Skill Based Elective – Paper

III BSc - Botany

Unit - I

Horticulture

Horticulture – Definition, Branches, Scope and Importance of Horticulture

Horticulture is a part of plant agriculture which is concerned with the cultivation of "garden crops". Garden crops traditionally include fruits, vegetables, ornamental plants, spices, plantation, medicinal and aromatic plants which form a vital ingredient of our daily diet and the development of pleasant surroundings for living and working, which create positive effects for emotional health.

The cultivation of the garden plants is in contrast to the cultivation of field crops which is practiced in an extensive manner. Horticulture relies on growing and manipulating plants in a relatively intensive manner. The horticultural crops require very intense care in planting, carrying out cultural operations, manipulating growth, harvesting, packing, marketing, storage, and processing. Many horticultural produces are highly perishable, their constituent water is essential to their quality and hence mostly utilized in the living stage. In contrast, the produces of agronomy and forestry are often utilized in the non-living state and are usually high in dry matter.

Horticulture can be defined as the branch of agriculture concerned with intensively cultured plants directly used by people for food, for medicinal purposes, or for aesthetic gratification. It is the intensive commercial production of high-value and high-yielding plants. But it also includes the cultivation of garden crops, landscape ornamentals, and the interaction of science and art. Horticulture also contributes to the economy, provides good nutrition, and is a valuable spiritual and psychological therapy.

Branches of horticulture

Horticulture is a very wide field and includes a great variety and diversity of crops. The science of horticulture can be divided into several branches depending upon the crops it deals with. The following are the branches of horticulture.

Pomology: refers to the science of fruit crops such as the cultivation of Mango, Litchi, Citrus, Sapota, Guava, Grape, Banana, Pineapple, Apple, Pear, Peach, Plum, and Cherry, etc.

Olericulture: refers to the science of vegetable crops such as the cultivation of Potato, onion, garlic, chilly, Brinjal, Okra, radish, Tomato, Capsicum, Peas, Cabbage, Beans, Cucurbits, etc.

Floriculture: refers to the study of flower crops such as the cultivation of Rose, Jasmine, Carnation, Aster, Marigold, Dahlia, Zinnia, Cosmos, Hibiscus, Balsam, Poinsettia, Hollyhock, Gerbera, and Gaillardia, etc

Landscape gardening: it is the art of beautifying a piece of land using garden design, methods, and plant material.

Post-harvest technology: It deals with post-harvest handling, grading, packaging, storage, processing, value addition, marketing, and preservation of produce of horticulture crops.

Plantation crops: These crops are cultivated on an extensive scale in large contiguous areas, owned and managed by an individual or a company and whose produce is utilized only after processing. such as the cultivation of Coffee, Tea, Rubber, Coconut, Cocoa, etc. are some of the important plantation crops.

Spices and condiments: This branch deals with the cultivation of crops whose produce is used mainly for seasoning and flavouring dishes.

Spices: These are those plants products which are used as food adjuncts to add aroma and flavour. For example, Pepper, Cardamom, Clove, Cinnamon, etc.

Condiments: These are those plants products which are used as food adjuncts to add taste only. For example, Turmeric, Ginger, Red chillies, Onion, Garlic etc.

Medicinal and aromatic plants: It deals with the cultivation of medicinal plants, which provide drugs and aromatic crops which yields aromatic (essential) oils.

Medicinal plants: These plants are rich in secondary metabolites and are potential sources of drugs. The secondary metabolites include alkaloids, glycosides, coumarins, flavonoids and steroids etc. Important medicinal plants are Periwinkle, Opium, Menthe, Cinchona, Dioscorea Yam, Belladona, Senna, Sarpagandha, Aswagandha, Tulasi etc.

Aromatic plants: These plants possess essential oils in them. The essential oils are the odoriferous steam volatile constituents of aromatic plants. Lemon-grass, Citronella, Palmarosa, Vetiver, Geranium, Davanam, Lavender etc are some of the aromatic plants.

Importance of Horticulture

The importance of Horticulture can be deseribed under following heads

Income generation: Horticultural crops, especially fruits, vegetables, and plantation crops are more and prolific yielder as compared to other crops. Furthermore, Spices, medicinal, aromatic, and flori-crops are high-value crops. These crops get more prices in the market. One hectare field of horticultural crops may generate income to the extent of Rs. 10,000 to Rs. 1,00,000 and even more, depending upon the nature and value of crops.

Employment generation: Horticultural crops are labour intensive. These crops are very delicate and tender in nature, require utmost care in each and every aspect of cultivation, right from selection of the site to harvesting, processing, marketing, and storage. All such factors raise man-days requirements. As far as the employment generation is concerned, one hectare of fruit production generates 860 man-days per annum as against 143 man-days in cereal crops. Some industrial attribute linked and cultural intensive crops like grape, banana, and pineapple, generate much large employment ranging from 1,000 to 2,500 man-days per hectare. The Cashew industry alone provides employment to over 5.5 lakh workers annually.

Industrial development: Horticulture plants or their products directly Or indirectly Constitute raw material for many industries. The whole of the plantation crops like Tea, Coffee, Rubber, Cardamom, Coconut, Oil-palm, etc. form viable entities for industries. Growing of ornamental plants is an industry in itself. Indoor pot plants, bulbous plants, orchids etc. are plants of great marketing value. Aromatic plants like Rose, Jasmine, Tuberose, Sandal, Khas, etc. bestowed with aroma essence are used in the perfumery industry. The manufacturing of soaps, shampoos, creams, lotions, etc. depends a lot on the plant-based products. An array of products are prepared using horticultural plants or produces.

Religious and sacred value: Many plant parts like leaves, twigs. flowers, fruits, etc. possess religious value and are used in many ceremonies. Festunes of mango leaves, the entrance gate of banana, omen-flare of coconut fruits, etc. have their own significance in celebrations.

Food value: Some fruits like banana and vegetables like potato and sweet potato, being very rich in carbohydrate, whereas almond, walnut, cashew nut are very rich in fat and protein. Banana and sweet-potato constitute staple food in some areas, About 24 bananas each weighing around 100 g would provide the energy requirement (2400 calories per day).

Nutritional value: Fruits and vegetables, being rich in vitamins and minerals, are known as protective food. Realizing the worth of fruits and vegetables in human health, Indian Council of Medical Research (ICMR) recommends the use of 120 g fruits and 280 g vegetables per capita per day. Consumption of adequate amount of fruits and vegetables helps in maintaining health and vigour of an individual.

Aesthetic value: A young growing plant gives an impression of youth. Fruit trees were considered a symbol of life and youth. Many rulers and emperors planted avenues with trees of fruits like Mango, Litchi, Mahua, Sapota, Khirni, etc. in their gardens having been enchanted by the aesthetic look of the trees.

Export value: Among fresh fruits, mangoes and grapes in vegetables, onion and potato, among flowers, roses, among plantation and spice crops, black pepper, cardamom, ginger, turmeric, chillies, cashew nut, tea, coffee, coconut, arecanut etc. constitute the bulk of the export basket.

