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MODULE 6: LANDSCAPE INSTALLATION AND MAINTENANCE PRACTICES

UNIT 1: LANDSCAPE INSTALLATION PRACTICES

6.1.3.1 INTRODUCTION

An unmaintained property is unsightly for you, your neighbors and potential buyers. If you have invested time and money into your home, it is important to ensure your landscaping is working to help your investment rather than hurt it. Much like home renovations, landscape installations increase the value of your property. The curb appeal of your home is estimated to increase by approximately 20 percent with high-quality landscape work.

Along with the increased property value that comes with quality landscaping, installations will work to preserve long-term lawn health. By adding trees, shrubs or other flora to your outdoor areas, you can add natural drainage systems. Additional plants work to absorb excess ground water that plagues us Ohioans throughout much of the year. By removing water from your lawn, you are ensuring that your grass health will be at optimal levels. Additionally, trees and other large landscape installations can provide your home with shade, which lowers energy costs.

Some common landscape installations include new trees, bed installation, hedges, fences, landscaping beds that contain a variety of plants and shrubs, patios, outdoor furnaces, gravel pathways, mulch and turf installation

6.1.2 OBJECTIVES

At the end of this unit, you should be able to:

1. Understand the ideal time to plant landscape plants.
2. Know how to prepare the planting bed and carry out other agronomic operations in the landscape.
3. Describe the process of hardscape installations.
4. Illustrate how to properly install plant material.
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6.1.3 LANDSCAPE INSTALLATION PRACTICES

6.1.3.1 Hardscape installation

Most residential and commercial landscapes feature a combination of hardscapes and ornamental plants. Hardscapes are any built element placed in the landscape. Hardscape features can significantly impact the tone and use of a space. These components can enhance the landscape by providing opportunities for entertainment and recreation, providing a focal point in the landscape, minimizing erosion, resolving privacy or security challenges, and making areas more accessible and easier to maintain. Hardscape structures may include retaining walls, patios, fences, arbors, gazebos, water fountains, gazing pools, sidewalks, or pathways.

There are many different hardscape materials, such as gravel, pebbles, sand, bricks, wood, rocks, stones, pavers, and cement. Other elements, such as a birdbath, swing set, gazing ball, pool, spa, or sculpture, are also part of the hardscape. Hardscaping follows basic design principles and elements, blending colors, textures, forms and lines with balance, proportion, repetition, emphasis, and unity.

The installation of a hardscape usually precedes the planting of trees and shrubs in the landscape. Hardscaping most typically involves the construction of pathways, patios, retaining walls, and water features. There are numerous other types of hardscape elements.

Brick patios and pathways

Bricks provide a classic hardscape medium for patios, pathways, and garden borders. Brick offers a natural complement to the softscape. Many patios and walkways are constructed with brick, although pavers, poured concrete, or crushed gravel or stone may be used.

Retaining walls

Retaining walls are used in both commercial and residential settings as a way to hold soil on a sloped site or simply as an aesthetic way to define a garden bed or frame a patio. For example, in a hillside setting, a retaining wall can make the land more usable. An area can be leveled and a retaining wall used to hold back the remaining soil from the slope. Retaining walls also manage storm water runoff and limit soil erosion. Retaining walls may be just a freestanding wall that delivers seating in an entertainment area. They can also be used as a design feature to physically divide spaces in the landscape. Retaining walls can be constructed using a variety of materials. Common materials include:

i. Cement block: Solid and semi-solid blocks are strong and versatile. Many systems are designed to fi t together with clips or pins, and they can be split easily to fi t the wall. Many cement blocks have a rough face that provides a nice look. Smooth concrete blocks can be the foundation material and be faced with stone or brick.

ii. Rocks and stones: For centuries, stone walls on farms have complemented the rural landscape of the northeast. Farmers would use stone from their fields and construct walls to define their properties. There are a wide variety of choices that will fi t just about any style of yard and garden. Stone is usually the most expensive material. Skilled workers are needed to construct stone walls.

iii. Wood: Using standard timbers, a wood wall can easily incorporate angular walls and steps. Timbers are readily available, inexpensive, and easy to build with. Timbers are placed on a gravel base to provide good drainage behind the wall. They are set with long spikes or screws. Timbers should be treated to be suitable for ground contact and sealed to reduce rotting.

Most retaining walls are professionally constructed to account for the engineering considerations of holding significant volumes of soil and managing steep sloping land. How best to work with heavy materials and the height of the wall must also be considered. Simpler, smaller projects around a school or home can be fun projects that are easily doable. To begin crafting the wall, mark the site according to the landscape design using stakes to mark the borders. String is wound through the stakes and pulled tightly.

Begin the excavation of the soil to prepare the base on which the block will be laid. As with a brick patio or path, the foundation is essential to the integrity of the wall structure. The depth of the trench depends on the height of the wall, but generally for every 8″ (20 cm) of wall, 1″ (2.5 cm) of soil should be removed. For example, a wall that is 4′ (1.2 m) high should be set in a base that is 6″ (15.2 cm) deep. Make the trench level, and compact the soil with a tamping tool.

Water Features

Water in the landscape evokes feelings of tranquility and reflection. Water features can soften undesirable noises and provide water for wildlife or habitats for animals. Ponds, fountains, small streams, and even swimming pools and spas are water features that can be designed for the landscape, A swimming pool may not be appropriate for a commercial landscape, such as one for an office building. However, a small pond or fountain can enhance the workplace and provide a soothing focal point where employees can gather for lunch or an informal meeting.

Most water features require the professional services of a landscape contractor for installation. Most features have common elements and steps needed for construction. Site preparation, lining material, installation of a water circulating pump, and access to electricity for the pump to run are typically involved. For a pond or a pool, the soil should be excavated and the space lined with an appropriate liner or pre-formed insert. Ponds can be installed with flexible waterproof liners that come in varying thicknesses or with

pre-made plastic shells. Pools have similar construction. They can be a pre-made fiberglass structure or lined with concrete. A fountain should be placed on a stable base that has been created in a similar fashion as a patio or pathway foundation.

Once the liner, insert, and/or fountain has been installed in the landscape, a circulating pump should be connected. The pump will continuously move water and provide oxygen in the aquatic environment. For a fountain, this pump moves water throughout the fountain and constantly recirculates the water. In ponds and pools, the addition of a filter will allow for contaminants large and small to be caught. The filter should be frequently cleaned. Ponds and small streams can be stocked with fish and aquatic or water-loving plants. Pond plants are generally potted in a container and placed within the pond. Some species that will thrive in this environment include cannas, sedges, taro plants, cattails, calla lilies, Siberian and Japanese irises, horsetails, umbrella grass, and water poppies. Many plants (e.g. American lotuses, water lettuces, water ferns, water hyacinths, and water lilies) can float on the surface of the water.

Some sites have drainage issues that need to be addressed. Without the proper installation of a good drainage system, plants, features, or structures may be damaged. Patios can lift, wooden structures can rot, plants may drown in saturated soils, or drainage water may overwhelm building foundations. Drainage systems collect water close to buildings and other structures, such as retaining walls, and send the water to catch basins set in the lawns. Water from roof gutters and downspouts is often directed into the drainage system as well. Drainage water is routed to the street storm water drains or an approved natural runoff location. However, many places across the country may not need a drainage system. The landscape designer determines this information.

6.1.3.2 Installation of plants

After the installation of the hardscape, the site needs to be prepared prior to installing plants. Amending soil with organic materials, such as compost and manure, and tilling it in will provide a medium that permits plants to flourish. If irrigation systems are to be

installed, it should be completed before any plant material is planted. The irrigation pipe that was previously laid is now extended throughout the garden with drip lines (or sprinkler heads as the case may be) being set as listed in the design plan. Once the irrigation system has been established, planting can commence. The landscape plan will detail the quantity and size of the plant material to be ordered. Woody ornamental trees and shrubs are available in several different ways, including in containers, balled and burlapped (B&B), and bare root. The following practices are important.

