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# Partcipant Handbook

Sector
**Agriculture and Allied**

Sub-Sector
**Agriculture Crop Production**

Occupation
**Precision Farming**

Reference ID: **AGR/Q1003, Version 1.0**
**NSQF Level 4**

## Green House Operator

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**Shri Narendra Modi**
Prime Minister of India

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for

## SKILLING CONTENT : PARTICIPANT HANDBOOK

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We are thankful to all organizations and individuals who have helped us in preparation of this Participant manual. We also wish to extend our gratitude to all those who reviewed the content and provided valuable inputs for improving quality, coherence and content presentation of chapters. This handbook will lead to successful roll out the skill development initiatives, helping greatly our stakeholders particularly trainees, trainers and assessors etc. We are thankful to our Subject Matter Expert Dr. Rouhangiz Hayati Dahiya who has given the content and helped us in preparation of Participant Handbook.

It is expected that this publication would meet the complete requirements of QP/NOS based training delivery, we welcome the suggestions from users, Industry experts and other stakeholders for any improvement in future.

## About this book

A Green House Operator is a person who plays a critical role in executing various operations involved in greenhouse. The individual is responsible for various operations involved in raising seedlings/plantlets under controlled environment in the greenhouse. This job requires the individual to work specifically as per the instructions of the supervisor. The individual should be laborious and should have inclination to new learnings. Requires clarity and should be result oriented. The individual should also be able to demonstrate skills of using various tools and keep records as required. The trainee will enhance his/her knowledge under the guidance of the trainer in the following skills:

- **Knowledge and Understanding**: Adequate operational knowledge and understanding to perform the required task
- **Performance Criteria**: Gain the required skills through hands on training and perform the required operations within the specified standards
- **Professional Skills**: Ability to make operational decisions pertaining to the area of work.

The handbook incorporates well-defined roles of Green House Operator like operating and maintaining the various components of Green House, manage the green house operations and maintain the Health & Safety at the Green House etc. The participant should be result oriented and responsible for his/her own working and learning. The participant should also be able to demonstrate skills of using various tools and decision making for instant problem solving.

We wish all the best for your future in the Green House Operation Sector

## Symbols Used


Key Learning Outcomes


Steps


Time


Tips


Notes


Unit Objecti es


Exercise

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# 1. Introduction

Unit 1.1 - Basic concept of Protected Cultivation

Unit 1.2 - Different types of Greenhouse Structures

Unit 1.3 - Roles and responsibilities of a Greenhouse Operator

## Key Learning Outcomes

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

- Understand General Discipline in the class room (Do's & Don'ts).
- Study the Scope & importance of Greenhouse in India.
- Know different crops that can be grown in greenhouse.
- Understand the Role of a Greenhouse Operator.

# Unit 1.1: Basic Concept of Protected Cultivation

## Unit Objectives

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

- Understand the importance of Greenhouse in India.
- Understand the types of crops can be grown in Greenhouse.

## 1.1.1 What is Greenhouse?

A greenhouse is a structure made of galvanized steel and covered with agricultural plastic film or shading net/thermal net on all the sides, in which plants can be grown in regulated and optimum climatic conditions.

The greenhouse technology has been considerable importance in better space utilization, growing crops in extreme climatic conditions and high rainfall areas. The plastics film used in greenhouse act as selective radiation filters. The solar radiations pass through it and trap the thermal energy inside the greenhouse, which is emitted by the objects that are kept inside, this phenomenon is known as "greenhouse effect".

The size of Greenhouse ranges typically from 1 Acre 3 Acres in India, while large land holding farmers can choose to make several 1-3 acres of Greenhouses.

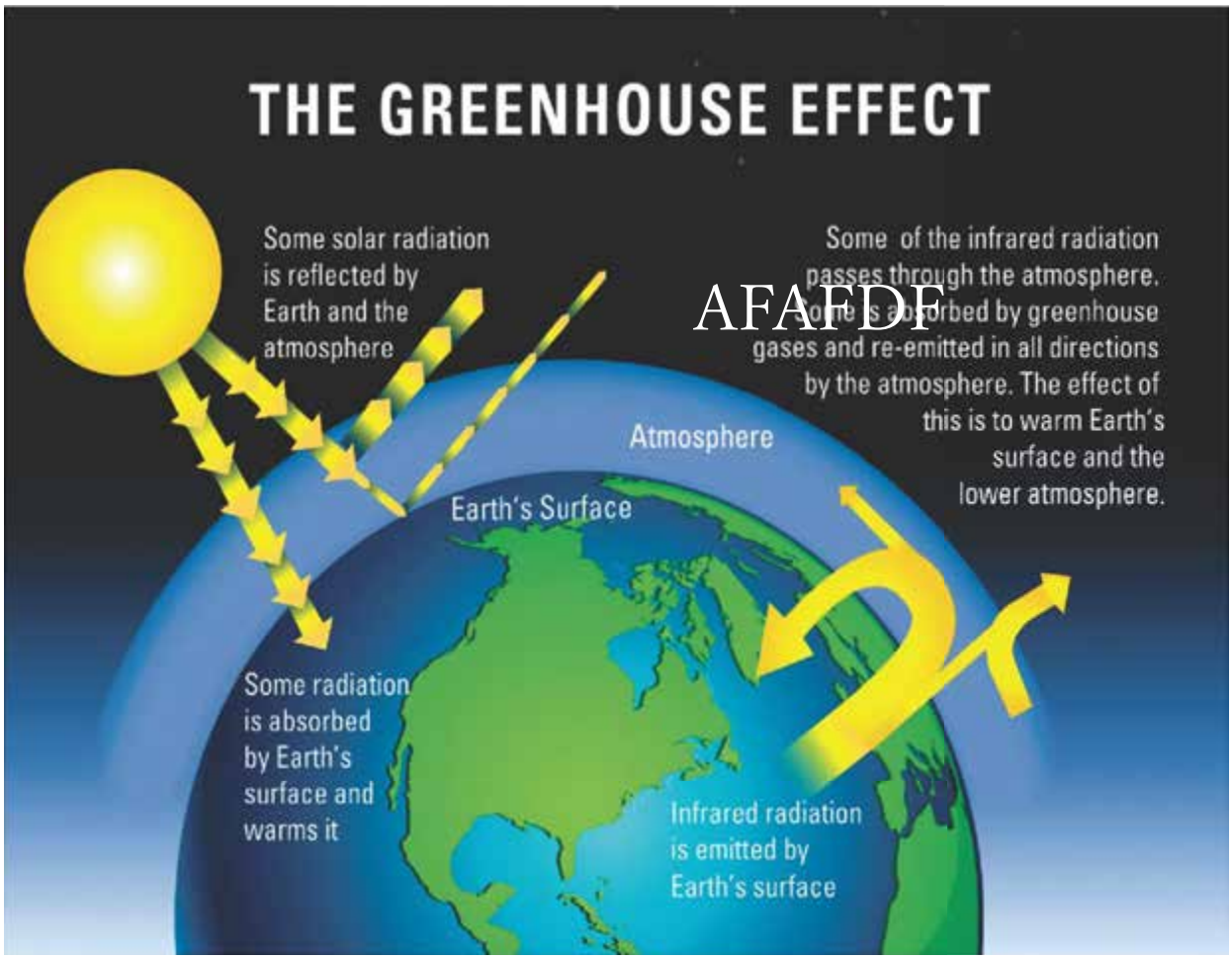
*Fig 1.1.1 Green House*

## 1.1.2 What is Greenhouse effect ?

Greenhouse Effect - The role the atmosphere plays in insulating and warming the earth's surface. The atmosphere is largely transparent to incoming solar radiation. When this radiation strikes the earth's surface, some of it is absorbed, thereby warming the earth's surface. The surface of the earth emits some of this energy back out in the form of infrared radiation. As this infrared radiation travels through the atmosphere, much of it is absorbed by atmospheric gases such as carbon dioxide, methane, nitrous oxide and water vapor.

These gases then re-emit infrared radiation, some of which strikes and is absorbed by the earth. The absorption of infrared energy by the atmosphere and the earth, called the greenhouse effect, maintains a temperature range on earth that is hospitable to life.

It is clear that for survival of living plants on the earth, there should be a favorable environment in terrestrial region controlled by short wave length radiation transmitted by the atmosphere. However, using the concept for optimum growth of living plants, a micro climate can also be created for maximizing crops production in a controlled environment.




AFAFDF

*Fig 1.1.2 Green House Effect*

## 1.1.3 Why Greenhouse is important ?

Greenhouses are used in many tropical regions of the world for the production of vegetable crops. The greenhouse offers the ability to manage the growing environment in order to increase control over quality and productivity. It is possible to build, with relatively simple means, greenhouses in tropical areas, in which plants are protected and can grow in temperatures and other environmental conditions that produce higher yields and healthier crops.

The primary reasons for protected cultivation in the tropics are for pest exclusion, protection from extreme solar radiation, and heavy rains and wind. In the tropics, plants in open-field cultivation are often completely destroyed by severe storms and suffer from many pests and diseases. Under these circumstances, plants can be highly productive, their fruits are generally not of the highest quality or, they may contain too many residues of plant protection chemicals. This is unfortunate, given that tropical areas have more than enough available sunlight and, very often also, more than enough water.

**The main challenges to greenhouse production in tropical areas include:**

- High relative humidity and ambient temperatures reaching more than 40°C.
- Reduced light especially below minimum threshold levels in cloudy or rainy days.
- Impedance of flower fertilization and fruit set and development.
- Low level of maintenance of exterior parts of the greenhouse structure.
- Lack of adequate maintenance of undesirable vegetation, drainage and other
- environmental elements surrounding the structure.
- Lack of guttering causing algal growth on the outer surface of the cover material.
- Bad orientation and site selection of the structure leading to incorrect direction of flow of prevailing winds.

Greenhouses helps in achieving greater control over the growing conditions which influence plant growth.

Depending upon the technical specification of a greenhouse, key factors which may be controlled include:

- Temperature
- Levels of light and shade
- Irrigation
- Fertilizer application
- Atmospheric humidity.

Greenhouses may be used to enhance plant growth and regulate planting and harvesting cycle by providing them optimum growing conditions. Greenhouses may also be used to overcome limitationsof the environmental factors in a particular growing region, such as extreme temperatures, extreme humidity levels, limited water availability, high or low light intensity, Soil type, etc. to achieve greater yield with limited resources. Greenhouses in hot, dry climates used specifically to provide shade are sometimes called "shade net houses" and are covered by shading net or thermal nets.

As Greenhouses enable to achieve higher yield from a limited land area and help certain crops to be grown throughout the year, they are increasingly important in the food supply.

*Fig 1.1.3 Crop Cultivation in Green House*

## 1.1.4 Why Greenhouse technology is important in India?

Agriculture is the backbone of India's economic activity and our experience during the last 50 years hasdemonstrated the strong correlation between agricultural growth and economic prosperity. The present agricultural scenario is a mix of outstanding achievements and missed opportunities. If India has to remain self-sufficient and provide food security to the poor population while also able to export high quality fruits and vegetable, we need a new and effective technology which can improve continuously the productivity, profitability, sustainability of our major farming systems. One such technology is the green house technology. Although it is centuries old, it is new to India.

India geography lies to the north of the equator between 6° 44' and 35° 30' north latitude and 68° 7' and 97° 25' east longitude. India enjoys varied climatic condition due to its diverse topography across length and breadth, such as Tropical Wet (Humid), Tropical Dry, Subtropical Humid, Mountain dry and cold which are suitable for wide varieties of crops. The average Precipitation is 1083 mm per year andaverage cultivable temperature ranges from 7°C to 45°C across states.

India is long considered and designated as Agricultural economy largely because of maximum employing sector and also due to good share of GDP through Agriculture and allied sectors. Around 60% of total land is under Agriculture in India and employs more than 60% of working population of India. Agriculture makes up to 90% of rural economy.

India's land use under Greenhouse technology has increased from only 100 ha in 1995 to 5730 ha in 2012. Although India still lies far behind other countries who have chosen Greenhouse technology for major share of land use under agriculture, such as, Netherland 89,600 ha, China 51,000 ha, Japan 40,000 ha, Spain 28,000 ha, South Korea 21, 000 ha, Italy 19,500 ha, Israel 18,000 ha, USA 15,000 ha, Turkey 12,000 ha.

In India use of greenhouse technology started only during 1980's and it was mainly used for research activities. Now Greenhouses are being commercially used for extending the growing season of vegetables from 3 to 8 months, getting higher yield per crop cycle, achieve lower chemical residue or even grow organic crops. In the North-East, greenhouses are being constructed essentially as rain shelters to permit off-season vegetable production.

In India, protected cultivation technology for commercial production is hardly three decades old. In developed countries viz., Japan, Holland, Russia, UK, China and others, it is about two centuries old, China started protected cultivation in 1990's and today the area under protected cultivation in China is more than 51,000 ha and 90 per cent area is under vegetables, Israel is one country which has taken big advantage of this technology by producing quality fruits, vegetables, flowers, etc. in water deficit desert area.

The fruits and vegetables are missing in the diet of poor marginal Indian because of their overall shortage. Majority of farmers are not ready to shift their crop land to fruits and vegetable cultivation, hence under such condition poly houses can be the only answer for this. The poly house technologies are advanced in Israel, Holland, Spain, Italy, Kenya, South Africa, Japan and China. But unfortunately much neglected in India. India and Holland having more or less same land under flower cultivation but in world's flower export, Holland's contribution is 70% and India's contribution is just 1% or even less because of advanced technology of poly houses in Holland.

*Fig 1.1.4 Green House Establishment*

After the advent of green revolution, more emphasis is laid on the quality of the agricultural product along with the quantity of production to meet the ever-growing food and nutritional requirements. Both these demands can be met when the environment for the plant growth is suitably controlled. The need to protect the crops against unfavorable environmental conditions led to the development of protected agriculture. Greenhouse is the most practical method of achieving the objectives of protected agriculture, where natural environment is modified by using sound engineering principles to achieve optimum plant growth and yield. Poly house cultivation has become an important policy of Indian Agriculture. Our country is self-dependent on food grain production but to fulfill the nutritional security, the gap between increasing demand of horticultural produce has to be filled. This gap cannot be filled by the traditional horticulture which required large area under horticulture to increase the production for the ever growing population. Green house technology has potential to produce more produce per unit area with increased input use efficiency. Therefore, this problem can be coped up by adopting green /poly house technology for the horticultural production. For example, if one lakhs hectare area under vegetable cultivation is brought out under poly house cultivation the annual availability of vegetable will be increased by at least 100 lakhs tons. Besides this it will also increase the significant jobs opportunity for the skilled rural men, youths and rural women.

Total production of vegetables in India is next to China, but per capita availability of vegetables is much lower than required. The production of vegetable crops are to be increased to meet the demand of the ever growing population otherwise per capita availability of vegetables will further go down. There is lot of pressure on cultivable land caused due to industrialization, urbanization and expansion of the rural villages. Therefore, it is utmost necessary to improve the productivity of crops including vegetables by adopting intensive cultivation, hydroponics and poly house cultivation. By adopting poly house cultivation, the productivity of vegetable crops can be increased by 3-5 times as compared to open environment. Besides productivity, the better quality of produce is also obtained under poly house cultivation. This technology can be adopted by the rural youth for more income per unit of land.

**Advantages of greenhouse:**

The yield may be 10-12 times higher than that of our doorcultivation depending upon the type of greenhouse, type of crop, environmental control facilities.

- Reliability of crop increases under greenhouse cultivation.
- Ideally suited for vegetables and flower crops.
- Year round production of floricultural crops.
- Off-season production of vegetable and fruit crops.
- Disease-free and genetically superior transplants can be produced continuously.
- Efficient utilization of chemicals, pesticides to control pest and diseases.
- Water requirement of crops very limited and easy to control.
- Maintenance of stock plants, cultivating grafted plant-lets and micro propagated plant-lets.
- Hardening of tissue cultured plants
- Production of quality produce free of blemishes.
- Most useful in monitoring and controlling the instability of various ecological system.
- Modern techniques of Hydroponic (Soil less culture), Aeroponics and Nutrient film techniques are possible only under greenhouse cultivation.

## 1.1.5 What are the different crops can be grown under Greenhouse?

There is a great difference between the quality of crops produce grown in open cultivation and the greenhouse vegetables. It is recommended to grow vegetables and fruits in greenhouse where we have greater control over environment to control temperature, humidity, extend crop duration, achieve higher yield per crop cycle per ha unit of land, plan crop harvest cycle, reduce pesticide residue. However, if you are new to planting fruits and vegetables, how can you select which are the best vegetables to grow in the greenhouse? Here are the most common crops grown under Greenhouses for best results according to season, region and type of Greenhouse.

**• Leafy greens:**

Almost every other leafy vegetable grows in the same manner, especially when considering the bedding plants. Other than the basic knowledge, there is some aesthetic knowledge needed as well when growing leafy vegetables. They have varying tastes and colours. These can be a great source of income because of the great export potential and even domestic consumption of leafy greens is on increasing trend.

*Fig 1.1.5 Crop Cultivation in Green House*

- **Cucumber:**

*Fig 1.1.5 Crop Cultivation in Green House*

- **Tomatoes:**

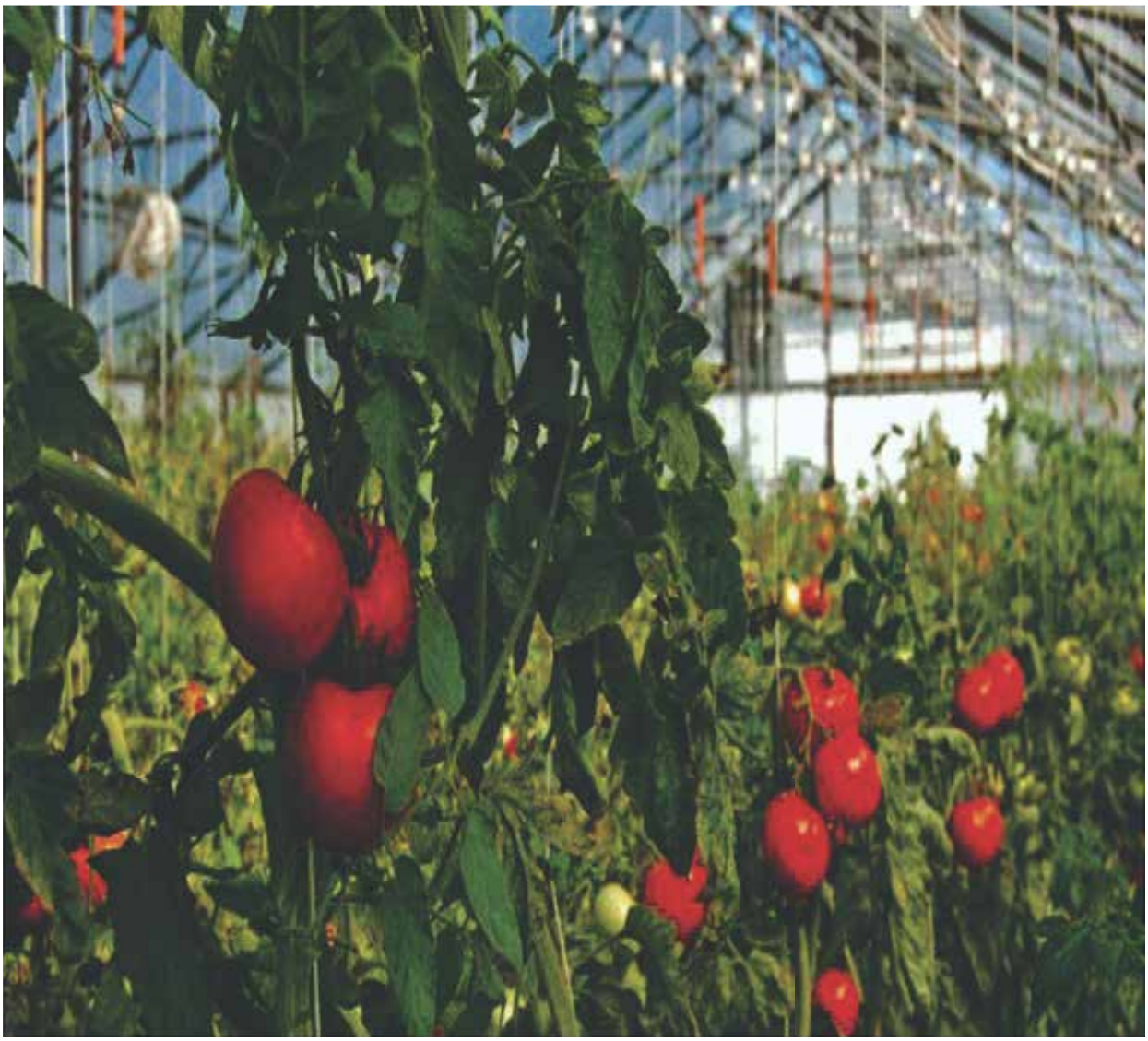


*Fig 1.1.5 Crop Cultivation in Green House*

- **Peppers:**

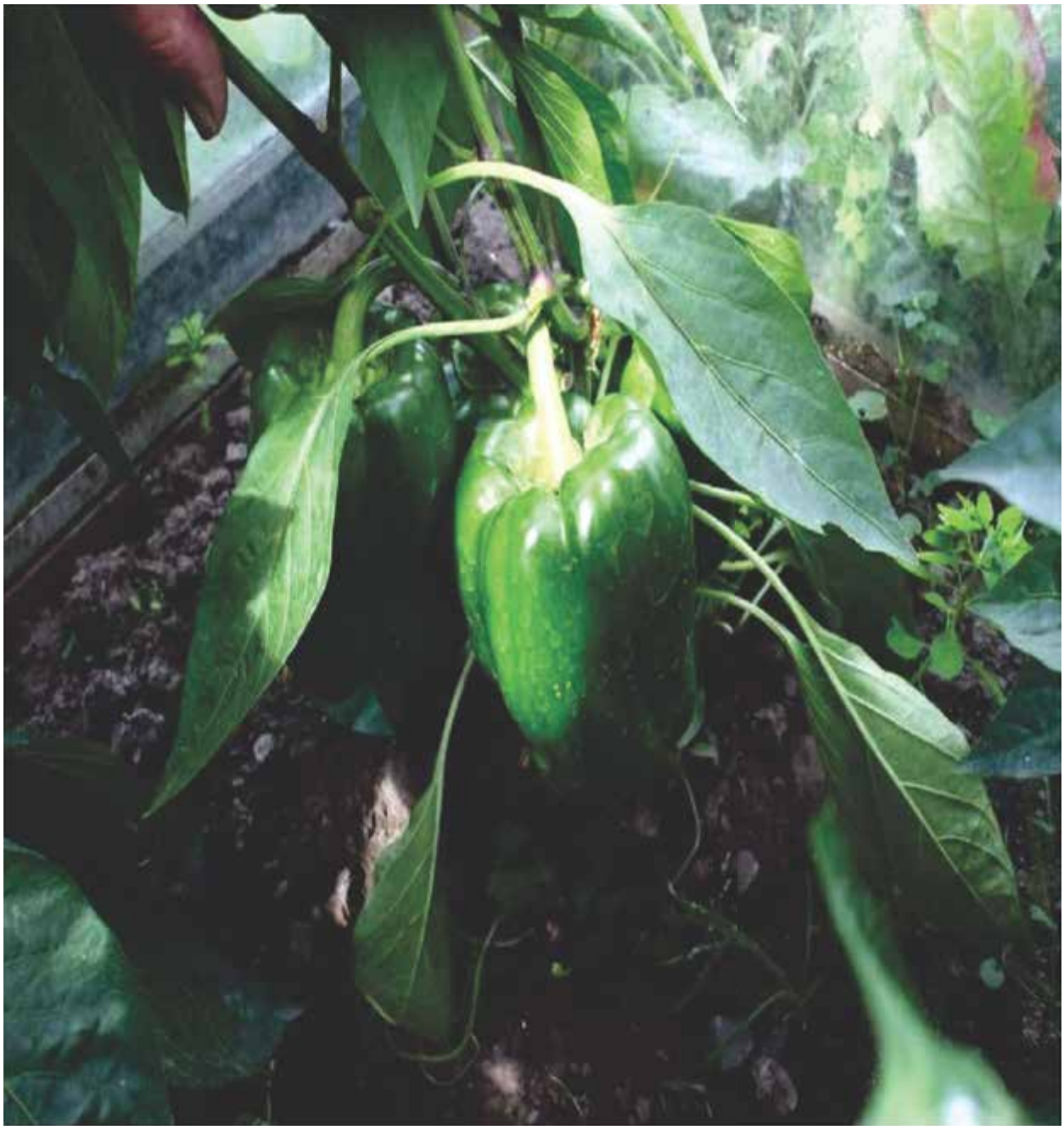


*Fig 1.1.5 Crop Cultivation in Green House*

- **Citrus fruits:**

You can grow a number of winter fruits in your greenhouse – these include sweet and sour, delicious looking melons, oranges and lemons. They have the ability to sustain even the coldest weather, so enjoy your winter evenings with juicy fruits.

*Fig 1.1.5 Crop Cultivation in Green House*

• **Grapes:**

Many do not know that the grapes can even be grown in the greenhouse – many free greenhouse plans can highlight details for you. You have to protect them from pests and take special care of the varieties like "black ham burgh" and "Buckland Sweetwater".

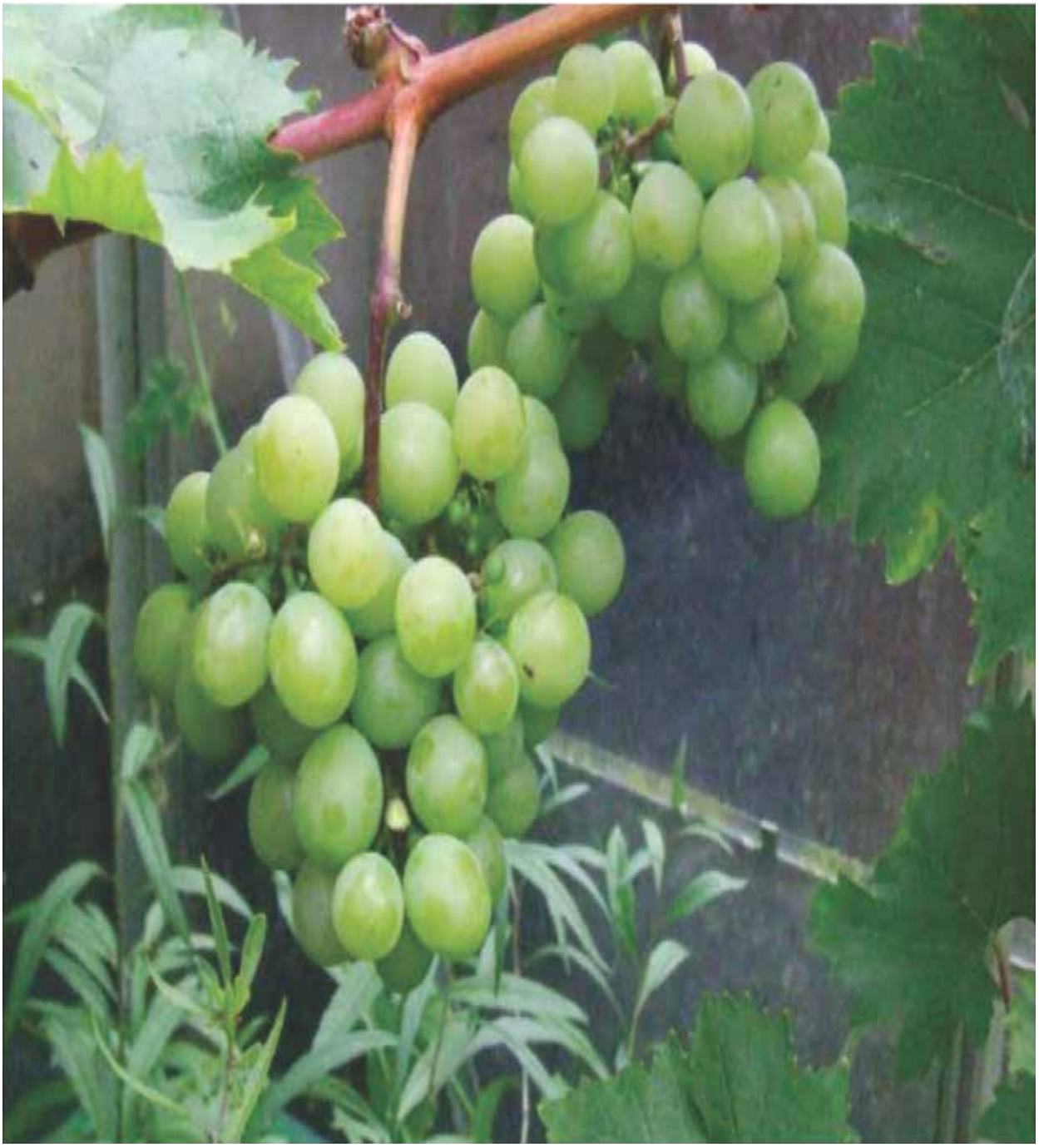


*Fig 1.1.5 Crop Cultivation in Green House*

**• Strawberries:**

Fill your greenhouse with tasty strawberries this season – you can grow whatever type you want. Just make sure you provide them with sufficient space and ventilation.

*Fig 1.1.5 Crop Cultivation in Green House*

- **Peaches:**

It is very important for a newbie to select the right kind of greenhouse fruits and veggies. For example, peaches are extremely good to grow in the greenhouses or small gardens. They are nourishing and simple to handle too.