Miscellaneous: Horticultural trees work in maintaining the ecosphere.They help in transforming micro-climate. Provide shelter to birds, reptiles and other micro-organisms. As an economic proposition as they give higher returns per unit area in terms of energy, money, job, etc. Effective utilization of wasteland through the cultivation of hardy fruits and medicinal plants.

Scope of Horticulture:

Like many other things, scope of horticulture depends on the incentive it has for the farmers, adaptability of the crops, necessity and facilities for future growth through inputs availability and infrastructure for the distribution of produce/marketing etc.

To exploit the great variability of agro-climatic conditions.

Meet the need for fruits, vegetables, flowers, spices, beverages in relation to population growth based on minimum nutritional and other needs.

To meet the requirement of the processing industry.

To substitute imports and increase export.

Improve the economic conditions of the farmers and to engage more labourers to avert the problem of unemployment.

To protect the environment.

Soil mixture

Potting soil, also known as potting mix or miracle soil, is a medium in which to grow plants, herbs and vegetables in a pot or other durable container. The first recorded use of the term is from an 1861 issue of the American Agriculturist. Most commonly, potting soil is either peat moss (with limestone-based or coconut coir-based. Additional ingredients used in the mix may include sand, perlite, and grit (for improving drainage) and vermiculite (to increase water retention).

Fertiliser (in the form of compost; i.e. leaf mold, bark compost or recycled mushroom compost) is generally not added (or only in very small quantities) for potting soil used for cuttings and seedlings as large amounts of fertiliser are too aggressive for them. It is used for larger plants (large pots).

Despite its name, little or no soil is used in potting soil because it is considered too heavy for growing houseplants.

Peat

The use of peat is controversial since the harvesting of peat moss from peatlands (which includes unique habitats such as bogs and fens) degrades these peatlands. Peatlands are home to a diverse range of plant and animal species. Peat also has a very slow accumulation rate, as little as 1mm per year, so they take a long time to regenerate. Also, the removal of the layer of CO2 absorbing plants releases CO2 into the atmosphere, contributing to climate change.

As such, alternatives such as coconut coir are promoted by some organisations. Different mixes for different uses and plants. For seed starting and cuttings, a mix can be made using 40% coconut coir or peat moss with limestone, 40% vermiculite, and 20% sand.

Plants also require potting soil that is specific for their environment. For example, an African violet would grow better in potting soil containing extra peat moss. Cacti and succulents require sharp drainage, thus requiring a much larger percentage of perlite or sand. Insectivorous plants, such as the Venus flytrap and the pitcher plant, prefer nutrient-poor soils common to bogs and fens, while water-based plants thrive in a heavier topsoil mix.

Sterilization

As with garden soil, potting soil can attract insects. For example, the fungus gnat is often found around houseplants because it lays eggs in moist potting soil Commercially available potting soil is sterilized, in order to avoid the spread of weeds and plant-borne diseases. It is possible to reuse commercial potting soil, provided that the remnants of plant roots, fungus, weeds and insects are removed from the mixture through heating before new planting can take place. Packaged potting soil is sold in bags ranging from 5 to 50 pounds (2.3–22.7 kg).

Vermiculite

Vermiculite is a hydrous phyllosilicate mineral which undergoes significant expansion when heated. Exfoliation occurs when the mineral is heated sufficiently, and commercial furnaces can routinely produce this effect. Vermiculite forms by the weathering or hydrothermal alteration of biotite or phlogopite. Large commercial vermiculite mines currently exist in the United States of America, Russia, South Africa, China, and Brazil.

Occurrence

Vermiculite was first described in 1824 for an occurrence in Millbury, Massachusetts. Its name is from Latin vermiculare, "to breed worms", for the manner in which it exfoliates when heated.

It typically occurs as an alteration product at the contact between felsic and mafic or ultramafic rocks such as pyroxenites and dunites. It also occurs in carbonatites and metamorphosed magnesium-rich limestone. Associated mineral phases include: corundum, apatite, serpentine, and talc. It occurs interlayered with chlorite, biotite and phlogopite.

Structure

Vermiculite is a 2:1 clay, meaning it has two tetrahedral sheets for every one octahedral sheet. It is a limited-expansion clay with a medium shrink–swell capacity. Vermiculite has a high cation-exchange capacity (CEC) at 100–150 meq/100 g. Vermiculite clays are weathered micas in which the potassium ions between the molecular sheets are replaced by magnesium and iron ions.

Commercial uses

Molded shapes: this process involves mixing exfoliated vermiculite with inorganic bonding agents such as sodium silicate, cement (specific quantities), and other compounds, such as potassium ones, to produce an 'earth damp' mixture. This material is then hydraulically pressed into shape in a mold and then heat cured at temperatures up to 180 °C for up to 24 hours, depending upon the thickness of the moulded part. Such parts can withstand service temperatures of up to 1150 °C and are often used in the aluminium smelting industry as back-up insulation behind the carbon cathode in the potcells which contain the molten mixture of cryolite and alumina. The moulded shapes and boards are used in: Open fireplaces ,High-temperature or refractory insulation, Acoustic panels, Fireproofing of structural steel and pipes

Calcium silicate boards: exfoliated vermiculite is added to a calcium silicate slurry. This is then dewatered by pressing or by using one of the Fourdriner/Magnani/Hatschek processes to form a flat board which is then heat cured under pressure (typically 10–15 bar) for periods of up to 24 hours.

Brake linings: finer grades of exfoliated vermiculite are being used in brake linings primarily for the automotive market. The properties of vermiculite that make it an appropriate choice for use in brake linings include its thermal resistance, ease of addition to other raw materials to achieve a homogeneous mix, and its shape and surface characteristics.

Roof and floor screeds and insulating concretes: exfoliated vermiculite (typically the finer grades) can be added at site to Portland cement and other aggregates, rheological aids, and water to produce roof and floor concrete screeds which are lightweight and insulating. In many cases, vermiculite-based roof screeds are used in conjunction with other insulation materials, such as polystyrene board, to form a total roofing system. A bituminous binder can also be used with exfoliated vermiculite to produce a dry, lightweight roof screed which has the advantages of low thermal conductivity, low moisture content, and ease of placement (by pouring from the bag and then tamping).

Soilless growing medium: exfoliated vermiculite is combined with other materials such as peat or composted pine bark to produce soilless growing medium for the professional horticulturalist and for the home gardener. These mixes promote faster root growth and give quick anchorage to young roots. The mixture helps retain air, plant food, and moisture, releasing them as the plant requires them.[5] These mixes were pioneered by Boodley and Sheldrake. Exfoliated vermiculite is also used as a growing medium for hydroponics.

Seed germination: vermiculite, alone or mixed with soil or peat, is used to germinate seeds; very little watering is required. When vermiculite is used alone, seedlings should be fed with a weak fertilizer solution when the first true leaves appear. Start with one teaspoon of 5-10-5 soluble fertilizer per gallon of water, gradually increasing to one tablespoon (1:256 ratio) when transplanting.

Storing bulbs and root crops: pour vermiculite around bulbs placed in container. If clumps are dug, allow to dry for a few hours in the sun and then place in cartons or bushel baskets and cover with vermiculite. The absorptive power of vermiculite acts as a regulator that prevents mildew and moisture fluctuation during the storage period. It will not absorb moisture from the inside of stored tubers, but it does take up free water from the outside, preventing storage rot.