1. Plant at an ideal time

Most woody trees, shrubs, vines and groundcovers as well as herbaceous perennials are preferably planted during the rainy season. Temperatures are moderate and less stressful to plants than the hot temperatures of the dry season. The advantages of planting in the rainy season include the following:

i. Plants require less frequent irrigation and are less likely to suffer sun scorch or heat-related stress.
ii. Plants continue to develop a strong root system even after their tops have gone dormant.
iii. Rainy season establishment will benefit the plant tremendously the following the dry season as the well-established root system can readily funnel water and nutrients to the above-ground growth.
iv. Ornamental plants that have a cold requirement (flowering bulbs) or are sensitive to frosts and freezes (annuals) are best planted according to recommended planting dates.

2. Prepare the planting bed properly by deep tilling

An ideal soil for optimal plant health contains air space for good drainage and good water holdng capacity. It contains some organic matter that supplies nutrients and improves soil structure and texture. A poorly drained and compacted soil can shut down root systems and may result in wasted water through runoff. A poorly drained soil can also lead to disease problems later, shutting down a plant's ability to function properly.

Deep tilling the entire planting bed to a depth of 8 to 12 inches is perhaps the best and most cost-effective way to improve the planting site. Tilling will break up and loosen the existing soil, allowing easier plant root penetration and water infiltration. Deep tilling will help a plant get established more quickly with a healthier root system that can handle moisture extremes.

When planting solitary plants in undisturbed soil, make the planting hole as large as possible to encourage new root growth. Dig the hole at least twice the diameter of the root ball. Set the top of the root system level with the soil surface or slightly higher if the soil is prone to settling. Planting too deeply will cause root suffocation, but shallow planting may cause root death from dehydration.

Before planting balled-and-burlapped plants, cut the wire or cord around the trunk and pull back the burlap from the top one-third of the root ball. Otherwise, the burlap may serve as an impediment to root growth. When planting container-grown plants that are root bound, use a knife to make shallow, vertical slits around the root ball in four to six locations and spread out the root system within the planting hole. This will allow water to readily penetrate the root ball while encouraging new root growth.

3. Add appropriate amendments to the planting bed (when necessary) to improve the physical properties of the soil

Most soils are low in organic matter, so it is usually beneficial to incorporate an organic amendment such as compost during the tilling process. Apply at least 4 inches of the amendment on the soil surface and thoroughly incorporate it into the native soil to a depth of 12 inches.

There are two broad types of soil amendments: organic and inorganic. Organic amendments come from something that is or was alive. Inorganic amendments are either mined or man-made. Examples of organic amendments include compost, peat moss, manure and biosolids.

Organic amendments improve water retention, oxygen infiltration and nutrient-holding capacity of a soil. They also provide beneficial fungi and bacteria, earthworms and other living organisms that improve nutrient availability and aeration of the soil. Examples of inorganic amendments include vermiculite, perlite, pea gravel, shale and sand. They are used to improve the structure and drainage of a soil. Unlike organic amendments, these products have little nutritional value.

Other considerations when selecting soil amendments include: how long the amendment will last in the soil (coarser type amendments typically will last longer than fine ones); cost and availability of the materials salt content and effect on soil pH.

4. Avoid placing granular general-purpose fertilizers in the planting hole; they can dehydrate the roots of plants

Granular general-purpose fertilizers such as 10-10-10, 8-8-8 or 16-4-8 are chemical salts and may be caustic to the tender roots of newly planted ornamentals. They may actually dehydrate the roots and cause the plant to demand more water in the planting hole. Use general-purpose type fertilizers on the soil surface once the plant is established. Spread the fertilizer away from the base of the plant out to the drip line area. Do not pile the fertilizer to one side of the root system, since this might cause roots to burn.

In general, fertilizers are not a necessary ingredient in the planting hole. The plant will have enough stored energy in its roots to get established. One exception to this rule is seasonal color plantings. It is a common practice in the landscape industry to place slow-release fertilizer in the planting hole beneath annuals and perennials. This assures a season-long supply of nutrients and results in stronger growth compared to broadcast application.

5. Give special care to seasonal color beds because of their high demand for water and maintenance.

Seasonal color beds are short-lived and shallow-rooted, and they demand a uniform supply of water and nutrients for optimum growth in the typical landscape. Organically

amended beds are essential to promote good health and water transfer for annuals. On new beds, add 4 inches of organic matter to the soil surface and incorporate it to a depth of 12 inches. Raise the planting bed approximately 10 to 15 inches above grade to assure good drainage and improve the visual appeal of the planting. Raised beds assure good filtration and movement of water in the soil, prevent possible water-logged conditions, and result in a healthier rooting environment.

A slow-release fertilizer added to the planting hole results in uniform growth throughout the season and a healthy, fibrous root system that makes best use of available water. Additional fertilizer may be needed to provide nutrition throughout the growing season.

6. Apply 3-5 inches of mulch on the soil surface after planting to conserve moisture and help maintain a uniform soil temperature while preventing weeds that compete with plants for light, water and nutrients. Fine-textured mulches prevent evaporative water loss better than coarse-textured mulches.

Mulches have many benefits in the landscape. They hold moisture in soil, prevent weeds, inhibit certain soil-borne foliar diseases, insulate the roots of the plants from temperature extremes, and provide a protective barrier around the plant to keep lawn mowers or string trimmers away. They also provide a pleasing background contrast for plants.

Common mulches include pine straw, pine bark nuggets, hardwood chips and cypress shavings. Fall leaves also are a good mulch, provided they are shredded prior to use. Grass clippings are not a good mulch because they tend to mat down and inhibit the flow of water and nutrients into the soil. They may also introduce weeds into the planting bed.

Inorganic mulches such as rocks, gravel or marble are good soil insulators, but they are not good choices for Georgia landscapes because they absorb and re-radiate heat in the planting bed, increasing water loss from plants.

Apply mulches 3 to 5 inches deep. When mulching trees, remember that the root system of a mature tree may spread two or three times the canopy width, so mulch as large an area as possible.

Landscape fabrics are sometimes used under organic mulches to prevent weeds and to serve as an added barrier to moisture loss. Make sure these fabrics are free from soil on top, since weeds may germinate.

6.1.3.3 Key steps to a successful landscape installation

1. Carry out some research

Look at pictures in books and other print materials, walk your neighborhood, take pictures of plants you like, go to a plant nursery and see what catches your eye.

2. Get recommendations

Every contractor is different and every homeowner is different. Seek out qualified contractors through trusted friends and family that have taken on similar projects. There are so many contractors available that all claim to be professionals, but will cut all grass types to the same height, spread the same fertilizer on every type of grass, and put the wrong plants in the wrong spot. You do not want to be an amateur landscaper's guinea pig when it comes to installing a new landscape. We recommend selecting one or two companies that you trust so that you are not overwhelmed with too many different ideas and inundated with different recommendations and information. Too many ideas or recommendations can make the process frustrating, and it is supposed to be exciting for you!

3. Know your budget

Knowing what you would like to spend will help guide your contractor toward recommending the most cost-effective and important aspects of the landscape installation process.

4. Get a plan drawn up

It is one thing to talk about ideas, but it's another to see it on paper. A good contractor will either draw up a plan in-house or recommend a professional to have a formal plan drawn up. Having a plan in place can help you plan for 1-10 years down the road also allows you to see the layout and flow of the different plant choices, pathways, yard space, lighting layout, and other elements of the installation.

5. Communicate throughout the project

It is usually very easy to make a change while the installation is happening, but not so easy after the fact. If you see something that you realize in the moment will not work well for your family or your lifestyle, or if you see something that just doesn't look good, tell your contractor. Sometimes an item was installed, a plant chosen, etc. for a specific reason; however, an item choice can be changed, and a happy solution can be found. Communication always makes things go smoother.