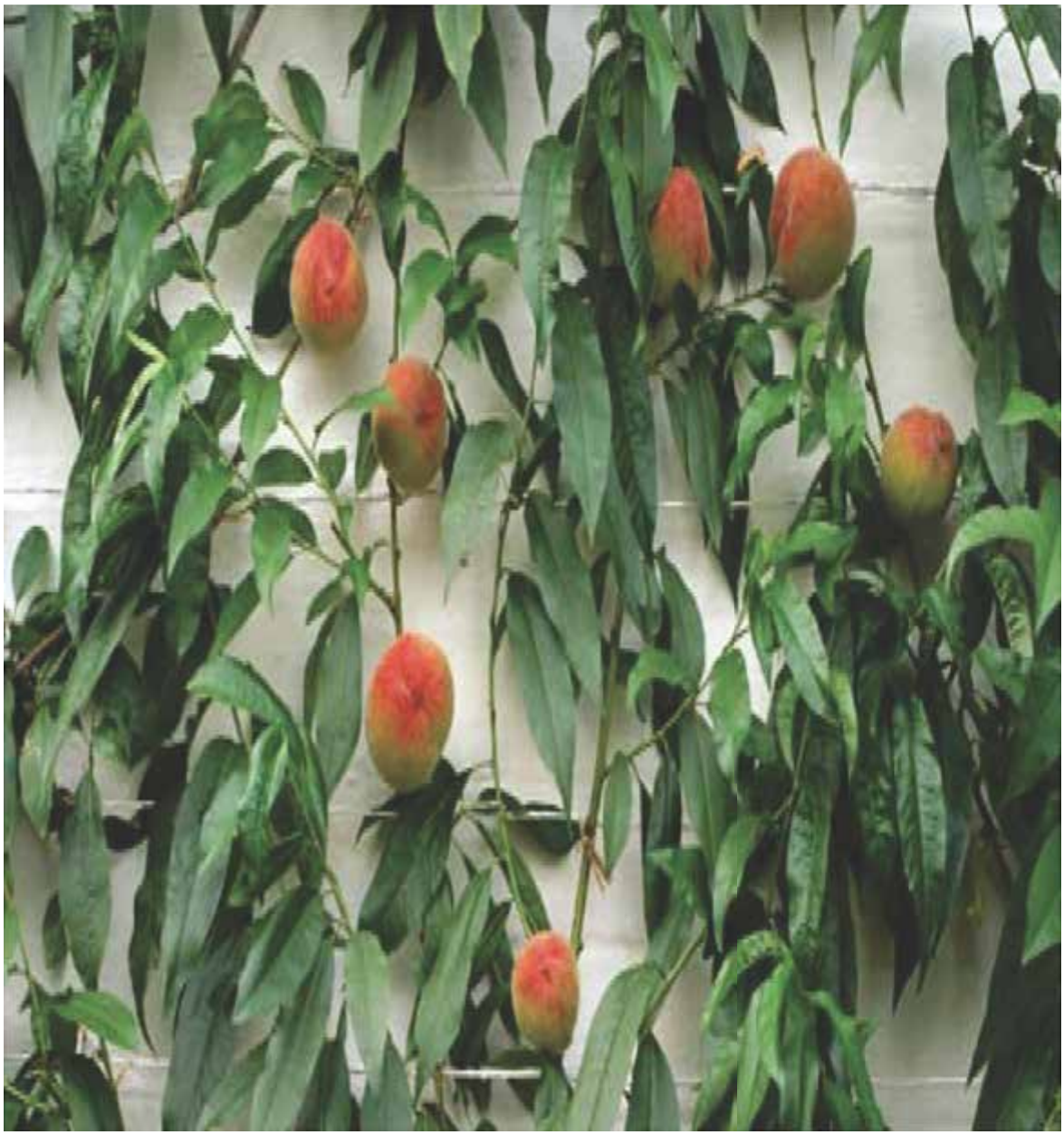


*Fig 1.1.5 Crop Cultivation in Green House*

**• Coriander:**

You cannot miss out the refreshing leafy vegetable, which is perfect topping for salads and soups. You simply need to pay attention while the plant is growing, as it requires proper aeration and water.

*Fig 1.1.5 Crop Cultivation in Green House*

- **Chilies:**

You can even keep a corner of the greenhouse to plant chilies – it can include green chilies and red ones too. It solely depends upon the kind of flavor you would like to have.

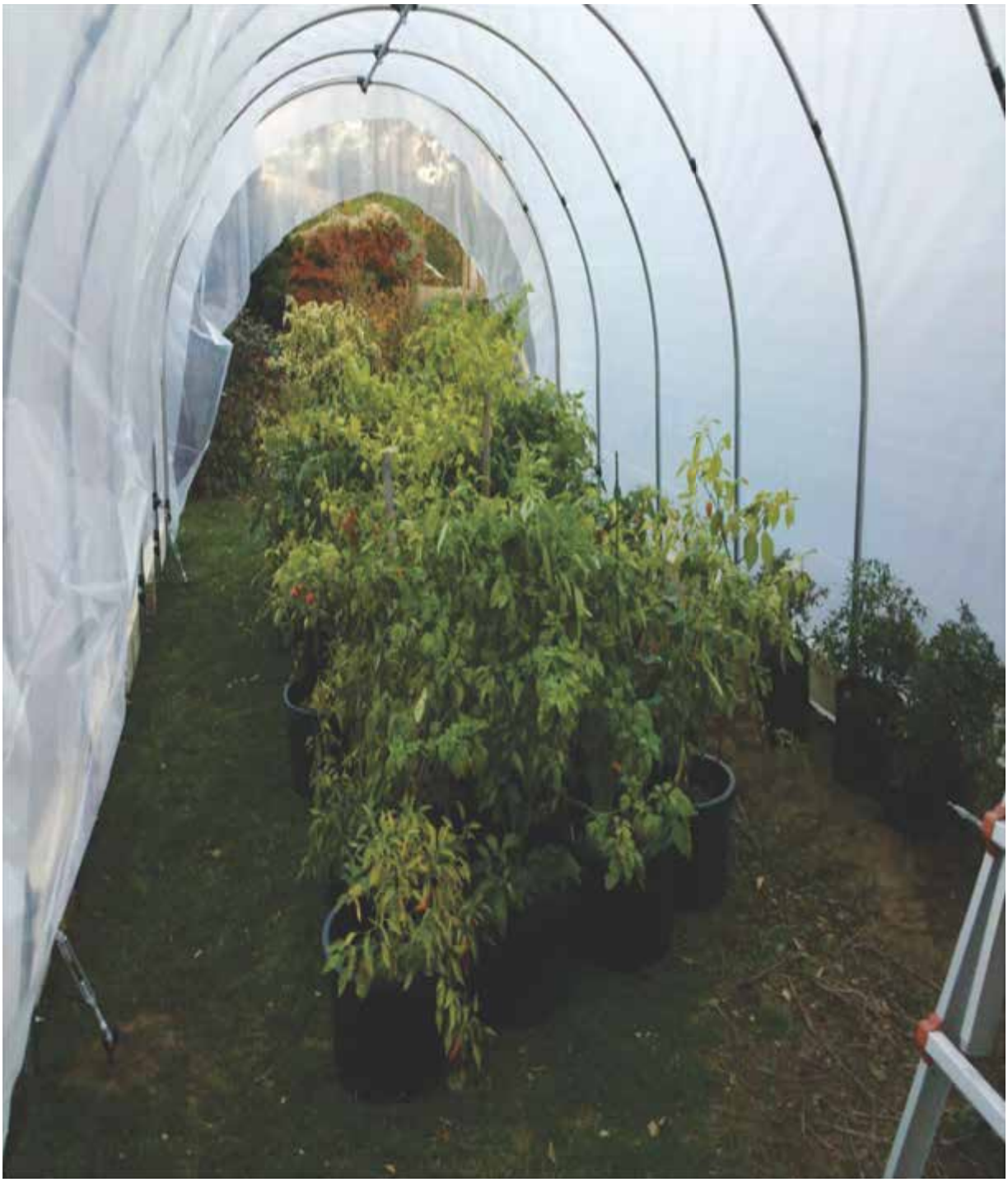


*Fig 1.1.5 Crop Cultivation in Green House*

**• Raspberries:**

You can actually do a very good business by growing raspberries – supply them to cake bakers and enjoy the money. In addition, they are so tasty that you can add as many in your delicious fruit salads and please the guests too. They are also ideal to blend with milk and have it in the form to shakes.

*Fig 1.1.5 Crop Cultivation in Green House*

## Exercise

1. Define Green house.

Answer: .....

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2. What is Green House Effect? Explain.

Answer:.....

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3. What are the importance of Green House Technology in India?

Answer:.....

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4. List out the crops which can be grown under Green House.

Answer:.....

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## Notes

# Unit 1.2: Different types Green house Structures

## Unit Objectives

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

- Understand the different types Greenhouse structures.
- Understand the importance of structural design.

## 1.2.1 What are different types of Greenhpuse suitable in India.

The design of Greenhouse has to be as per the climatic conditions of the particular region and should complement with natural environment to enhance growth and yield of the crops chosen specific to the region.

The design of the Greenhouse influences the micro environment inside the greenhouse which in turn has high impact on the crops.

Following are the factor which are controlled by Greenhouse:

- Humidity
- Temperature
- Light intensity
- Light diffusion

These environmental changes can be done inside by choosing the right type of Greenhouse. The factor which influence environmental control are Greenhouse height, Greenhouse build up area, greenhouse peripheral corridor, type of ventilation (top / Side), Curtain system, Fan and pad system, Top screen system, misting system, etc.

*Fig 2.1.1 Green House Structures in India*

**Types of Greenhouse:**

- **Saw Tooth Model**

*Fig 2.1.1 Saw Tooth Model*

- **Gothic type**

*Fig 2.1.1 Gothic type of Green House Structure*

- High tunnels


*Fig 2.1.1 High Tunnels*

- **Permanent Top Ventilated type**

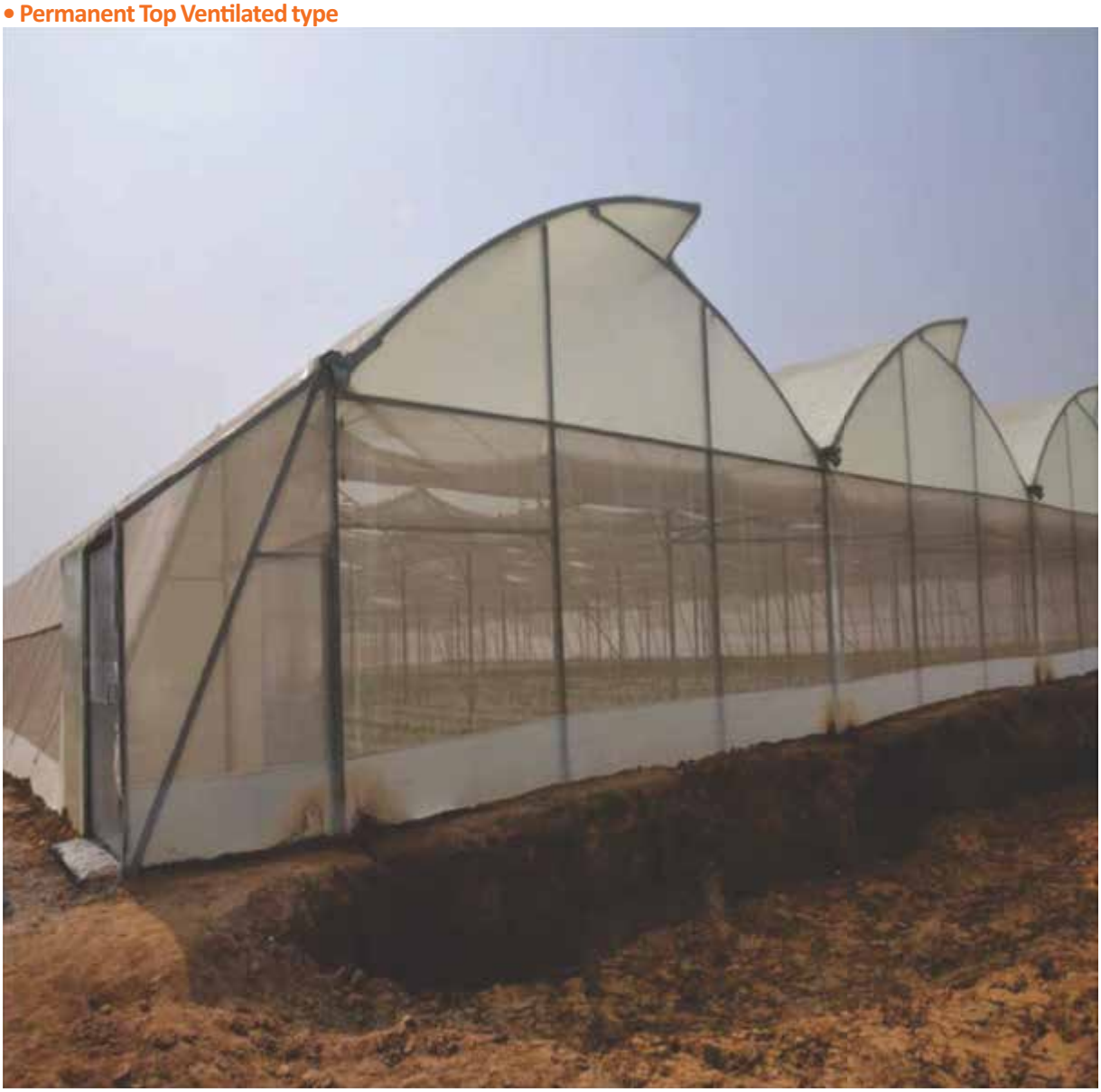

*Fig 2.1.1 Permanent top ventilated type Green House*

- **Designs and classification of greenhouse**

Greenhouses are frames of inflated structure covered with a transparent material in which crops are grown under controlled environment conditions. Greenhouse cultivation as well as other modes of controlled environment cultivation have been evolved to create favorable micro-climates, which favours the crop production could be possible all through the year or part of the year as required. Greenhouses and other technologies for controlled environment plant production are associated with the off-season production of ornamentals and foods of high value in cold climate areas where outdoor production is not possible. The primary environmental parameter traditionally controlled is temperature, usually providing heat to overcome extreme cold conditions. However, environmental control can also include cooling to mitigate excessive temperatures, light control either shading or adding supplemental light, carbon dioxide levels, relative humidity, water, plant nutrients and pest control.

### Classification of greenhouse based on suitability and cost

#### a) Low cost or low tech greenhouse

Low cost greenhouse is a simple structure constructed with locally available materials such as bamboo, timber etc. The ultra violet (UV) film is used as cladding materials. Unlike conventional or hi-tech greenhouses, no specific control device for regulating environmental parameters inside the greenhouse are provided. Simple techniques are, however, adopted for increasing or decreasing the temperature and humidity. Even light intensity can be reduced by incorporating shading materials like nets. The temperature can be reduced during summer by opening the side walls. Such structure is used as rain shelter for crop cultivation. Otherwise, inside
temperature is increased when all sidewalls are covered with plastic film. This type of greenhouse is mainly suitable for cold climatic zone.

#### b) Medium-tech greenhouse

Greenhouse users prefers to have manually or semiautomatic control arrangement owing to minimum investment. This type of greenhouse is constructed using galvanized iron (G.I) pipes. The canopy cover is attached with structure with the help of screws. Whole structure is firmly fixed with the ground to withstand the disturbance against wind. Exhaust fans with thermostat are provided to control the temperature. Evaporative cooling pads and misting arrangements are also made to maintain a favorable humidity inside the greenhouse. As these systems are semi-automatic, hence, require a lot of attention and care, and it is very difficult and cumbersome to maintain uniform environment throughout the cropping period. These greenhouses are suitable for dry and composite climatic zones.

#### c) Hi-tech greenhouse

To overcome some of the difficulties in medium-tech greenhouse, a hi-tech greenhouse where the entire device, controlling the environment parameters, are supported to function automatically.
Other classifications
The greenhouse can also be classified based on type of structures, type of glazing, number of spans, environmental control etc. The various types are as follows:
Classification as per type of structure

a) Quonset type
b) Curved roof type
c) Gable roof type

#### Classification as per glazing

a) Glass glazing

b) Fiberglass reinforced plastic glazing
   i. Plain sheet
   ii. Corrugated sheet

c) Plastic film
   i. Ultra violet stabilized low density poly ethylene
   ii. Silpaulin

### Classification based on number of spans

a. Free standing or single span
b. Multi-span or ridge and furrow or gutter connected

### Classification based on environmental control

a. Naturally ventilated
b. Passive ventilation

### Poly house

The crops grown in open field are exposed to vivid environmental conditions, attack of insects and pests, whereas the polyhouse provides a more stable environment. Polyhouse can be divided in to two types:

### a) Naturally ventilated polyhouse

These polyhouse do not have any environmental control system except for the provision of adequate ventilation and fogger system to prevent basically the damage from weather aberrations and other natural agents.
b) Environmental controlled polyhouse

This type of polyhouse helps to extend the growing season or permits off-season production by way of controlling light, temperature, humidity, carbon-dioxide level and nature of root medium.
Orientation of greenhouse.

The design of greenhouse should be based upon sound scientific principles which facilitates controlled environment for the plant growth. Controlled environment plant production systems are used widely throughout the world to produce plant materials and products at a time or place, or of a quality that cannot be obtained outdoors. Controlled environment agriculture requires far more capital investment per unit area than field agriculture and thus must essentially be correspondingly more intensive to justify investment costs. The greenhouse is a structure covered with a transparent material for admitting natural light for plant growth. The main components of greenhouse like structure, covering/glazing and temperature control systems need proper design for healthy growth of plants.

Under Indian conditions, Quonset type, multi-span greenhouse is most suitable, because of its low cost and ease of fabrication. Ultra violet resistant low density polyethylene (UVLDPE) single film cladding of 200-micron thickness is sufficient for Naturally Ventilated (NV) greenhouse and fan and pad (FP) greenhouses. This should be fully tightened by stretching on the structure to avoid flutter and tearing. It should not be nailed or screwed to the structure as it gives the chance for tearing. The T-Lock of LLock should be used for fastening the sheet at structure, as this does not tear the sheet and sheet replacement is easy.

**The structure has to carry the following loads and is to be designed accordingly.**

**a) Dead load:** weight of all permanent construction, cladding, heating and cooling equipment, water pipes and all fixed service equipments to the frame.

**b) Live load:** weights superimposed by use (include hanging baskets, shelves and persons working on roof). The greenhouse has to be designed for a maximum of 15 kg per square meter live load. Each member of roof should be capable of supporting 45 kg of concentrated load when applied at its center.

**c) Wind load:** The structure should be able to withstand winds of 110 kilometers per hour and at least 50 kg per square meter of wind pressure.

**d) Snow load:** These are to be taken as per the average snowfall of the location The greenhouse should be able to take dead load plus live load or dead load plus wind load plus half the live load.

The greenhouses are to be fabricated out of Galvanized Iron Pipes. The foundation can be 60cmx60cmx60cm or 30 cm diameter and one-meter depth in PCC of 1:4:8 ratios. The vertical poles should also be covered to the height of 60 cm by PCC with a thickness of 5cm. This avoids the rusting of the poles

**Orientation**

Orientation of the greenhouse is a compromise for wind direction, latitude of location and type of temperature control. Single greenhouses with latitude above 40°N should have ridge running east to west to allow low angle light to enter from side rather than ends. Below 40°N the ridge of single greenhouses should be oriented from north to south, since the angle of sun is much higher. This orientation permits the movement of shadow of the gutter across the green house. The location and orientation of the greenhouse should avoid falling of shadow on the adjacent greenhouses. To avoid the shading effect from one green house to another greenhouse these should be oriented East to West. However, the wind direction and latitude are also to be considered.

**Wind effects**

If the greenhouse is naturally ventilated, the advantage of natural wind direction has to be taken to the maximum possible. The maximum dimension (length) of greenhouse should be perpendicular to the wind direction especially in summer. For fan and pad greenhouse the natural wind direction should be same as the air blown by fan.

**Size of the greenhouse**

The dimension of NAV GH should not be more than 50m x 50m. Bigger the greenhouse, more will be the temperature build up due to poor ventilation. The length of evaporatively cooled greenhouse should not be more than 60m.

**Spacing between greenhouses**

The spacing between naturally ventilated green house should be 10 to 15 m so that the exhaust from one greenhouse should not enter the adjacent greenhouse.

### Height of greenhouse

The maximum height can be up to 5m for 50m x 50m green house and this can be reduced as per the reduced size of the green house. Higher is the greenhouse more is the wind load for structure and glazing. The side ventilation can be of 2 m width and roof ventilation is 1m in width.

### Structural design

The greenhouses are to be designed for necessary safety, serviceability, general structural integrity and suitability. The structure should be able to take all the necessary dead, live, wind and snow loads. The foundation, columns and trusses are to be designed accordingly. The greenhouse structures are to be designed to take up the loads as per design loads prescribed by the National Greenhouse Manufactures Association (NGMA of USA) standards –1994.

### Environmental factors influencing greenhouse cultivation

Plants need an optimum temperature for maximum yield and quality. The greenhouses in plain and coastal region of India needs cooling. The greenhouses in mild climates and coastal region can be naturally ventilated. The greenhouses for hot summer climates of northern plains have to evaporative cooled or with fan and pad (FP). The greenhouses for northern plains may require both cooling and heating depending on the crop.

### Natural ventilation

The greenhouse has to be thoroughly ventilated for control of temperature. It should be noticed that the temperature built up in the greenhouse is not exceeding 2°C throughout the year. Further during hot months, the temperature in the greenhouse was same as the ambient temperature.

## Exercise

1. Write a note on Different types of Green House.

Answer: ----------
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## Notes

# Unit 1.3: Roles and responsilities of a Greenhouse operator

## Unit Objectives

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

- Understand the different types Greenhouse structures.
- Understand Basic work discipline at Greenhouse.

## 1.3.1 Become a Greenhouse Operator.

Becoming a greenhouse operator takes a combination of industry experience, the proper skill set, and knowing where to look for a job. Below we've outlined what you'll need to succeed in a career as a greenhouse operator. We've also included helpful information for a greenhouse operator career, such as job description, job duties, a list of possible employers and much more.

### • Greenhouse Operator Job Description

Greenhouse operators are responsible for planning and directing the work activities of greenhouse staff. They must ensure that crops are propagated, grown and marketed properly and efficiently.

### • Greenhouse Operator Job Duties

a) Determine the types and quantities of plants to grow such as bedding plants, cut or potted flowers, vegetables and other plant varieties.
b) Operate and maintain various pieces of equipment such as water treatment machines, carbon dioxide generators and ultraviolet sterilizers
c) Supervise employees who plant, transplant, prune and feed plants
d) Identify and control problems being caused by insects, rodents, disease and nutritional deficiencies
e) Plan and develop irrigation systems
f) Perform basic maintenance and structural repairs to greenhouse

### • Who Hires Greenhouse Operators?

a) Greenhouse operators can be hired by any organization that grows flowers and other plants for commercial or retail purposes. These employers typically include:
b) Agricultural companies
c) Florists
d) Lawn and garden centres
e) Privately owned greenhouses
f) Service firms to agriculture
g) Supermarkets that operate seasonal greenhouses and nurseries

• **Skills Needed to Succeed as a Greenhouse Operator**

a) Strong interest in plants and working with plants
b) Manual dexterity can be helpful when dealing with plants and equipment
c) Lack of allergies to plants, pollen and various chemicals
d) Attentive to details
e) Industry specific knowledge and skills

• **Career Advancement for Greenhouse Operators**

a) Greenhouse operators typically begin their careers in entry-level positions and may work their way up to supervisory or management positions. With enough knowledge and experience, they may also start their own horticultural business.
b) Career advancement typically depends on the level of experience of the greenhouse employee, their attitude, and the availability of supervisory positions. Career

advancement opportunities beyond the greenhouse operator level are limited and typically require additional training in the areas of science and business.

• **Work Conditions for Greenhouse Operators**

a) Typically, the work conditions for greenhouse operators don't tend to vary all that much from one organization to another. Differences in working conditions can exist however, depending on factors such as what types of horticultural or agricultural products are grown, which season it is, and the size of the greenhouse or business operation.
b) Hours of work: The hours of work for greenhouse operators are often irregular, and days can be very long, particularly in the prime growing seasons of spring and summer.
c) Job hazards: Operating and repairing machinery and equipment can be quite hazardous in a greenhouse, as can working with chemicals and pruning or picking at heights in excess of five feet above the ground.
d) Work environment:Greenhouse operators typically work either in greenhouses, which can vary in temperature but are generally quite humid, or they can work in offices, which may or may not utilize climate control.

## Exercise

1. Write a note on Roles and responsibilities of a Green House Operator.

Answer: .....

## Notes

Skill India
कौशल भारत-कुशल भारत

सत्यमेव जयते
GOVERNMENT OF INDIA
MINISTRY OF SKILL DEVELOPMENT
& ENTREPRENEURSHIP

N·S·D·C
National
Skill Development
Corporation
Transforming the skill landscape

ASCI
Agriculture Skill Council of India

# 2. Operate and maintain various greenhouse components

Unit 2.1 - Green house components and its operations

Unit 2.2 Maintenance of greenhouse components

AGR/N1007

## Key Learning Outcomes

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

- Understand use and purpose of various Greenhouse components
- Learn to operate various Greenhouse components.
- Understand maintenance of Greenhouse components.

# Unit 2.1: Green house components and its operations

## Unit Objectives

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

- Understand various accessories components of Greenhouse.
- Under purpose and uses of various accessories and components of greenhouse components.

## 2.1.1 Greenhouse components and its operations

### ROOF

The angle (pitch) of the roof to the horizontal or radius of curvature of roof members is important for two reasons. Firstly, overall steep angles allow for fast runoff of rain and so allows for faster removal of debris and dust. Secondly, the design of split ventilated roofs: angles less than 15 degree has no advantage to create the hot air extraction ventilation effect at the top of the roof. It should be noted that gable roof designs tend to shorten the life span of the UV polyethylene plastic film cover by allowing flapping and abrasion to occur during windy and sunny periods when the plastic expands. In such environments, fastening of plastic tightly may be required on every truss or it may be better to use arch designs to avoid this problem. The use of ridged (clear) materials such as fiberglass reinforced plastics, acrylic or polycarbonate sheets would alleviate this problem.

Height of roof sides determines the height of the lowest part of the structure above the crop. This is important especially in hot humid conditions with average day temperatures >28°C. A temperature air buffer zone should be a minimum of 1.6m of height for open side structures and at least 3m for fully-protected structures. In situations where tall trellising crops, such as vining tomato, are grown, little or no buffer zone can be established, especially when the crop has reached maturity. This is even more problematic in indeterminate varieties of vining crops.

Height of roof sides determines the height of the lowest part of the structure above the crop. This is important especially in hot humid conditions with average day temperatures >28°C. A temperature air buffer zone should be a minimum of 1.6m of height for open side structures and at least 3m for fully-protected structures. In situations where tall trellising crops, such as vining tomato, are grown, little or no buffer zone can be established, especially when the crop has reached maturity. This is even more problematic in indeterminate varieties of vining crops.

The height of the centre of the greenhouse structure also determines the angle of slope of the roof as well as the efficiency of ventilation of split-roof designs. Tall structures in excess of 3m on the sides and 4m at the centre require a longer period of time to reach high temperatures in excess of 40°C and with generally a relatively small reduction in peak temperature. Increased height requires larger posts and more bracing, thereby increasing the cost of the structure.

## GUTTERING

Guttering is strongly recommended for use in greenhouse structures for the following reasons:

1. It prevents runoff from falling on the sides of the insect screen thereby reducing the build-up of algae and/or moss which can severely restrict ventilation.

2. It can serve as a water-harnessing mechanism for the collection of rainwater for irrigation.

3. It allows better drainage control of runoff from the roof to the drains thereby preventing water-logged conditions within and along the perimeter of the structure.

Generally, the minimum guttering size recommended is 15cm wide with a 10cm downpipe every 80cm$^2$. However, this can vary depending on the slope of the roof and the slope of the guttering along the structure (greater the slope the faster the runoff).

## GROUND COVER

For soil-grown production of vegetables (greenhouse floor used as growth medium), the greenhouse design should utilise a minimum of vertical support posts so as not to hinder

operations. Concrete or gravel walkways between rows in the greenhouse and between buildings not only facilitate the movement of materials but can improve sanitation by minimizing the tracking of contaminated soil or plant material into the greenhouse. However, this type of material absorbs excessive amount of heat and negatively impacts on the greenhouse environment.

For non-soil grown production (growth media in pots or bags) floors should provide a firm dry surface to support greenhouse activities and pedestrian movement throughout the greenhouse and surrounding outside perimeter. The floor should also facilitate a clean, weed-free environment. Floor design starts with a porous sub-base material such as unscreened gravel or crushed rock, the thickness depending on the drainage required and parent subsurface soil conditions (usually 10 to 15cm thickness will work in most cases).

Muddy conditions, or conditions where the site has a high water table or parent soil material that has a high clay content require more extensive excavation, filling or raising, to have a firm dry surface. The sub-base should be graded, rolled and/or compacted with a double cambered slope from along the centre length of the structure to the sides with a grade of 1 in 180 to 1 in 200. The sub-base should be prepared before erection of the structure and it is recommended that it be then covered with a layer of sand not exceeding a thickness of 5cm. This can then be covered with ground cover fabric or weed resistant material that is porous to water. It is not advisable to completely cast the floor in concrete as this material traps and retains heat within the greenhouse.

Doors should have a minimum width of about 82cm and a minimum height of about 2m so as to allow the free movement of personnel, equipment and materials required for all activities associated with crop production. The enclosed area between the two doors should be large enough to allow at least one person with a wheelbarrow to traverse between the two doors, with one door closed at all times. It is recommended that the floor between the double doors contain a foot bath of disinfectant to prevent dirty shoes from introducing pests or disease vectors.

## VENTILATION

The main challenge to greenhouse structures especially in the hot humid tropics at sea level or low altitudes is high temperatures. It is not uncommon to find internal temperatures reaching greater than 40°C by mid-morning. The solution to this problem is to find a cost-effective reliable design or intervention that facilitates the movement of hot air out of the structure and cooler air in.

The exchange of air within the internal environment with air from the external environment is defined as ventilation. One underlying factor that is important in any design for a greenhouse in tropical regions is the amount of vent area. For passive or naturally ventilated greenhouses, the roof vent area should be 20% of the floor area and located on the leeward side of the greenhouse.

Most completely-enclosed designs rely on passive ventilation for cooling and should have the following to maximise this:

- Split roof designs to force a pressure differential to extract the hot air at the top of the structure.
- High side walls in excess of 3m.
- Orientation of the structure so as to harness the maximum cooling benefit of the prevailing wind.
- Use of an appropriate mesh size that aids air flow through it while screening out harmful insects.