As a soil conditioner: Where the native soil is heavy or sticky, gentle mixing of vermiculite—up to one half the volume of the soil—is recommended. This creates air channels and allows the soil mix to breathe. Mixing vermiculite in flower and vegetable gardens or in potted plants will provide the necessary air to maintain vigorous plant growth. Where soils are sandy, mixing of vermiculite into the soil will allow the soil to hold the water and air needed for growth.

As loose-fill insulation: Exfoliated vermiculite treated with a water repellent is used to fill the pores and cavities of masonry construction and hollow blockwork to enhance fire ratings (e.g. Underwriters Laboratories Wall and Partition designs), thermal insulation, and acoustic performance. Expanded vermiculite has also been used as thermal insulation in the attics and walls of houses and in water heaters, fire safes, stoves, furnaces, and refrigerators.

As a packing material, valued for its high absorbency.

As a lightweight aggregate for plaster, proprietary concrete compounds, firestop mortar, and cementitious spray fireproofing: Exfoliated vermiculite is used in both hand and spray-applied general building plasters to improve coverage, ease of handling, adhesion to a wide variety of substrates, fire resistance, and resistance to chipping/cracking/shrinkage.

As an additive to fireproof wallboard. As a component of the interior fill for firestop pillows, along with graphite. As a carrier for dry handling and slow release of agricultural chemicals.

Used in in-ground swimming pools to provide a smooth pool base: Finer grades of exfoliated vermiculite plus Portland cement may be combined either on-site or in a factory premix to provide a

base for swimming pool vinyl liners. These mixes are pumped into place using a rotor stator pump, or hand poured.

Used as part of a substrate for cultivation of fungi.

In 2014, South Africa, Brazil, the US, and China were the top producers of mined, concentrated and unexfoliated vermiculite, with about 90% world share. South Africa's production is decreasing, while Brazil's is significantly increasing.

While some end processors and exfoliators of vermiculite specialize, with proprietary products sold in a wide variety of industries, some have more varied end products, with less stringent technical requirements. Some vermiculite exfoliators blend with lower-cost perlite also. Vermiculite exfoliators have an international trade association called The Vermiculite Association to represent the industry's interests and to exchange information.

Fireproofing

Today spray-applied fireproofing materials use vermiculite, other industrial minerals, and expanded polystyrene, depending upon the exact commercial product. The ingredients for these products all have to meet stringent regulatory requirements, particularly in the US and Europe. In the past, vermiculite from the W. R. Grace mines in Libby, Montana, have been associated with asbestos. Therefore, old spray-applied fireproofing, pre-1991, may contain small quantities of asbestos. In August 2014, the NYSDoH qualified two, more exact, test methods, better designed to identify materials with this potential problem, and assist in safely dealing with any issues associated with its removal. Modern spray applied fireproofing today is made with various light weight aggregates that does not contain asbestos and is carefully monitored at all stages of mining and production to ensure this is the case.

Asbestos contamination

Although not all vermiculite contains asbestos, some products were made with vermiculite that contained asbestos until the early 1990s.Vermiculite mines throughout the world are now regularly tested for it and are supposed to sell products that contain no asbestos. The former vermiculite mine in Libby, Montana, did have tremolite asbestos as well as winchite and richterite (both fibrous amphiboles)—in fact, it was formed underground through essentially the same geologic processes as the contaminants. Pure vermiculite does not contain asbestos and is non-toxic. Impure vermiculite may contain, apart from asbestos, also minor diopside or remnants of the precursor minerals biotite or phlogopite.

Compost

Compost is organic matter that has been broken down into simpler organic or inorganic matter in a process called composting. This process recycles various organic materials otherwise regarded as waste products and produces a soil conditioner (the compost).

Compost is rich in nutrients. It is used, for example, in gardens, landscaping, horticulture, urban agriculture and organic farming. The compost itself is beneficial for the land in many ways, including as a soil conditioner, a fertilizer, addition of vital humus or humic acids, and as a natural pesticide for soil. Compost is useful for erosion control, land and stream reclamation, wetland construction, and as landfill cover.

At the simplest level, the process of composting requires making a heap of wet organic matter (also called green waste), such as leaves, grass, and food scraps, and waiting for the materials to break down into humus after a period of months. However, composting can also take place as a multi-step, closely monitored process with measured inputs of water, air, and carbon- and nitrogen-rich materials. The decomposition process is aided by shredding the plant matter, adding water and ensuring proper aeration by regularly turning the mixture when open piles or "windrows" are used. Fungi, earthworms and other detritivores further break up the material. Aerobic bacteria and fungi manage the chemical process by converting the inputs into heat, carbon dioxide, and ammonium.

Composting is an aerobic method (meaning that it requires the presence of air) of decomposing organic solid wastes. It can therefore be used to recycle organic material. The process involves decomposition of organic material into a humus-like material, known as compost, which is a good fertilizer for plants. Composting requires the following three components: human management, aerobic conditions, and development of internal biological heat.

Composting organisms require four equally important ingredients to work effectively:

Carbon — for energy; the microbial oxidation of carbon produces the heat, if included at suggested levels. High carbon materials tend to be brown and dry.

Nitrogen — to grow and reproduce more organisms to oxidize the carbon. High nitrogen materials tend to be green (or colorful, such as fruits and vegetables) and wet.

Oxygen — for oxidizing the carbon, the decomposition process.

Water — in the right amounts to maintain activity without causing anaerobic conditions.

The most efficient composting occurs with an optimal carbon:nitrogen ratio of about 25:1. Hot container composting focuses on retaining the heat to increase decomposition rate and produce compost more quickly. Rapid composting is favored by having a C/N ratio of ~30 or less. Above 30 the substrate is nitrogen starved, below 15 it is likely to outgas a portion of nitrogen as ammonia.

Nearly all plant and animal materials have both carbon and nitrogen, but amounts vary widely, with characteristics noted above (dry/wet, brown/green). Fresh grass clippings have an average ratio of about 15:1 and dry autumn leaves about 50:1 depending on species. Mixing equal parts by volume approximates the ideal C:N range. Few individual situations will provide the ideal mix of materials at

any point. Observation of amounts, and consideration of different materials as a pile is built over time, can quickly achieve a workable technique for the individual situation.

Microorganisms

With the proper mixture of water, oxygen, carbon, and nitrogen, micro-organisms are able to break down organic matter to produce compost. The composting process is dependent on micro-organisms to break down organic matter into compost. In addition, earthworms not only ingest partly composted material, but also continually re-create aeration and drainage tunnels as they move through the compost.

Phases of composting -Under ideal conditions, composting proceeds through three major phases

Mesophilic phase: An initial, mesophilic phase, in which the decomposition is carried out under moderate temperatures by mesophilic microorganisms.

Thermophilic phase: As the temperature rises, a second, thermophilic phase starts, in which the decomposition is carried out by various thermophilic bacteria under higher temperatures (50 to 60 °C (122 to 140 °F).)

Maturation phase: As the supply of high-energy compounds dwindles, the temperature starts to decrease, and the mesophiles once again predominate in the maturation phase.