SELF-ASSESSMENT EXERCISE 13

Answer True or False

i. Plants require less frequent irrigation and are less likely to suffer sun scorch or heat-related stress. **True/False**

ii. Plants continue to develop a strong root system even after their tops have gone dormant. **True/False**

iii. Rainy season establishment will benefit the plant tremendously the following the dry season as the well-established root system can readily funnel water and nutrients to the above-ground growth. **True/False**

iv. Ornamental plants that have a cold requirement or are sensitive to frosts and freezes are best planted according to recommended planting dates. **True/False**

6.1.4 CONCLUSION

Most residential and commercial landscapes feature a combination of hardscapes and ornamental plants. Hardscapes are any built element placed in the landscape. Ornamental plants, which are the keystone used in softscaping, come in attractive colours and different sizes and shapes of their flowers, leaves and fruits suitable to a broad array of landscape designs.

6.1.5 SUMMARY

Landscape installation activities can include properly planting the trees, shrubs, and flowers as well as constructing other features, such as walkways. Landscape plans are used to turn ideas into visual concepts. They contain detailed plans and drawings that

allow landscaping ompanies to understand the overall intentions of the landscape designer. Reading a landscape plan is like reading a map. It shows the placement of individual plants as well as representing where paths, patios, water features, etc will go.

6.1.6 TUTOR MARKED ASSIGNMENT (TMA)

1. What are the advantages of installing landscape plants in the rainy season?
2. Outline five (5) key steps to a successful landscape installation
3. Retaining walls can be constructed using a variety of materials. List three (3) materials that can be used for retaining walls.

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UNIT 2: LANDSCAPE MAINTENANCE PRACTICES

6.2.1 INTRODUCTION

After the pavers have been placed and the last shrub has been planted, the new landscape is vibrant. Although the yard has been transformed in a matter of days, the months and years following are what really matter. The care of a newly installed landscape is critical to long-term growth and development of the plant material and the integrity of the hardscape. Landscapes require an investment in time and money. They may be maintained by a homeowner or through the contracted services of a professional landscape company.

6.2.2 OBJECTIVE

At the end of this unit, you should be able to:

1. Understand landscape maintenance practices.
2. Explain the fundamentals for maintaining a healthy landscape.

6.2.3 LANDSCAPE MAINTENANCE PRACTICES

For plants to properly mature and thrive, a number of essential maintenance tasks should be frequently considered, such as watering, fertilizing, pruning, edging, and mulching.

6.2.3.1 Watering the plants

Watering freshly planted trees, shrubs, and flowers is important to the longevity of your landscape. The first 1-2 weeks is the most critical for new plants as the roots still need to be established in the soil. Even if your plants are close to a water source, they are only able to absorb water near their small roots. Direct watering at a low pressure will allow the plant to uptake the maximum amount of water.

Watering needs for plants vary depending on the type of plant, size of plant, and weather conditions. It's important to check the soil condition before watering to avoid flooding the roots. If you are questioning the hydration of your foliage, check the soil. If the soil is dry 4-7 inches deep, that is sign your plants need to be watered.

Good irrigation practices include the following:

i. Watch for moisture stress symptoms before deciding when to irrigate. An abnormal gray-green color or obvious wilting are good indicators that a plant needs moisture.
ii. The best time to irrigate is at night or early in the morning to conserve moisture and to avoid evaporative loss of water.
iii. When irrigating, apply enough water to wet the soil to a depth of 8 to 10 inches to promote deep root growth. Deep watering encourages strong, healthy, water-efficient root systems. Avoid light, frequent irrigation that encourages shallow rooting.

6.2.3.2 Fertilization

Proper nutrition assures optimum plant growth and resistance to diseases, insects and environmental problems. Plants receiving proper nutrition also will be more water efficient. They have healthier, larger root systems that can better sustain the plant during periods of limited rainfall. Be mindful of the following:

i. A soil test provides the best gauge for fertilization requirements of the landscape. A healthy landscape is more water efficient.

ii. Slow-release fertilizers provide a more even uptake of nutrients by the plant, resulting in a more uniform growth rate. Excess nitrogen or high nitrate fertilizers cause rapid growth and an increased demand for water.

iii. Avoid over-fertilization. Excessive fertilizer can harm the plant's water efficiency, health and the environment. The frequency of fertilization depends on the type of plants, the age of the plants, and the type of fertilizer used. In general, most established woody ornamentals need only one application of a slow-release fertilizer per year. Annuals benefit from light monthly applications of a water-soluble fertilizer or the use of a slow-release fertilizer.

iv. Newly planted ornamental trees and shrubs will benefit from light additions of fertilizer in three applications during the growing season.

v. Avoid fertilizing during periods of limited rainfall or high temperatures.

6.2.3.3 Pruning

If irrigation is impossible, cutting back herbaceous annuals and perennials that are wilting will reduce water loss from leaves by taking pressure off the root system. Less water will then be lost through the leaves of the plant. Be sure to provide mulch to help with moisture retention in the soil.

Pruning is not only suggested to keep your yard looking immaculate, but it also protects your plants from many forms of damage. Before you start pruning, make sure you know exactly how and where to trim. Always trim branches at the base or collar of the branch. Open stubs leave the plant vulnerable to disease in the future. Observe the following:

i. During time of severe drought, cut back annual and perennial flowers to reduce moisture loss.

ii. Maintain pruning equipment in good order to improve the health and water efficiency of plants. Dull hand pruners will not cut cleanly and will cause cut branches to be frayed. Frayed branches will not recover as quickly as those cut cleanly by sharp blades and will allow more water loss. In addition, poorly cut branches can be a site for disease penetration that can weaken the plant. Learn

to sharpen tools properly with a stone, and keep them clean and oiled. Buy the best tools you can afford.

iii. Do not prune natural form of feathered trees unless damaged, diseased or deadwood present.

iv. Prune in accordance with good horticultural practice.

v. Thin, trim and shape appropriately to each species, location, season, and stage of growth, leaving a well-balanced natural appearance.

vi. Trim off ragged edges of bark or wood with a sharp knife.

vii. Remove branches without damaging or tearing the stem.

viii. Keep wounds as small as possible and cut cleanly back to sound wood. Make cuts above and sloping away from an outward facing healthy bud, angled so that water will not collect on cut area.

Without pruning, trees and shrubs can become overgrown, grow weak, and lose vigor. Pruning provides a host of benefits for trees and shrubs, including:

i. Maintaining or reducing plant size.

ii. Removing unwanted growth.

iii. Removing weakened, diseased, dead, or broken branches.

iv. Motivating growth of fl owers and fruit.

v. Revitalizing older plants.

vi. Preventing damage to property from fall

6.2.3.4 Weed control

To ensure adequate weed control:

i. Use a suitable herbicide to maintain a weed free zone around the base of each tree. Herbicide should be applied by a certified user in accordance with the manufacturer's instructions, taking special care to prevent spray drift into water bodies and adjoining land.

ii. Keep the base of all tree and shrub guards/shelters clear of weeds and grass, by hand weeding to ensure there is no weed or grass growth within the ring spray

area (where herbicide ring spraying misses weeds growing close to each tree/shrub).

iii. Remove all weeds, including roots, by hand using hoes, trowels or forks, taking care to

remove not more than a minimum quantity of soil, causing minimum disturbance to

trees and leaving the area in a neat, clean condition.

iv. Use a suitable herbicide and appropriate method of application to maintain all newly seeded and existing grassed areas predominantly free of noxious and notifiable weeds or other undesirable species.

v. Treatments should ensure that existing grass cover and planting are not detrimentally affected by any such herbicide application.

vi. Spot application methods to be utilized to prevent spray drift or kill of required ground cover and vegetation

6.2.3.5 Inspection of tree stakes and ties

Inspect and carry out the following:

i. Check stakes for looseness, breaks and decay and replace as necessary to original specification.

ii. If a tree with a defective stake has grown sufficiently to become self-supporting, remove stake(s) and fill the hole(s) with lightly compacted soil.

iii. Adjust, re-fix or replace loose or defective ties as necessary.

iv. Remove redundant tapes, tags, ties, labels and other encumbrances.

v. Check all tree and shrub guards at regular intervals to ensure that they are secure.