It is recommended that passive ventilated structures be oriented to harness the maximum cooling benefit of the prevailing winds. Also, a 100% air exchange per minute is needed for the internal temperature to be equal to that of the outside temperature. In some areas in the Caribbean at sea level, the wind flow is not consistent or strong enough for adequate ventilation and optimal conditions cannot be achieved using passive ventilation despite use of the best designs and features. It may be, therefore, practical to use larger meshes or remove mesh sections in certain parts (e.g. the roof vent mesh in split roof structures) or even have open sides at high temperatures. The adoption of the latter measures would be at the expense of increased pest and disease pressure

## FORCED VENTILATION

An alternative to passive ventilation, especially in large structures wider than 10m and longer than 22m, is the use of forced ventilation by the incorporation of extractor fans but this requires a source of reliable electricity which is generally costly in most areas of the Caribbean Region. Alternative sources of energy are solar, wind and hydro, but these technologies are initially very expensive to set up and are out of the reach of most producers. Since several greenhouses in the Region are located in areas away from the electric grid system, forced or artificial cooling is impossible. Ultimately, cost and sustainability become the major considerations. .

Extractor fan placement and structural orientation are dependent on design and dynamics of air movement in and out of the structure. It should be noted that louvered extractor fans move air from inside the structure to outside across the covering mesh. The size of the fan required depends on the size of the greenhouse and the rate of extraction needed while consideration needs to be given to additional structural support and bracing. Circulation fans move air from one part to another within the structure.

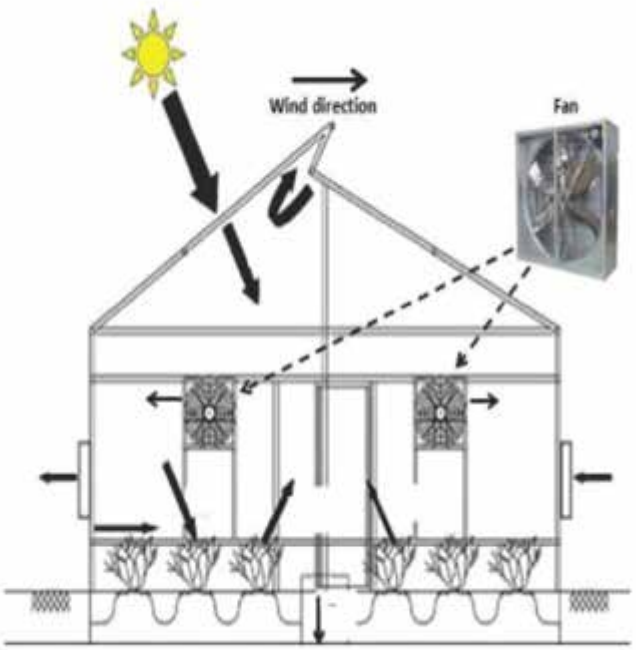


*Fig 2.1.1 Ventilation in Green House*

COOLING WITH MIST SPRAYS Most tropical greenhouse Greenhouse Operators face a continual battle with low humidity and high temperatures. Greenhouse plants can be seriously affected if the humidity drops below 30% so it is important to maintain an adequate humidity level of 50% to 70% in a greenhouse while higher humidity levels help to reduce the watering frequency of plants.

The use of misting systems is most beneficial and efficient in the dry periods of the year where the relative humidity is below 50% but the use of these systems depends on climatic conditions of the area and the access to affordable utilities. When the greenhouse is vented, essential moisture is lost, and plants are more likely to dry out and wilt. Misting systemswith fine nozzles are very effective at providing additional humidity because they pressurise water into aerosol particles of micron size and disperse them evenly into the greenhouse environment causing them to evaporate quickly and produce cooling. The downside to misting is that not all of the mist will evaporate, and water will collect on plants thereby providing an environment for diseases. The cost/benefit ratio should be carefully considered and it is important for Greenhouse Operators to determine what they want to accomplish with a misting system before purchasing one.

WATER SUPPLY Factors such as the type of crops being produced, area to be watered, light intensity, growing media and time of year, all influence the water requirements of a greenhouse operation. A typical greenhouse operation requires 800m$^3$ of water per 100m$^2$ of growing space per year. The irrigation system and pump need to be designed to deliver adequate water to individual plants during peak consumptive periods.

The main sources of water are:

1. Public utility water.
2. Surface, pond, spring (well) and river water.
3. Rain water.

Water from the water authority can be from three sources, namely, treated well water, river or pond (reservoir) water. The main treatment method by the water authority is chlorination but this is bad for most plants since chlorine damages the roots, hinders nutrient uptake by the plant and, usually complexes with nutrient constituents in fertilisers thereby making them non-absorptive. Therefore, chlorinated water should be left standing for 24 hours before being used for watering so as to allow the chlorine as a dissolved gas to be expelled. Additionally, the presence of dissolved salts can be seen as a white film deposit on green leaves and pots. Dissolved salts usually originate from two sources. The first, is dissolved minerals found in well water from the soil and ground rock and, the second, is from flocculating agents used in the filtration process by the water authority. This accumulation of deposits has a detrimental effect on plant health. Managing this problem most often requires a regular watering programme to keep the soil moist or, a complete flushing of the plant media once a month depending on the plant or crop or, complete washing of media prior to replanting and reuse of the media. Treatment will depend on the crop and the cropping system.

Another important water quality parameter is the concentration of micro-organisms common in many of the waterways and ponds. The high microbial water from these sources can predispose plants to various bacterial diseases when used directly for irrigation. Water from surface sources should also be tested for use and should be managed to meet optimum crop requirements. Necessary equipment and installation systems for filtration and disinfection are required to maintain water quality and efficient delivery to plants.

## FERTIGATION SYSTEM

Fertigation is by far the most popular method used to supply fertiliser feed to greenhouse plants. It involves applying fertiliser dissolved in the irrigation water directly to the root zone of each plant. Automation of the fertiliser delivery system will save time and money. Many Greenhouse Operators add fertiliser stock to the mixing tank by hand but this can be made

automatic through the use of timers, injectors, electronic valves and, electric pumps to supply the required operating pressure. There are several automatic fertigation systems available on the market and the Greenhouse Operator must check their specifications carefully before making a selection.

Plants growing directly in soils or in the various forms of artificial growing media may be fed using this method. Fertigation is an accurate and efficient method of applying nutrients and certain pesticides to the plant. The system must be maintained regularly to eliminate waste and reduce runoff. It is best to always use high grade material which will give the least residue, reduce waste, reduce blockage to lines, filters, drippers and other parts of the irrigation system.

## PLANT SUPPORT SYSTEMS

The most common internal structures are plant support systems in greenhouse crop production. The plant support systems are of two types, namely, stand-alone systems which are independent of the main greenhouse structure and, the integrated structures which are part of the main greenhouse structure.

The selection of a particular system is dependent on structural design and structural strength of the materials with which the greenhouse is constructed. Plant support systems consist of three levels of support, namely:

1) Primary level: This consists of those structural members on which the main cumulative loads of the system rest and include stanchions, posts and large cross braces.

2) Secondary level: The load distribution system where loads are borne in sections between primary level members. These include pulling wire (8 -10 guage galvanised wire), light cables (1cm diameter or less) and/or light small diameter (2.5cm or less) support bars. 3) Tertiary level: This consists of hooks, lines, nylon strings, clips, reels, clamps and/or other individual plant supporting mechanisms often suspended from the secondary support system and attached to the plant especially vining crops.

In addition to these, other specialised structures can be found in greenhouse crop production. These include independent low benches and plant supports that are used to support plant pots or grow bags and stems to facilitate air movement and to prevent contact of vining crop stems with the ground thereby stopping the establishment of secondary roots. These structures are common in indeterminate tomato production systems.

## MONITORING EQUIPMENT

Monitoring growing parameters in greenhouse production in the past required a range of individual instruments. These instruments can be grouped into two types, namely, those that

measure environmental conditions including light, carbon dioxide ($CO_2$), temperature and relative humidity (RH) and, those that measure soil pH, soil moisture and fertilizer parameters of soil pH and electrical conductivity (EC).

Technological advancement has led to one or a few instruments capable of measuring several parameters. For example, there are now dataloggers that function as a single instrument used to measure all the environmental parameters. These can be programmed as to the automatic timing of measurements and the information stored over a period of time. Digital soil moisture meters can be left in media for continuous monitoring. There are now irrigation/fertigation controllers and extractor fans that can be fully integrated with these units for continuous and complete environmental monitoring and control.

### Relative Humidity meter (Hygrometer)

- Greenhouse Operators should use this meter to adjust for the desired level of RH which should be between 50 and 70% since a high RH in the greenhouse can predispose plants to fungal disease.

- These meters can be digital or analog and are often paired with thermometers.

### pH meter

- Greenhouse Operators should invest in buying a good quality pH meter and regularly check the pH of the nutrient solution as well as the pH of the growing medium.

- Some pH meters are integrated with an EC meter.

- The degree of acidity in the growth medium and the nutrient feed solution is indicated by the pH which is measured on a scale of 0 to 14 (7 is neutral; less than 7 is acidic; and, more than 7 is alkaline).

### Electrical Conductivity (EC) meter

- An EC meter is used to estimate soluble salts in water which are measured by their electrical conductivity expressed as millimhos per centimeter (mmho/cm) or milliSiemens per centimeter (mS/cm). [Note: 1mmho/cm = 1000µmmos/cm = 1dS/m = 1mS/cm]. The total dissolved salts in the root zone affect nutrient absorption by plant roots.

- Measurement should be made of the nutrient feed solution and the root medium.

- The EC measurement alone does not indicate the types of fertilizer in the nutrient solution, but this measurement can provide a good indication of the total amount of fertilizer being applied. A root-zone EC of above 1.5mmhos/cm should alert Greenhouse Operators to salt build-up and whether the growing medium should be flushed.

### Light meter

- Inexpensive light meters are available for measuring the light intensity. The most common light meters are calibrated in foot candles (1ft cd =10.76lux). Foot candles should be measured at the growing level of the plants (Envirocept, 2013).

- The Greenhouse Operator should research his/her particular type of plant to find out what the optimum foot candles are for growth or propagation. Then the light level should be adjusted accordingly (by structural and design factors discussed previously in this chapter) so that the foot candles are correct at the growing level when measured with the light meter.

### Roof: transparent cover of a green house.

*Fig 2.1.1 Transparent roof of Green House*

**Gable: transparent wall of a green house**

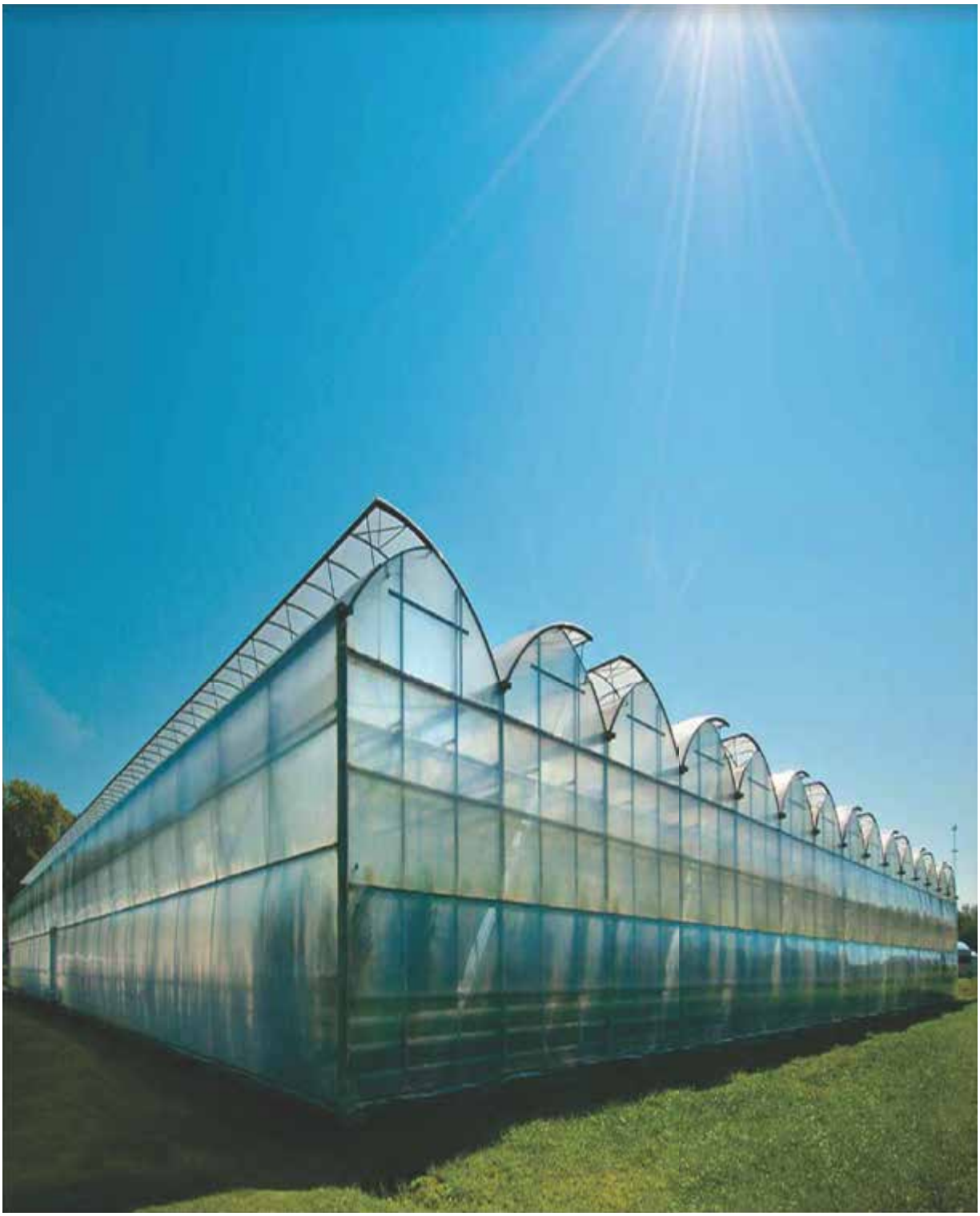

*Fig  Transparent wall og freen house*

**Gutter: collects and drains rain water and snow which is place at an elevated level between two spans.**

*Fig Drainage System*

**Column: vertical structure member carrying the green house structure**

*Fig Vertical Structure in Green House*

**Purlin: a member who connects cladding supporting bars to the columns**

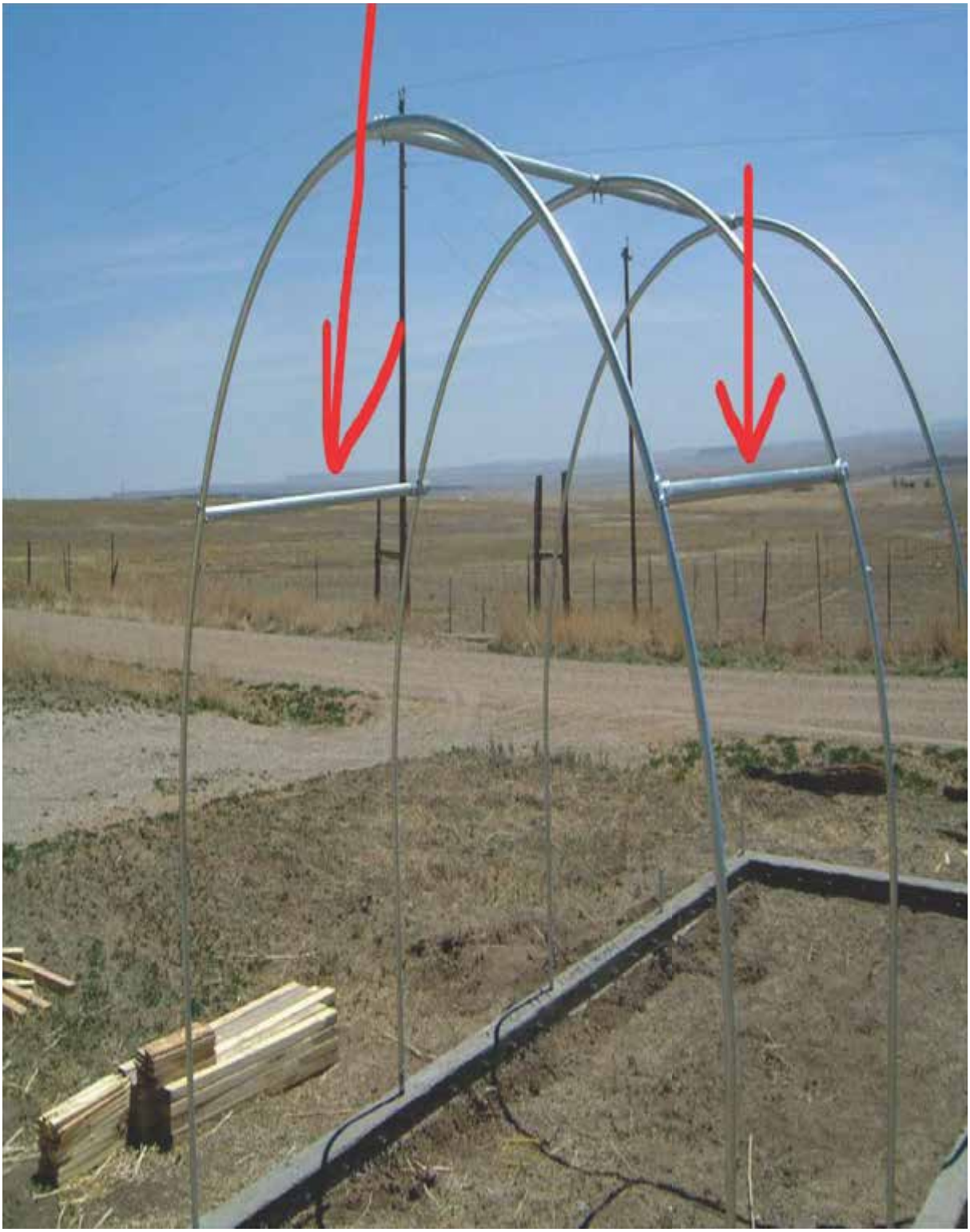

*Fig 2.1.1 Purlin in Green House*

**Ridge: highest horizontal section in top of the roof**

**Girder: horizontal structure member, connecting columns on gutter height**

**Bracings: To support the structure against wind**

**Arches: Member supporting covering materials**

**Foundation pipe: Connection between the structure and ground**

**Span width: Center to center distance of the gutters in multispan houses**

**Green house length: dimension of the green house in the direction of gable**

**Green house width: dimension of the green house in the direction of the gutter**

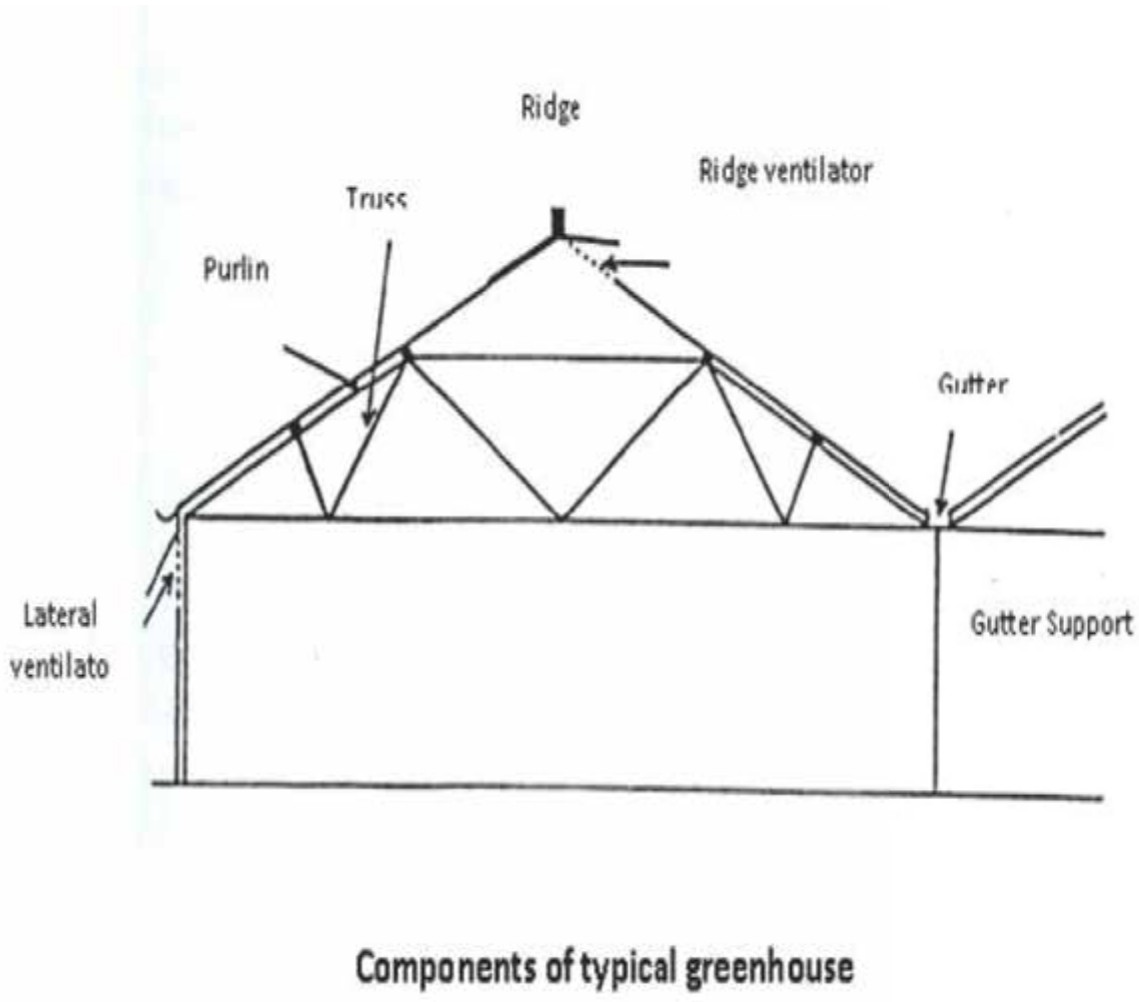


*Fig 2.1.1 Green House Components*

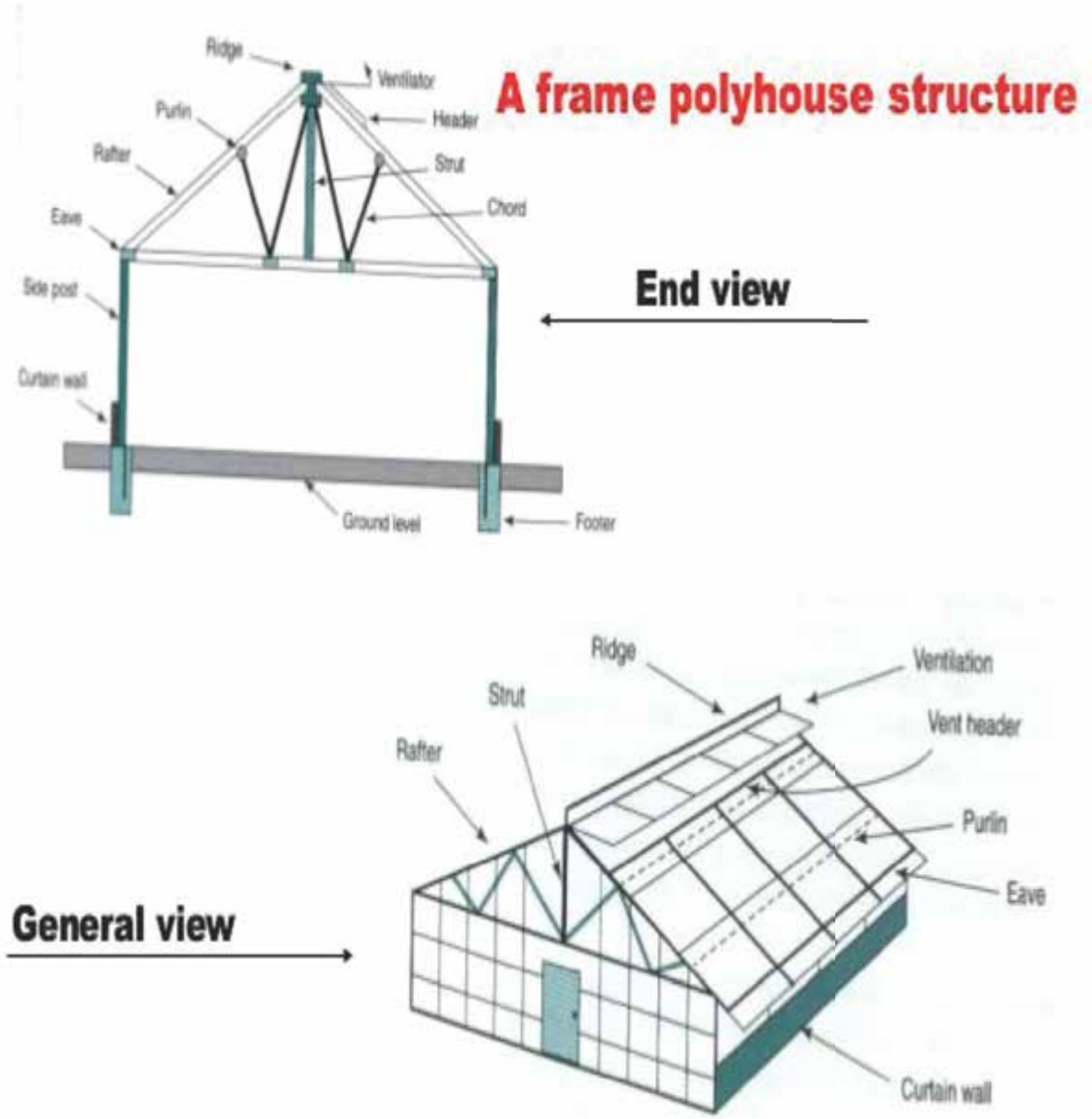


*Fig 2.1.1 Poly house Structure*

## Cladding material

Polythene proves to be an economical cladding material. Now long lasting, unbreakable and light roofing panels-UV stabilized clear fiber glass and polycarbonate panels are available.

*Fig 2.1.1 Poly House*

Plastics are used in tropical and sub-tropical areas compared to glass/fiberglass owing to their economic feasibility. Plastics create enclosed ecosystems for plant growth. LDPE (low density polyethylene) / LLDPE (linear low density polyethylene) will last for 3-4 years compared to polythene without UV stabilizers.

## Comparison of different kinds of covering materials

| Sl.No. | Type | Durability | Transmission | | Maintenance |
|---|---|---|---|---|---|
| | | | Light | Heat | |
| 1. | Poly ethylene | One year | 90% | 70% | Very high |
| 2. | Poly ethylene UV resistant | Two years | 90% | 70% | High |
| 3. | Fiber Glass | Seven years | 90% | 5% | Low |
| 4. | Tedlar coated Fiber Glass | Fifteen years | 90% | 5% | Low |
| 5. | Double strength Glass | Fifty years | 90% | 5% | Low |
| 6. | Poly carbonate | Fifty years | 90% | 5% | Very low |

*Table 2.1.1 Comparison between the different covering materials*

## Drip irrigation and fertigation systems in greenhouse cultivation

The plant is required to take up very large amounts of water and nutrients, with a relatively small root system, and manufacture photosynthesis for a large amount of flower per unit area with a foliar system relatively small in relation to required production.

*Fig 2.1.1 Drip Irrigation in Green House*

## Watering system

Micro irrigation system is the best for watering plants in a greenhouse. Micro sprinklers or drip irrigation equipment can be used. Basically the watering system should ensure that water does not fall on the leaves or flowers as it leads to disease and scorching problems. In micro sprinkler system, water under high pressure is forced through nozzles arranged on a supporting stand at about 1 feet height. This facilitates watering at the base level of the plants.

**Equipment required for drip irrigation system include**

a) A pump unit to generate 2.8kg/cm2 pressure
b) Water filtration system – sand/silica/screen filters
c) PVC tubing with dripper or emitters

**Drippers of different types are available**

a) Labyrinth drippers
b) Turbo drippers
c) Pressure compensating drippers – contain silicon membrane which assures uniform flow rate for years
d) Button drippers- easy and simple to clean. These are good for pots, orchards and are available with side outlet/top outlet or micro tube out let
e) Pot drippers – cones with long tube

**Water output in drippers**

a. 16mm dripper at 2.8kg/cm2 pressure gives 2.65 liters/hour (LPH).
b. 15mm dripper at 1 kg/cm2 pressure gives 1 to 4 liters per hour.

**Filters:** Depending upon the type of water, different kinds of filters can be used.

**Gravel filter:** Used for filtration of water obtained for open canals and reservoirs that are contaminated by organic impurities, algae etc. The filtering is done by beds of basalt or quartz.

**Hydro cyclone:** Used to filter well or river water that carries sand particles.

**Disc filters:** Used to remove fine particles suspended in water

**Screen filters:** Stainless steel screen of 120 mesh ( 0.13mm) size. This is used for second stage filtration of irrigation water.

**Fertigation system**

In fertigation system an automatic mixing and dispensing unit is installed which consists of three systems pump and a supplying device. The fertilizers are dissolved separately in tanks and are mixed in a given ratio and supplied to the plants through drippers.

*Fig 2.1.1 Fertigation in Green House*

## Fertilizer injectors

This device injects small amount of concentrated liquid fertilizer directly into the water lines so that greenhouse crops are fertilized with every watering.

### Multiple injectors

Multiple injectors are necessary when incompatible fertilizers are to be used for fertigation. Incompatible fertilizers when mixed together as concentrates form solid precipitates. This would change nutrient content of the stock solution and also would clog the siphon tube and injector. Multiple injectors would avoid this problem. These injectors can be of computer controlled H.E. ANDERSON is one of the popular multiple injector.

### Fertilizer Injectors

Fertilizer injectors are of two basic types: Those that inject concentrated fertilizer into water lines on the basis of the venturi principle and those that inject using positive displacement.