There are many proponents of rapid composting that attempt to correct some of the perceived problems associated with traditional, slow composting. Many advocate that compost can be made in 2 to 3 weeks. Many such short processes involve a few changes to traditional methods, including smaller, more homogenized pieces in the compost, controlling carbon-to-nitrogen ratio (C:N) at 30 to 1 or less, and monitoring the moisture level more carefully. However, none of these parameters differ significantly from the early writings of compost researchers,[who?] suggesting that, in fact, modern composting has not made significant advances over the traditional methods that take a few months to work. For this reason and others, many scientists who deal with carbon transformations are skeptical that there is a "super-charged" way to get nature to make compost rapidly. However, most professionals recommend that the compost be given time to cure before using in a nursery for starting seeds or growing young plants. An alternative approach is anaerobic fermentation, known as bokashi. It retains carbon bonds, is faster than decomposition, and for application to soil requires only rapid but thorough aeration rather than curing. It depends on sufficient carbohydrates in the treated material.

There are two broad categories of organic solid waste: green waste and brown waste. Green waste is generally considered a source of nitrogen and includes pre- and post-consumer food waste, grass clippings, garden trimmings and fresh leaves. Animal carcasses, roadkill and butcher residue can also be composted and these are considered nitrogen sources. Brown waste is a carbon source and typical examples are dried vegetation and woody material such as fallen leaves, straw, woodchips, limbs, logs, pine needles, sawdust and wood ash (not charcoal ash). Products derived from wood such as paper and plain cardboard are also considered carbon sources.

Food waste can be an important feedstock depending on the region. For example, residential food waste is collected as a separate waste stream in some municipalities, and will then be included in large municipal recycling facilities. In other areas, food waste may be part of the regular waste stream and the only option for composting will be backyard or community programs.

Animal manure and bedding

On many farms, the basic composting ingredients are animal manure generated on the farm as a nitrogen source, and bedding as the carbon source. Straw and sawdust are common bedding materials. Non-traditional bedding materials are also used, including newspaper and chopped cardboard. The amount of manure composted on a livestock farm is often determined by cleaning schedules, land availability, and weather conditions. Each type of manure has its own physical, chemical, and biological characteristics. Cattle and horse manures, when mixed with bedding, possess good qualities for composting. Swine manure, which is very wet and usually not mixed with bedding material, must be mixed with straw or similar raw materials. Poultry manure also must be blended with carbonaceous materials - those low in nitrogen preferred, such as sawdust or straw.

Uses

Compost can be used as an additive to soil, or other matrices such as coir and peat, as a tilth improver, supplying humus and nutrients. It provides a rich growing medium as absorbent material (porous). This material contains moisture and soluble minerals, which provides support and nutrients. Although it is rarely used alone, plants can flourish from mixed soil, sand, grit, bark chips, vermiculite, perlite, or clay granules to produce loam. Compost can be tilled directly into the soil or growing medium to boost the level of organic matter and the overall fertility of the soil. Compost that is ready to be used as an additive is dark brown or even black with an earthy smell.

Compost can be used to increase plant immunity to diseases and pests.

Commercial sale

The term "compost" can also refer to potting mixes which are bagged up and sold commercially in garden centers and other outlets. This may include composted materials such as manure and peat, but is also likely to contain loam, fertilizers, sand, grit, etc. Varieties include multi-purpose composts designed for most aspects of planting, John Innes formulations, growbags, designed to have crops such as tomatoes directly planted into them. There are also a range of specialist composts available, e.g. for vegetables, orchids, houseplants, hanging baskets, roses, ericaceous plants, seedlings, potting on etc.

Coir

Coir , or coconut fibre, is a natural fibre extracted from the outer husk of coconut and used in products such as floor mats, doormats, brushes and mattresses. Coir is the fibrous material found between the hard, internal shell and the outer coat of a coconut. Other uses of brown coir (made from ripe coconut) are in upholstery padding, sacking and horticulture. White coir, harvested from unripe coconuts, is used for making finer brushes, string, rope and fishing nets. It has the advantage of not sinking, so can be used in long lengths on deep water without the added weight dragging down boats and buoys.

History

The name coir comes from kayar, the Tamil and Malayalam word for cord or rope (traditionally a kind of rope is made from the coconut fibre. Ropes and cordage have been made from coconut fibre since ancient times. Indian navigators who sailed the seas to Malaya, Java, China, and the Persian Gulf centuries ago used coir for their ship ropes. Arab writers of the 11th century AD referred to the extensive use of coir for ship ropes and rigging.

A coir industry in the UK was recorded before the second half of the 19th century. During 1840, Captain Widely, in co-operation with Captain Logan and Mr. Thomas Treloar, founded the known carpet firms of Treloar and Sons in Ludgate Hill, England, for the manufacture of coir into various fabrics suitable for floor coverings.

Coir fibres are found between the hard, internal shell and the outer coat of a coconut. The individual fibre cells are narrow and hollow, with thick walls made of cellulose. They are pale when immature, but later become hardened and yellowed as a layer of lignin is deposited on their walls. Each cell is about 1 mm (0.04 in) long and 10 to 20 µm (0.0004 to 0.0008 in) in diameter. Fibres are typically 10 to 30 centimetres (4 to 12 in) long. The two varieties of coir are brown and white. Brown coir harvested from fully ripened coconuts is thick, strong and has high abrasion resistance. It is typically used in mats, brushes and sacking. Mature brown coir fibres contain more lignin and less cellulose than fibres such as flax and cotton, so are stronger but less flexible. White coir fibres harvested from coconuts before they are ripe are white or light brown in color and are smoother and finer, but also weaker. They are generally spun to make yarn used in mats or rope.

The coir fibre is relatively waterproof, and is one of the few natural fibres resistant to damage by saltwater. Fresh water is used to process brown coir, while seawater and fresh water are both used in the production of white coir. It must not be confused with coir pith, or formerly cocopeat, which is the powdery material resulting from the processing of the coir fibre. Coir fibre is locally named 'coprah' in some countries, adding to confusion.

Processing

Green coconuts, harvested after about six to 12 months on the palm, contain pliable white fibres. Brown fibre is obtained by harvesting fully mature coconuts when the nutritious layer surrounding the seed is ready to be processed into copra and desiccated coconut. The fibrous layer of the fruit is then separated from the hard shell (manually) by driving the fruit down onto a spike to split it

(dehusking). A well-seasoned husker can manually separate 2,000 coconuts per day. Machines are now available which crush the whole fruit to give the loose fibres. These machines can process up to 2,000 coconuts per hour.

Brown fibre

The fibrous husks are soaked in pits or in nets in a slow-moving body of water to swell and soften the fibres. The long bristle fibres are separated from the shorter mattress fibres underneath the skin of the nut, a process known as wet-milling. The mattress fibres are sifted to remove dirt and other rubbish, dried in the sun and packed into bales. Some mattress fibre is allowed to retain more moisture so it retains its elasticity for twisted fibre production. The coir fibre is elastic enough to twist without breaking and it holds a curl as though permanently waved. Twisting is done by simply making a rope of the hank of fibre and twisting it using a machine or by hand. The longer bristle fibre is washed in clean water and then dried before being tied into bundles or hanks. It may then be cleaned and 'hackled' by steel combs to straighten the fibres and remove any shorter fibre pieces. Coir bristle fibre can also be bleached and dyed to obtain hanks of different colours.