6.2.3.6 Cleaning out and removing dead wood

i. Remove dead, dying, or diseased wood, broken branches and stubs.

ii. Remove fungal growths and fruiting bodies.

iii. Remove wind-blown or accumulated rubbish in branch forks.

6.2.3.7 Replacement planting

i. Replacement trees to be the same species and of a comparable size with the surrounding trees (where practical to do so).

ii. Additional watering and fertilizer applications are to be undertaken, sufficient to ensure the successful establishment of the tree.

iii. Do not undertake replacement planting in periods of drought or out of season.

6.2.3.8 Edging

The edge of a landscape defines the space between two areas. Most commonly, an edge may be between a landscape or garden bed and a lawn. Edging materials, such as plastic, metal, bricks, or some other artful material, can create this border. In large landscape areas, a small motorized edging machine is used. It carves into turf and the ground. As the operator walks the line detailed in the design, the edges of the bed are made.

The process of edging the line between the spaces must be done fairly frequent during the active growing season. Edging can be done by hand by using a shovel and digging into the soil in a line that follows the edge. The unwanted plant growth, such as turfgrass or weeds, is removed to create a clean edge. A hand tool (also called an edger) can be used as well. It has a rounded blade with spikes that sinks into the soil and pulls up a soil clod. The clods are crumbled back into the earth. Many landscape companies and gardeners will use a trimmer to maintain a crisp and clean edge.

6.2.3.9 Mulching

Mulching is important for healthy landscape plants. Mulch provides numerous benefits to the landscape including:

i. Retains moisture.

ii. Improves the soil structure (with organic mulches).

iii. Prevents soil crusting.

iv. Lessens soil compaction.

v. Increases aesthetic appeal.

vi. Reduces weed growth.

vii. Moderates soil temperatures to be cooler in the summer and warmer in the winter.

viii. Minimizes soil splashing to reduce incidences of soil borne disease.

ix. Limits soil erosion.

There are two basic types of mulches: organic and inorganic. Organic mulches are made from living and once-living materials, such as decomposed leaves, shredded bark, pine bark, wood chips, pine needles, grass clippings, newspapers, and straw. Organic mulches will decompose over time. They may need to be replaced after one growing season or after a few years, depending on the material. Inorganic mulches include materials such as gravel, pebbles, black plastic, and landscape fabrics. While plastic and fabrics do not decompose, they do break down over time and need to be replaced.

6.2.3.10 Other maintenance practices

Other maintenance practices on landscapes include the following:

i. Re-firm soil around any loose plants, without compacting and ensure that all plants are upright after each visit.

ii. Ensure any recently replaced planting in remote areas of the site are re-visited to re-firm and straighten as necessary.

iii. Once the tree/shrub has successfully established with firm root support and no indications of movement around the root ball, remove the stake, tie and guard from the tree, bear in mind individual trees may not develop at the same rate and each tree should be checked independently before removing support.

iv. All ties and guards to be removed off suite and recycled in appropriate recycling facilities upon removal.

v. Newly planted trees should be protected from grazing stock by permanent stock proof fencing. The fencing and associated maintenance access gates should be inspected at regular intervals and repaired or reinstated as required to maintain these elements in a fully functional condition at all times.

vi. Thinning and coppicing operations to be undertaken at year 5 and subsequently on 5 yearly cycles subject to development of the planting Thinning and coppicing only to be undertaken to promote healthy vegetation cover, structural/age diversity and to retain preferred species content of the original planting. Where thinning is required treat the cut stump immediately after felling with a suitable herbicide to prevent re-growth.

SELF-ASSESSMENT EXERCISE 14

1. Which the following is not an aspect of landscape inspection?

i. Check stakes for looseness, breaks and decay and replace as necessary to original specification.

ii. Newly planted trees should be protected from grazing stock

iii. If a tree with a defective stake has grown sufficiently to become self-supporting, remove stake(s) and fill the hole(s) with lightly compacted soil.

iv. Adjust, re-fix or replace loose or defective ties as necessary.

2. What are herbicides?

6.2.4 CONCLUSION

The care of a newly installed landscape is critical to long-term growth and development of the plant material and the integrity of the hardscape

6.2.5 SUMMARY

After a landscape is installed, it must be maintained to provide the highest degree of satisfaction for clients. Landscape maintenance is a critical for a healthy landscape that lasts for decades. Key maintenance tasks include watering, fertilizing, pruning, edging, and mulching. Watering is critical to long-term plant health, especially during hot, dry conditions. Fertilization supplements naturally occurring essential mineral elements in the soil to maintain an optimum supply for plant growth. Without pruning, trees and shrubs can become overgrown, grow weak, and lose vigor. The timing of pruning is generally based on the flowering, fruiting, or growth habits of a plant.

6.2.6 TUTOR MARKED ASSIGNMENT (TMA)

1. What are some maintenance tasks that are essential for a landscape?
2. What are some benefits that come from pruning landscapes plants?
3. What benefits do mulches provide to the landscape?
4. There are two basic types of mulches. Name them.

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MODULE 7: FLORICULTURE INDUSTRY IN NIGERIA

UNIT1: POTENTIALS OF THE FLORICULTURE INDUSTRY IN NIGERIA

7.1.1 INTRODUCTION

Floriculture is a class of horticulture that deals with the science and practice of cultivating and arranging of ornamental flowering plants for aesthetic purpose. It is the science and practice of growing, harvesting, storing, designing and marketing of ornamental plants. It also involves the intensive production of flowers and ornamental shrubs. Hence floricultural plants are classified by the use of cut flowers, potted plants, foliage plants and bedding plants grown in a controlled environment.

Over the years, a number of developing countries experienced a rapid growth in their exports of highly perishable horticultural products to developed countries, but the contribution of ornamental plants is still at the infancy stage. However, the production of

both cut flowers and home plants has continued to increase steadily in most developing countries. Nigeria's diversified agro-climatic conditions make it suitable for the production of wide range of ornamental plants. Its comparative abundant land and labour as well as reasonably good water resources create ample opportunities for flower production. The country is endowed with enormous varieties of ornamental plants such as orchids, which may not be found in any part of the world, these plants when properly identified, classified and developed will be a good source of employment, income and foreign exchange for Nigeria.

The country has the capability of becoming a leading flower industry in Africa and may even compete favorably with the world leading flower producers. Nigeria has a large flower market to be exploited with a population of 140 million (National Population Commission, 2007) as local market, this could be expanded to meet the need of neighboring West African nations before being exported to other international markets like Japan, Korea and Singapore. For these expectations to be realized all limitations must be studied and probable solutions proffered.

7.1.2 OBJECTIVES

At the end of this unit, you should be able to:

1. Appreciate the importance of ornamental plants
2. Appreciate the constraints facing the floriculture industry in Nigeria

7.1.3 POTENTIALS OF THE FLORICULTURE INDUSTRY IN NIGERIA

7.1.3.1 Importance of ornamental plants

Ornamental plants are the keystone used in landscaping. They come in attractive colours, different sizes, shapes of their flowers, leaves and fruits suitable to a broad array of landscape designs. In terms of biological properties and agro-technical requirement, ornamental plants are divided into groups, such as trees and shrubs. Over the years, the production of both cut flowers and home plants has continued to increase steadily in most developed countries.