### A. Venturi Principle Injectors

- Basically these injectors work by means of a pressure difference between the irrigation line and the fertilizer stock tank. a. The most common example of this is the HOZON proportioner.

b) Low pressure, or a suction, is created at the faucet connection of the Hozon at the suction tube opening. This draws up the fertilizer from the stock tank and is blended in to the irrigation water flowing through the Hozon faucet connection.

c) The average ratio of Hozonproportioners is 1:16. However, Hozonproportioners are not very precise as the ratio can vary widely depending on the water pressure.

d) These injectors are inexpensive and are suitable for small areas. Large amounts of fertilizer application would require huge stock tanks due to its narrow ratio.

### B. Positive displacement injectors.

1. These injectors are more expensive than Hozon types, but are very accurate in proportioning fertilizer into irrigation lines regardless of water pressure.
2. These injectors also have a much broader ratio with 1:100 and 1:200 ratio being the most common. Thus, stock tanks for large applications areas are of manageable size and these injectors have much larger flow rates.
3. Injection by these proportioners is controlled either by a water pump or an electrical pump.
4. Anderson injectors are very popular in the greenhouse industry with single and multiple head models.
   - Ratios vary from 1:100 to 1:1000 by means of a dial on the pump head for feeding flexibility.
   - Multihead installations permit feeding several fertilizers simultaneously without mixing. This is especially significant for fertilizers that are incompatible (forming precipitates, etc.) when mixed together in concentrated form.
5. Dosatron feature variable ratios (1:50 to 1:500) and a plain water bypass.
6. Plus injectors also feature variable ratios (1:50 to 1:1000) and operates on water pressure as low as 7 GPM.
7. Gewa injectors actually inject fertilizer into the irrigation lines by pressure.
   - The fertilizer is contained in a rubber bag inside the metal tank.
   - Water pressure forces the fertilizer out of the bag into the water supply.
   - Care must be taken when filling the bags as they can tear.
   - Ratios are variable from 1:15 to 1:300.

8. If your injector is installed directly in a water line, be sure to install a bypass around the injector so irrigations of plain water can be accomplished.

## Exercise

1. What are the components of Green House?

Answer: .....

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2. Define Fertigation.

Answer: .....

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## Notes

# Unit 2.2: Greenhouse Operations

## Unit Objectives

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

- Understand various Greenhouse environmental controls.
- Learn important operations like land preparation, planting, weeding, irrigation, crop nutrition, pest control, protection of greenhouse and crops.

## 2.2.1 How to Maintain Greenhouse Components?

STRUCTURAL MANAGEMENT AND MAINTENANCE PRACTICES It is important that cleaning practices be carried out routinely to ensure maximum transmission of light through the roof and sides and maximum ventilation through the mesh sides. Besides choosing an appropriate structure, good surrounding environmental maintenance practices are also required. These include removal of trees, shrubs, vines, bushes and grass on and in close proximity to the greenhouse structure and continued maintenance of this environment to ensure the best ventilation conditions for the structure. This also aids in integrated pest management practices. Maintenance must also be carried out on the structure itself. This includes corrosion management and replacement of parts, bolts and or cables/wires so as to maintain the structural integrity and maximise the lifespan of the structure. It is also worthy to note that consideration should be given to scheduled cleaning, sanitation and maintenance activities to coincide with most difficult climatic conditions especially with respect to the occurrence of high temperatures. A critical decision will have to be made by the Greenhouse Operator as to the timing of sanitation and maintenance operations so that the crop harvest can be scheduled to take advantage of favourable market prices.

Proper greenhouse sanitation is a key component in reducing costs of managing pests and pathogens. Investing time and money in greenhouse sanitation is much less expensive than paying for repeated pesticide applications and crop losses associated with unsanitary conditions. Greenhouse sanitation aims to prevent disease and insect outbreaks since insects and pathogens easily enter greenhouses. It is critical to properly train anyone using the greenhouse to recognise pest and pathogen problems, and to understand what can be done to reduce their presence in the greenhouse. It also pays to recognise the major sources of greenhouse pests, including floors and benches, weeds, tools, containers, equipment, trash, clothing and, new plants that have been introduced into the greenhouse. The greenhouse floor is a major source of pests and pathogens many of which can survive in soil and residues for extended periods. In the greenhouse, many pathogens can spread to container-grown plants through splashed water, nozzles in contact with plant roots and growth media or, nozzles placed on the floor.

Proper sanitation starts with maintaining a clean workspace with chemically sterilised benches. Establishing an area away from the benches for storing dirty containers and 25 tools helps ensure that items get cleaned again before using. Keeping plants on benches rather than on the floor helps keep the plants from becoming contaminated.

All equipment, including potting containers and tools require steaming, washing or chemical sterilisation before use. The greenhouse's irrigation system requires periodic cleaning so as to make sure that fresh, clean solution comes into contact with the plants. Use of chlorine dioxide applied over the course of two nights offers a solution for both irrigation systems and all surfaces in the greenhouse. Copper ionisation offers another method of controlling algae and pathogens in the irrigation system.

## STORM PREPARATION GUIDELINES

Since high winds from Storm can be a major risk, greenhouses are designed so that the wide insect mesh side covers can come away from the building before causing any damage to the framework.

### Six months pre-Storm:

1. Construct buildings according to codes and regulations for Storm wind loads.
2. Schedule maintenance for equipment used during Storms, such as adding stabilisers to fuel generators.
3. Develop a written plan of pre- and post- Storm responsibilities and job descriptions for personnel.

### Two to six months pre-Storm:

1. Clean ditches and grade areas for drainage.
2. Prune permanent trees to reduce wind resistance.
3. Provide for portable water storage.
4. Tie down portable buildings.

### One to two days pre-Storm:

5. Irrigate plants and remove water from reservoirs.
6. Remove plants from benches.
7. Fill fuel tanks and fill sprayers with water.
8. Print out payroll, plant inventory, fertiliser and pesticide inventory.

### Within one-day pre-Storm:

9. Secure items such as small portable trailers and substrate mixing equipment; position portable generators.
10. Dismantle irrigation risers; remove greenhouse plastic and shade cloth.
11. Turn off natural and propane gas, water and electricity.

## Exercise

1. Write a note on maintenance of Green House Components.

Answer: .....

## Notes

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# 3. Manage greenhouse operations

Unit 3.1 - Green House operations
Unit 3.2 - Monitoring and ducumentation of Green House Operations

AGR/N1008

## Key Learning Outcomes

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

- Understand various Greenhouse environmental controls.
- Learn important operations like land preparation, planting, weeding, irrigation, crop nutrition, pest control, protection of greenhouse and crops.
- Understand definition of crop planning, crop seasons, crop cycle, harvest management.
- Understand marketing of produce.
- Learn book keeping, basic cost management, and farm operation record keeping.

# Unit 3.1: Greenhouse Operations

## Unit Objectives

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

- Understand various Greenhouse environmental controls.
- Learn important operations like land preparation, planting, weeding, irrigation, crop nutrition, pest control, protection of greenhouse and crops.

## 3.1.1 Introduction

Controlling a crop's environment to target optimum plant growth accounts for approximately 90% of the yield. Greenhouse Operators need to manage the key environmental factors in a timely and economic manner to achieve maximum yields and reduce plant stress. Many greenhouse operators rely on controlling these factors with the aid of automation.

### LIGHT

Important aspects of light relative to plant growth are its intensity, duration and quality. Intensity is brightness, duration is how long it lasts (photoperiod) and, quality is the wavelength of the light (photosynthesis uses light of wavelength 400-700nm).
The amount of light (photosynthetically active radiation, PAR) required and the use of the light by the plant for photosynthesis depend on the type of crop grown, the crop stage of growth and other environmental and plant factors. Generally, increasing energy in the PAR range increases the plant photosynthesis up to a point. The cumulative amount of PAR received by the plant over a day period is known as the Daily Light Integral (DLI) and is a function of both PAR amount and time.
Plants generally utilise morning light more effectively, as their metabolism is most active during the mornings. Although it is assumed not to be a problem in the tropics, low light intensity within greenhouses has contributed significantly to loss of production. Adequate light might be available outside of the greenhouse but is often insufficient inside the structure because of the following:

- Dirty roof cover.
- Use of incorrect plastic film covering.
- Use of incorrect shade netting.
- Overcrowded beds (plant density too high).
- Objects casting shadows on the greenhouse.

Light quality may be improved in the greenhouse through the use of reflective material such as white side netting, white grow bags and white ground cover. When supplemental light is used, it must be of the right intensity (brightness).

Contrary to popular belief, red and blue light have the greatest effect on plants. Green light has the least effect on plants and as such is reflected; it is this reflected light that gives plants their green colour.
Periods of uninterrupted darkness promote flower production (process known as photoperiodism) in many plants. Hence it is important that farmers understand that plants also need uninterrupted periods of darkness. Plants may be placed into three groups, depending on their flowering response to the duration of darkness, namely, short-day plants, long-day plants and, day-neutral plants. Some species of plants such as strawberry can show all three responses depending upon variety.

## TEMPERATURE

High ambient temperatures present the greatest problem to tropical greenhouse vegetable production. Temperature affects the productivity and growth of a plant, the extent of the effects being dependent on whether the plant is adapted to warm or cool season. If temperatures are high and days long, cool season crops such as broccoli and cauliflower will bolt. Both day and night temperatures influence plant vigour, leaf size, leaf expansion rate, and time to fruit development. Under low night temperatures, the rate of leaf growth is slower, and leaf size is reduced in young plants. Day and night temperatures should be carefully monitored. A general rule of thumb for most horticultural crops is for night temperatures to be approximately 7°C lower than day temperatures.

High temperatures in excess of 30°C to 35°C will cause many different types of damage to plants, such as inhibition of growth and even death. The physiological nature of heat damage is thought to involve a denaturation of some protein component of plant cells. Fruit abortion may occur at these temperatures as well. Temperatures lower than optimum will alter the plant metabolic systems, slow growth and, hinder fruit set.

In warm season crops such as tomato and sweet pepper, if temperatures are too high or too low, fruit set is hampered as pollen grains lose their viability. During the warmer dry months when plants are stressed, plants may drop fruits, or if fruit embryos are not properly formed, the plants will develop mal-formed fruit. Bitterness in lettuce can be caused by high temperatures.
Plants produce their maximum yield when exposed to day temperatures 5.5-8o C higher than night temperatures.

Photosynthesis must exceed respiration for growth of the plant to take place because when respiration exceeds photosynthesis, the plant is using food faster than the rate at which food is being manufactured. The temperature of the air, the type of growing medium and, irrigation water directly affects the temperature of the plant.

Efforts to reduce heat in tropical greenhouses often also result in a reduction of light intensity within the structure. Indeed, it is very difficult to separate light from heat since heat is the infra-red component of light.
In order to reduce the temperature within a greenhouse, a mist or fog system could be employed. This system is based on spraying water as small droplets (droplet diameter of 2–60mm) with high pressure nozzles. Cooling is achieved by evaporation of droplets. Fogging can also be used to increase the relative humidity as well as cooling the greenhouse. A combination of forced ventilation and fogging system can be used for cooling greenhouses.

High pressure nozzles of uniformity distribution coupled with fans placed at both ends can achieve the required cooling demand. Air temperature and relative humidity of 28$^{o}$C and 80%, respectively, can be maintained with the combination of forced ventilation and fogging.

## WATER

There are two main parameters which determine the quality of water, namely, pH and electrical conductivity (EC). Generally, the optimum pH range is 5.2 to 6.8 for most plants.

EC is a measure of the total dissolved salts in the irrigation water. Water used for irrigation should have an EC of less than 1.5mmhos/cm (mS/cm). The EC varies with age and type of plant and should be ≤0.6mmhos/cm for germinating seeds or rooting cuttings and ≤1.2mmhos/cm for general plant growth.
Water helps to maintain turgidity within the individual cells, and also to keep the plant erect; lack of water in this manner causes flaccidity within the cells, ultimately resulting in wilting of the plant and over an extended period, the eventual death of the plant. Water acts as a solvent for minerals moving in the plant and for manufacturing carbohydrates that are translocated to the storage organs.

Greenhouse crops require a very good source of high quality water. Water with high levels of soluble salts is not suitable for greenhouse vegetable production. For instance, high pH, calcium and bicarbonate levels in water limit growth, clog nozzles and, cause spots on leaves.

All water selected for use within the greenhouse environment must be tested for the presence of nutrients, soluble salts and some organic toxins. Water with an EC of 0.8mmhos/cm or less is considered of good quality. If the EC is higher than 0.8mmhos/cm, special management practices are required.
The alkalinity or the measure of the dissolved carbonate, bicarbonates and hydroxides in the irrigation water, must be taken into account as this feature of the water will help to determine the availability of fertilisers as well as the efficacy of several pesticides, growth stimulants, etc., used with the crop.

## ALKALINITY IN WATER

Alkalinity is the ability of the water to change the pH of the growing media and is a measure of the total carbonates ($CO_3^{2-}$), bicarbonates ($HCO_3^-$) and hydroxyl ions ($OH^-$). To correct for high alkalinity in irrigation water, the following actions are necessary:

- For $CaCO_3$ content greater than 480ppm, use reverse osmosis.
- For $CaCO_3$ content of 180-480ppm, use acidification.
- For $CaCO_3$ content of 120-180ppm, use acidic fertilisers.
- For $CaCO_3$ content of 40-120ppm, use neutral fertilisers.
- For $CaCO_3$ content less than 40ppm, add alkalinity and use basic fertilisers. [Note: 1meq/L alkalinity = 50ppm $CaCO_3$ or 61ppm $HCO_3^-$].

Water within the air surrounding the plant canopy must also be taken into account due to the effect that it has on the plant. The Relative Humidity (RH) is expressed as a percentage (%) and is calculated by dividing the amount of water in the air by the amount of water the air could hold at constant temperature and pressure.
Warm air can hold more water vapour than cold air; if the amount of water in the air is constant and the temperature increases, the RH will decrease. Water will move from an area of high RH to an area of low RH and, the greater the difference in RH between the two areas, the faster the movement. The optimum RH range for greenhouse crops is generally 50-70%.

RH is measured using a hygrometer; the moisture content of the growing media is measured with a tensiometer; and, levels of evapo-transpiration from the crop is measured with a lysimeter.

## GROWING MEDIA

The growing medium is a very important part of the production system. The growing media within the Caribbean Region's greenhouses range from soil, organic matter mixes, non-soil media, combination of several non-soil mixes and, water as used in NFT hydroponics. Some
Greenhouse Operators are now growing in non-soil media due to problems with soil such as nematodes, soil pathogens, poor drainage and pH-related issues.
The transition to soilless media is relatively slow due to the high cost, limited availability of most non-soil media and, the unforgiving nature of these media when compared with soil. Some advantages of using

### soilless media are as follows:

- Lower incidence of root diseases.
- Greater control of the root zone.
- Ease of disinfection.
- Ability to grow on marginal lands.
- Higher quality produce.

### Irrespective of the kind of medium selected, it should have the following characteristics:

- Good aeration and drainage.
- Free from material having sharp edges.
- Free from pathogens. o Free from harmful chemicals.
- Have a low EC.
- Have a near neutral pH.
- Have a good Cation Exchange Capacity (CEC). This refers to the media's ability to hold nutrients having a positive charge, such as $NH_4$, Ca, Mg and K. The term "buffering capacity" is often used interchangeably with CEC. It refers to the ability of the media, as a result of its CEC, to resist changes in pH and nutrient levels.

Commonly available growing media materials include: coir, perlite, sand, peat, rockwool, sawdust, several combinations of the above and water (hydroponics).

## COIR

Coir is made from coconut fibre and is the most popular growing medium being used by farmers.
The physical properties of coir include:

- High water holding capacity of 70-80%.
- High lignin, making it suitable for microbial decomposition.
- Good re-wetting capacity.
- High CEC.
- High EC.
- High carbon/nitrogen ratio (C/N) of 80:1. o pH of 4.5-5.8.

Coir may have high initial levels of sodium and chlorine which require leaching (flushing) before use. Coir will absorb large amounts of nitrogen from the fertilizer feed during the early phase of its decomposition and the Greenhouse Operator must compensate for this loss by using more nitrogen in the fertiliser feed or by supplemental foliar applications of nitrogen.

pH and EC meters are used to assist in the preparation of coir as a growth medium. Coir may be purchased loose or in a dried compressed form. The loose form is very bulky and presents a challenge for the transportation of large volumes; the compressed form is transported more easily but requires a considerable amount of work and water to hydrate the bags.

Since coir holds up to 80% water it is imperative that drainage holes are cut in the bags. Coir lay-flat bags should have slits in the sides approximately 2.5 to 4cm from the base, the slits corresponding with the plants established in the bag, that is, one hole per root zone area. If additional drainage is required, drainage holes may be carefully punched directly in the bottom of the bags. All grow bags, pots, continuous troughs, etc., must be isolated from the underlying floor using an appropriate ground covering material. Isolation is most important when dealing with contaminated or infested soils and hot surfaces such as concrete.

Applying nutrients to the uncovered surface of coir will cause the growth of algae which appears as an impermeable thick crust on top of the medium. This reduces percolation of water and nutrients to the roots of the plant. Greenhouse Operators using sprayer stakes in containers are at a higher risk of causing this condition. To reduce this algae growth, nutrients should be applied at least 1.3cm below the surface of the growing medium; drip pegs, drip stakes and subsurface irrigation can be used to accomplish this exercise.

## PERLITE

Several plants are well-adapted to growing in perlite contained in bags, troughs and pots. Perlite is made from volcanic rocks heated to very high temperatures of about 982o C until they expand to form white light fluffy "popcorn-looking" particles made up of closed air-filled cells. Perlite possesses large pore, good aeration, is light-weight and, holds water loosely to its outer surface. It is chemically inert, has a negligible CEC and a near neutral pH of 7.5. Particles of perlite can range from small (1mm) to large (8mm). The Greenhouse Operator must select the perlite of the required size based on the anticipated use. As perlite ages, it disintegrates into progressively smaller particles. Perlite should be washed with bleach or hydrogen peroxide as a sterilisation agent.

After a crop cycle, perlite accumulates debris from crop residues that must be removed from the system. Providing there is no contamination of the perlite, it can be re-used for several years. Sterilisation and solar treatment to kill pathogens in perlite helps to increase the active life of the product.

Algae growth and build up can also be present within the perlite medium, the level of growth and build up being directly related to the amount of nutrient that is exposed to sunlight. If the perlite is applied too thinly, less than 10cm deep, then sunlight will penetrate it and get to the nutrient film on the surface of the channel resulting in the growth of algae.

Trials using a mixture of coir and perlite at various ratios can give favourable results. Perlite and coir mixes provide large pore spaces that allow quicker penetration of nutrient solution throughout the substrate. This facilitates lateral movement of the solution into the pores of coir, resulting in a more uniform wetting.

The dust inhaled from dry perlite, especially when new, is bad for health and a respirator or dust mask should be used when handling the product. Periodical wetting of the material with a fine spray of water will help to reduce the dust.

## ROCKWOOL

Rockwool is an inert porous, sterile product made from rocks heated to high temperatures and formed into fibres. The fibers are then made into slabs. Rockwool is slightly alkaline, has a very low CEC and, holds water relatively well. Rockwool slabs are usually 7.6cm x 15.2cm x 92cm appearing as lay-flat grow bags. The bags are re-usable up to three crop cycles providing they were not contaminated by root pathogens. Extended use (up to six years) may be gained by

steam treatment and re-wrapping. Rockwool is very expensive and even its disposal incurs further cost. Common mistakes encountered with the use of container-grown plants include:

- Direct radiation from the sun causes overheating of the container.
- Salt accumulation when root zone not sufficiently leached.
- Root death due to oxygen deficiency under over-watering especially under hot conditions.

### Layout of bags of growing media

Leachate from lay-flat bags is allowed to drain into the walkways (furrows) or directed to the centre of the bed where it is drained to the exterior exterior; the latter being the better option. The drained solution should not be allowed to run to waste, as it still contains fertiliser nutrients which can either be re-circulated to the greenhouse crop or collected and re-distributed to open field cultivation.

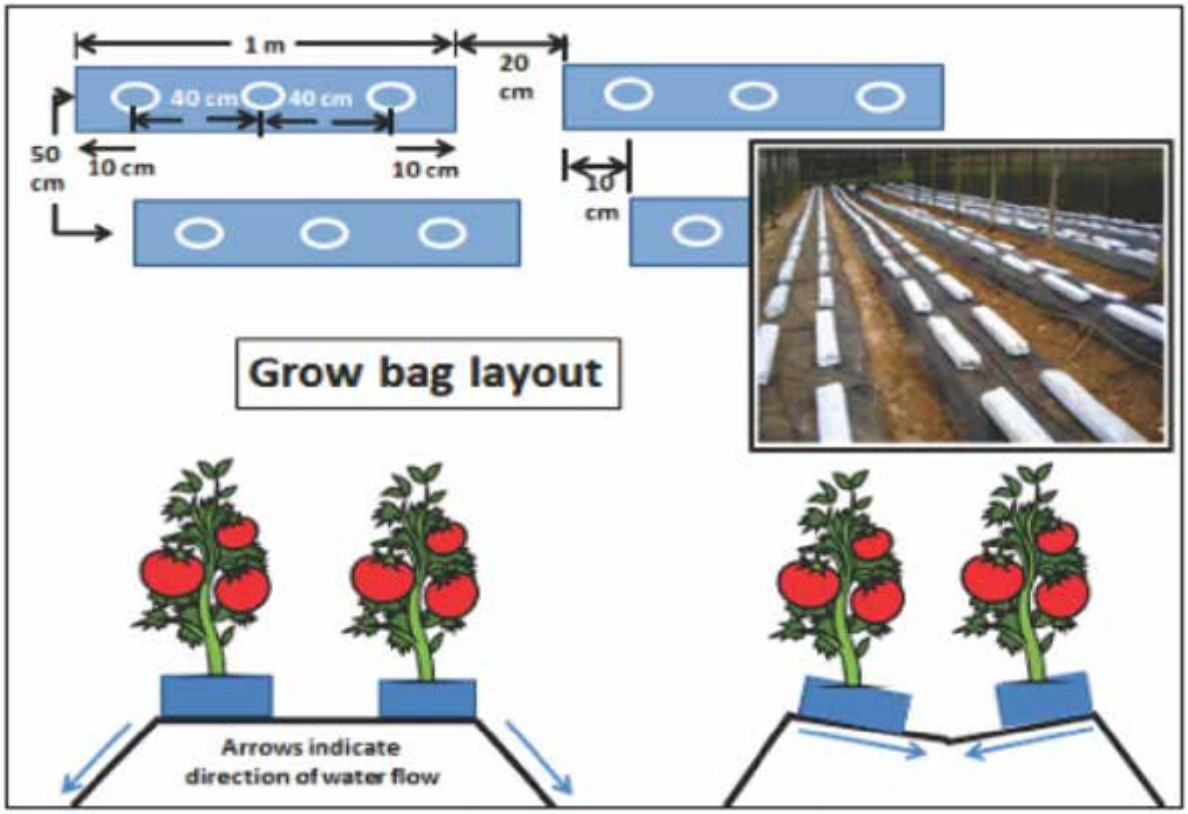


*Fig 3.1.1 Layout bags of Growing media*

## Management of bags of growing media

### Salt accumulation

- Manifested in high EC values in the lowest zone of slabs i.e. corners.
- Occurs between two plants and emitters.
- Ions accumulating in the dead corners include $Cl^{--}$, $SO_4^{2-}$, $Ca^{2+}$, $Mg^{2+}$.
- Caused by poor drainage.
- During sunny periods expect nutrient accumulation; signs include: o Wilting of plants during sunny periods of day even though root substrate is moist.
- Overall growth slows down.
- Roots die from the tips back (particularly in drier parts of the rootzone).
- Leaves become necrotic along margins.

### (ii) Leaching

- Flushing of rootzone to reduce salt accumulation.
- Leachate should be of 5-10% concentration when plants are young.
- Increase to 20-30% concentration when older and during high temperatures.
- Prevents "pooling" of feed solution in the bottom of the growbag.

### (iii) Conditioning of pot before transplanting (24 hours before).

- Collect drainage solution.
- Measure EC.
- Depending on the EC, flush with water again.
- Inject nutrient solution into growth media.

## 3.1.2 What are goog practices of plant Propogation?

The greenhouse Operator should try to acquire at least a basic knowledge of plant production. In this pursuit, emphasis must be placed on crop and variety selection, methods of propagation and plant care.

### Varietal selection

The Greenhouse Operator must constantly evaluate the market, to make sure that the variety supplied is filling the needs of the consumers. If this is not so, the Greenhouse Operator must seek to get varieties that satisfy demand. In general, he should grow varieties that are:

1. Appealing to the market.
2. Compatible with the production system.
3. Newly-developed and satisfies specific needs.

The introduction of hybrids has given Greenhouse Operators more flexibility. They have the advantages ofproducing more stable uniform yields, more uniform fruit size and greater resistance to diseases. However, they are more expensive and saved seeds will not produce true-totype offspring of the parent plant. Greenhouse Operators who plant the progeny seeds of hybrids are very unlikely to get plants yielding fruits of the same characteristics as those of the original parent plant.

Open field varieties are not bred for greenhouse production, though they may be grown under these structures and benefit equally from the environmental conditions created therein.

### Purchasing and storage of seeds

Greenhouse Operator should always aim to select high quality seeds and be determined to verify the authenticity of seeds purchased. They should always consult the various seed catalogues or seek advice from experienced personnel who can provide them with accurate information on the seeds or planting material. They should:

1. Select high quality seeds from a reputable seed company.
2. Note that open-field varieties are not bred for greenhouses.
3. Always check packaging for information related to:
    - the numbers of seed. o the test date for the batch of seeds.
    - the percentage germination.
    - the presence of pesticide which might be harmful to the handler. 4. Make sure seeds were stored under cool conditions at the point of purchase.
5. After opening packages containing seeds and there is need to store remaining seeds, make sure the seeds are dry and the container has as little air as possible.
6. Store seeds in a tightly-sealed container within the vegetable compartment of the refrigerator.
7. When handling seeds coated with a pesticide, make sure to wear gloves, face goggles and a respirator.
8. If the seed handler has sweaty hands, take care not to get perspiration onto the seeds or into the container holding the seeds.

### Important points to note for the propagation from seeds

**1.** Calculate the number of seeds required per row or per area.
**2.** Sow 3-10% more seeds than counted, 3% more when using hybrids and 10% more when using non-hybrids.
**3.** Sanitize all trays, tools and equipment, using a 100ppm chlorine solution.
**4.** Starter solution may be mixed into the growing medium, but care must be taken to ensure that the solution is mixed to the correct strength so that there is no damage to the emerging seedling.
**5.** Fill seedlings trays loosely; do not compact the medium.
**6.** Place seeds in the centre of the cells and cover them lightly.
**7.** The depth of cover depends on the seed; in general, cover seed 2.5 times its length.
**8.** The first wetting of the trays should be gentle and enough so that water droplets start falling through the openings found in the bottom of each cell.
**9.** Place seeds in the germination chamber which must be housed in a cool place.
**10.** Check seeds regularly to avoid etiolation.

### Germination of seeds

Germination time depends on seed viability, the type of crop, the variety and, environmental conditions. For instance, sweet pepper generally germinates in 6 to 8 days and tomato in about 3 days.

Seed propagation media should provide the following:

a. Good levels of moisture.
b. Good levels of aeration.
c. Be chemically inert.
d. Be free from disease pathogens.

There are commercial germination mixes, which may be purchased at a farm store.

The size and number of cells within the seedling trays to be used is determined by the crop. Popular tray sizes in use are: 50, 72, 128 and 200 cells. The smaller the cell, the shorter the period of time the seedling can remain in it. Seedlings left to grow for too long in a restricted root media space will become root-bound. The resulting plant will have a very weak root system which is also out of proportion with the growth of the stem.

The use of Styrofoam seedling trays should be avoided, as very fine root hairs often get trapped into the walls of these trays making cleaning and disinfecting of them very difficult when compared to plastic trays. Plastic trays, too, must be used with caution and are not to be left with seedlings in intense direct sunlight, as they heat up easily and can change the media temperature.

## Methods of plant propagation

Propagation can be from seeds, in which case, it is referred to as "sexual "propagation, or it can be from any vegetative part of the plant, and referred to as "asexual" or "vegetative" propagation.

Propagation from seeds is most common for vegetable farmers within the Region. Asexual techniques such as grafting, budding, layering, air-layering and micro-propagation (tissue culture) are practised by a few Greenhouse Operators on a small scale. The need to practise more of these techniques is very relevant to the improvement and increase of local germplasm.

Greenhouse Operators of tomatoes often use "auxiliary buds", "suckers", or "gormandisers", to grow a new plant. In the process, healthy suckers are selected from a relatively young plant and treated so that they produce roots. Roots are encouraged to grow by placing the sucker ina medium such as sand, coir, potting mixture or, even moist soil. The practice can save the Greenhouse Operator money and while it can give yields similar to the original parent plant, there is always the risk of multiplying the growth of diseased plant material.

## Disease control during germination and early seedling stages

Damping-off is the most important disease affecting small seedlings at all stages of their life cycle. It is caused by certain fungi primarily Pythium ultimum and Rhizoctoniasolani. There are also other fungi, bacteria and viruses that are present within the seed or irrigation water. Common water-related fungi are Botryis cineraria and Phytopthora species.

## The development of damping-off is promoted by the following conditions:

- Diseased soil medium.
- Over watering.
- Poor drainage.
- Poor light.
- Poor ventilation.
- Too much nitrogen.

## Control of damping-off is by:

- The use of sterile seedling trays.
- The use of sterile growing medium.
- Avoiding over-watering; applying heavier watering in the morning.
- Watering from bottom up.
- Using less ammonia-based fertilisers.
- Inoculating seedlings with biological control agents such as Trichoderma.
- Using broad spectrum fungicides as a last resort.

### Acclimatisation (hardening-off) process

This usually starts a week in advance of placing the seedlings into the production area. The process starts by gradually reducing water and nutrient, along with slow exposure to environmental conditions similar to those in the production area. During this time, the Greenhouse Operator must use the opportunity to cull weak plants and constantly check for pests and diseases.