White fibre

The immature husks are suspended in a river or water-filled pit for up to ten months. During this time, micro-organisms break down the plant tissues surrounding the fibres to loosen them — a process known as retting. The Segments of the husk are then beaten with iron rods to separate out the long fibres which are subsequently dried and cleaned. Cleaned fibre is ready for spinning into yarn using a simple one-handed system or a spinning wheel.

Coir does provide a suitable substrate for horticultural use as a soilless potting medium. The material's high lignin content is longer-lasting, holds more water, and does not shrink off the sides of the pot when dry allowing for easier rewetting. This light media has advantages and disadvantages that can be corrected with the addition of the proper amendment such as coarse sand for weight in interior plants like Draceana. Nutritive amendments should also be considered. Calcium and magnesium will be lacking in coir potting mixes, so a naturally good source of these nutrients is dolomitic lime which contains both. pH is of utmost importance as coir pith tends to have a high pH after some months of use, resulting in plant stunting and multiple deficiencies. Coir has as well the disadvantage of being extremely sensitive to the Leucocoprinus greenhouse fungus. The addition of beneficial microbes to the coir media have been successful in tropical green house conditions and interior spaces as well. However, it is important to note that the microbes will engage in growth and reproduction under moist atmospheres producing fruiting bodies (mushrooms).

Bristle coir

Bristle coir is the longest variety of coir fibre. It is manufactured from retted coconut husks through a process called defibering. The coir fibre thus extracted is then combed using steel combs to make the fibre clean and to remove short fibres. Bristle coir fibre is used as bristles in brushes for domestic and industrial applications.

Uses

Cordage, packaging, bedding, flooring, and others

Red coir is used in floor mats and doormats, brushes, mattresses, floor tiles and sacking. A small amount is also made into twine. Pads of curled brown coir fibre, made by needle-felting (a machine

technique that mats the fibres together), are shaped and cut to fill mattresses and for use in erosion control on river banks and hillsides. A major proportion of brown coir pads are sprayed with rubber latex which bonds the fibres together (rubberised coir) to be used as upholstery padding for the automobile industry in Europe. The material is also used for insulation and packaging.

The major use of white coir is in rope manufacture. Mats of woven coir fibre are made from the finer grades of bristle and white fibre using hand or mechanical looms. White coir also is used to make fishing nets due to its strong resistance to saltwater.

Agricultural and horticultural uses

In agriculture and horticulture, coir is used as an organic and decorative component in soil and potting mixes. Due to the increasing concern regarding the sustainability of producing sphagnum (peat moss) and peat from peatlands, usage of alternative substrates has been on the rise; the byproduct coir is one commonly used substitute. Many sources of coir however are heavily contaminated with pathogenic fungi, and the choice of the source is important. Coir is also useful to deter snails from delicate plantings, and as a growing medium in intensive glasshouse (greenhouse) horticulture.

Coconut coir from Mexico has been found to contain large numbers of colonies of the beneficial fungus Aspergillus terreus, which acts as a biological control against plant pathogenic fungi.

Coir is also used as a substrate to grow mushrooms. The coir is usually mixed with vermiculite and pasteurised with boiling water. After the coir/vermiculite mix has cooled to room temperature, it is placed in a larger container, usually a plastic box. Previously prepared spawn jars are then added, spawn is usually grown in jars using substrates such as rye grains or wild bird seed. This spawn is the mushrooms mycelium and will colonize the coir/vermiculite mix eventually fruiting mushrooms.

Coir can be used as a terrarium substrate for reptiles or arachnids. Coir fibre pith or coir dust can hold large quantities of water, just like a sponge. It is used as a replacement for traditional peat in soil mixtures, or, as a soil-less substrate for plant cultivation. It has been called "coco peat" because it is to fresh coco fibre somewhat like what peat is to peat moss, although it is not true peat.

Coir waste from coir fibre industries is washed, heat-treated, screened and graded before being processed into coco peat products of various granularity and denseness, which are then used for horticultural and agricultural applications and as industrial absorbent. Usually shipped in the form of compressed bales, briquettes, slabs or discs, the end user usually expands and aerates the compressed coco peat by the addition of water.

Greenhouse

A greenhouse (also called a glasshouse, or, if with sufficient heating, a hothouse) is a structure with walls and roof made chiefly of transparent material, such as glass, in which plants requiring regulated climatic conditions are grown. These structures range in size from small sheds to industrial-sized buildings. A miniature greenhouse is known as a cold frame. The interior of a greenhouse exposed to sunlight becomes significantly warmer than the external temperature, protecting its contents in cold weather.

Many commercial glass greenhouses or hothouses are high tech production facilities for vegetables, flowers or fruits. The glass greenhouses are filled with equipment including screening installations, heating, cooling, lighting, and may be controlled by a computer to optimize conditions for plant growth. Different techniques are then used to evaluate optimality degrees and comfort ratio of greenhouses, such as air temperature, relative humidity and vapour-pressure deficit, in order to reduce production risk prior to cultivation of a specific crop.

The idea of growing plants in environmentally controlled areas has existed since Roman times. The Roman emperor Tiberius ate a cucumber-like vegetable daily. The Roman gardeners used artificial methods (similar to the greenhouse system) of growing to have it available for his table every day of the year. Cucumbers were planted in wheeled carts which were put in the sun daily, then taken inside to keep them warm at night. The cucumbers were stored under frames or in cucumber houses glazed with either oiled cloth known as specularia or with sheets of selenite (a.k.a. lapis specularis), according to the description by Pliny the Elder.

The treatise contains detailed instructions on constructing a greenhouse that is capable of cultivating vegetables, forcing flowers, and ripening fruit within an artificially heated environment, by utilizing gondola, the traditional Korean underfloor heating system, to maintain heat and humidity; cob walls to insulate heat; and semi-transparent oiled hanji windows to permit light penetration for plant growth and provide protection from the outside environment.

The concept of greenhouses also appeared in the Netherlands and then England in the 17th century, along with the plants. Some of these early attempts required enormous amounts of work to close up at night or to winterize. There were serious problems with providing adequate and balanced heat in these early greenhouses. The first 'stove' (heated) greenhouse in the UK was completed at Chelsea Physic Garden by 1681. Today, the Netherlands has many of the largest greenhouses in the world, some of them so vast that they are able to produce millions of vegetables every year.

The French botanist Charles Lucien Bonaparte is often credited with building the first practical modern greenhouse in Leiden, Holland, during the 1800s to grow medicinal tropical plants. Originally only on the estates of the rich, the growth of the science of botany caused greenhouses to spread to the universities. The French called their first greenhouses orangeries, since they were used to protect orange trees from freezing. As pineapples became popular, pineries, or pineapple pits, were built. Other large greenhouses built in the 19th century included the New York Crystal Palace, Munich’s Glaspalast and the Royal Greenhouses of Laeken (1874–1895) for King Leopold II of

Belgium. In Japan, the first greenhouse was built in 1880 by Samuel Cocking, a British merchant who exported herbs.