The ornamental plant production industry generates employment for both the rural and urban dwellers. The industry provides wide varieties of jobs for many categories of people. These jobs include skilled labour jobs like the Greenhouse and nursery managers and jobs for individuals involved in the cultivation and marketing of the ornamental plants. The industry has also contributed to the foreign exchange earnings of many countries. For instance in 2006, the floriculture items sold at all rated outlets in the United States of America was worth USD 20.8billion (Society of American Florist, 2006). Acquaah (2002) reported that in many societies some flowers are associated with specific events. For instance, the rose flowers are used to mark the valentine season while the poinsettias flowers are associated with yuletide periods. The importance of the floriculture industry cannot be over-emphasized, as can be seen in the following areas:

Health: The importance of ornamental plants in human health cannot be over emphasized, they are not only sources of medicinal herbs which are primary form of therapy for treatment of diseases; they are also known to have therapeutic values (Fakayode,et al., 2008). For instance walking through a botanical garden can be very relaxing and healthy; people with emotional and mental problems have been helped when deliberately exposed to ornamental plants. Another benefit of ornamental ornamentals is in the area of sports and recreation.

Sport fields: Turfs are cultivated for sports field and community garden plots that are strategically located along walking paths which serves as convenient places where people converse and interact.

Environment: they also serve as environmental stimulant that trigger pleasant memories. These plants also play crucial role in cooling the atmosphere through the evapo-transpiration process on their leaves and other parts thereby preventing health hazard. Events: in many societies some flowers are associated with specific events. For example the rose flowers are used to mark valentine season while poinsettias flowers are associated with yuletide periods.

Employment: The industry has potentials for generating employment for both rural and urban dwellers directly or indirectly. The direct jobs include those for skilled labour like

researchers, teachers, greenhouse managers and nursery managers among others, while the indirect jobs include those of factories that produce chemicals and machineries for the production and processing of floricultural produce.

Aesthetic: The aesthetic value of floriculture could be noticed in public places such as botanical gardens, aboreteum, and parks for public admiration. Socially, the pionsettias flowers are associated with Yule-tide period, rose are associated with valentine period and lilies are associated with Easter period.

Food and nutrition: The role floriculture in food and nutrition cannot be over-emphasized. This is because floricultural plant such as cauliflower serves as food.

Beatification: In view of the increasing number of personal houses and corporate organizations' buildings in Nigeria, the investment in floricultural enterprises has become quite relevant in today's business environment. This is because floricultural plants have great role in enhancing the beauty and attractiveness of such buildings.

Floriculture has however remained a lowly recognized enterprise in Nigeria in spite of the inherent unique potentials of the industry in transforming a nation's economy. The industry has received very little attention in the nation's plan for agricultural development (Oseni, 2004). This may however be attributed to inadequate awareness of the profitability potential of the enterprise as well as insufficient knowledge of the most important issues that affect returns to floricultural plant production.

The United States leads other nations of the world in flower business with gross cash receipt of over 400 million dollars annually, with over 15 billion dollars in 2005 (USDA, 2006). In 2006 the floriculture item sold at all retail outlets in the United States of America was worth USD20.8billion (Society of American Florists, 2006).

In Africa, with little government intervention, Kenya is presently the leader in floriculture production. It produces nearly 200 million dollars in cut flowers and foliage annually

accounting for about 14% of total earning and providing employment for nearly 50,000 Kenyans (Kolavalli and Whitaker, 2004).

7.1.3.2 Constraints facing the floriculture industry in Nigeria

Despite the enormous potentials of ornamental plants business in economic development, the industry in Nigeria has been hampered by many problems. It has also received very little attention in the nation's plan for agricultural development (Oseni, 2004). A lot of problems still militate against the industry in Nigeria especially the ornamental plants production which is far below average in Nigeria (Bankole, 2002). Some of the constraints are as follows:

1. Though flower business is flourishing in Nigerian metropolitan centers, their production and awareness still remain a serious problem.
2. In Nigeria, as in most developing countries a well-developed domestic ornamental business market is absent making the industry to contribute little or no contribution to national income.
3. Pest and disease attack are also major constraints.
4. Shortage of water during the dry season
5. Dry season market glut
6. Lack of basic nursery facilities such as green house, irrigation equipment and storage facilities.
7. Scarcity of local planting materials
8. Absence of improved/exotic stocks.

SELF-ASSESSMENT EXERCISE 15

1. Lack of basic nursery facilities such as green house, irrigation equipment and storage facilities. **True/False**
2. Floriculture is a lowly recognized enterprise in Nigeria. **True/False**
3. Discuss the importance of ornamental plants under the following sub-headings:
   a. Beautification
   b. Health

7.1.4 CONCLUSION

The floriculture industry in Nigeria has huge potentials in income generation for both rural and urban dwellers directly or indirectly, as the rapid rate of urbanization in Nigeria offers opportunities for the uptake of cut flowers and foliage. However, the industry has remained underdeveloped and has received very little attention in the nation's plan for agricultural development.

7.1.5 SUMMARY

Ornamental plants are the keystone used in landscaping. In terms of biological properties and agro-technical requirement, ornamental plants are divided into groups, such as trees and shrubs. Over the years, the production of both cut flowers and home plants has continued to increase steadily in most developed countries. The importance of ornamental plants in human health cannot be over-emphasized.

The neglect of ornamental horticulture by researchers in Nigeria is now more evident than ever. This might be attributed partly to general lack of interest in ornamental studies and also partly due to plant identification problem. Factors reported for the ill state of ornamental plants production in Nigeria include the lack of political will, lack of knowledge of the discipline, land tenure, inadequate credit facilities and farm inputs among, pests and diseases as well as environmental factors.

7.1.6 TUTOR MARKED ASSIGNMENT (TMA)

1. Ornamental plants production which is far below average in Nigeria. The following are constraints to the ornamental industry in Nigeria, except:

a. Though flower business is flourishing in Nigerian metropolitan centers, their production and awareness still remain a serious problem.
b. Shortage of water during the rainy season.
c. In Nigeria, as in most developing countries a well-developed domestic ornamental business market is absent making the industry to contribute little or no contribution to national income.

d. Pest and disease attack are also major constraints.

2. The floriculture industry has received very little attention in the nation's plan for agricultural development. What can you attribute this apathy to?

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UNIT 2: CUT FLOWERS OF COMMERCIAL IMPORTANCE TO EXPORT MARKET

7.2.1 INTRODUCTION

Foliage and cut flower arrangements are a part of floriculture which represents the aesthetic branch of horticulture. Cut flower production is one of the underexploited industries in Nigeria. Floral arrangement is the creative art of organizing flowers, foliage and other floral accessories to produce an attractive ambience, in beautifies homes and add to the aesthetics of celebration.

Although cut flowers for export have been on the increase globally since 2009 (Rijswick, 2015), the cut flower business is low in Nigeria but it could make significant contributions to improved livelihoods in the face of high rate of unemployment due to the down turn in the oil business. Many growers are producing a small amount of cut flowers to enhance their direct-marketing product mix. With few exceptions, most producers grow fewer than 5 acres of flowers.

Most of the flowers that local growers focus on are those that do not ship well or have shorter postharvest vase lives. These flowers have come to be termed "specialty

cut flowers." Examples of specialty flowers include sunflowers, zinnia, lisianthus, dahlia, ageratum, and peonies to name but a few on this long list. Local growers can readily develop a market niche with these flowers by using the advantage of longer vase life if produced locally, higher percentage of usable flowers, and a wider choice of colors and varieties.

Increasing demand for a wide variety of locally grown, fresh-cut flowers has kept this market growing in volume for years.