### Adjusting the Shoot:Root ratio

- Symptoms of too high a Shoot:Root ratio are:
- Stretched seedlings.
- Large, soft leaves.
- Poor root growth.
- Small and light-coloured leaves.
- Small top with very short internodes.
- Profuse root growth.

### Corrective measures for root toning:

- Reduce moisture levels.
- Change fertiliser to one with more nitrates, ammonium, phosphorus and calcium.
- Alternate wet/dry moisture cycles (increase moisture stress).
- Reduce light levels.

### General transplanting guidelines

Seedlings should be transplanted when they have four to six true leaves. On the morning of transplant, they should be watered thoroughly so that they return to full vigour. The desired length and width of the seedling block are shown in Figure 13. Seedlings should be placed in the hole with the tip of the root ball 1.5cm below the surface of the growing medium.
Recent work with sweet peppers is, however, supporting the placement of seedlings in the medium to a depth where the cotyledon node is totally covered. The practice is said to reduce a disease condition of sweet peppers called "Elephant's Foot".

When establishing the seedling, the medium should fill the hole and be firm around the root of the seedlings. Fertigation must be carried out immediately after transplanting.

### Transplanting (non-soil production)

Greenhouse Operators must make sure that the environmental conditions including those of the growing medium are conducive for the introduction of the seedlings. They should:

a. Conduct water and media tests prior to planting.
b. Check the EC and pH of the solution from flushed medium.
c. Introduce nutritive solution into the growing medium 1-2 days prior to transplanting.
d. Make sure the entire fertigation system is functioning properly.
e. Saturate the growing medium with the feed solution and check to make sure the EC and pH are 0.8-1.2mmho/cm and 5.2-6.8, respectively.

## 3.1.3 How to manage Crop Nutrition?

Crop nutrition may be described as the process of determination, formulation, application and monitoring of the correct balance of the mixture of the essential mineral nutrient elements and the plant root environment to get optimum plant growth and fruit production. Plants get most of their mineral nutrients from the soil or from water solutions with the nutrients dissolved in them. Carbon, hydrogen and oxygen are obtained from water and carbon dioxide.

Greenhouse Operator should know the nutritional requirements of the crop(s) and be prepared to monitor them on a regular basis. Fertiliser management is a critical element in greenhouse vegetable production. The stage of crop growth, fertiliser formulation and concentration, climate control and disease control practices must be taken into account when developing a fertiliserprogramme. The fertiliser is generally delivered through the irrigation system. Greenhouse Operators should ensure that they have appropriate storage tanks to hold and deliver the nutrient solutions.

**Essential elements may be divided into three groups, namely:**

1. Mega-nutrients (used in extremely large quantities): carbon, hydrogen and oxygen.
2. Macro-nutrients (used in relatively large quantities): nitrogen, phosphorus, potassium, calcium, magnesium and sulphur.
3. Micro-nutrients (used in small quantities): iron, copper, zinc, manganese, molybdenum, boron.

**Essential element criteria An element or nutrient is considered essential if:**

**1.** The plant cannot satisfactorily complete growth and production in the absence of the element.
**2.** The action of the element must be specific and no other element can completely substitute for it.
**3.** The nutrient must be directly involved in plant nutrition processes.
**4.** Deficiency symptoms are seen in the absence of the element.

**Nutrient deficiency**

A nutrient deficiency occurs when one or more elements are absent or are not available to the plant in sufficient quantities to meet the needs of the plant for growth, development and production.
In growing systems where fertilizer recipes are developed and applied to fit the specific needs of the crop plant, nutrient deficiencies are greatly reduced; however, they are not totally eliminated as there are several factors which can render nutrient unavailable to the plant, though present in the growing environment.

**Plants will show deficiency symptoms in many ways, namely:**

1. Chlorosis: yellowing of the plant tissues due to lack of chlorophyll production.
2. Necrosis: death of plant tissues.
3. Accumulation of pigments, e.g. red or purple colour.
4. Growth cessation: lack of new growth.
5. Stunting: new growth that is reduced when compared to normal growth.

### Induced deficiency

This occurs when mineral nutrients are supplied in correct quantities but the plant shows deficiency symptoms, because there are other factors within the plant growing environment which limit the plant's ability to access nutrients.

### Considerations under induced deficiency

1. Uptake of iron is reduced in the presence of excess Cu, Zn, Cr and Ni.
2. Excess magnesium reduces the uptake of potassium and calcium.
3. Macro-nutrient cations are leached at low pH.
4. Boron uptake is reduced between pH 7.5–8.5.
5. High media pH affects the uptake of phosphorous.
6. High levels of calcium can reduce the uptake of nitrogen and can lead to limeinduced chlorosis.
7. Excess sodium affects the uptake of calcium and magnesium and can lead to tip burn and Blossom End Rot (BER).
8. Excess phosphorous in the root zone reduces the uptake of zinc, iron and copper resulting in poor plant growth.

### Plant nutrient toxicity

The lack or oversupply of a nutrient can both have detrimental effects on the plant. Minerals may be toxic to plants if:

a. They are present in quantities which interfere with plant metabolism.
b. They are present in concentrations, that if combined with other factors in the solution, causes them to interfere with the plant water relations.
c. Elements such as Na, Cl, Br, Se and heavy metals such as Co, Ni, Cr and Al can also cause toxicity.
d. All plants grow poorly in very acidic media (pH≤3.5).

Greenhouse Operators using soil as a medium have to pay keen attention to the information given above, making soil and water tests a compulsory part of their operations. Greenhouse Operators using artificial growing media need to also test the growing media for excessive salts, but more importantly, they need to conduct tests for heavy metals within the irrigation water.

### Factors affecting nutrient availability

Frequently, all the required nutrients are present within the nutrient solution, but not available to the crop plant. Below are some factors that cause unavailability of nutrients in solution.

1. Cation Exchange Capacity (CEC) of the medium is a measure of how well the medium can hold positively charged nutrient ions and how easily it will release these ions when required by the plant.
2. Media buffering capacity relates to how well the medium can resist changes in pH. Media with high buffering capacity will also have high CEC and require large volumes of material to amend them. It is not an issue if the media has the correct pH but, if the pH has to be adjusted, this can be difficult to fix.
3. If the pH is not in the correct range, certain individual nutrients will not be taken up, while on the other hand, some nutrients may be taken up too rapidly resultingin toxicity to the plant. Most nutrient elements are

The following information, related to nutrient uptake, may be used as a general guide:

### At very high pH

1. Occurrence of micro-nutrient deficiencies e.g. boron, molybdenum.
2. Toxicity of phosphorous, potassium and sulphur.

### At very low pH

1. Occurence of macro-nutrient deficiencies e.g. phosphorus, potassium and sulphur.
2. Occurrence of micro-nutrient toxicity, e.g. iron.

The ideal alkalinity range for most crops is 50-120ppm of calcium carbonate equivalent; within this range the media pH is stable. Unstable media pH will affect the uptake of mineral nutrients.

Greenhouse Operators can reduce the "liming effect" caused by high alkalinity by adding a strong mineral acid such as nitric, sulphuric, or phosphoric to the irrigation water. Fertilisers high in the ammonium form of nitrogen produce an acidic reaction, which can neutralise the liming effect of water alkalinity.

Ideally, in the process of lowering pH, high alkalinity within the irrigation water is also reduced. If the irrigation water has a high pH and an alkalinity below 50ppm the Greenhouse Operator must lower the pH then add alkalinity or buffer; potassium bi-carbonate is often used to add alkalinity.

In general, the higher the pH or alkalinity of the water, the lower the solubility of the fertilisers and the efficacy of insecticides, fungicides, growth regulators, etc.

Other methods to neutralise water alkalinity include reverse osmosis, de-ionisation, distillation and electro-dialysis; these are, however, very expensive procedures to conduct and in most cases would not be practical for Greenhouse Operators.

### Solubility limits of fertilizers

This is a measure of the maximum amount of fertiliser that can be dissolved in a given volume of water at ambient temperature.
Several of the factors already discussed such as pH, alkalinity and, temperature and purity of the solvent, also affect the solubility limit.
Solubility limits of some fertilisers (mass of fertiliser per unit volume of ambient water)

### Fertiliser kg/100L

Ammonium nitrate: 118
Ammonium sulphate: 71
Calcium nitrate: 102
Calcium chloride: 60
Diammonium phosphate: 43
Monoammonium phosphate: 23
Potassium nitrate: 13
Urea: 78
Borax: 1
Magnesium sulphate: 71
Potassium sulphate: 10

The Greenhouse Operator must remember that the ability of the solvent to dissolve more fertiliser is gradually reduced with each quantity of fertiliser that is dissolved in it. When mixing several fertiliser quantities it is best to dissolve each in a container with the solvent and then add to a stock tank. Solubility of several fertilisers, particularly those containing the mico-nutrients is greatly improved by mixing in warm water. Dissolving potassium sulphate can be challenging.

### Fertilisers for greenhouses

Greenhouse crops are considered to be heavy feeders requiring large quantities of fertiliser which must be fed at the right ratio and from a reputable source.
Materials used to supply nutrients for greenhouse vegetable production are chosen based on several factors including cost per unit of nutrient, solubility in water, ability to supply multiple nutrients, freedom from contaminants and ease of handling.

### Chemical fertilisers

Of all the fertilisers supplied to the plant by the Greenhouse Operator nitrogen, phosphorous, potassium are used in the largest quantities and are referred to as primary macro-nutrients or macroelements. Most common greenhouse fertilisers will contain one, two or three of these elements in various ratios based on formulation. Calcium, magnesium and sulphur are usually supplied in lesser quantities and are referred to as secondary macro–nutrients. The micro-nutrients boron, chlorine, copper, iron, manganese, molybdenum, and cobalt are used by the plant in very small quantities and are also called trace elements.

### Fertiliser application techniques

Fertilisers may be supplied to the plants using several techniques or methods and absorption is via the roots or the leaves. All plant foods are absorbed in solution form.

### Foliar feeding

Small pore-like openings in the leaves called "stomata" facilitates the absorption of water, mineral salts and the exchange of gases between the plant and the environment. The absorption of dilute forms of fertilisers can take place through these openings. Foliar application of fertiliseris not recommended as the normal method to supply the plant with food, but is usually done when the Greenhouse Operator wants to quickly correct a nutrient deficiency.

Plants readily absorb nutrients through their leaves and care must be taken, not to over feed them. Foliar applications of fertiliser must be dilute and applications done when the growing environment is cool (early morning). The pH of the solution has to be within the prescribed range to enhance rapid absorption via the leaves.

### Pre-plant fertilisers

In this method, fertiliser is mixed into the growing media prior to the establishment of the crop plant. Pre-plant fertilisers will start decomposition as soon as they come in contact with water. This method is not popular among greenhouse Greenhouse Operators as they use the fertigation system to accurately supply fertiliser whenever needed.

### Fertiliser mixing

Fertiliser mixing, proportioning and delivery can be manual or largely automatic. The selection of the method is dependent on factors such as affordability, access to electricity, access to the correct inputs and, the level of skill. Common to both systems is thepreparation of concentrated fertiliser feed firstly in two "Stock" tanks ("A" and "B") and then mixed together in a mixing tank called the "Bulk" tank or "Mother Solution" tank. The two Stock tanks and the Bulk tank are the "heart-beat" of a fertigation feeding programme. Not all that is put into the tanks is taken up by the plants and, if the chemical properties of the solutions are not correct, the plants will not feed.

### Bulk tank system

The Bulk tank system requires the following items:

1. A final Bulk tank from which the plants are fed directly.
2. Two Stock tanks, "A" and "B" which must be of plastic or stainless steel.
3. A water treatment tank for treating approximately 380L water for the stock tanks.
4. Submersible water pump with a capacity of approximately 4500L/hour.
5. Weighing scale.
6. pH (with thermometer) and EC meters.
7. Alkalinity tester (consumer models not very reliable and water analysis might be better option).

### Mixing stock solutions in Stock tanks "A" and "B"

As discussed earlier, there are several factors which impact the solubility of fertilisers; in addition, some fertilisers are incompatible with each other when mixed at high concentrations within a stock tank. For instance, fertilisers containing phosphates, and sulphates are not mixed with calcium nitrate. When incompatible fertilisers are mixed, precipitation, re -crystallisation or displacement in some chelates will occur. When writing fertiliser recipes, the technician may reduce or eliminate these problems by doing the following:

1. Carefully select the quality and type of fertilisers.
2. Group compatible fertilisers in the same stock tank.
3. Manage the quality and pH of the mixing water.

Following the procedure above should result in a solution that is clear with no suspension (cloudy or milky), no precipitates (sediments) and no sludge. The presence of any of these is an indication that you are wasting

fertiliser and, by extension, money. Also, the nutrients precipitated will be unavailable for uptake and can eventually lead to nutrient deficiencies.

The quantities of the different fertilisers are to be accurately weighed and mixed in their separate Stock tanks using pH-corrected water. The pH in these Stock tanks needs to be kept below 5.5. The EC in Stock tanks is usually very high and may cause irreversible damage to some EC meters. In which case, diluted percentages of the solutions are used to calculate the approximate strengths of the solutions within the Stock tanks.

After Stock tanks "A" and "B" are mixed to specification, the recommended proportion of their respective contents is to be added to a third tank (the Bulk tank). The Bulk tank should be half-full with pH-corrected water, the recommended quantity of stock in tank "A" measured and placed into it, making sure to mix continually using the submersible pump. After the full quantity of stock in tank "A" is added, continue to fill the Bulk tank up to the three-quarters full point, using more pH-corrected water and making sure the mixing continues via the submersible pump. With all of the stock in tank "A" fully mixed in the three-quarters full Bulk tank, its concentration is now low enough for the contents of Stock tank "B" to be added without any problems. The calculated portion of stock from tank "B" is added and mixing

continued. After a very thorough mix, the pH and EC of the contents within the Bulk tank are checked and corrected based on the recommended recipe for the final solution which is then fed within the fertigation system to the particular crop plants.

## 3.1.4 Irrigation

Water delivered to the crop may be done using various types of irrigation systems. The Greenhouse Operator must meet crop watering needs by selecting an economical and efficient irrigation method that is safe to the user, the public and the environment.

### Greenhouse irrigation water

Greenhouse operations require a very good source of high quality water. Water used for greenhouses in the tropics is mainly sourced from rivers, gullies, wells, streams, ponds with harvested surface water, ponds or tanks with harvested rain water and from the domestic water supply systems. Water with high salt content is not recommended for use within greenhouses and especially within hydroponics systems. Water with high salt may be made good by reverse osmosis; this is, however, a very expensive venture which might not be cost-effective for most Greenhouse Operators, in which case, relocation and the harvesting of rain water become more viable alternatives.

### Top-down irrigation

This refers to irrigating from above the foliage using sprayer or applying water to the top of the growing media by hand or drip lines. The downward movement of solution causes leaching of excess salts out of the root zone. It is recommended that in top-down irrigation systems, 10% of the solution applied be allowed to drain from the bottom of the container.

### Spraying with nutrient solution

Sprayers can supply sufficient solution to provide plants with fertiliser, but they over-wet leaves and are, therefore, not the best option for fertiliser application within tropical greenhouses.

### Trickle tubes or micro–tubes or spaghetti tubes

These tubes extend from main lines to the surface of the substrate of the individual plant in the container or to the root zone of plants grown in beds. Ideally, the leaves of the plants are not wet during irrigation. Drip pegs or stakes are recommended for use in this application to deliver the solution below the surface of the growing medium. Nutritive solutions applied to the surface of the growing medium, such as with spray stakes, encourages the growth of algae on top of the media.

### Sub-irrigation

In this method, plants are irrigated from below, through capillary uptake or flooding. Dry or partially dry substrate will draw water upwards when the lower portion of the substrate is in contact with the water. This is referred to as capillary uptake, the success of the capillary uptake depending on the number of capillary spaces within the media. Growing media with very large air spaces do not facilitate capillary action and require amendment to reduce the spaces between particles. Methods of hydroponics, such as the ebb and flow systems and others which rely on the upward movement of nutrients from the surface of the growing channel to the roots in the growing media, depend heavily on the media ability to facilitate capillary movement.

Capillary mats used in seedling nurseries provide the seedlings with irrigation from below as their roots grow down towards water or nutrients. The system is helpful as it encourages the early downward growth of roots and no water touches the foliage of the seedlings.

## 3.1.5 General pests, diseases and physiological disorders of tropical greenhouse vegetables and their management

General IPM Considerations Integrated pest management (IPM) is the use of a number of compatible practices, such as Biological, Cultural, Mechanical, Genetic and Chemical, to minimise pest damage and prevent economic losses. Management of pests must be done at all stages of the crop starting at the nursery through land preparation, plot establishment, plant growth and harvesting. Under IPM Greenhouse

**Operators should aim to achieve the following:**

- Grow a healthy crop.
- Understand and conserve natural enemies.
- Observe the greenhouse regularly by scouting.
- Seek to increase knowledge in crop management.

Greenhouse Operator must remember that disease-causing organisms (pathogens) are always in the environment; however, if conditions do not favour their growth, development or survival, they cannot affect the crop.

Greenhouse Operator must remember that they cannot eliminate all pests as most measures can only result in the reduction of their population. The objective then is to keep the number of pests at a level where they do not cause unacceptable economic losses.

IPM measures should promote the reduction of negative impacts on the environment and human health. These measures can only work if there is great co-operation among the stakeholders.

**The Greenhouse IPM**

The good conditions created for the plant within the greenhouse will also benefit several pests once they get into the structure. Greenhouses provide ideal conditions for the spread of some diseases and insects making disease and pest control an essential part of any production system.

**Mechanical control (screens, barriers, hand-picking pests)**

Mechanical control measures under IPM rely heavily on the principle of exclusion, as physical barriers are placed in the path of the organism wanting to cause disease. The construction of greenhouses is one such measure as the coverings installed unto the structure serves to keep out whatever is not wanted in the greenhouse.

Ultra violet blocking plastic films can be used to manage the rays from the sun, so they have an effect on the flight orientation of some insects thus reducing flight activities within the greenhouse. Blocking certain aspects of the sun's rays can also inhibit the germination of certain fungal spores.

In an attempt to exclude diseases from the greenhouse the Greenhouse Operator needs to practise the following:

- At least one greenhouse door must always be closed.
- Use foot-bath with bleach, iodine, disinfectant, etc.
- No spaces allowed under the greenhouse sides.
- Repair all holes in mesh.
- Any material entering greenhouse has to be pest & disease-free (visual inspections, cleaning, sanitising).
- Quality of the water must be disease-free.
- Specific boots and overalls to be worn only in the greenhouse.
- Equipment and tools to be used only in the greenhouse.

**Cultural control (site selection, use of non-soil media, sanitation, spacing, solarisation, cultivar selection, water management).**

Cultural control plays a critical part in any IPM program. It can be one of the least costly methods of disease control if procedures are carried out in a sequential order making sure to

start with clean planting material introduced into a clean healthy space. Avoid having weeds or planting certain crops immediately outside the walls of the greenhouse. Cropsplanted in these areas cannot be from the same family as the crop in the greenhouse and must not be tall enough to block the flow of air and light going into the greenhouse through the side netting. Critical to cultural control, is an environment which is not conducive to the growth and development of the pathogen.

Improvement in the relative humidity (RH) and the lowering of temperature within the greenhouse, is sometimes achieved through leaf pruning as this practice improves the air flow within the structure. Removal of lower, often diseased and non-functional leaves can reduce the need for chemical applications as the affected leaves are physically removed from the plant and the greenhouse. When all the cultural practices are followed it creates a bright, fresh, neat and clean space, an environment where plants are positively affected and where the greenhouse technician can work comfortably.

**The Operator needs to consider the following under cultural control as a part of IPM practices:**

- Pests are generally brought into the greenhouse on new planting material.
- Many pests are able to survive short periods of time between harvest and the planting of the next crop.
- Inspect new plants thoroughly to prevent the accidental introduction of pests into the greenhouse.
- Keep doors, screens and ventilators in good repair.
- Use clean or sterile growing media.
- Clean or sterilise tools, flats and other equipment.
- Maintain a clean, closely mowed or covered (ground cover) area around the greenhouse to reduce invasion by pests that develop in the weeds .
- Eliminate pools of standing water on the greenhouse floor.
- Dispose of trash and old plant debris in the area; plant material removed through activities such as pruning must not be left in the greenhouse overnight.
- Avoid over watering and promote good ventilation to minimise wet areas conducive to the breeding of flies and fungus.
- Avoid wearing yellow and blue clothing, as they attract many insect pests.
- Maintain a weed-free greenhouse at all times.
- Eliminate infestations by removing heavily-infested plants.

## Biological control (natural enemies, pheromones, beneficial fungi)

Biological control involves the use of living organisms to control other organisms. These may include beneficial microorganisms e.g. Trichoderma spp., or natural enemies of the pest.

Natural enemies of the insect pest, also called biological control agents, include predators, parasitoids and pathogens. Natural predators such as birds, lady beetle and, lace wings, will consume a large number of pests during their life time. Predators such as birds may enter the greenhouse via the window at the extreme top of the structure which is sometimes left open to improve ventilation. This window can also serve as a point of entry for butterflies and moths, so proper management is required.

Spiders also use their web to trap flying insects and, for this reason, can be allowed to remain in the structure. Biological control is more management-intensive than using conventional pesticides and requires a greater knowledge of the pest biology and pest numbers.

There are many factors which will help to determine the success or failure of biological control methods; these include:

1. Release rates.
2. Time of release.
3. Placement.
4. Temperature and humidity.
5. Previous use of chemicals.
6. Quality of the biological control agent.

High pest populations will be difficult to control using biological agents. The life span of the predator or parasite will determine how often it has to be reintroduced. Parasitoid wasps will live longer if they are given a nectar source of food. If all the pests are eliminated, then the beneficial insects will also get eliminated. When beneficial insects are used to work within the greenhouse sticky cards should be temporarily removed.

Parasitoids are species with their immature period developing on or within a single insect host, weakening or eventually killing the host. Many species of wasps and some flies are parasitoids. Fungi, bacteria and viruses are pathogens which will debilitate or kill their host.

Trichoderma is a beneficial fungus; its spores germinate and live in the soil near the roots of the plant, feeding on the nutrients that exude from the plant roots. It grows at an alarming rate and is able to out-grow and displace many plant pathogens. The fungusgrows over the roots and acts like a protective glove making it very difficult for pathogens to reach the plant. Trichoderma is presently being used in the Caribbean Region by farmers for the reduction of some pests and diseases. For instance, nematode infestation in tomato has been dramatically reduced through the use of Trichoderma. The spores of the fungus must be stored under the prescribed conditions as outlined by the manufacturers. Naturally-occurring biological controls are oftentimes just as susceptible to pesticides used to control pathogens of the crop plant and care must be taken not to eliminate the friends along with the enemies.

### Chemical control (last resort; only when necessary; use of soaps, oils, botanical and biorationals)

Chemical control is often practised as the first line of defence in the fight against greenhouse and open field pests. This is unfortunate, as chemical control should only be used when all other methods have failed. Farmers have gotten accustomed to the often fast action of chemical pesticides and have either lost patience or trust in other methods of control as they anticipate a quick-fix to the problems. All chemicals are harmful and absolute care must be taken when using chemical pesticides, starting with the selection of the correct chemical and all the safety equipment required when using the chemical

If and when chemicals are used, the farmer should practise the following:

- Use only as a last resort.
- Rotate chemicals; rotations must include pesticides belonging to different chemical classes that use different modes of action to control the pests.
- Limit treatments to pest "hot spots" to avoid treating the entire house.
- Use a selective, short residual pesticide where possible.

Bio-rational pesticides such as insecticidal soaps, oils, neem products and Bacillus thuringiensis (BT) can be much less harmful to beneficial insects although active against certain pest species. Systemic insecticides and insect growth regulators for mating disruption can also be used. Some products are harmful to some stages of some beneficial insects and not others. For instance, oils are toxic to lacewing eggs and adult parasitoid wasps, but have very little effect on adult lady beetles and lacewings. Soaps are toxic to young lady beetles larvae while neem and BT are relatively safe.

Conventional insecticides still have a place in IPM as sometimes it is not feasible to use bio-rational and biological control agents to get the desired control. When using chemicals, following the steps below can be beneficial:

1. Choose the right insecticide. Making the proper identification of the pest and understanding its biology and life cycle allows the Greenhouse Operator to make wiser decisions in choosing the best insecticide.

2. Use the correct amount of insecticide. Read the label to determine the correct amount to be used. The decision will vary based on the size or stage of the pest and the size of the population.

### Genetic control

This approach to IPM deals with the breeding and use of cultivars which are resistant to the pest. Information about these cultivars can be found in the seed catalogues available from the seed companies. Greenhouse Operators must keep checking on new developments in order to remain current and to benefit from the advancement of technology as it relates to their area.

## Crop scouting and monitoring

When scouting and monitoring are practised correctly, they result in the early detection and diagnosis of pest infestations. Many of the general IPM practices and tactics that are applied to the control of plant diseases relate to the management of insects and mites. All the plants within the greenhouse must be inspected at least once a week. As a guideline, plants should be randomly inspected in a zigzag pattern with the scout stopping in at least 1 spot for every 10m² of production area. Special attention must be given to plants near ventilators, doors, windows and fans. Examine the leaves, flowers, fruits and roots for pests and diseases (the scout must be aware of the habits of pests e.g. Tomato Fruitworm is found on the leaf below the highest open flower because this is the preferred site for egg deposition).

Inspection of the plants should take place from the ground up to the growing tip, as some insects will feed on roots, stems, leaves, flower blossoms and fruits. Inspect both leaf surfaces upper and lower. Most insects as well as a number of diseases will start their attack on the plant from the lower surface of the leaf.

Many insects and mites feed from the lower surface of the leaf, they will only move to the upper surface and other parts of the plant if overcrowding forces them to move. Some insects, particularly Thrips, will be found within the blossoms. They are very small insects requiring the use of a hand lens for proper identification. They hide so carefully within the blossoms, that it is often necessary to blow warm air from the mouth onto the blossom to cause them discomfort and force them to move. The area under the calyx or stem end of tomatoes and cucumbers is also a popular hiding place for insects. In general, insects will stay in secluded parts of plants. If

there are weeds, examine them for pests, after which they must be removed from the greenhouse or the areas near the greenhouse. In this case, they can be used as indicator plants to give advance warning. Aphids, caterpillars and, leaf miners, can easily be identified while scouting. Yellow and blue sticky cards are also helpful in detecting insects flying in and around

the greenhouse. Greenhouse Operators should observe the entire plant looking for any abnormalities including:

1. Stunted growth.
2. Breaks in leaf colour.
3. Distorted leaves.
4. Irregularly shaped fruits.
5. Off-coloured fruits.

All comparisons should be made against a normal healthy plant.

## Types of greenhouse pests

The pests which affect crops in greenhouses are similar to those that attack plants in open-field. In the greenhouse, they enjoy all the comforts of the protected space including easy access to food and shelter from the harsh environmental conditions; as such, their rate of multiplication and the severity of their attack on the crop can be more devastating.

Several insects and mites seem to be a habitual problem to greenhouse farmers. Although the pests are similar the control is often times different, one large difference being, all the pesticides used in open field are not automatically recommended for use within greenhouses, making finding a suitable pesticide difficult at times. The most important pests attacking tomato, sweet pepper, cucumber and lettuce are:

- Spider mites
- Aphids
- Whiteflies
- Thrips
- Beetles
- Caterpillars
- Leafminers
- Brown Stinkbug
- Snails and Slugs
- Mealybugs
- Nematodes

Good disease management is crucial in the production of greenhouse vegetables. Greenhouse Operators must remember that under plant disease control "prevention is easier and cheaper than to control". Most of the pathogenic diseases that affect plants in greenhouses are caused by fungus. Fungicides labelled

specifically for use within greenhouse are very limited for the following reasons:

1. Greenhouse vegetable acreages are small when compared to open field so manufacturers of fungicides do not target greenhouse acreages due to the smaller size of the market.
2. Fungicides cleared for use in greenhouses have resulted in much more worker exposure, resulting in more legal actions against responsible parties.
3. Phyotoxicity caused by pesticide formulations are more frequent in greenhouses, when compared to open field.
4. Pesticide residues are higher in greenhouses due to the absence of environmental forces such as rain, wind and UV light which help to erode the chemicals.

Because of the conditions listed above it is imperative that Greenhouse Operators focus more on the prevention of the diseases, using methods of control which do not involve the use of chemicals. Disease control is achieved through crop monitoring, cultural, chemical, physical and biological control strategies. Greenhouse Operators need to utilise all of these methods to ensure a productive operation. The main diseases affecting tropical greenhouse crops are:

- Septoria Leaf Spot
- Early Blight
- Anthracnose
- Fusarium Wilt
- Verticillium Wilt
- Late Blight
- Bacterial Spot
- Bacterial Speck
- Bacterial Canker
- Grey Mould
- Leaf Mould
- Powdery Mildew
- Elephant's Foot Disease

## Exercise

1. Brief note on Plant propagation in Green House.

Answer: .....

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2. Short note on the Factors which influence the Green House Operations.

Answer:.....

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## Notes

# Unit 3.2: Monitoring and Documentation of Greenhouse Operations

## Unit Objectives

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

- Understand Importance of record keeping of operations.
- Understand various records to maintain and monitor for Greenhouse operations.

## 3.2.1 Introduction

The importance of monitoring production and keeping record in the case of greenhouse crops cannot be over-emphasised. Ideally, at all stages of the production process, farmers should be aware of their planning, possible yield, economic viability, expenditures, market prices, etc. so that they can be aware of any uncalled situation of crisis and to enale planned earnings and yield. Given the complexity of the greenhouse vegetables production system, Greenhouse Operators must record Day to day operations and planning sheets and should not depend on memory recall.

## 3.2.2 What are various records and monitoring system a Greenhouse operator should adopt?

Depending on the type of enterprise and crop and market requirments, various types of records are needed to ensure planned finance management and crop management.

Following can be few records which would help an Operator to monitor their Greenhouse financial and Agronomical health and to keep them on track.

- Greenhouse production – Activities, labor hours, inputs, and supplies by crop
- Field production – Activities, labor hours, equipment, and inputs by crop
- Harvest & pack – Labor hours, equipment, yield, handling, supplies, and storage by crop
- Marketing/distribution – Labor hours for loading, driving, setup, selling, breakdown, and backhaul – Mileage/depreciation for vehicle and marketing equipment – Load list, sales, and price.
- ALL income and expenses related to farm.