Greenhouse structures adapted in the 1960s when wider sheets of polyethylene (polythene) film became widely available. Hoop houses were made by several companies and were also frequently made by the growers themselves. Constructed of aluminum extrusions, special galvanized steel tubing, or even just lengths of steel or PVC water pipe, construction costs were greatly reduced. This resulted in many more greenhouses being constructed on smaller farms and garden centers. Polyethylene film durability increased greatly when more effective UV-inhibitors were developed and added in the 1970s; these extended the usable life of the film from one or two years up to 3 and eventually 4 or more years. Gutter-connected greenhouses became more prevalent in the 1980s and 1990s. These greenhouses have two or more bays connected by a common wall, or row of support posts. Heating inputs were reduced as the ratio of floor area to exterior wall area was increased substantially. Gutter-connected greenhouses are now commonly used both in production and in situations where plants are grown and sold to the public as well. Gutter-connected greenhouses are commonly covered with structured polycarbonate materials, or a double layer of polyethylene film with air blown between to provide increased heating efficiencies.

The warmer temperature in a greenhouse occurs because incident solar radiation passes through the transparent roof and walls and is absorbed by the floor, earth, and contents, which become warmer. As the structure is not open to the atmosphere, the warmed air cannot escape via convection, so the temperature inside the greenhouse rises. This differs from the earth-oriented theory known as the "greenhouse effect" Ventilation is one of the most important components in a successful greenhouse. If there is no proper ventilation, greenhouses and their growing plants can become prone to problems. The main purposes of ventilation is to regulate the temperature and humidity to the optimal level, and to ensure movement of air and thus prevent the build-up of plant pathogens (such as Botrytis cinerea) that prefer still air conditions. Ventilation also ensures a supply of fresh air for photosynthesis and plant respiration, and may enable important pollinators to access the greenhouse crop. Ventilation can be achieved via the use of vents - often controlled automatically via a computer - and recirculation fans.

Heating or electricity is one of the most considerable costs in the operation of greenhouses across the globe, especially in colder climates. The main problem with heating a greenhouse as opposed to a building that has solid opaque walls is the amount of heat lost through the greenhouse covering. Since the coverings need to allow light to filter into the structure, they conversely cannot insulate very well. With traditional plastic greenhouse coverings having an R-value of around 2, a great amount of money is therefore spent to continually replace the heat lost. Most greenhouses, when supplemental heat is needed use natural gas or electric furnaces.

Passive heating methods exist which seek heat using low energy input. Solar energy can be captured from periods of relative abundance (day time/summer), and released to boost the temperature during cooler periods (night time/winter). Waste heat from livestock can also be used to heat greenhouses, e.g., placing a chicken coop inside a greenhouse recovers the heat generated by the chickens, which would otherwise be wasted.[citation needed] Some greenhouses also rely on geothermal heating.

Cooling is typically done by opening windows in the greenhouse when it gets too warm for the plants inside it. This can be done manually, or in an automated manner. Window actuators can open windows due to temperature difference or can be opened by electronic controllers. Electronic controllers are often used to monitor the temperature and adjusts the furnace operation to the

conditions. This can be as simple as a basic thermostat, but can be more complicated in larger greenhouse operations.

During the day, light enters the greenhouse via the windows and is used by the plants. Some greenhouses are also equipped with grow lights (often LED lights) which are switched on at night to increase the amount of light the plants get, hereby increasing the yield with certain crops.

The benefits of carbon dioxide enrichment to about 1100 parts per million in greenhouse cultivation to enhance plant growth has been known for nearly 100 years. After the development of equipment for the controlled serial enrichment of carbon dioxide, the technique was established on a broad scale in the Netherlands. Secondary metabolites, e.g., cardiac glycosides in Digitalis lanata, are produced in higher amounts by greenhouse cultivation at enhanced temperature and at enhanced carbon dioxide concentration. Carbon dioxide enrichment can also reduce greenhouse water usage by a significant fraction by mitigating the total air-flow needed to supply adequate carbon for plant growth and thereby reducing the quantity of water lost to evaporation. Commercial greenhouses are now frequently located near appropriate industrial facilities for mutual benefit. For example, Cornerways Nursery in the UK is strategically placed near a major sugar refinery, consuming both waste heat and CO2 from the refinery which would otherwise be vented to atmosphere. The refinery reduces its carbon emissions, whilst the nursery enjoys boosted tomato yields and does not need to provide its own greenhouse heating.

In domestic greenhouses, the glass used is typically 3mm (or ⅛") 'horticultural glass' grade, which is good quality glass that should not contain air bubbles (which can produce scorching on leaves by acting like lenses). Plastics mostly used are polyethylene film and multiwall sheets of polycarbonate material, or PMMA acrylic glass. Commercial glass greenhouses are often high-tech production facilities for vegetables or flowers. The glass greenhouses are filled with equipment such as screening installations, heating, cooling and lighting, and may be automatically controlled by a computer.

Uses

Greenhouses allow for greater control over the growing environment of plants. Depending upon the technical specification of a greenhouse, key factors which may be controlled include temperature, levels of light and shade, irrigation, fertilizer application, and atmospheric humidity. Greenhouses may be used to overcome shortcomings in the growing qualities of a piece of land, such as a short growing season or poor light levels, and they can thereby improve food production in marginal environments. Shade houses are used specifically to provide shade in hot, dry climates.

Greenhouses are often used for growing flowers, vegetables, fruits, and transplants. Special greenhouse varieties of certain crops, such as tomatoes, are generally used for commercial production. Many vegetables and flowers can be grown in greenhouses in late winter and early spring, and then transplanted outside as the weather warms. Bumblebees are the pollinators of choice for most pollination,[citation needed] although other types of bees have been used, as well as artificial pollination. Hydroponics (especially hydroponic A-frames) can be used to make the most use of the interior space. The relatively closed environment of a greenhouse has its own unique management requirements, compared with outdoor production. Pests and diseases, and extremes of temperature and humidity, have to be controlled, and irrigation is necessary to provide water. Most greenhouses use sprinklers or drip lines. Significant inputs of heat and light may be required, particularly with winter production of warm-weather vegetables.

Garden tools

A garden tool is any one of many tools made for gardening and overlaps with the range of tools made for agriculture and horticulture. Garden tools can be divided into hand tools and power tools.

Pruning tools that can be used to maintain a garden. The hand tools still used by gardeners originated with the earliest agricultural implements used by humans. Examples include: hatchet, axe, sickle, scythe, pitchfork, spade, shovel, trowel, hoe, fork, and rake. In some places, the machete may be used as a garden tool as well. The earliest tools were made of wood, flint, metal, tin, and bone. However, the development of metal working, first in copper and later in iron and steel, enabled the manufacture of more durable tools. Industrial metalworking enabled the manufacture of efficient cutting tools including pruning shears (secateurs – for example anvil pruning shears), grass shears, and loppers. In present days the gardening tools are made from light materials and are easy to handle. Different tools may vary in size depending on their use and brand.

Power tools

The first power tool to become popular with gardeners was the lawn mower. This has been followed by a very wide range of power tools, including: cultivators, string trimmers, irrigation sprinklers, hedge trimmers, lawn aerators, lawn sweepers, trenchers, leaf blowers, chainsaws, and mini-tractors.