7.2.2 OBJECTIVES

At the end of this unit, you should be able to:

i. Understand the considerations that are necessary for cut flower production
ii. Understand the best time to harvest flowers
iii. Know the basic marketing alternatives that are available to the cut-flower grower
iv. Know the important steps for starting a flower export business

7.2.3 CUT FLOWERS OF COMMERCIAL IMPORTANCE TO EXPORT MARKET

7.2.3.1 Production Considerations

Producing fresh-cut flowers is not for everyone, however, as they have special production requirements, as well as a fairly short shelf life. Any grower considering cut flower production should also be aware of the relatively short field growing and marketing season. The following production considerations are necessary:

i. Site selection

The vast majority of cut flowers prefer a well-drained site. Having deep, fertile soils will greatly simplify the process of site development, but soils can be improved through cover cropping, the application of composts and manures, and other soil-building practices. Conducting a soil test prior to planting and applying lime and fertilizer according to the soil test recommendations is highly recommended. Soil test kits may be obtained at your local extension office. Installing drain tile or

building raised beds may offer an adequate solution for sites with poor drainage or very shallow soils. Raised beds are fast becoming a standard practice in growing higher-value produce and flowers. They provide for an earlier crop by allowing the beds to be heated by the sun on the sides as well as on the top. They can also boost production by increasing the depth of topsoil. When used with plastic covering for weed control and drip tape for fertigation, raised beds can greatly decrease weed pressure and simplify fertilizer application.

ii. Planting

Most new growers begin by planting everything by hand. The need to plant many different flowers in small plots over a long time period tends to keep planting largely a hand operation. Plants such as sunflowers are both direct seeded and transplanted, while others are best started as plugs (starting the plant in a greenhouse or cold frame in flats with small cells in a planting medium) and then transplanted to the field or bed. While traditional vegetable transplanters can easily do double duty in planting many types of cut flowers, many growers continue to place all their plugs by hand. Spacing between plants varies widely within each species and sometimes by individual cultivar as some plants are much larger than others. In general, cut flowers are planted closely together to encourage growth of longer stems. New growers will want to learn the specific demands of each flower in order to get the best production.

iii. Irrigation

Any high-value crop should be irrigated to ensure more reliable production. Most flower growers use drip irrigation tape either under plastic or laid on top of the ground to maximize water efficiency, keep water off the leaves and flowers (this improves overall quality as it prevents foliar diseases and chemical stains), and provide for fertilizer or chemical application. In addition, a steady, reliable supply of water ensures production of the longest stems possible.

iv. Wind Protection

Producing high-quality cut flowers requires preventing wind damage since bent flower stems have little or no value. Therefore, wind protection through both site selection and use of windbreaks is necessary when planning your operation. Windbreaks can be live plants, such as an evergreen hedge, or fencing materials, such as split bamboo or board-on-board planking. Whatever method you choose, it is important to consider how far the most distant flowers are from the windbreak. The farther away the windbreak is, the less effective the protection. Sometimes, multiple windbreaks are required. Many cut flowers require stem support as well. Several wide-mesh products are available that can be used as a grid for the flowers to grow through, thus giving them support. Support mesh also prevents damage by keeping flower stems upright during heavy rain.

v. Pest and disease control

Cut flowers represent a wide group of plants. There is a significant difference in pest problems among each genus, species, and cultivar. Discussion of the range of pest and disease management options available to cut-flower growers is beyond the scope of this course. As a new grower, you will want to do some careful research into each plant that you choose for your operation. When possible, select those that are indicated as relatively pest and disease free. Keep careful records of those that you do select and scout your plants often for pest and disease problems. Detecting a problem early will usually make controlling it easier and less costly.

Insects

While a wide variety of insects will inhabit any flower planting, only a few are recognized as causing economic damage, including aphids and thrips. There are wide differences in not only pests but also tolerance to specific pests. Biological, biorational, and synthetic chemical controls are available. Pest populations can also be controlled by naturally occurring parasites and predators. Avoiding cover sprays of broad-spectrum insecticides will help maintain these populations. Beneficial

insects, such as lacewings, can also be purchased from biological control companies. Biorational controls include horticultural oils, insecticidal soaps, and plant extracts such as neem oil. These typically have short residuals and minimal impact on beneficial organisms. It may be necessary to use synthetic chemicals for insect control at times. Always use products labeled specifically for the use you intend and seek to use materials that have the lowest toxicity to bees.

Diseases

Fungal diseases can have a major impact on cut-flower plantings. While many diseases will not kill the flowers, they can drastically reduce their marketability. Powdery mildew can be a real problem in zinnias and many other flowers. Many seedlings are susceptible to damping off, and a number of leaf spot fungi can also reduce the value of certain species. Good crop rotations, careful selection of cultivars, maintenance of optimal growing conditions, and control of weeds and insects will significantly reduce the incidence of diseases.

Weeds

Weeds are generally controlled best through good pre-plant soil preparation. Using a cover crop will not only add valuable organic matter to increase soil tilth, but many cover crops will also outcompete or suppress weeds. Cereal rye, for example, can provide significant weed control through smothering and suppression from natural herbicides produced by the rye. Other cover crops, such as hairy vetch, will add significant nitrogen to the soil and attract many beneficial insects as well. These cover crops are traditionally planted the prior year and are usually tilled under prior to planting your flower crop.

Using a preemergence herbicide labeled for use in flowers is another avenue worth considering. Only a handful of herbicides are currently labeled for flower production. In general, it is very easy to find an herbicide to control both pre- and postemergent grasses in flowers, but the choices for broadleaf weed control are very limited because many flowers are closely related to these weed types. Planting plugs alleviates much of this problem as well-chosen preemergent herbicides seldom

damage well-established plants. The Penn State Extension publication *Controlling Weeds in Nursery and Landscape Plantings* (available for free through your local extension office) is a good source of information on herbicide use in flower production. Make sure you read the product label and understand the proper uses of any herbicides before you apply them.

Many growers decide to use plastic mulch for weed control. This has many advantages over herbicides in that it works on all weeds and will prevent mud from splashing onto the flowers as well. Until recently, the only choice was black plastic, which worked well. Now research is exploring many of the new, colored plastic mulches. In vegetable production, research conducted on some of these colored mulches has shown them to increase yield and decrease pest populations.

Some of the pesticides that may be used in cut-flower production are restricted-use pesticides and require a pesticide license to purchase. Pesticide applicators tests are usually administered at county extension offices, so you should contact your local office for dates and times of these examinations. When using any pesticides in your enterprise, remember to follow all label recommendations regarding application rates and personal protection equipment (PPE) requirements. Also remember that any Worker Protection Standards (WPS) apply both to you and your employees.

7.2.3.2 Harvest and postharvest handling

Flowers are best harvested in the morning after the dew has dried but before the heat of the day because the flowers are cooler and will suffer less heat stress and better retain their quality. Packing damp flowers close together for shipping will promote the development of Botrytis (gray mold), which will render the flowers unfit for sale. Rapidly cool the harvested flowers or at least remove them from direct sunlight.

Many flowers benefit from the use of floral preservatives. Some flowers, such as yarrows, are best harvested as soon as pollen is evident, while sunflowers are best harvested as soon as the flower is almost completely open. Again, knowing the characteristics of each flower you decide to grow is critical to producing a high-quality

product. Planting small test plots prior to entering actual production will aid in the flower-selection decision-making process.

7.2.3.3 Marketing

Fresh-cut flowers are generally sold either by the bunch, in prearranged bouquets, or individually. Some growers will set up u-design displays at markets along with pre-made bouquets. Six basic marketing alternatives are available to the cut-flower grower:

Wholesale markets

Direct to florists

Pick-your-own operations

Roadside stands

Farm markets

Subscription.

Because freshness is always a consideration, astute cut-flower growers should always seek to streamline the process from the farm to final consumer. As with marketing most annual crops, entering the market early with a quality product will help attract (and retain) customers to your business and usually command a higher selling price.

When planning production, first consider your ability to market. You should conduct some market research because growers often overestimate their ability to sell in a given market. Production of less than one acre of many floriculture crops is typical for most growers.

With the wholesale option, you typically either deliver your crop to a distributor or have them pick up the flowers at your farm. Wholesalers generally buy and resell your flowers for a predetermined price that can change during the season. This marketing alternative is subject to the greatest price fluctuation as product rapidly moves in and out of the wholesale marketplace. Wholesale prices also vary based on regional, national, and international flower inventories.