## Greenhouse Seeding Record

| | DATE | CROP | VARIETY | FARM | AMT | NAME |
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| SEEDSONLY | | | | | | |
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## Greenhouse Transplanting Record

| TRANSPLANTSONLY | DATE ON TAG | TRANS-PLANTDATE | CROP | VARIETY | FARM | QTY | SIZE: 72, 4", or gal | NAME |
|---|---|---|---|---|---|---|---|---|
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*Table 3.2.1 Documentation of Green House Operations*

## Crop Planting Record

| DATE | CROP | LOCATION | AMOUNT (pounds of seed or # bed ft) | NOTES |
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## Daily Harvest Data

| Date: | | CSA Shares:<br>Lg -<br>Reg -<br>Total - | |
|---|---|---|---|
| Crop | Needed | Harvested | Weight |
| | | | |

*Table 3.2.1 Documentation of Green House Operations*

## Field Harvest Record

| Date | Crop | Variety | Unit | Quantity | Notes |
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## Daily Market Sheet

| MARKET SHEET | | | | | | |
|---|---|---|---|---|---|---|
| DATE:_____ TUE or THUR | | Marketer(s): | | | | |
| Produce, *VARIETY* | UNITS | Price | To Mkt | From Mkt | Total Sold | NOTES |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
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| | | | | | | |

*Table 3.2.1 Documentation of Green House Operations*

Organic System Plan - Materials Inventory (Section K)

Farm / Grower Name: Certificati on #:

List all materials you plan to use this production year below. Use your application records or materials list from last year's inspection report as a reminder.
*Crop Production Aids include grafting materials, potting soil mixes, greenhouse materials, growth regulators, pH adjusters, buffers, sticking agents, spreading agents, etc.

| Material | | Locations of Material Applications | | 2012 | Type of Material | | | | | | Brand Approved | | Generic Materials | | Grower Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| allow | Brand Name or Source | Where will you apply the material? List specific crops | International Crops | | Fertility Input | Pest Control | Disease Control | Weed Control | Crop Production Aid* | Post Harvest | OMRI | WSDA List | Natural Approved | Synthetic Approved | Provide additional information if the material you plan to use meets one of the below criteria:<br>• Brand name materials not approved on WSDA or by OMRI: List all ingredients<br>• Generic materials not approved by National Organic Standards (205.601): List all ingredients<br>• Raw, uncomposted manure products: List expected application and harvest dates |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
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| | | | | | | | | | | | | | | | |

## Compost Pile Tracking Sheet 2012

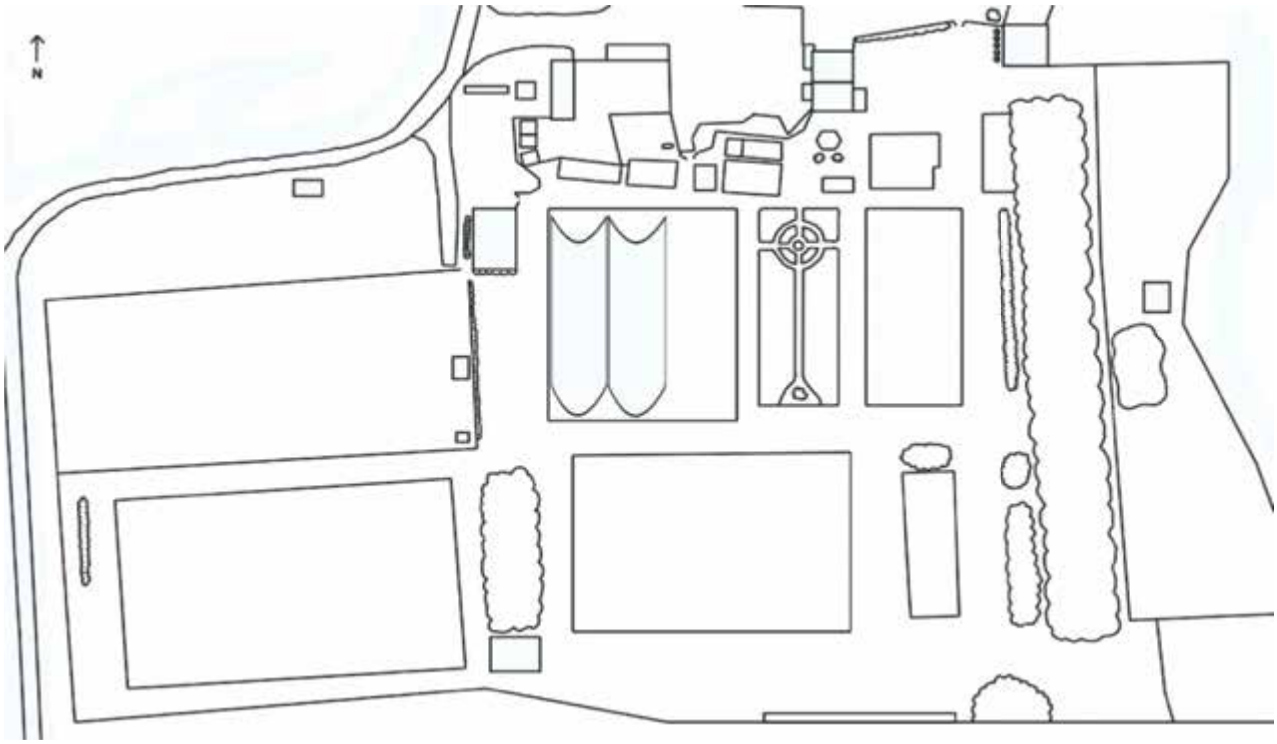
**Pile Name:** _____ **Date Made:** _____

**Location Made:** _____ **Manure Spreader Used? Y/N**

| Compost Mix Ratio and Ingredients: | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | | | | | | |
| % Moisture | Amount Water Added | Bulk Density | Free Air Space | Temp. | Fan +/- | Fan Speed | Other |
| | | | | | | | |

**Notes:** (characteristics, smell, feel, look, etc.)

*Table 3.2.1 Documentation of Green House Operations*




## Equipment Records

| | Farm Tractor Log Kubota B1700 | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Date | Operator's Name | Starting Hours | Ending Hours | Oil | Diesel | Coolant | Hydro | Screen | Zerks | Leaks /Bolts | Tasks Performed | Cleaned | Notes |
| 20-Mar | Darah | 13693 | 13695 | X | X | X | X | X | X | X | Joy Riding | Yes | Fun! |
| 21-Mar | Melissa | 13695 | 13695 | X | X | X | X | X | X | X | Checking Needs | Yes | Lift arms don't work |

*Table 3.2.1 Documentation of Green House Operations*

| Farm tasks | Hour(s) this year | My hours/year |
|---|---|---|
| a. Pre-planting tillage | | |
| b. Collecting, transporting, & spreading compost, manure and other plant nutrients | | |
| c. Buying &/or ordering seeds & transplants | | |
| d. Growing transplants | | |
| e. Planting transplants & seeds | | |
| f. Irrigating and/or fertigating | | |
| g. Pruning and trellising | | |
| h. Weed control (hoeing, cultivating, spreading plastic mulch, etc.) and thinning | | |
| i. Harvesting | | |
| j. Marketing, including transport, through all outlets | | |
| k. Machinery maintenance and repair | | |

*Table 3.2.1 Documentation of Green House Operations*

| Expenses | | $ This Year |
|---|---|---|
| | a. Land rent or annual mortgage payment (% area for this crop x total) | |
| | b. Purchased soil nutrients (compost, manure, etc.) for this crop | |
| | c. Purchased plastic or other weed control cover for this crop | |
| | d. Purchased seeds & transplants | |
| | e. Purchased frost covers | |
| | f. Gasoline, diesel | |
| | g. Vehicle repairs, maintenance, & licenses (pro rata share) | |
| | h. Fees for accountants and attorneys | |
| | i. Professional dues and travel to meetings | |
| | j. Publications, books, & educational materials | |
| | k. Credit card fees from sales | |
| | l. Interest for operating loan | |
| | m. Wages for nonfamily workers | |

*Table 3.2.1 Documentation of Green House Operations*

## Exercise

1. Write a note on Green House Operations

Answer: .....

## Notes

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सत्यमेव जयते
GOVERNMENT OF INDIA
MINISTRY OF SKILL DEVELOPMENT
& ENTREPRENEURSHIP

N·S·D·C
National
Skill Development
Corporation
Transforming the skill landscape

ASCI
Agriculture Skill Council of India

# 4.Maintain Health & Safety at the place

Unit 4.1 - Maintain clean and efficient work place
Unit 4.2 - Render appropriate emergency procedures at the work place

AGR/N9903

## Key Learning Outcomes

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

- Understand general cleanliness procedures of Greenhouse.
- Understand health hazards at Greenhouse.
- Learn first aid and reducing risk at primary level at Greenhouse.

# Unit 4.1 : Maintain clean and efficient work place

## Unit Objectives

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

- Understand importance of Cleanliness in Greenhouse
- Basic Hygiene and Sanitation Procedures at Greenhouse.

## 4.1.1 Introduction

A clean greenhouse, providing a conducive environment for plant growth, will produce strong and healthy plants, which, in turn, will increase profits for Greenhouse Operators.

There is much to be said about the premise of starting clean and staying clean. It is beneficial to scout crops routinely and in many instances, preventive programs can be implemented to reduce to occurrence of certain insect pests and diseases. With proper preparations, good sanitary practices, and sound production practices, Greenhouse Operators can reduce the occurrence of many cultural problems during production.

Clean greenhouses do grow better plants with fewer insect and disease problems—a fact that has been stated over and over, yet it's so very easy to forget in your struggles to turn a profit. Spending money on picking up and putting away is difficult to justify when the truck needs to be loaded.

## 4.1.2 How to clean Greenhouse?

Cleaning involves physically removing existing pests from within and around the growing area. Some common practices include removing all plant debris, rouging and disposing any diseased plant materials from crops, and controlling weeds (which serve as alternate hosts of plant pests) in and around the greenhouse. Keeping a clean production area greatly reduces future pest problems.

Disinfecting involves applying anti-microbial agents (quaternary ammonium compounds, hydrogen dioxide products, and 10% solutions of household bleach) to kill all pathogenic organisms. Many Greenhouse Operators provide foot mats and hand washing stations containing disinfectants or anti-bacterial soaps at the entry points of the production areas to prevent pest organisms from entering. It is important to disinfect floors, bench surfaces, plastic pots and trays, tools, and equipment between uses. Greenhouse Operators should note that household bleach is NOT an EPA registered disinfectant for application in greenhouses and nurseries and should only be applied to non-crop areas.

There are numerous strategies used to help Greenhouse Operators maintain a high level of cleanliness in their production sites. Properly cleaning and disinfecting greenhouses at the beginning of and between crop cycles is an important aspect of pest management. Inspect all plant materials for pests before placing them in the main production area. If insects or diseases are found, treat them with an appropriate product before transplanting them or placing infected plants into the greenhouses. These steps will help ensure your crops are as clean as possible and will limit the number or outbreaks or 'fires' you'll have to contend with.

At the end of each production cycle all structures, irrigation infrastructure, clips, and truss support systems should be cleaned with a 10% bleach solution.

Floors should be swept to remove all plant debris and accumulated soils. Make sure to clean the trench drains. Pull weeds out of cracks and trenches. Disinfecting the floor is an effective method to prevent disease-causing organisms like Pythium and Rhizoctonia. Chlorine dioxide or similar chemicals can be used to sterilise greenhouse benches.

It is preferable to use new containers for each crop; however, for economic and other reasons, some Greenhouse Operators re-use their pots, containers, and flats multiple times. Whenever old containers are used, it is critical to make sure that they are free of disease pathogens. If the previous crop had a disease problem, it is likely the disease can spread to new transplants or other greenhouse vegetables through leftover soil particles. Organisms like Pythium and Rhizoctonia can survive in soil particles and infect plants. All containersshould be thoroughly washed to remove plant debris and soil particles after which they should be treated with a greenhouse disinfectant

A 10% solution of household chlorine bleach could be used, but its activity period is short compared to other disinfectants. To obtain better results, soak containers for a minimum of 30 minutes and finally rinse with water. Rinsing helps to avoid phytotoxicity to plants.

Spraying and fumigating (also, post-fumigation practices)

It is important to fumigate a greenhouse between crops to clear out any pests that have flourished during the previous crop. Fumigating with a sulphur candle has been the traditional way of clearing pests, but now those nasty sulphur candles can be replaced by chemical-free Biofume Garlic Candle. It is important to kill any pests which have thrived during the cropping season i.e. red spider mite, whitefly and aphids, before beginning a new crop.
The following steps are used for fumigation:

1. Ensure that all doors, windows, etc., of the greenhouse are firmly closed.
2. Place the Biofume Garlic Candle on a brick or in a metal container in the middle of the greenhouse and light the paper wick.
3. Close the door and leave overnight.
4. After at least 12 hours, open the greenhouse and ventilate well.

A good and easy first step in greenhouse sanitation is to physically remove all crop debris. Weeds, plant debris and unsalable plants can serve as sites for insects and mites to live and for diseases to develop, progress or spread. To properly manage weeds, see "Weeds in the greenhouse: More than unsightly." Remove all weeds and crop debris and place them in a tightly sealed, covered garbage bin so that pests and pathogens are not able to migrate out of the trash and into your crop. Remember to remove the trash daily. Also, remove spilled media because organic residues from plants and growing media reduce the effectiveness of disinfectants.

If you ultimately compost the removed organic material, make sure the compost pile is at least 30 feet away from the greenhouse and not uphill or downwind from the greenhouse (Photo 3). Situating the compost pile in this manner will prevent pests from migrating from the compost pile back to the greenhouse. When removing diseased or infested plants, discard them into containers or bags that are immediately adjacent to the plants and seal the container or bag to transport them out of the greenhouse immediately. In this way, inoculum or insects are contained and not spread throughout the greenhouse during transport.

Once all surfaces are free of organic matter, consider power-washing structures and walkways with soap and water when in between cropping cycles. Then, clean those same surfaces with a disinfectant. Make sure propagation or pruning tools such as knives, scissors, etc., are properly disinfected after being used on each bench or each variety or cultivar.

It is also best not to reuse pots as some diseases, like *Thielaviopsis*, are capable of surviving on recycled trays and thus infecting new crops. However, if you must use recycled containers, be sure that all organic matter is removed from the pots first and then disinfect them properly with a bleach, quartinery ammonium or peroxide product.

Once the greenhouse is sufficiently sanitized, to maintain the cleanliness, consider restricting entry into growing areas to necessary personnel and supervise all visitors. Consider requiring everyone to clean their shoes before entering growing areas by first removing any soil on the shoes and then using a foot bath or foot mat that contains disinfectant. Remember to change the disinfectant daily in these foot baths or mats. Also, make sure employees wash their hands thoroughly with warm, soapy water and perhaps other sanitizing products as well before work and at intervals throughout the day before handling plants. Think about having employees use

protective clothing, such as disposable or sterile coveralls, gloves or shoe coverings, during potting or transplanting, when taking cuttings, or when rouging diseased plants. Remove and dispose of used protective clothing before working with healthy plants.Try and treat the greenhouse environment as you would any other room in your house; a decent level of cleanliness will result in happier, healthier plants and crops.

## Exercise

1. Note on Health & Safety management in Green House.

Answer: .....

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2. What are the emergency situations may occur in the Green House.

Answer: .....

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## Notes

# Unit 4.2 : Render appropriate emergency procedures at the work place

## Unit Objectives

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

- know Common health hazards at Greenhouse.
- Learn to render basic emergency services in need.

## 4.2.1 Introduction

The rapid expansion of the modern greenhouse industry gives rise to concern for the occupational safety and health of greenhouse workers.

### HEAT

Workers exposed to hot and humid conditions are at a high risk of heat illness, especially if they are doing heavy work tasks or using bulky protective clothing and equipment. New workers may also be at greater risk than others if they have not built up a tolerance to hot conditions. Employers must take steps to help workers become acclimated.

Prevention. Heat-related illnesses, while potentially deadly, are easily preventable. When working in hot conditions, remember "water, rest, shade." Drink water every 15 minutes, even when not thirsty. Wear a hat and light-colored clothing. Rest in the shade. Be sure to watch out for fellow workers and know your location in case you need to call for assistance. Get help right away if there are any signs of illness.

### LADDERS & FALLS

Greenhouse operator and other workers at Greenhouse are required to operate on heights upto 4 meters' time to time depending on various purposes such as cleaning, plastic sheet adjustment.
Using harness belts or ropes while using ladders is advisable to avoid any injuries by falling from ladders.

### MUSCULOSKELETAL INJURIES

Workers in Greenhouse operations for typically use repetitive motions in awkward positions and which can cause musculoskeletal injuries.

Ergonomic risk factors are found in jobs requiring repetitive, forceful, or prolonged exertions of the hands; frequent or heavy lifting, pushing, pulling, or carrying of heavy objects; and prolonged awkward postures.

Vibration and cold may intensify these conditions.
New technologies and automation may reduce some types of ergonomic injuries but increase others. Ergonomic protections. Proper tools, padding to reduce vibration, and fewer activities with high repetition are some methods for reducing musculoskeletal injuries.

### HAZARDOUS EQUIPMENT AND MACHINERY

Greenhouse operators routinely use knives, hoes, and other cutting tools; work on ladders; or use machinery. However, these simple tools can be hazardous and have the potential for causing severe injuries when used or maintained improperly.

- All tools should be maintained in good condition and used according to the manufacturers' instructions.
- Power tools must be properly grounded or double insulated and all guards or shields must be in place.
- Greenhouse operators should wear the proper personal protective equipment (PPE) and make sure that clothing has no strings or loose ends that could be caught by machinery. Long hair should be tied back to prevent entanglement.

### RESPIRATORY DISTRESS

Respiratory hazards in Greenhouse range from acute to chronic air contaminants. Greenhouse operators most common respiratory hazards are bio aerosols, such as organic dusts, microorganisms, and endotoxins and chemical toxicants.

## 4.2.2 Rendering appropriate emergency services.

An emergency can strike your Greenhouse at any time. It is important to be prepared with a plan of action should the need arise. Part of that plan should include information to assist emergency responders and others if called upon should a disaster like a fire, flood or disease outbreak or even cuts and minor injuries occur. Each Greenhouse may present unique challenges in an emergency situation. Ensuring that public safety officials and emergency response planners in your community are aware of your specific needs will serve to reduce the impact of an emergency on youand your property.

## Notes

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# 5. Employability & Entrepreneurship Skills



AGR/N4103

## Key Learning Outcomes

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

1. Explain the meaning of health
2. List common health issues
3. Discuss tips to prevent common health issues
4. Explain the meaning of hygiene
5. Understand the purpose of Swacch Bharat Abhiyan
6. Explain the meaning of habit
7. Discuss ways to set up a safe work environment
8. Discuss critical safety habits to be followed by employees
9. Explain the importance of self-analysis
10. Understand motivation with the help of Maslow's Hierarchy of Needs
11. Discuss the meaning of achievement motivation
12. List the characteristics of entrepreneurs with achievement motivation
13. List the different factors that motivate you
14. Discuss how to maintain a positive attitude
15. Discuss the role of attitude in self-analysis
16. List your strengths and weaknesses
17. Discuss the qualities of honest people
18. Describe the importance of honesty in entrepreneurs
19. Discuss the elements of a strong work ethic
20. Discuss how to foster a good work ethic
21. List the characteristics of highly creative people
22. List the characteristics of highly innovative people
23. Discuss the benefits of time management
24. List the traits of effective time managers
25. Describe effective time management technique
26. Discuss the importance of anger management
27. Describe anger management strategies
28. Discuss tips for anger management
29. Discuss the causes of stress
30. Discuss the symptoms of stress
31. Discuss tips for stress management
32. Identify the basic parts of a computer
33. Identify the basic parts of a keyboard
34. Recall basic computer terminology
35. Recall basic computer terminology

36. Recall the functions of basic computer keys
37. Discuss the main applications of MS Office
38. Discuss the benefits of Microsoft Outlook
39. Discuss the different types of e-commerce
40. List the benefits of e-commerce for retailers and customers
41. Discuss how the Digital India campaign will help boost e-commerce in India
42. Explain how you will sell a product or service on an e-commerce platform
43. Discuss the importance of saving money
44. Discuss the benefits of saving money
45. Discuss the main types of bank accounts
46. Describe the process of opening a bank account
47. Differentiate between fixed and variable costs
48. Describe the main types of investment options
49. Describe the different types of insurance products
50. Describe the different types of taxes
51. Discuss the uses of online banking
52. Discuss the main types of electronic funds transfers
53. Discuss the steps to prepare for an interview
54. Discuss the steps to create an effective Resume
55. Discuss the most frequently asked interview questions
56. Discuss how to answer the most frequently asked interview questions
57. Discuss basic workplace terminology
58. Discuss the concept of entrepreneurship
59. Discuss the importance of entrepreneurship
60. Describe the characteristics of an entrepreneur
61. Describe the different types of enterprises
62. List the qualities of an effective leader
63. Discuss the benefits of effective leadership
64. List the traits of an effective team
65. Discuss the importance of listening effectively
66. Discuss how to listen effectively
67. Discuss the importance of speaking effectively
68. Discuss how to speak effectively
69. Discuss how to solve problems
70. List important problem solving traits

71. Discuss ways to assess problem solving skills
72. Discuss the importance of negotiation
73. Discuss how to negotiate
74. Discuss how to identify new business opportunities
75. Discuss how to identify business opportunities within your business
76. Understand the meaning of entrepreneur
77. Describe the different types of entrepreneurs
78. List the characteristics of entrepreneurs
79. Recall entrepreneur success stories
80. Discuss the entrepreneurial process
81. Describe the entrepreneurship ecosystem
82. Discuss the government's role in the entrepreneurship ecosystem
83. Discuss the current entrepreneurship ecosystem in India
84. Understand the purpose of the Make in India campaign
85. Discuss the relationship between entrepreneurship and risk appetite
86. Discuss the relationship between entrepreneurship and resilience
87. Describe the characteristics of a resilient entrepreneur
88. Discuss how to deal with failure
89. Discuss how market research is carried out
90. Describe the 4 Ps of marketing
91. Discuss the importance of idea generation
92. Recall basic business terminology
93. Discuss the need for CRM
94. Discuss the benefits of CRM
95. Discuss the need for networking
96. Discuss the benefits of networking
97. Understand the importance of setting goals
98. Differentiate between short-term, medium-term and long-term goals
99. Discuss how to write a business plan
100. Explain the financial planning process
101. Discuss ways to manage your risk
102. Describe the procedure and formalities for applying for bank finance
103. Discuss how to manage your own enterprise
104. List important questions that every entrepreneur should ask before starting an enterprise

# UNIT 5.1: Personal Strengths & Value Systems

## Unit Objectives

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

1. Explain the meaning of health
2. List common health issues
3. Discuss tips to prevent common health issues
4. Explain the meaning of hygiene
5. Understand the purpose of Swacch Bharat Abhiyan
6. Explain the meaning of habit
7. Discuss ways to set up a safe work environment
8. Discuss critical safety habits to be followed by employees
9. Explain the importance of self-analysis
10. Understand motivation with the help of Maslow's Hierarchy of Needs
11. Discuss the meaning of achievement motivation
12. List the characteristics of entrepreneurs with achievement motivation
13. List the different factors that motivate you
14. Discuss how to maintain a positive attitude
15. Discuss the role of attitude in self-analysis
16. List your strengths and weaknesses
17. Discuss the qualities of honest people
18. Describe the importance of honesty in entrepreneurs
19. Discuss the elements of a strong work ethic
20. Discuss how to foster a good work ethic
21. List the characteristics of highly creative people
22. List the characteristics of highly innovative people
23. Discuss the benefits of time management
24. List the traits of effective time managers
25. Describe effective time management technique
26. Discuss the importance of anger management
27. Describe anger management strategies
28. Discuss tips for anger management
29. Discuss the causes of stress
30. Discuss the symptoms of stress
31. Discuss tips for stress management

## 5.1.1 Health, Habits, Hygiene: What is Health

As per the World Health Organization (WHO), health is a "State of complete physical, mental, and social well-being, and not merely the absence of disease or infirmity." This means being healthy does not simply mean not being unhealthy – it also means you need to be at peace emotionally, and feel fit physically. For example, you cannot say you are healthy simply because you do not have any physical ailments like a cold or cough. You also need to think about whether you are feeling calm, relaxed and happy.

## Common Health Issues

Some common health issues are:

- Allergies
- Asthma
- Skin Disorders
- Depression and Anxiety
- Diabetes
- Cough, Cold, Sore Throat
- Difficulty Sleeping
- Obesity

## Tips to Prevent Health Issues

Taking measures to prevent ill health is always better than curing a disease or sickness. You can stay healthy by:

- Eating healthy foods like fruits, vegetables and nuts
- Cutting back on unhealthy and sugary foods
- Drinking enough water everyday
- Not smoking or drinking alcohol
- Exercising for at least 30 minutes a day, 4-5 times a week
- Taking vaccinations when required
- Practicing yoga exercises and meditation

**How many of these health standards do you follow? Tick the ones that apply to you.**

1. Get minimum 7-8 hours of sleep every night. ☐
2. Avoid checking email first thing in the morning and right before you go to bed at night. ☐
3. Don't skip meals – eat regular meals at correct meal times. ☐
4. Read a little bit every single day. ☐
5. Eat more home cooked food than junk food. ☐

6. Stand more than you sit. ☐
7. Drink a glass of water first thing in the morning and have at least 8 glasses of water through the day. ☐
8. Go to the doctor and dentist for regular checkups. ☐
9. Exercise for 30 minutes at least 5 days a week. ☐
10. Avoid consuming lots of aerated beverages. ☐

## What is Hygiene?

As per the World Health Organization (WHO), "Hygiene refers to conditions and practices that help to maintain health and prevent the spread of diseases." In other words, hygiene means ensuring that you do whatever is required to keep your surroundings clean, so that you reduce the chances of spreading germs and diseases.

For instance, think about the kitchen in your home. Good hygiene means ensuring that the kitchen is always spick and span, the food is put away, dishes are washed and dustbins are not overflowing with garbage. Doing all this will reduce the chances of attracting pests like rats or cockroaches, and prevent the growth of fungus and other bacteria, which could spread disease.

**How many of these health standards do you follow? Tick the ones that apply to you.**

1. Have a bath or shower every day with soap – and wash your hair with shampoo 2-3 times a week. ☐
2. Wear a fresh pair of clean undergarments every day. ☐
3. Brush your teeth in the morning and before going to bed. ☐
4. Cut your fingernails and toenails regularly. ☐
5. Wash your hands with soap after going to the toilet. ☐
6. Use an anti-perspirant deodorant on your underarms if you sweat a lot. ☐
7. Wash your hands with soap before cooking or eating. ☐
8. Stay home when you are sick, so other people don't catch what you have. ☐
9. Wash dirty clothes with laundry soap before wearing them again. ☐
10. Cover your nose with a tissue/your hand when coughing or sneezing. ☐

See how healthy and hygienic you are, by giving yourself 1 point for every ticked statement!

Then take a look at what your score means.

**Your Score**

0-7/20: You need to work a lot harder to stay fit and fine! Make it a point to practice good habits daily and see how much better you feel!

7-14/20: Not bad, but there is scope for improvement! Try and add a few more good habits to your daily routine.

14-20/20: Great job! Keep up the good work! Your body and mind thank you!

## Swachh Bharat Abhiyan

We have already discussed the importance of following good hygiene and health practices for ourselves. But, it is not enough for us to be healthy and hygienic. We must also extend this standard to our homes, our immediate surroundings and to our country as a whole.

The 'Swachh Bharat Abhiyan' (Clean India Mission) launched by Prime Minister Shri Narendra Modi on 2nd October 2014, believes in doing exactly this. The aim of this mission is to clean the streets and roads of India and raise the overall level of cleanliness. Currently this mission covers 4,041 cities and towns across the country. Millions of our people have taken the pledge for a clean India. You should take the pledge too, and do everything possible to keep our country clean!

## What are Habits?

A habit is a behaviour that is repeated frequently. All of us have good habits and bad habits. Keep in mind the phrase by John Dryden: "We first make our habits, and then our habits make us." This is why it is so important that you make good habits a way of life, and consciously avoid practicing bad habits.

Some good habits that you should make part of your daily routine are:

- Always having a positive attitude
- Making exercise a part of your daily routine
- Reading motivational and inspirational stories
- Smiling! Make it a habit to smile as often as possible
- Making time for family and friends
- Going to bed early and waking up early

Some bad habits that you should quit immediately are:

- Skipping breakfast
- Snacking frequently even when you are not hungry
- Eating too much fattening and sugary food
- Smoking, drinking alcohol and doing drugs
- Spending more money than you can afford
- Worrying about unimportant issues
- Staying up late and waking up late

## Tips

- Following healthy and hygienic practices every day will make you feel good mentally and physically.
- Hygiene is two-thirds of health – so good hygiene will help you stay strong and healthy!