Garden

A garden is a planned space, usually outdoors, set aside for the display, cultivation, or enjoyment of plants and other forms of nature, as an ideal setting for social or solitary human life. The single feature identifying even the wildest wild garden is control. The garden can incorporate both natural and man-made materials.

Gardens may exhibit structural enhancements including statuary, follies, pergolas, trellises, stumperies, dry creek beds and water features such as fountains, ponds (with or without fish), waterfalls or creeks. Some gardens are for ornamental purposes only, while others also produce food crops, sometimes in separate areas, or sometimes intermixed with the ornamental plants. Food-producing gardens are distinguished from farms by their smaller scale, more labor-intensive methods, and their purpose (enjoyment of a hobby or self-sustenance rather than producing for sale, as in a market garden). Flower gardens combine plants of different heights, colors, textures, and fragrances to create interest and delight the senses.

Gardening is the activity of growing and maintaining the garden. This work is done by an amateur or professional gardener. A gardener might also work in a non-garden setting, such as a park, a roadside embankment, or other public space.

Landscape architecture is a related professional activity with landscape architects tending to specialise in design at multiple levels.

The most common form today is a residential or public garden, but the term garden has traditionally been a more general one. Zoos, which display wild animals in simulated natural habitats, were formerly called zoological gardens. Western gardens are almost universally based on plants, with garden, which etymologically implies enclosure, often signifying a shortened form of botanical garden. Some traditional types of eastern gardens, such as Zen gardens, however, use plants sparsely or not at all. Landscape gardens, on the other hand, such as the English landscape gardens first developed in the 18th century, may omit flowers altogether.

The culture of gardening reaches deep into antiquity, when Alexander the Great was reportedly awestruck by the magnificence of Babylon's gardens. Homer tells of the Garden of Alcinous, its fertility and symmetry of form.Th e Romans were known for planting their gardens with the riches of Asia.

Etymology

The etymology of the word gardening refers to enclosure: it is from Middle English gardin, from Anglo-French gardin, jardin, of Germanic origin; akin to Old High German gard, gart, an enclosure or compound, as in Stuttgart. See Grad (Slavic settlement) for more complete etymology.The words yard, court, and Latin hortus (meaning "garden," hence horticulture and orchard), are cognates—all referring to an enclosed space.

Garden design is the process of creating plans for the layout and planting of gardens and landscapes. Gardens may be designed by garden owners themselves, or by professionals. Professional garden designers tend to be trained in principles of design and horticulture, and have a knowledge and experience of using plants. Some professional garden designers are also landscape architects, a more formal level of training that usually requires an advanced degree and often a state license.

Elements of garden design include the layout of hard landscape, such as paths, rockeries, walls, water features, sitting areas and decking, as well as the plants themselves, with consideration for their horticultural requirements, their season-to-season appearance, lifespan, growth habit, size, speed of growth, and combinations with other plants and landscape features. Most gardens consist of a mix of natural and constructed elements, although even very 'natural' gardens are always an inherently artificial creation. Natural elements present in a garden principally comprise flora (such as trees and weeds), fauna (such as arthropods and birds), soil, water, air and light. Constructed elements include paths, patios, decking, sculptures, drainage systems, lights and buildings (such as sheds, gazebos, pergolas and follies), but also living constructions such as flower beds, ponds and lawns.

Garden

Public Garden

A public garden is an institution that maintains collections of plants for the purposes of public education and enjoyment, in addition to research, conservation, and higher learning. It must be open to the public and the garden's resources and accommodations must be made to all visitors. Public gardens are staffed by professionals trained in their given areas of expertise and maintain active plant records systems.

Many related entities are part of American Public Gardens Association or benefit from member organizations. These entities include: Botanical gardens, arboreta, cemeteries, zoological gardens, sculpture gardens, college and university campuses, historic homes, urban greening organizations, natural areas, and city/county/state/federal parks.

The following public garden definitions are utilized by some of these entities.

Botanical Garden

"A place where a wide variety of plants are cultivated for scientific, educational and ornamental purposes, often including a library, a herbarium and greenhouses; an arboretum." --American Heritage Dictionary

"A garden often with greenhouses for the culture, study, and exhibition of special plants —also called botanic garden." --Merriam-Webster Dictionary

Arboretum

"A place where trees and plants are grown in order to be studied or seen by the public." -- Merriam Webster Dictionary

It is becoming increasingly difficult to obtain leases from landowners without public liability insurance. Garden insurance is a new thing for many insurance carriers and their underwriters are reluctant to cover community gardens. It helps if you know what you want before you start talking to agents. Two tips: you should probably be working with an agent from a firm which deals with many different carriers (so you can get the best policy for your needs) and you will probably have better success with one of the ten largest insurance carriers, rather than smaller ones.

SETTING UP A NEW GARDENING ORGANIZATION

Many garden groups are organized very informally and operate successfully. Leaders "rise to the occasion" to propose ideas and carry out tasks. However, as the work load expands, many groups choose a more formal structure for their organization.

State any official policies or practices:eg. garden group will avoid the use of hazardous substances; group will agree to keep all adjacent sidewalks in good repair and free of ice and snow in season; group will make all repairs necessary to keep equipment, fences and furniture in good order and repair.

"We the undersigned members of the (name) garden group hereby agree to hold harmless (name owner) from and against any damage, loss, liability, claim, demand, suit, cost and expense directly or indirectly resulting from, arising out of or in connection with the use of the (name) garden by the garden group, its successors, assigns, employees, agents and invites."

Public Garden

Aesthetic Garden

The definition of aesthetic (adjective), in the most basic sense, is "pertaining to the appreciation of beauty or good taste." The corresponding noun is "aesthetics," which means "the study of the appreciation of beauty or how we perceive beauty." This study is considered important enough to constitute a branch of philosophy.

In the context of landscape design, the term is often used casually. You might say, for example: "That homeowner's yard is aesthetically pleasing," meaning that you like the way it looks.

Landscape design is concerned both with aesthetic and functional elements of landscaping. While the former is ultimately subjective (there is no accounting for tastes, as the old expression goes), professional landscape designers are, in fact, guided by some basic rules that help them to create aesthetically pleasing designs in their clients' yards.

Applying Aesthetics to Your Yard

Where landscape design is concerned with aesthetics, the terminology used is somewhat similar to that employed in the art world: Landscape design principles include such subjects as color theory, form and texture, the role of focal points, and how our perception of "line" and "scale" influence our opinion of a scene.

One of the great aesthetic debates the last few centuries between gardeners has been one focused on overall style: between the styles of the informal and formal garden design schools. The latter prefers symmetry, tight structure, and orderliness. A classic look in a formal garden design is a hedge, neatly manicured, consisting of English boxwood, and used to set off topiary plants. Such a hedge may serve as a divider between planting areas, which bespeaks a tightly-organized design.

By contrast, those whose aesthetic tastes lean toward informal garden design may be drawn to cottage gardens, marked by a wild riot of color and a disdain for obvious organization. This style may seem chaotic, but there is a method behind the madness. Distinctive cottage garden plants are chosen and arranged carefully to give a sense of refined rusticity. While formal gardens are designed to wow us with their geometric precision, cottage gardens are supposed to make us feel relaxed, comfortable, "at home."