Florists should always be a primary consideration when developing your flower marketing plan. Market surveys indicate that many florists show at least some willingness to purchase locally grown cut flowers. With the generally high quality and wide selection available through florists' regular market channels, their expectations for service and quality are high. Emphasis on a broad selection and freshness may open florists' doors to locally produced cut flowers. Some growers start selling to florists by bringing a van-load of flowers to their shop and inviting the staff out to check out their selection.

Pick-your-own, roadside stands, and farm markets (both on the farm and at organized farmers markets) have the potential to generate substantially higher prices for the grower. Most new growers enter flower marketing through one of these avenues as they provide the greater level of inventory flexibility that new growers will likely need as their production skills develop. Subscription sales are an offshoot of the Community Supported Agriculture (CSA) movement. Most CSAs are based around produce sales with each member purchasing a share of a farm's production. This is a contract between the growers and their members that provides for a weekly portion of fruit and vegetables based on production and subscription level. If a crop is lost, everybody loses; if there is a bumper crop, everybody wins. Some CSAs provide flower shares as part of the contract or as an option. Another option under subscription sales is in providing vase service to restaurants, country clubs, and professional offices.

Most flower prices are quoted for bunches of ten with specific stem lengths or individually for large flowers, such as sunflowers, or very expensive items, such as orchids.

Generally, prices paid are substantially higher at growers markets in urban or suburban areas than those paid in rural markets. A direct-market grower should provide only the freshest, highest-quality product in order to develop a solid niche in locally grown flowers. A list of commonly grown cut flowers grown for sale in Nigeria is provided below.

Some ornamentals available for sale in Nigeria

Common name	Scientific name
Heliconia (lobster-claws)	*Heliconia aurantiaca*
false bird of paradise	*Heliconia rostrata*
false plantain	*Heliconia psittacorum*
Red ginger (ostrich plume and pink cone ginger)	*Alpinia purpurata*
Porcelain rose (touch ginger, touch lily, wild ginger)	*Etlingera elatior*
Celosia, cock's comb	*Celosia argentea*
Bird of paradise	*Strelitzia reginae*
Anthurium (tail flower, flamingo flower, lace leaf)	*Anthurium andraeanum*
Roses	*Rosa rubiginosa*
Muraya, orange Jessamine	*Murraya paniculata*
Jungle geranium (flame of the woods or jungle flame)	*Ixora coccinea*
Fern	*Dicksonia antarctica*
Spindle tree	*Euonymus europaeus*

7.2.3.4 Starting a flower export business

The following are six (6) steps to start flower export business

1. Market research

In starting the flower export business, understanding the market is the most important aspect. First of all, identify the flowers that you can procure locally. Additionally,

identify the potential foreign markets for those specific flowers. Figure out the rates. Generally, the export industry is highly organized. Therefore, you can obtain data and information thoroughly. The important floricultural crops in the international cut flower trade are the rose, carnation, chrysanthemum, gerbera, gladiolus, gypsophila, Liatris, nerine, orchids, achillea, anthurium, tulip, and lilies.

Apart from flowers, there are several floriculture products that have huge export potential. The list includes bulbs, tubers, tuberous roots, cactus, mushrooms spawn, unrooted cutting, plant for tissue culture, etc. Some of the major importing countries are the United States, Germany, United Kingdom, Netherlands, and the United Arab Emirates.

2. Create a business plan

After having all the data and relevant information, craft a detailed business plan. Mention business objective, executive summary, mission, and vision. Clearly, determine the financial plan and marketing plan. A detailed business plan helps in arranging finance also.

3. Obtaining license for flower export business

In starting this business, you will need to obtain different types of permissions and licenses. And the licensing procedure hugely depends on the location where you are starting the business. Additionally, you will need to identify the upcoming tax liabilities also.

4. Flower export procedure

After choosing your export product as a cut flower, roots, bulb, plants other live trees, send the samples to your clients. Additionally, send the terms of payment and terms of delivery. After getting a positive reply you must send other terms and conditions. When you receive an export order for Cut flowers, roots, bulbs, other live trees followed by a purchase order from your overseas buyer, send a proforma invoice.

Generally, the mode of payment plays an important role in this business. You can get payment in two ways. Either as an advance payment or as LC (letter of credit). If you have a good credit score, then you can arrange the finance from the bank for the export order. Additionally, you must arrange the insurance to avoid the risk involved in transit.

After quality check, you will need to arrange proper packing with Palletization or Crating. Additionally, you will need to determine the type of container according to the specific product. Then you will need to prepare the documents like export invoice, export packing list, certificate of origin and other documents. After completion of export customs clearance either by the exporter or his Customs broker, the carrier will issue the Bill of Lading.

5. Flower export business operation

According to your business model, you will need to build the infrastructure. However, the business is all about getting convertible leads and procuring the flower as per client specifications. Therefore, you must have a commercial office space for operating the business. Additionally, you must have a computer, internet, and telephone connection with an international calling facility. You can also consider having some business tools like accounting software etc. In addition, you must hire some experienced manpower for smooth operations.

In starting this business, don't establish the packaging and storage infrastructure. It is always advisable to start flower export by hiring this facility. As your business grows, you can scale up at any moment in time.

6. Flower export business promotion

You must promote your business. And there are several ways for that. First of all, take the membership of the export associations of your area. Attend the export-import fairs. give advertisements on the export and floriculture-related magazines. In addition, online marketplaces are great options for advertising your business.

Make your company available on the online export classifieds. Additionally, create your own website. Clearly mention the products you deal with, contact number, and address.

Include a blog on your website. Basically, networking is the most important of promoting the flower export business. You must establish a solid business network to get quality leads.

SELF-ASSESSMENT EXERCISE 16

Visit any ornamental market in Nigeria and carry out the following exercise:

i. Identify the flowers that you can procure locally.
ii. Identify the potential foreign markets for those specific flowers
iii. Craft a detailed business plan. In your business plan:
    a. Bring out the business objective(s),
    b. State the executive summary, mission, and vision.
    c. Determine the financial plan
    d. Determine the marketing plan

7.2.4 CONCLUSION

At present, the vast majority of cut flowers are imported from overseas. Leading producers include the Netherlands, Columbia, Kenya, and Israel. Flowers imported from overseas are largely roses, carnations, Gerbera daisies, garden mums, and orchids. These flowers ship reasonably well and make up the bulk of the flowers used in arrangements by most florists.

7.2.5 SUMMARY

Flowers are highly perishable items. Therefore, they demand high-quality post-harvest management including packaging and storage. Cut flowers exporting is a profitable business. However, there are several aspects you must consider before starting the business. If you are living in a high-quality flower-growing area then only you can consider starting this business. In addition, you must identify the potential overseas markets for those specific flowers.

Generally, you can start a flower exporting business in two ways:

i. You buy the flowers from the growers and sell them to your clients at your own price.

ii. You can sell the flowers directly from the growers and enjoy a certain amount of transaction fees.

The first option demands substantial capital investment and a large infrastructure. Definitely, you can earn more profit here. On the other hand, the second option demands small capital investment and also offers small profits. If you are an absolute beginner in this business, it is better to start with the second option.

7.2.6 TUTOR MARKED ASSIGNMENT (TMA)

1. Outline the steps involved in starting an export flower business

2. The following basic marketing alternatives are available to the cut-flower grower, except:

a. Wholesale markets

b. Direct to florists

c. Pick-your-own operations

d. Accidental markets

3. What is the best time to harvest flowers and why?

7.2.7 REFERENCES AND FURTHER READINGS

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UNIT 3: PRINCIPLES AND PRACTICES OF OUT-OF-DOOR AND GREENHOUSE CUT-FLOWER PRODUCTION

7.3.1 INTRODUCTION

Flower cultivation has a great role in addition to amelioration of the hill environment to boost the rural economy of the state which owes to the following points:

i. Generation of the sources of cash income to the rural people ii.
ii. Generation of employment opportunities in pre and post harvest activities in this sector
iii. Satisfying the aesthetic needs of the people
iv. Development of sustainable system of permanent agriculture in hilly areas

The farmers and horticulturists are in general reluctant to take up flower cultivation on commercial scale, as flowers are highly perishable commodities.