## 5.1.2: Safety: Tips to Design a Safe Workplace

Every employer is obligated to ensure that his workplace follows the highest possible safety protocol. When setting up a business, owners must make it a point to:

- Use ergonomically designed furniture and equipment to avoid stooping and twisting
- Provide mechanical aids to avoid lifting or carrying heavy objects
- Have protective equipment on hand for hazardous jobs
- Designate emergency exits and ensure they are easily accessible
- Set down health codes and ensure they are implemented
- Follow the practice of regular safety inspections in and around the workplace
- Ensure regular building inspections are conducted
- Get expert advice on workplace safety and follow it

## Non-Negotiable Employee Safety Habits

Every employer is obligated to ensure that his workplace follows the highest possible safety protocol. When setting up a business, owners must make it a point to:

- Immediately report unsafe conditions to a supervisor
- Recognize and report safety hazards that could lead to slips, trips and falls
- Report all injuries and accidents to a supervisor
- Wear the correct protective equipment when required
- Learn how to correctly use equipment provided for safety purposes
- Be aware of and avoid actions that could endanger other people
- Take rest breaks during the day and some time off from work during the week

## Tips

- Be aware of what emergency number to call at the time of a workplace emergency
- Practice evacuation drills regularly to avoid chaotic evacuations

## 5.1.3 Self Analysis – Attitude, Achievement Motivation: What is Self-Analysis

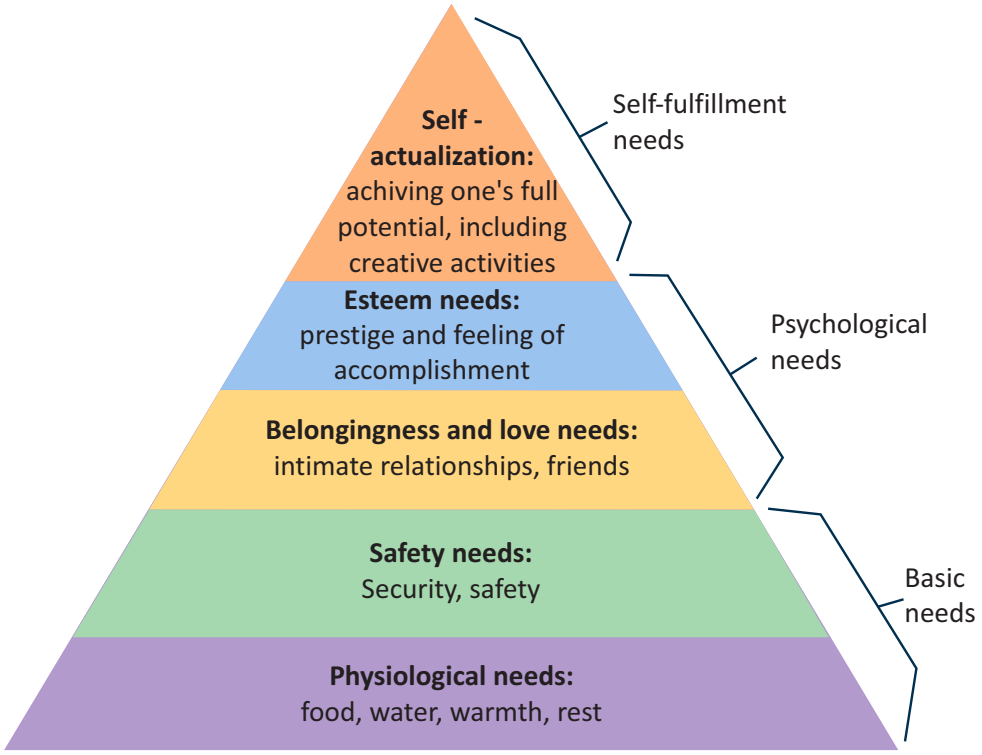
To truly achieve your full potential, you need to take a deep look inside yourself and find out what kind of person you really are. This attempt to understand your personality is known as self-analysis. Assessing yourself in this manner will help you grow, and will also help you to identify areas within yourself that need to be further developed, changed or eliminated. You can better understand yourself by taking a deep look at what motivates you, what your attitude is like, and what your strengths and weaknesses are.

## What is Motivation?

Very simply put, motivation is your reason for acting or behaving in a certain manner. It is important to understand that not everyone is motivated by the same desires – people are motivated by many, many different things. We can understand this better by looking at Maslow's Hierarchy of Needs.

## Maslow's Hierarchy of Needs

Famous American psychologist Abraham Maslow wanted to understand what motivates people. He believed that people have five types of needs, ranging from very basic needs (called physiological needs) to more important needs that are required for self-growth (called self-actualization needs). Between the physiological and self-actualization needs are three other needs – safety needs, belongingness and love needs, and esteem needs. These needs are usually shown as a pyramid with five levels and are known as Maslow's Hierarchy of Needs.



As you can see from the pyramid, the lowest level depicts the most basic needs. Maslow believed that our behaviour is motivated by our basic needs, until those needs are met. Once they are fulfilled, we move to the next level and are motived by the next level of needs. Let's understand this better with an example.

Rupa comes from a very poor family. She never has enough food, water, warmth or rest. According to Maslow, until Rupa is sure that she will get these basic needs, she will not even think about the next level of needs – her safety needs. But, once Rupa is confident that her basic needs will be met, she will move to the next level, and her behaviour will then be motivated by her need for security and safety. Once these new needs are met, Rupa will once again move to the next level, and be motivated by her need for relationships and friends. Once this need is satisfied, Rupa will then focus on the fourth level of needs – her esteem needs, after which she will move up to the fifth and last level of needs – the desire to achieve her full potential.

## Understanding Achievement Motivation

We now know that people are motivated by basic, psychological and self-fulfillment needs. However, certain people are also motivated by the achievement of highly challenging accomplishments. This is known as Achievement Motivation, or 'need for achievement'.

The level of motivation achievement in a person differs from individual to individual. It is important that entrepreneurs have a high level of achievement motivation – a deep desire to accomplish something important and unique. It is equally important that they hire people who are also highly motivated by challenges and success.

## What Motivates You?

What are the things that really motivate you? List down five things that really motivate you.

Remember to answer honestly!

**I am motivated by:**

## Characteristics of Entrepreneurs with Achievement Motivation

Entrepreneurs with achievement motivation can be described as follows:

- Unafraid to take risks for personal accomplishment
- Love being challenged
- Future-oriented
- Flexible and adaptive
- Value negative feedback more than positive feedback
- Very persistent when it comes to achieving goals
- Extremely courageous
- Highly creative and innovative
- Restless - constantly looking to achieve more
- Feel personally responsible for solving problems

**Think about it:**

- How many of these traits do you have?
- Can you think of entrepreneurs who display these traits?

## How to Cultivate a Positive Attitude

The good news is attitude is a choice. So it is possible to improve, control and change our attitude, if we decide we want to! The following tips help foster a positive mindset:

- Remember that you control your attitude, not the other way around
- Devote at least 15 minutes a day towards reading, watching or listening to something positive
- Avoid negative people who only complain and stop complaining yourself
- Expand your vocabulary with positive words and delete negative phrases from your mind
- Be appreciative and focus on what's good in yourself, in your life, and in others
- Stop thinking of yourself as a victim and start being proactive
- Imagine yourself succeeding and achieving your goals

## What is Attitude?

Now that we understand why motivation is so important for self-analysis, let's look at the role our attitude plays in better understanding ourselves. Attitude can be described as your tendency (positive or negative), to think and feel about someone or something. Attitude is the foundation for success in every aspect of life. Our attitude can be our best friend or our worst enemy. In other words:

"The only disability in life is a bad attitude."

When you start a business, you are sure to encounter a wide variety of emotions, from difficult times and failures to good times and successes. Your attitude is what will see you through the tough times and guide you towards success. Attitude is also infectious. It affects everyone around you, from your customers to your employees to your investors. A positive attitude helps build confidence in the workplace while a negative attitude is likely to result in the demotivation of your people.

## What Are Your Strengths and Weaknesses?

Another way to analyze yourself is by honestly identifying your strengths and weaknesses. This will help you use your strengths to your best advantage and reduce your weaknesses.

Note down all your strengths and weaknesses in the two columns below. Remember to be honest with yourself!

| Strengths | Weaknesses |
|---|---|
| | |

## Tips

- Achievement motivation can be learned.
- Don’t be afraid to make mistakes.
- Train yourself to finish what you start.
- Dream big.

## 5.1.4 Honesty & Work Ethics: What is Honesty?

Honesty is the quality of being fair and truthful. It means speaking and acting in a manner that inspires trust. A person who is described as honest is seen as truthful and sincere, and as someone who isn't deceitful or devious and doesn't steal or cheat. There are two dimensions of honesty – one is honesty in communication and the other is honesty in conduct.

Honesty is an extremely important trait because it results in peace of mind and builds relationships that are based on trust. Being dishonest, on the other hand, results in anxiety and leads to relationships full of distrust and conflict.

## Qualities of Honest People

Honest individuals have certain distinct characteristics. Some common qualities among honest people are:

1. They don't worry about what others think of them. They believe in being themselves – they don't bother about whether they are liked or disliked for their personalities.
2. They stand up for their beliefs. They won't think twice about giving their honest opinion, even if they are aware that their point of view lies with the minority.
3. They are think skinned. This means they are not affected by others judging them harshly for their honest opinions.
4. They forge trusting, meaningful and healthy friendships. Honest people usually surround themselves with honest friends. They have faith that their friends will be truthful and upfront with them at all times.

They are trusted by their peers. They are seen as people who can be counted on for truthful and objective feedback and advice.

- Honesty and employees: When entrepreneurs build honest relationships with their employees, it leads to more transparency in the workplace, which results in higher work performance and better results.
- Honesty and investors: For entrepreneurs, being honest with investors means not only sharing strengths but also candidly disclosing current and potential weaknesses, problem areas and solution strategies. Keep in mind that investors have a lot of experience with startups and are aware that all new companies have problems. Claiming that everything is perfectly fine and running smoothly is a red flag for most investors.
- Honesty with oneself: The consequences of being dishonest with oneself can lead to dire results, especially in the case of entrepreneurs. For entrepreneurs to succeed, it is critical that they remain realistic about their situation at all times, and accurately judge every aspect of their enterprise for what it truly is.

## Importance of Honesty in Entrepreneurs

One of the most important characteristics of entrepreneurs is honesty. When entrepreneurs are honest with their customers, employees and investors, it shows that they respect those that they work with. It is also important that entrepreneurs remain honest with themselves. Let's look at how being honest would lead to great benefits for entrepreneurs.

- Honesty and customers: When entrepreneurs are honest with their customers it leads to stronger relationships, which in turn results in business growth and a stronger customer network.

## What are Work Ethics?

Being ethical in the workplace means displaying values like honesty, integrity and respect in all your decisions and communications. It means not displaying negative qualities like lying, cheating and stealing.

Workplace ethics play a big role in the profitability of a company. It is as crucial to an enterprise as high morale and teamwork. This is why most companies lay down specific workplace ethic guidelines that must compulsorily be followed by their employees. These guidelines are typically outlined in a company's employee handbook.

## Elements of a Strong Work Ethic

An entrepreneur must display strong work ethics, as well as hire only those individuals who believe in and display the same level of ethical behavior in the workplace. Some elements of a strong work ethic are:

- **Professionalism**: This involves everything from how you present yourself in a corporate setting to the manner in which you treat others in the workplace.
- **Respectfulness**: This means remaining poised and diplomatic regardless of how stressful or volatile a situation is.
- **Dependability**: This means always keeping your word, whether it's arriving on time for a meeting or delivering work on time.
- **Dedication**: This means refusing to quit until the designated work is done, and completing the work at the highest possible level of excellence.
- **Determination**: This means embracing obstacles as challenges rather than letting them stop you, and pushing ahead with purpose and resilience to get the desired results.
- **Accountability**: This means taking responsibility for your actions and the consequences of your actions, and not making excuses for your mistakes.
- **Humility**: This means acknowledging everyone's efforts and had work, and sharing the credit for accomplishments.

## How to Foster a Good Work Ethic

As an entrepreneur, it is important that you clearly define the kind of behaviour that you expect from each and every team member in the workplace. You should make it clear that you expect employees to display positive work ethics like:

- **Honesty**: All work assigned to a person should be done with complete honesty, without any deceit or lies.
- **Good attitude**: All team members should be optimistic, energetic, and positive.
- **Reliability**: Employees should show up where they are supposed to be, when they are supposed to be there.
- **Good work habits**: Employees should always be well groomed, never use inappropriate language, conduct themselves professionally at all times, etc.
- **Initiative**: Doing the bare minimum is not enough. Every team member needs to be proactive and show initiative.
- **Trustworthiness**: Trust is non-negotiable. If an employee cannot be trusted, it's time to let that employee go.

- **Respect**: Employees need to respect the company, the law, their work, their colleagues and themselves.
- **Integrity**: Each and every team member should be completely ethical and must display above board behaviour at all times.
- **Efficiency**: Efficient employees help a company grow while inefficient employees result in a waste of time and resources.

## Tips 

- Don't get angry when someone tells you the truth and you don't like what you hear.
- Always be willing to accept responsibility for your mistakes.

## 5.1.5 Creativity & Innovation : What is Creativity

Creativity means thinking outside the box. It means viewing things in new ways or from different perspectives, and then converting these ideas into reality. Creativity involves two parts: thinking and producing. Simply having an idea makes you imaginative, not creative. However, having an idea and acting on it makes you creative.

## Characteristics of Highly Creative People

Some characteristics of creative people are:

- They are imaginative and playful
- They see issues from different angles
- They notice small details
- They have very little tolerance for boredom
- They detest rules and routine
- They love to daydream
- They are very curious

## What is Innovation?

There are many different definitions of innovation. In simple terms, innovation means turning an idea into a solution that adds value. It can also mean adding value by implementing a new product, service or process, or significantly improving on an existing product, service or process.

## Characteristics of Highly Innovative People

Some characteristics of highly innovative people are:

- They embrace doing things differently
- They don't believe in taking shortcuts
- They are not afraid to be unconventional
- They are highly proactive and persistent
- They are organized, cautious and risk-averse

## Tips

- Take regular breaks from your creative work to recharge yourself and gain fresh perspective.
- Build prototypes frequently, test them out, get feedback, and make the required changes.

## 5.1.6 Time Management: What is Time Management?

Time management is the process organizing your time, and deciding how to allocate your time between different activities. Good time management is the difference between working smart (getting more done in less time) and working hard (working for more time to get more done).

Effective time management leads to an efficient work output, even when you are faced with tight deadlines and high pressure situations. On the other hand, not managing your time effectively results in inefficient output and increases stress and anxiety.

## Benefits of Time Management

Time management can lead to huge benefits like:

- Greater productivity
- Better professional reputation
- Higher chances for career advancement
- Higher efficiency
- Reduced stress
- Greater opportunities to achieve goals

Not managing time effectively can result in undesirable consequences like:

- Missing deadlines
- Substandard work quality
- Stalled career
- Inefficient work output
- Poor professional reputation
- Increase in stress and anxiety

## Traits of Effective Time Managers

Some traits of effective time managers are:

- They begin projects early
- They set daily objectives
- They modify plans if required, to achieve better results
- They are flexible and open-minded
- They inform people in advance if their help will be required
- They know how to say no
- They break tasks into steps with specific deadlines
- They continually review long term goals
- They think of alternate solutions if and when required
- They ask for help when required
- They create backup plans

## Effective Time Management Techniques

You can manage your time better by putting into practice certain time management techniques. Some helpful tips are:

- Plan out your day as well as plan for interruptions. Give yourself at least 30 minutes to figure out your time plan. In your plan, schedule some time for interruptions.
- Put up a “Do Not Disturb” sign when you absolutely have to complete a certain amount of work.
- Close your mind to all distractions. Train yourself to ignore ringing phones, don’t reply to chat messages and disconnect from social media sites.

- Delegate your work. This will not only help your work get done faster, but will also show you the unique skills and abilities of those around you.
- Stop procrastinating. Remind yourself that procrastination typically arises due to the fear of failure or the belief that you cannot do things as perfectly as you wish to do them.
- Prioritize. List each task to be completed in order of its urgency or importance level. Then focus on completing each task, one by one.
- Maintain a log of your work activities. Analyze the log to help you understand how efficient you are, and how much time is wasted every day.
  Create time management goals to reduce time wastage.

## Tips 

- Always complete the most important tasks first.
- Get at least 7 – 8 hours of sleep every day.
- Start your day early.
- Don’t waste too much time on small, unimportant details.
- Set a time limit for every task that you will undertake.
- Give yourself some time to unwind between tasks.

## 5.1.7 Anger Management: What is Anger Management

Anger management is the process of:

1. Learning to recognize the signs that you, or someone else, is becoming angry
2. Taking the best course of action to calm down the situation in a positive way

Anger management does not mean suppressing anger.

## Importance of Anger Management

Anger is a perfectly normal human emotion. In fact, when managed the right way, anger can be considered a healthy emotion. However, if it is not kept in check, anger can make us act inappropriately and can lead to us saying or doing things that we will likely later regret.
Extreme anger can:

- **Hurt you physically:** It leads to heart disease, diabetes, a weakened immune system, insomnia, and high blood pressure.
- **Hurt you mentally**: It can cloud your thinking and lead to stress, depression and mental health issues.
- **Hurt your career**: It can result in alienating your colleagues, bosses, clients and lead to the loss of respect.
- **Hurt your relationships**: It makes it hard for your family and friends to trust you, be honest with you and feel comfortable around you.
  This is why anger management, or managing anger appropriately, is so important.

## Anger Management Strategies

Here are some strategies that can help you control your anger:

**Strategy 1: Relaxation**

Something as simple as breathing deeply and looking at relaxing images works wonders in calming down angry feelings. Try this simple breathing exercise:

1. Take a deep breath from your diaphragm (don't breathe from your chest)
2. Visualize your breath coming up from your stomach
3. Keep repeating a calming word like 'relax' or 'take it easy' (remember to keep breathing deeply while repeating the word)
4. Picture a relaxing moment (this can be from your memory or your imagination)

Follow this relaxation technique daily, especially when you realize that you're starting to feel angry.

**Strategy 2: Cognitive Restructuring**

Cognitive restructuring means changing the manner in which you think. Anger can make you curse, swear, exaggerate and act very dramatically. When this happens, force yourself to replace your angry thoughts with more logical ones. For instance, instead of thinking 'Everything is ruined' change your mindset and tell yourself 'It's not the end of the world and getting angry won't solve this'.

**Strategy 3: Problem Solving**

Getting angry about a problem that you cannot control is a perfectly natural response. Sometimes, try as you may, there may not be a solution to the difficulty you are faced with. In such cases, stop focusing on solving the problem, and instead focus on handling and facing the problem. Remind yourself that you will do your best to deal with the situation, but that you will not blame yourself if you don't get the solution you desire.

**Strategy 4: Better Communication**

When you're angry, it is very easy to jump to inaccurate conclusions. In this case, you need to force yourself to stop reacting, and think carefully about what you want to say, before saying it. Avoid saying the first thing that enters your head. Force yourself to listen carefully to what the other person is saying. Then think about the conversation before responding.

**Strategy 5: Changing Your Environment**

If you find that your environment is the cause of your anger, try and give yourself a break from your surroundings. Make an active decision to schedule some personal time for yourself, especially on days that are very hectic and stressful. Having even a brief amount of quiet or alone time is sure to help calm you down.

## Tips for Anger Management

- The following tips will help you keep your anger in check:
- Take some time to collect your thoughts before you speak out in anger.
- Express the reason for your anger in an assertive, but non-confrontational manner once you have calmed down.
- Do some form of physical exercise like running or walking briskly when you feel yourself getting angry.
- Make short breaks part of your daily routine, especially during days that are stressful. Focus on how to solve a problem that's making you angry, rather than focusing on the fact that the problem is making you angry.

## Tips

- Try to forgive those who anger you, rather than hold a grudge against them.
- Avoid using sarcasm and hurling insults. Instead, try and explain the reason for your frustration in a polite and mature manner.

## 5.1.8 Stress Management: What is Stress

We say we are 'stressed' when we feel overloaded and unsure of our ability to deal with the pressures placed on us. Anything that challenges or threatens our well-being can be defined as a stress. It is important to note that stress can be good and bad. While good stress keeps us going, negative stress undermines our mental and physical health. This is why it is so important to manage negative stress effectively.

## Causes of Stress

Stress can be caused by internal and external factors.

**Internal causes of stress**

- Constant worry
- Rigid thinking
- Unrealistic expectations
- Pessimism
- Negative self-talk
- All in or all out attitude

**External causes of stress**

- Major life changes
- Difficulties with relationships
- Having too much to do
- Difficulties at work or in school
- Financial difficulties
- Worrying about one's children and/or family

## Symptoms of Stress

Stress can manifest itself in numerous ways. Take a look at the cognitive, emotional, physical and behavioral symptoms of stress.

| Cognitive Symptoms | Emotional Symptoms |
|---|---|
| • Memory problems | • Depression |
| • Concentration issues | • Agitation |
| • Lack of judgement | • Irritability |
| • Pessimism | • Loneliness |
| • Anxiety | • Anxiety |
| • Constant worrying | • Anger |

| Physical Symptoms | Behavioral Symptoms |
|---|---|
| • Aches and pain | • Increase or decrease in appetite |
| • Diarrhea or constipation | • Over sleeping or not sleeping enough |
| • Nausea | • Withdrawing socially |
| • Dizziness | • Ignoring responsibilities |
| • Chest pain and/or rapid heartbeat | • Consumption of alcohol or cigarettes |
| • Frequent cold or flu like feelings | • Nervous habits like nail biting, pacing etc. |

## Tips to Manage Stress

The following tips can help you manage your stress better:

- Note down the different ways in which you can handle the various sources of your stress.
- Remember that you cannot control everything, but you can control how you respond.
- Discuss your feelings, opinions and beliefs rather than reacting angrily, defensively or passively.
- Practice relaxation techniques like meditation, yoga or tai chi when you start feeling stressed.
- Devote a part of your day towards exercise.
- Eat healthy foods like fruits and vegetables. Avoid unhealthy foods especially those containing large amounts of sugar.
- Plan your day so that you can manage your time better, with less stress.
- Say no to people and things when required.
- Schedule time to pursue your hobbies and interests.
- Ensure you get at least 7-8 hours of sleep.
- Reduce your caffeine intake.
- Increase the time spent with family and friends.

## Tips 

- Force yourself to smile even if you feel stressed. Smiling makes us feel relaxed and happy.
- Stop yourself from feeling and thinking like a victim. Change your attiude and focus on being proactive.

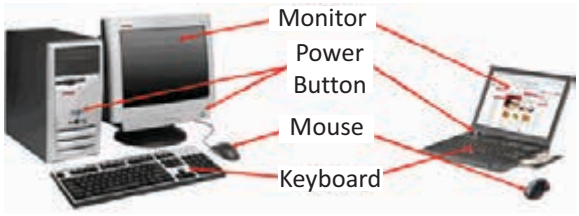
# UNIT 5.2. Digital Literacy: A Recap

## Unit Objectives

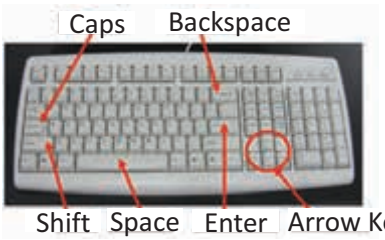
**At the end of this unit, you will be able to:**

1. Identify the basic parts of a computer
2. Identify the basic parts of a keyboard
3. Recall basic computer terminology
4. Recall basic computer terminology
5. Recall the functions of basic computer keys
6. Discuss the main applications of MS Office
7. Discuss the benefits of Microsoft Outlook
8. Discuss the different types of e-commerce
9. List the benefits of e-commerce for retailers and customers
10. Discuss how the Digital India campaign will help boost e-commerce in India
11. Describe how you will sell a product or service on an e-commerce platform

## 5.2.1 Computer and Internet basics: Basic Parts of a Computer




## Basic Parts of a Keyboard



## Basic Parts of a Computer

- **Central Processing Unit (CPU)**: The brain of the computer. It interprets and carries out program instructions.
- **Hard Drive**: A device that stores large amounts of data.
- **Monitor**: The device that contains the computer screen where the information is visually displayed.
- **Desktop**: The first screen displayed after the operating system loads.
- **Background**: The image that fills the background of the desktop.

## Basic Parts of a Computer

- **Mouse**: A hand-held device used to point to items on the monitor.
- **Speakers**: Devices that enable you to hear sound from the computer.
- **Printer**: A device that converts output from a computer into printed paper documents.
- **Icon**: A small picture or image that visually represents something on your computer.
- **Cursor**: An arrow which indicates where you are positioned on the screen.
- **Program Menu**: A list of programs on your computer that can be accessed from the Start menu.
- **Taskbar**: The horizontal bar at the bottom of the computer screen that lists applications that are currently in use.
- **Recycle Bin**: A temporary storage for deleted files.

## Basic Internet Terms

- **The Internet**: A vast, international collection of computer networks that transfers information.
- **The World Wide Web**: A system that lets you access information on the Internet.
- **Website**: A location on the World Wide Web (and Internet) that contains information about a specific topic.
- **Homepage**: Provides information about a website and directs you to other pages on that website.
- **Link/Hyperlink**: A highlighted or underlined icon, graphic, or text that takes you to another file or object.
- **Web Address/URL**: The address for a website.
- **Address Box**: A box in the browser window where you can type in a web address.

## Basic Computer Keys

- **Arrow Keys**: Press these keys to move your cursor.
- **Space bar**: Adds a space.
- **Enter/Return**: Moves your cursor to a new line.
- **Shift**: Press this key if you want to type a capital letter or the upper symbol of a key.
- **Caps Lock**: Press this key if you want all the letters you type to be capital letters. Press it again to revert back to typing lowercase letters.
- **Backspace**: Deletes everything to the left of your cursor.

## Tips 

- When visiting a .com address, there no need to type http:// or even www. Just type the name of the website and then press Ctrl + Enter. (Example: Type 'apple' and press Ctrl + Enter to go to www.apple.com)
- Press the Ctrl key and press the + or - to increase and decrease the size of text.
- Press F5 or Ctrl + R to refresh or reload a web page.

## 5.2.2 MS Office and Email: About MS Office

MS Office or Microsoft Office is a suite of computer programs developed by Microsoft. Although meant for all users, it offers different versions that cater specifically to students, home users and business users. All the programs are compatible with both, Windows and Macintosh.

## Most Popular Office Products

Some of the most popular and universally used MS Office applications are:

- **Microsoft Word**: Allows users to type text and add images to a document.
- **Microsoft Excel**: Allows users to enter data into a spreadsheet and create calculations and graphs.
- **Microsoft PowerPoint**: Allows users to add text, pictures and media and create slideshows and presentations.
- **Microsoft Outlook**: Allows users to send and receive email.
- **Microsoft OneNote**: Allows users to make drawings and notes with the feel of a pen on paper.
- **Microsoft Access**: Allows users to store data over many tables.

## Why Choose Microsoft Outlook

A popular email management choice especially in the workplace, Microsoft Outlook also includes an address book, notebook, web browser and calendar. Some major benefits of this program are:

- **Integrated search function**: You can use keywords to search for data across all Outlook programs.
- **Enhanced security**: Your email is safe from hackers, junk mail and phishing website email.
- **Email syncing**: Sync your mail with your calendar, contact list, notes in One Note and…your phone!
- **Offline access to email**: No Internet? No problem! Write emails offline and send them when you're connected again.

## Tips

- Press Ctrl+R as a shortcut method to reply to email.
- Set your desktop notifications only for very important emails.
- Flag messages quickly by selecting messages and hitting the Insert key.
- Save frequently sent emails as a template to reuse again and again.
- Conveniently save important emails as files.

## 5.2.3 E-Commerce: What is E-Commerce

E-commerce is the buying or selling of goods and services, or the transmitting of money or data, electronically on the internet. E-Commerce is the short form for "electronic commerce."

## Examples of E-Commerce

Some examples of e-commerce are:

- Online shopping
- Online auctions
- Online ticketing
- Electronic payments
- Internet banking

## Types of E-Commerce

E-commerce can be classified based on the types of participants in the transaction. The main types of e-commerce are:

- **Business to Business (B2B)**: Both the transacting parties are businesses.
- **Business to Consumer (B2C)**: Businesses sell electronically to end-consumers.
- **Consumer to Consumer (C2C):** Consumers come together to buy, sell or trade items to other consumers.
- **Consumer-to-Business (C2B)**: Consumers make products or services available for purchase to companies looking for exactly those services or products.
- **Business-to-Administration (B2A)**: Online transactions conducted between companies and public administration.
- **Consumer-to-Administration (C2A)**: Online transactions conducted between individuals and public administration.

## Benefits of E-Commerce

The e-commerce business provides some benefits for retailers and customers.

**Benefits for retailers**:

- Establishes an online presence
- Reduces operational costs by removing overhead costs
- Increases brand awareness through the use of good keywords
- Increases sales by removing geographical and time constraints

**Benefits for customers:**

- Offers a wider range of choice than any physical store
- Enables goods and services to be purchased from remote locations
- Enables consumers to perform price comparisons

## Digital India Campaign

Prime Minister Narendra Modi launched the Digital India campaign in 2015, with the objective of offering every citizen of India access to digital services, knowledge and information. The campaign aims to improve the country's online infrastructure and increase internet connectivity, thus boosting the e-commerce industry.

Currently, the majority of online transactions come from tier 2 and tier 3 cities. Once the Digital India campaign is in place, the government will deliver services through mobile connectivity, which will help deliver internet to remote corners of the country. This will help the e-commerce market to enter India's tier 4 towns and rural areas.

## E-Commerce Activity

Choose a product or service that you want to sell online. Write a brief note explaining how you will use existing e-commerce platforms, or create a new e-commerce platform, to sell your product or service.

## Tips

- Before launching your e-commerce platform, test everything.
- Pay close and personal attention to your social media.

# UNIT 5.3: Money Matters

## Unit Objectives

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

1. Discuss the importance of saving money
2. Discuss the benefits of saving money
3. Discuss the main types of bank accounts
4. Describe the process of opening a bank account
5. Differentiate between fixed and variable costs
6. Describe the main types of investment options
7. Describe the different types of insurance products
8. Describe the different types of taxes
9. Discuss the uses of online banking
10. Discuss the main types of electronic funds transfers

## 5.3.1 Personal Finance – Why to Save: Importance of Saving

We all know that the future is unpredictable. You never know what will happen tomorrow, next week or next year. That's why saving money steadily through the years is so important. Saving money will help improve your financial situation over time. But more importantly, knowing that you have money stashed away for an emergency will give you peace of mind. Saving money also opens the door to many more options and possibilities.

## Benefits of Saving

Inculcating the habit of saving leads to a vast number of benefits. Saving helps you:

- **Become financially independent**: When you have enough money saved up to feel secure you can start making your choices, from taking a vacation whenever you want, to switching careers or starting your own business.
- **Invest in yourself through education**: Through saving, you can earn enough to pay up for courses that will add to your professional experience and ultimately result in higher paying jobs.
- **Get out of debt**: Once you have saved enough as a reserve fund, you can use your savings to pay off debts like loans or bills that have accumulated over time.
- **Be prepared for surprise expenses** : Having money saved enables you to pay for unforeseen expenses like sudden car or house repairs, without feeling financially stressed.
- **Pay for emergencies**: Saving helps you deal with emergencies like sudden health issues or emergency trips without feeling financially burdened.