As much as you want to beautify your yard, you can't let fancy carry you away. A yard is not an artist's palette where anything goes. It should offer privacy (unless you don't mind living in a fishbowl). You are unlikely to get full use out of even the loveliest yard if being in it does not fill you with a sense of serenity.

It is important to be realistic even with the plants that you choose to grow. The best-looking perennial will do you little good if you grow it in a location to which it is ill-suited. Always carefully research what to grow where before buying.

The Union of Beauty and Functionality

Although we speak in the abstract of aesthetics as if it were separate from landscaping elements that serve a practical purpose, the two, in reality, are often united. When we install a fence to improve the privacy in a yard, we want it to be attractive, too. Likewise, a practical walkway meant mainly to connect point A to point B can be nice to look at, too. Those two examples reference hardscape, but the principle applies to softscape and other landscaping elements, as well:

A ground cover can appeal to our aesthetic sense while also fighting erosion on a slope.

A landscaping berm can offer privacy, but it can also be planted with pretty shrubs to add to the beauty of your yard.

Indoor Garden

The idea of indoor gardening is essentially just growing plants indoors. There are, however, many different purposes for indoor gardening and multiple styles and techniques that can be used. The reasons for indoor gardening can be strictly practical, purely for enjoyment, or maybe for a little of both. Whatever your reasons for indoor gardening, there is a lot to know about what your specific garden will need. No doubt, the possibilities are endless when planning out your garden.

Indoor gardens can be grown in any indoor space. Indoor gardening works in homes, offices, restaurants, and anywhere else people want a little bit of life and color. Plants create such a peaceful atmosphere that it makes sense we would try to bring a little bit of their beauty into our homes.

Many of us don't have the yard space for an outdoor garden. Others live in a climate that would destroy the plants they're attempting to grow. Even in a mild climate, some plants are too delicate to be left in the fickle hands of Mother Nature. An indoor garden allows us to be in complete control of their environment.

Decor and Enjoyment

A popular reason for indoor gardening is the lovely ambiance fresh flowers and crisp green leaves can provide. Filling your home with living plants gives your decor a vibrancy that knick knacks and throw blankets just can't achieve. Many people just love gardening as a hobby but can't do it outside due to weather or yard space. Even in a small apartment, there are ways to squeeze some potted or hanging plants in.

Indoor Gardening for Food

A more practical reason for indoor gardening is to reap the fruits of your labor. Many herbs will thrive in an indoor herb garden. Fruits and vegetables can be grown indoors as well. Although, some, like tomatoes and lettuces, will be a little easier than others. With the right care, nearly any environment can create the perfect conditions for whatever you're trying to grow.

Air Quality

Plants are fantastic air purifiers. While you may want to fill your home with lush green leaves for the decor, a room full of plants could improve the air quality too. Not only do plants produce oxygen, but they can absorb contaminants from the air like benzene and formaldehyde. The microorganisms in the soil play a part in cleaning indoor air as well.

Supplement Outdoor Gardening

Indoor gardening might not even be your main goal. In areas with a harsher climate, bringing your delicate plants inside can prolong your growing season. You can also grow starter plants indoors in the cooler temperatures, moving them to your outdoor garden in the spring. Some plants may need a bit of acclimatization before being moved from their usual conditions of all-day direct sunlight to an indoor lighting situation.

Types Indoor Gardening

Container Gardening

The most common technique for indoor gardening is container gardening using pots, terrariums, and upcycled vessels. These can include coffee cans, vases, or old paint cans. If you plan to use

something other than a typical plant pot, be sure your container has drainage holes to allow excess water to escape. Alternately, place a few pebbles in it's base to create some level of drainage. When using pots or any other container for your plants, be sure to repot your plants as they grow to give their roots the room they need.

Hydroponics

You can also grow plants indoors with hydroponics, which is growing your plants in sand, gravel, or water without soil but by using added nutrients. Hydroponics can allow plants to grow much faster as their nutrients are readily available to them and they do not need to expend their energy searching for them within the soil. Hydroponic gardens can be as simple as some glass jars with a little water and nutrients or as complex as a fully irrigated table set up to grow a vast garden of herbs and veggies.

Living Walls and Edible Walls

Living walls are a unique technique you can use to create your indoor garden in a small space. They use irrigation tanks to provide the plants with a steady supply of water and nutrients. These walls can be constructed simply as a beautiful piece of decor or can be used to grow a small farm filled with lettuces, herbs, peas, or strawberries. Some herbs, fruits, and vegetables will grow better than others on a living wall so do some research before trying to set up a potato farm along your hallways.

Necessities for Indoor Gardening

Space

A lack of outdoor garden space may be the reason you have turned to indoor gardening, but at least some indoor space is still required. You may have a full living room you can dedicate to growing an indoor farm or perhaps a single windowsill with a long, narrow pot full of dirt to grow some herbs. The needs of your specific plants and their root systems will need to be considered when planning your garden so they will have the space they'll need to properly grow and thrive.

Light

Some plants require very little natural light to thrive while others absolutely cannot go without it. Sunlight is an obvious choice to help your plants grow but for an indoor garden, you may not have much direct sunlight available or it likely won't be available for as many hours as your plants need.

If you plan on growing some basic houseplants, standard incandescent light bulbs may do the trick. For herbs and seedlings, fluorescent lights might suffice. Any plants that produce fruit or flowers will need LED or HID grow lights in order to flourish. Different types of plants will have different lighting needs so investigate your specific plants and what they'll require while planning out your indoor garden.

Soil and Nutrients

Choosing the right soil for your plants is essential if they are to grow to their full potential. Indoor potted plants require soil that is light and fluffy so the soil can drain properly when watered. A medium weight soil is good for plants that will be in direct sunlight as it will retain water better than lighter soil. A light soil is better for hanging plants or plants that will not be in direct sunlight. A good quality fertilizer can be added to your indoor garden as well to replenish the nutrients in the soil. Repot your plants and give them fresh soil as often as they need it to keep them happy and healthy.

Water

Water is the simplest but one the most important things you indoor garden will require. It sounds easy, but watering your garden is more involved than pouring a bit of water over them every few days. Every plant is different and some will require more or less water than others. Some like to be watered from above while others prefer bottom watering so the leaves don't get wet and the lowest roots can soak up the moisture. Under-watering can dry plants out and give them crunchy leaves while over watering can turn their leaves yellow and eventually kill them.

Temperature and humidity will also affect how much water they require at any given time of the year. You can gauge how much water your indoor garden needs by checking that the top few inches of the soil isn't dry and that the soil near the drainage holes isn't soaking wet. It's important to research how much water your specific plants need to keep them in the healthiest condition.

There's an Indoor Gardening Option for You!

Whatever your living situation, size of your office, or accessibility to sunlight, there are indoor gardening plans that will work. Even if you just want a touch of greenery to brighten a windowless room, there are many houseplants that will thrive in low light. Creative potting techniques allow you to turn a small corner of your kitchen into a flourishing garden. Or turn a blank wall in your living room into a beautiful tapestry of life. Indoor gardening is the perfect way to nurture your green thumb all year round.