7.3.2 OBJECTIVES

At the end of this unit, you will be able to:

i. Know the principles of greenhouse cultivation
ii. Know the categories of greenhouse farmers
iii. Know the advantages of growing flower crops in greenhouses

7.3.3 PRINCIPLES AND PRACTICES OF OUT-OF-DOOR AND GREENHOUSE CUT-FLOWER PRODUCTION

7.3.3.1 Principles of greenhouse cultivation

Greenhouse businesses are generally classified in one of three types: (i) grower (ii) grower-wholesaler and (iii) grower-retailer.

i. Growers usually produce crops which are marketed by a wholesale or retail florist outlet. They often specialize in one crop or a limited number of crops. Growers concentrate on production. They leave the marketing of their crops to wholesalers.

ii. Grower-wholesalers also specialize in a limited number of crops. However, they purchase products from other producers in order to provide retailers with a full line of floral products. In addition to plant material, grower-wholesalers may provide a line of "hard goods" such as vases, pots, planters, ribbon, florist tape, etc.

iii. Grower-retailers generally produce a variety of crops for sale through their own retail outlets. Some of their crops may be sold to other wholesale or retail florists. In effect, grower-retailers eliminate the "middleman" to increase profits. However, they are then responsible for growing many crops expertly.

Greenhouse cultivation involves the following principles:

1. The greenhouse is covered with a transparent material such as plastic, pvc sheet or polycarbonate sheet or FRP (Fiber reinforced plastic) or glass.
2. Based upon its transparency the greenhouse cover transmits most of the sunlight.
3. The crop, floor and other objects inside the greenhouse absorb the sunlight admitted inside the greenhouse.
4. These objects in turn emit long wave thermal radiations for which the greenhouse covering material has lower transparency and as a result of this the solar energy is trapped thus leading to increased temperature inside the greenhouse.
5. This is known as greenhouse effect.

7.3.3.2 Advantages of growing flower crops in greenhouses

1. Ensures the production of any plant at any place and throughout the year
2. Blemish-free high quality product

3. Easy to control insect-pests and diseases
4. Water requirement reduces
5. Labour requirement is less
6. Earliness as it reduces crop duration

7.3.3.3 Basic considerations for flower cultivation in greenhouses:

1. Feasibility study
2. Type of greenhouse structures
3. Planting material
4. Growing system
5. Plant protection
6. Post- harvest handling
7. Supporting facilities for analyzing quality of water and growing media
8. Management and coordination

7.3.3.4 General cultural guidelines in cut flower production

1. Root Media

Root media for cut flower crops are usually soil-based, since most crops are produced in ground benches. The root media must have good drainage and aeration, yet allow for good water and nutrient-holding capacities. Usually, growers amend field soil with sphagnum peat moss, vermiculite, perlite, or other ingredients. Steam pasteurization of the root medium should be done after every crop.

Before planting, the root medium should be analyzed using soil tests and amended according to the recommendations made by the soil testing laboratory for the particular crop to be raised. For most cut flower crops, the soil-based root medium should be maintained at a pH of 6.0 - 6.5.

2. Watering and nutrition

Nearly all cut flower crops should be watered with a system that does not wet the foliage. This will help prevent foliar diseases like Botrytis. Watering systems such as ooze tubes and perimeter irrigation are most commonly used.

Fertilizers are typically applied on a constant-feed basis. Fertilizer injectors inject concentrated amounts of fertilizer stock solution directly into the water lines. For most crops, 200 to 250 ppm of both nitrogen and potassium is recommended. Ammonium nitrogen fertilizers should not be used during the winter because cold root media hinder the conversion of ammonium nitrogen to nitrate nitrogen. As a result, ammonium levels rising in the root medium may become toxic to the plants. Superphosphate, which supplies phosphorus, is mixed into the root medium before planting. The rest of the essential elements are supplied by micronutrient fertilizer mixes, dolomitic limestone, and other root medium amendments.

3. Light intensity

Most cut flower crops produce the best quality flowers when grown under full light intensity. However, sometimes in summer, when light intensity is very high, it may be necessary to reduce light intensity. Light intensity levels that are too high can cause petals to burn or scorch. Obviously, the quality of the flowers would be seriously affected. Growers then must make a choice:

1. Apply shading compound to the greenhouse glazing
2. Install shading curtains overhead
3. Place saran over the ground benches.

Reducing light intensity by 50 percent is often done to prevent flowers from scorching. Even at 50 percent light intensity, plants still receive sufficient light intensity for maximum rates of photosynthesis and subsequent growth.

4. Support

Most cut flower crops grow to heights of several feet. Thus, because flowers with long, straight stems are wanted, support must be provided for cut flower crops during production. The most common method of support is a series of welded wire fabric grids installed over the crop. Grid size can vary, but 8 x 8 inch square grids are most commonly used. As the plants grow, three or more series of grids are usually installed

over the ground bench and spaced 12 to 18 inches apart. The grid supports the plants as they grow up through the squares with long, straight stems.

5. Harvesting

Harvesting procedures for cut flower crops vary with the crop being grown. Usually, flowers are harvested just as they are beginning to open (like roses) or when only a few florets are open on a spike (like snapdragons). Some crops (like carnations and cut mums) are harvested when the flower buds are showing color. This stage of development is best for flowers being shipped long distances. Bud-cut flowers are less likely to be damaged during shipment than flowers that are fully open.

When the flower stem has been cut, the leaves are stripped from the lowest third of the stem. Leaves that are submersed in water will rot and shorten the post-harvest life of the flowers. The stems arc then recut under water to keep air bubbles from entering the stem and blocking the xylem, the water-conducting tissue of the stem. The stems are placed in a warm floral preservative solution, because a warm solution is rapidly absorbed by the stem. The cut flowers are then stored at 35° to 40°F until they are sold.

6. Post-harvest handling

Cut flowers that have been harvested are graded and bunched. Grading varies from one cut flower crop to the next: length of stem, stem strength, flower diameter, number of flowers per stem, or combinations of these are used. Cut flowers are bunched by the dozen or in groups of 25, depending on the crop. The bunched cut flowers are then often sleeved for protection during shipping.

Floral preservative is mixed into the water for holding cut flower crops after harvesting. Floral preservative helps to prolong the life of the cut flowers and to preserve their original quality as long as possible. A food source for the flowers is included in the floral preservative along with an ethylene-inhibiting agent. Ethylene is a gas that causes flower petals to fall off prematurely and prevents flower buds from opening. Carnations and freesia are especially susceptible to the effects of ethylene.

SELF-ASSESSMENT EXERCISE 17

Enumerate the general cultural guidelines in cut flower production

7.3.4 CONCLUSION

Floriculture is fast emerging money spinning component in the agriculture sector, growing at a modest rate throughout world and has become the potential agricultural activity especially for the developing countries.

7.3.5 SUMMARY

Greenhouse cultivation involves the involves certain principles, including covering the greenhouse with a transparent material to enable it transmits most of the sunlight; the crop, floor and other objects inside the greenhouse absorb the sunlight admitted inside the greenhouse; objects in turn emit long wave thermal radiations for which the greenhouse covering material has lower transparency and as a result of this the solar energy is trapped thus leading to increased temperature inside the greenhouse (greenhouse effect).

Basic considerations for flower cultivation in greenhouses include feasibility study, type of greenhouse structures, planting material, growing system, plant protection, post-harvest handling supporting facilities for analyzing quality of water and growing media, and management and coordination

7.3.6 TUTOR MARKED ASSIGNMENT (TMA)

1. Define "greenhouse."
2. What are the three classifications of greenhouse businesses
3. Name four commonly grown cut flower crops
4. Give the scientific name of each of these four plants

7.3.7 REFERENCES AND FURTHER READINGS

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