- **Afford large purchases and achieve major goals:** Saving diligently makes it possible to place down payments towards major purchases and goals, like buying a home or a car.
- **Retire**: The money you have saved over the years will keep you comfortable when you no longer have the income you would get from your job.

## Tips 

- Break your spending habit. Try not spending on one expensive item per week, and put the money that you would have spent into your savings.
- Decide that you will not buy anything on certain days or weeks and stick to your word.

## 5.3.2 Types of Bank Accounts, Opening a Bank Account: Types of Bank Accounts

In India, banks offer four main types of bank accounts. These are:

- Current Accounts
- Savings Accounts
- Recurring Deposit Accounts
- Fixed Deposit Accounts

**Current Accounts**

Current accounts offer the most liquid deposits and thus, are best suited for businessmen and companies. As these accounts are not meant for investments and savings, there is no imposed limit on the number or amount of transactions that can be made on any given day. Current account holders are not paid any interest on the amounts held in their accounts. They are charged for certain services offered on such accounts.

**Savings Accounts**

Savings accounts are meant to promote savings, and are therefore the number one choice for salaried individuals, pensioners and students. While there is no restriction on the number and amount of deposits made, there are usually restrictions on the number and amount of withdrawals. Savings account holders are paid interest on their savings.

**Recurring Deposit Accounts**

Recurring Deposit accounts, also called RD accounts, are the accounts of choice for those who want to save an amount every month, but are unable to invest a large sum at one time. Such account holders deposit a small, fixed amount every month for a pre-determined period (minimum 6 months). Defaulting on a monthly payment results in the account holder being charged a penalty amount. The total amount is repaid with interest at the end of the specified period.

**Fixed Deposit Accounts**

Fixed Deposit accounts, also called FD accounts, are ideal for those who wish to deposit their savings for a long term in return for a high rate of interest. The rate of interest offered depends on the amount deposited and the time period, and also differs from bank to bank. In the case of an FD, a certain amount of money is deposited by the account holder for a fixed period of time. The money can be withdrawn when the period expires. If necessary, the depositor can break the fixed deposit prematurely. However, this usually attracts a penalty amount which also differs from bank to bank.

## Opening a Bank Account

Opening a bank account is quite a simple process. Take a look at the steps to open an account of your own:

**Step 1: Fill in the Account Opening Form**

This form requires you to provide the following information:

- Personal details (name, address, phone number, date of birth, gender, occupation, address)
- Method of receiving your account statement (hard copy/email)
- Details of your initial deposit (cash/cheque)
- Manner of operating your account (online/mobile banking/traditional via cheque, slip books)

Ensure that you sign wherever required on the form.

**Step 2: Affix your Photograph**

Stick a recent photograph of yourself in the allotted space on the form.

**Step 3: Provide your Know Your Customer (KYC) Details**

KYC is a process that helps banks verify the identity and address of their customers. To open an account, every individual needs to submit certain approved documents with respect to photo identity (ID) and address proof. Some Officially Valid Documents (OVDs) are:

- Passport
- Driving License
- Voters' Identity Card
- PAN Card
- UIDAI (Aadhaar) Card

**Step 4: Submit All your Documents**

Submit the completed Account Opening Form and KYC documents. Then wait until the forms are processed and your account has been opened!

## Tips

- Select the right type of account.
- Fill in complete nomination details.
- Ask about fees.
- Understand the rules.
- Check for online banking – it's convenient!
- Keep an eye on your bank balance.

## 5.3.3 Costs: Fixed vs Variable: What are Fixed and Variable Costs

Fixed costs and variable costs together make up a company's total cost. These are the two types of costs that companies have to bear when producing goods and services.

A fixed cost does not change with the volume of goods or services a company produces. It always remains the same.

A variable cost, on the other hand, increases and decreases depending on the volume of goods and services produced. In other words, it varies with the amount produced.

## Differences Between Fixed and Variable Costs

Let's take a look at some of the main differences between fixed and variable costs:

| Criteria | Fixed Costs | Variable Costs |
|---|---|---|
| Meaning | A cost that stays the same, regardless of the output produced. | A cost that changes when the |
| Nature | Time related. | Volume related. |
| Incurred | Incurred irrespective of units being produced. | Incurred only when units are produced. |
| Unit cost | Inversely proportional to the number of units produced. | Remains the same, per unit. |
| Examples | Depreciation, rent, salary, insurance, tax etc. | Material consumed, wages, commission on sales, packing expenses, etc. |

## Tips

- When trying to determine whether a cost is fixed or variable, simply ask the following question: Will the particular cost change if the company stopped its production activities? If the answer is no, then it is a fixed cost. If the answer is yes, then it is probably a variable cost.

## 5.3.4 Investment, Insurance and Taxes:

### Investment

Investment means that money is spent today with the aim of reaping financial gains at a future time. The main types of investment options are as follows:

- **Bonds:** Bonds are instruments used by public and private companies to raise large sums of money – too large to be borrowed from a bank. These bonds are then issued in the public market and are bought by lenders.
- **Stocks:** Stocks or equity are shares that are issued by companies and are bought by the general public.
- **Small Savings Schemes:** Small Savings Schemes are tools meant to save money in small amounts. Some popular schemes are the Employees Provident Fund, Sukanya Samriddhi Scheme and National Pension Scheme.
- **Mutual Funds:** Mutual Funds are professionally managed financial instruments that invest money in different securities on behalf of investors.
- **Fixed Deposits:** A fixed amount of money is kept aside with a financial institution for a fixed amount of time in return for interest on the money.
- **Real Estate:** Loans are taken from banks to purchase real estate, which is then leased or sold with the aim of making a profit on the appreciated property price.
- **Hedge Funds:** Hedge funds invest in both financial derivatives and/or publicly traded securities.
- **Private Equity:** Private Equity is trading in the shares of an operating company that is not publicly listed and whose shares are not available on the stock market.
- **Venture Capital:** Venture Capital involves investing substantial capital in a budding company in return for stocks in that company.

## Insurance

There are two types of insurance – Life Insurance and Non-Life or General Insurance.

### Life Insurance

Life Insurance deals with all insurance covering human life.

### Life Insurance Products

The main life insurance products are:

- **Term Insurance:** This is the simplest and cheapest form of insurance. It offers financial protection for a specified tenure, say 15 to 20 years. In the case of your death, your family is paid the sum assured. In the case of your surviving the term, the insurer pays nothing.
- **Endowment Policy:** This offers the dual benefit of insurance and investment. Part of the premium is allocated towards the sum assured, while the remaining premium gets invested in equity and debt. It pays a lump sum amount after the specified duration or on the death of the policyholder, whichever is earlier.
- **Unit-Linked Insurance Plan (ULIP):** Here part of the premium is spent on the life cover, while the remaining amount is invested in equity and debt. It helps develop a regular saving habit.

- **Money Back Life Insurance:**While the policyholder is alive, periodic payments of the partial survival benefits are made during the policy tenure. On the death of the insured, the insurance company pays the full sum assured along with survival benefits.
- **Whole Life Insurance:** It offers the dual benefit of insurance and investment. It offers insurance cover for the whole life of the person or up to 100 years whichever is earlier.

### General Insurance

General Insurance deals with all insurance covering assets like animals, agricultural crops, goods, factories, cars and so on.

### General Insurance Products

The main general insurance products are:

- **Motor Insurance:** This can be divided into Four Wheeler Insurance and Two Wheeler Insurance.
- **Health Insurance:** The main types of health insurance are individual health insurance, family floater health insurance, comprehensive health insurance and critical illness insurance.
- **Travel Insurance:** This can be categorised into Individual Travel Policy, Family Travel Policy, Student Travel Insurance and Senior Citizen Health Insurance.
- **Home Insurance:** This protects the house and its contents from risk.
- **Marine Insurance:** This insurance covers goods, freight, cargo etc. against loss or damage during transit by rail, road, sea and/or air.

## Taxes

There are two types of taxes – Direct Taxes and Indirect Taxes.

### Direct Tax

Direct taxes are levied directly on an entity or a person and are non-transferrable.

Some examples of Direct Taxes are:

- **Income Tax:** This tax is levied on your earning in a financial year. It is applicable to both, individuals and companies.
- **Capital Gains Tax:** This tax is payable whenever you receive a sizable amount of money. It is usually of two types – short term capital gains from investments held for less than 36 months and long term capital gains from investments held for longer than 36 months.
- **Securities Transaction Tax:** This tax is added to the price of a share. It is levied every time you buy or sell shares.
- **Perquisite Tax:** This tax is levied is on perks that have been acquired by a company or used by an employee.
- **Corporate Tax:** Corporate tax is paid by companies from the revenue they earn.

### Indirect Tax

Indirect taxes are levied on goods or services.

Some examples of Indirect Taxes are:

- **Sales Tax:** Sales Tax is levied on the sale of a product.

- **Service Tax:** Service Tax is added to services provided in India.
- **Value Added Tax:** Value Added Tax is levied at the discretion of the state government. The tax is levied on goods sold in the state. The tax amount is decided by the state.
- **Customs Duty & Octroi:** Customs Duty is a charge that is applied on purchases that are imported from another country. Octroi is levied on goods that cross state borders within India.
- **Excise Duty:** Excise Duty is levied on all goods manufactured or produced in India.

## Tips

- Think about how quickly you need your money back and pick an investment option accordingly.
- Ensure that you are buying the right type of insurance policy for yourself.
- Remember, not paying taxes can result in penalties ranging from fines to imprisonment.

## 5.3.5 Online Banking, NEFT, RTGS etc.: What is Online Banking

Internet or online banking allows account holders to access their account from a laptop at any location. In this way, instructions can be issued. To access an account, account holders simply need to use their unique customer ID number and password.

Internet banking can be used to:

- Find out an account balance
- Transfer amounts from one account to another
- Arrange for the issuance of cheques
- Instruct payments to be made
- Request for a cheque book
- Request for a statement of accounts
- Make a fixed deposit

## Electronic Funds Transfers

Electronic funds transfer is a convenient way of transferring money from the comfort of one's own home, using integrated banking tools like internet and mobile banking.

Transferring funds via an electronic gateway is extremely convenient. With the help of online banking, you can choose to:

- Transfer funds into your own accounts of the same bank.
- Transfer funds into different accounts of the same bank.
- Transfer funds into accounts in different banks, using NEFT.
- Transfer funds into other bank accounts using RTGS.
- Transfer funds into various accounts using IMPS.

## NEFT

NEFT stands for National Electronic Funds Transfer. This money transfer system allows you to electronically transfer funds from your respective bank accounts to any other account, either in the same bank or belonging to any other bank. NEFT can be used by individuals, firms and corporate organizations to transfer funds between accounts.

In order to transfer funds via NEFT, two things are required:

- A transferring bank
- A destination bank

Before you can transfer funds through NEFT, you will need to register the beneficiary who will be receiving the funds. In order to complete this registration, you will require the following

- Recipient's name
- Recipient's account number
- Recipient's bank's name
- Recipient's bank's IFSC code

## RTGS

RTGS stands for Real Time Gross Settlement. This is a real time funds transfer system which enables you to transfer funds from one bank to another, in real time or on a gross basis. The transferred amount is immediately deducted from the account of one bank, and instantly credited to the other bank's account. The RTGS payment gateway is maintained by the Reserve Bank of India. The transactions between banks are made electronically.

RTGS can be used by individuals, companies and firms to transfer large sums of money. Before remitting funds through RTGS, you will need to add the beneficiary and his bank account details via your online banking account. In order to complete this registration, you will require the following information:

- Name of the beneficiary
- Beneficiary's account number
- Beneficiary's bank address
- Beneficiary's bank's IFSC code

## IMPS

IMPS stands for Immediate Payment Service. This is a real-time, inter-bank, electronic funds transfer system used to transfer money instantly within banks across India. IMPS enables users to make instant electronic transfer payments using mobile phones through both, Mobile Banking and SMS. It can also be used through ATMs and online banking. IMPS is available 24 hours a day and 7 days a week. The system features a secure transfer gateway and immediately confirms orders that have been fulfilled.

To transfer money through IMPS, the you need to:

- Register for IMPS with your bank
- Receive a Mobile Money Identifier (MMID) from the bank
- Receive a MPIN from the bank

Once you have both these, you can login or make a request through SMS to transfer a particular amount to a beneficiary.

For the beneficiary to receive the transferred money, he must:

1. Link his mobile number with his respective account
2. Receive the MMID from the bank

In order to initiate a money transfer through IMPS, you will need to enter the following information:

1. The beneficiary's mobile number
2. The beneficiary's MMID
3. The transfer amount
4. Your MPIN

As soon as money has been deducted from your account and credited into the beneficiary's account, you will be sent a confirmation SMS with a transaction reference number, for future reference.

## Differences Between NEFT, RTGS & IMPS

| Criteria | NEFT | RTGS | IMPS |
|---|---|---|---|
| Settlement | Done in batches | Real-time | Real-time |
| Full form | National Electronic Fund Transfer | Real Time Gross Settlement | Immediate Payment Service |
| Timings on Monday – Friday | 8:00 am – 6:30 pm | 9:00 am – 4:30 pm | 24x7 |
| Timings on Saturday | 8:00 am – 1:00 pm | 9:00 am – 1:30 pm | 24x7 |
| Minimum amount of money transfer limit | ` 1 | ` 2 lacs | ` 1 |
| Maximum amount of money transfer limit | ` 10 lacs | ` 10 lacs per day | ` 2 lacs |
| Maximum charges as per RBI | Upto 10,000 – ` 2.5<br>above 10,000 – 1 lac – ` 5<br>above 1 – 2 lacs – ` 15<br>above 2 – 5 lacs – ` 25<br>above 5 – 10 lacs – ` 25 | above 2 – 5 lacs – ` 25<br>above 5 – 10 lacs – ` 50 | Upto 10,000 – ` 5<br>above 10,000 – 1 lac – ` 5<br>above 1 – 2 lacs – ` 15 |

## Tips

- Never click on any links in any e-mail message to access your online banking website.
- You will never be asked for your credit or debit card details while using online banking.
- Change your online banking password regularly.

# UNIT 5.4. Preparing for Employment & Self Employment

## Unit Objectives

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

1. Discuss the steps to prepare for an interview
2. Discuss the steps to create an effective Resume
3. Discuss the most frequently asked interview questions
4. Discuss how to answer the most frequently asked interview questions
5. Discuss basic workplace terminology

## 5.4.1 Interview Preparation: How to Prepare for an Interview

The success of your getting the job that you want depends largely on how well your interview for that job goes. Therefore, before you go in for your interview, it is important that you prepare for it with a fair amount of research and planning. Take a look at the steps to follow in order to be well prepared for an interview:

1. **Research the organization that you are having the interview with.**
   - Studying the company beforehand will help you be more prepared at the time of the interview. Your knowledge of the organization will help you answer questions at the time of the interview, and will leave you looking and feeling more confident. This is sure to make you stand out from other, not as well informed, candidates.
   - Look for background information on the company. Ty and find an overview of the company and its industry profile.
   - Visit the company website to get a good idea of what the company does. A company website offers a wealth of important information. Read and understand the company's mission statement. Pay attention to the company's products/services and client list. Read through any press releases to get an idea of the company's projected growth and stability.
   - Note down any questions that you have after your research has been completed.
2. **Think about whether your skills and qualifications match the job requirements.**
   - Carefully read through and analyze the job description.
   - Make a note of the knowledge, skills and abilities required to fulfill the job requirements.
   - Take a look at the organization hierarchy. Figure out where the position you are applying for fits into this hierarchy.
3. **Go through the most typical interview questions asked, and prepare your responses.**
   - Remember, in most interviews a mix of resume-based, behavioral and case study questions are asked.
   - Think about the kind of answers you would like to provide to typical questions asked in these three areas.
   - Practice these answers until you can express them confidently and clearly.

4. **Plan your attire for the interview.**
   - It is always safest to opt for formal business attire, unless expressly informed to dress in business casual (in which case you should use your best judgement).
   - Ensure that your clothes are clean and well-ironed. Pick neutral colours – nothing too bright or flashy.
   - The shoes you wear should match your clothes, and should be clean and suitable for an interview.
   - Remember, your aim is to leave everyone you meet with the impression that you are a professional and highly efficient person.
5. **Ensure that you have packed everything that you may require during the interview.**
   - Carry a few copies of your resume. Use a good quality paper for your resume print outs.
   - Always take along a notepad and a pen.
   - Take along any information you may need to refer to, in order to fill out an application form.
   - Carry a few samples of your work, if relevant.
6. **Remember the importance of non-verbal communication.**
   - Practice projecting confidence. Remind yourself to smile and make eye contact. Practice giving a firm handshake.
   - Keep in mind the importance of posture. Practice sitting up straight. Train yourself to stop nervous gestures like fidgeting and foot-tapping.
   - Practice keeping your reactions in check. Remember, your facial expressions provide a good insight into your true feelings. Practice projecting a positive image.
7. **Make a list of questions to end the interview with.**
   - Most interviews will end with the interviewer(s) asking if you have any questions. This is your chance to show that you have done your research and are interested in learning more about the company.
   - If the interviewer does not ask you this question, you can inform him/her that you have some queries that you would like to discuss. This is the time for you to refer to the notes you made while studying the company.
   - Some good questions to ask at this point are:
     - What do you consider the most important criteria for success in this job?
     - How will my performance be evaluated?
     - What are the opportunities for advancement?
     - What are the next steps in the hiring process?
   - Remember, never ask for information that is easily available on the company website.

## Tips

- Ask insightful and probing questions.
- When communicating, use effective forms of body language like smiling, making eye contact, and actively listening and nodding. Don't slouch, play with nearby items, fidget, chew gum, or mumble.

## 5.4.2 Preparing an Effective Resume: How to Create an Effective Resume

A resume is a formal document that lists a candidate's work experience, education and skills. A good resume gives a potential employer enough information to believe the applicant is worth interviewing. That's why it is so important to create a résumé that is effective. Take a look at the steps to create an effective resume:

**Step 1: Write the Address Section**

The Address section occupies the top of your resume. It includes information like your name, address, phone number and e-mail address. Insert a bold line under the section to separate it from rest of your resume.

**Example:**

Jasmine Watts
Breach Candy, Mumbai – India
Contact No: +91 2223678270
Email: jasmine.watts@gmail.com

**Step 2: Add the Profile Summary Section**

This part of your resume should list your overall experiences, achievements, awards, certifications and strengths. You can make your summary as short as 2-3 bullet points or as long as 8-10 bullet points.

**Example:**

**Profile Summary**

- A Content Writer graduated from University of Strathclyde having 6 years of experience in writing website copy.
- Core expertise lies in content creation for e-learning courses, specifically for the K-12 segment.

**Step 3: Include Your Educational Qualifications**

When listing your academic records, first list your highest degree. Then add the second highest qualification under the highest one and so on. To provide a clear and accurate picture of your educational background, it is critical that include information on your position, rank, percentage or CPI for every degree or certification that you have listed.

If you have done any certifications and trainings, you can add a Trainings & Certifications section under your Educational Qualifications section.

**Example:**

**Educational Qualifications**

- Masters in International Management (2007) from Columbia University with 8.8 CPI.
- Bachelor of Management Studies (2004) from Mumbai University with 87% marks.
- 10+2 with Math, Stats (2001) from Maharashtra Board with 91% marks.
- High School (1999) from Maharashtra Board with 93% marks.

**Step 4: List Your Technical Skills**

When listing your technical skills, start with the skills that you are most confident about. Then add the skills that you do not have as good a command over. It is perfectly acceptable to include just one skill, if you feel that particular skill adds tremendous value to your résumé. If you do not have any technical skills, you can omit this step.

**Example:**

**Technical Skills**

- Flash
- Photoshop

**Step 5: Insert Your Academic Project Experience**

List down all the important projects that you have worked on. Include the following information in this section:

- Project title
- Organization
- Platform used
- Contribution
- Description

**Example:**

**Academic Projects**

**Project Title**: Different Communication Skills

**Organization**: True Blue Solutions

**Platform used**: Articulate

**Contribution**: Content writing and graphic visualization

**Description**: Development of storyboards for corporate induction & training programs

**Step 6: List Your Strengths**

This is where you list all your major strengths. This section should be in the form of a bulleted list.

**Example:**

**Strengths**

- Excellent oral, written and presentation skills
- Action-oriented and result-focused
- Great time management skills

**Step 7: List Your Extracurricular Activities**

It is very important to show that you have diverse interests and that your life consists of more than academics. Including your extracurricular activities can give you an added edge over other candidates who have similar academic scores and project experiences. This section should be in the form of a bulleted list.

**Example:**

**Extracurricular Activities**

- Member of the Debate Club
- Played tennis at a national level
- Won first prize in the All India Camel Contest, 2010

**Step 8: Write Your Personal Details**

The last section of your résumé must include the following personal information:

- Date of birth
- Nationality
- Gender & marital status
- Languages known

**Example:**

Personal Details

- Date of birth: 25th May, 1981
- Gender & marital status: Female, Single
- Nationality: Indian
- Languages known: English, Hindi, Tamil, French

## Tips

- Keep your resume file name short, simple and informational.
- Make sure the resume is neat and free from typing errors.
- Always create your resume on plain white paper.

## 5.4.3 Interview FAQs

Take a look at some of the most frequently asked interview questions, and some helpful tips on how to answer them.

**Q1. Can you tell me a little about yourself?**

**Tips to answer:**

- Don't provide your full employment or personal history.
- Offer 2-3 specific experiences that you feel are most valuable and relevant.
- Conclude with how those experiences have made you perfect for this specific role.

**Q2. How did you hear about the position?**

**Tips to answer:**

- Tell the interviewer how you heard about the job – whether it was through a friend (name the friend), event or article (name them) or a job portal (say which one).
- Explain what excites you about the position and what in particular caught your eye about this role.

**Q3. What do you know about the company?**

**Tips to answer:**

- Don't recite the company's About Us page.
- Show that you understand and care about the company's goals.
- Explain why you believe in the company's mission and values.

**Q4. Why do you want this job?**

**Tips to answer:**

- Show that you are passionate about the job.
- Identify why the role is a great fit for you.
- Explain why you love the company.

**Q5. Why should we hire you?**

**Tips to answer:**

- Prove through your words that you can not only do the work, but can definitely deliver excellent results.
- Explain why you would be a great fit with the team and work culture.
- Explain why you should be chosen over any other candidate.

**Q6. What are your greatest professional strengths?**

**Tips to answer:**

- Be honest – share some of your real strengths, rather than give answers that you think sound good.
- Offer examples of specific strengths that are relevant to the position you are applying for.
- Provide examples of how you've demonstrated these strengths.

**Q7. What do you consider to be your weaknesses?**

**Tips to answer:**

- The purpose of this question is to gauge your self-awareness and honesty.
- Give an example of a trait that you struggle with, but that you're working on to improve.

**Q8. What are your salary requirements?**

**Tips to answer:**

- Do your research beforehand and find out the typical salary range for the job you are applying for.
- Figure out where you lie on the pay scale based on your experience, education, and skills.
- Be flexible. Tell the interviewer that you know your skills are valuable, but that you want the job and are willing to negotiate.

**Q9. What do you like to do outside of work?**

**Tips to answer:**

- The purpose of this question is to see if you will fit in with the company culture.
- Be honest – open up and share activities and hobbies that interest and excite you.

**Q10. If you were an animal, which one would you want to be?**

**Tips to answer:**

- The purpose of this question is to see if you are able to think on your feet.
- There's no wrong answer – but to make a great impression try to bring out your strengths or personality traits through your answer.

**Q11: What do you think we could do better or differently?**

**Tips to answer:**

- The purpose of this question is to see if you have done your research on the company, and to test whether you can think critically and come up with new ideas.
- Suggest new ideas. Show how your interests and expertise would help you execute these ideas.

**Q12: Do you have any questions for us?**

**Tips to answer:**

- Do not ask questions to which the answers can be easily found on the company website or through a quick online search.
- Ask intelligent questions that show your ability to think critically.

## Tips

- Be honest and confident while answering.
- Use examples of your past experiences wherever possible to make your answers more impactful.

## 5.4.4 Work Readiness – Terms & Terminologies: Basic Workplace Terminology

Every employee should be well versed in the following terms:

- **Annual leave:** Paid vacation leave given by employers to employees.
- **Background Check:** A method used by employers to verify the accuracy of the information provided by potential candidates.
- **Benefits:** A part of an employee's compensation package.
- **Breaks:** Short periods of rest taken by employees during working hours.
- **Compensation Package:** The combination of salary and benefits that an employer provides to his/her employees.
- **Compensatory Time (Comp Time):** Time off in lieu of pay.
- **Contract Employee:** An employee who works for one organization that sells said employee's services to another company, either on a project or time basis.
- **Contract of Employment:** When an employee is offered work in exchange for wages or salary, and accepts the offer made by the employer, a contract of employment exists.
- **Corporate Culture:** The beliefs and values shared by all the members of a company, and imparted from one generation of employees to another.
- **Counter Offer/Counter Proposal:** A negotiation technique used by potential candidates to increase the amount of salary offered by a company.
- **Cover Letter:** A letter that accompanies a candidate's resume. It emphasizes the important points in the candidate's resume and provides real examples that prove the candidate's ability to perform the expected job role.
- **Curriculum Vitae (CV)/Resume:** A summary of a candidate's achievements, educational background, work experience, skills and strengths.
- **Declining Letter:** A letter sent by an employee to an employer, turning down the job offer made by the employer to the employee.
- **Deductions:** Amounts subtracted from an employee's pay and listed on the employee's pay slip.
- **Discrimination:** The act of treating one person not as favourably as another person.
- **Employee:** A person who works for another person in exchange for payment.
- **Employee Training:** A workshop or in-house training that an employee is asked to attend by his or her superior, for the benefit of the employer.
- **Employment Gaps:** Periods of unemployed time between jobs.
- **Fixed-Term Contract:** A contract of employment which gets terminated on an agreed-upon date.
- **Follow-Up:** The act of contacting a potential employer after a candidate has submitted his or her resume.
- **Freelancer/Consultant/Independent Contractor:** A person who works for him or herself and pitches for temporary jobs and projects with different employers.
- **Holiday**: Paid time-off from work.
- **Hourly Rate**: The amount of salary or wages paid for 60 minutes of work.

- **Internship**: A job opportunity offered by an employer to a potential employee, called an intern, to work at the employer's company for a fixed, limited time period.
- **Interview**: A conversation between a potential employee and a representative of an employer, in order to determine if the potential employee should be hired.
- **Job Application**: A form which asks for a candidate's information like the candidate's name, address, contact details and work experience. The purpose of a candidate submitting a job application, is to show that candidate's interest in working for a particular company.
- **Job Offer**: An offer of employment made by an employer to a potential employee.
- **Job Search Agent**: A program that enables candidates to search for employment opportunities by selecting criteria listed in the program, for job vacancies.
- **Lay Off**: A lay off occurs when an employee is temporarily let go from his or her job, due to the employer not having any work for that employee.
- **Leave**: Formal permission given to an employee, by his or her employer, to take a leave of absence from work.
- **Letter of Acceptance**: A letter given by an employer to an employee, confirming the offer of employment made by the employer, as well as the conditions of the offer.
- **Letter of Agreement**: A letter that outlines the terms of employment.
- **Letter of Recommendation**: A letter written for the purpose of validating the work skills of a person.
- **Maternity Leave**: Leave taken from work by women who are pregnant, or who have just given birth.
- **Mentor**: A person who is employed at a higher level than you, who offers you advice and guides you in your career.
- **Minimum wage**: The minimum wage amount paid on an hourly basis.
- **Notice**: An announcement made by an employee or an employer, stating that the employment contract will end on a particular date.
- **Offer of Employment**: An offer made by an employer to a prospective employee that contains important information pertaining to the job being offered, like the starting date, salary, working conditions etc.
- **Open-Ended Contract**: A contract of employment that continues till the employer or employee terminates it.
- **Overqualified**: A person who is not suited for a particular job because he or she has too many years of work experience, or a level of education that is much higher than required for the job, or is currently or was previously too highly paid.
- **Part-Time Worker**: An employee who works for fewer hours than the standard number of hours normally worked.
- **Paternity Leave**: Leave granted to a man who has recently become a father.
- **Recruiters/Headhunters/Executive Search Firms**: Professionals who are paid by employers to search for people to fill particular positions.
- **Resigning/Resignations**: When an employee formally informs his or her employer that he or she is quitting his or her job.
- **Self-Employed**: A person who has his or her own business and does not work in the capacity of an employee.
- **Time Sheet**: A form that is submitted to an employer, by an employee, that contains the number of hours worked every day by the employee.

# UNIT 5.5. Understanding Entrepreneurship

## Unit Objectives

1. At the end of this unit, you will be able to:
2. Discuss the concept of entrepreneurship
3. Discuss the importance of entrepreneurship
4. Describe the characteristics of an entrepreneur
5. Describe the different types of enterprises
6. List the qualities of an effective leader
7. Discuss the benefits of effective leadership
8. List the traits of an effective team
9. Discuss the importance of listening effectively
10. Discuss how to listen effectively
11. Discuss the importance of speaking effectively
12. Discuss how to speak effectively
13. Discuss how to solve problems
14. List important problem solving traits
15. Discuss ways to assess problem solving skills
16. Discuss the importance of negotiation
17. Discuss how to negotiate
18. Discuss how to identify new business opportunities
19. Discuss how to identify business opportunities within your business
20. Understand the meaning of entrepreneur
21. Describe the different types of entrepreneurs
22. List the characteristics of entrepreneurs
23. Recall entrepreneur success stories
24. Discuss the entrepreneurial process
25. Describe the entrepreneurship ecosystem
26. Discuss the government's role in the entrepreneurship ecosystem
27. Discuss the current entrepreneurship ecosystem in India
28. Understand the purpose of the Make in India campaign
29. Discuss the relationship between entrepreneurship and risk appetite
30. Discuss the relationship between entrepreneurship and resilience
31. Describe the characteristics of a resilient entrepreneur
32. Discuss how to deal with failure

## 5.5.1 Concept Introduction, (Characteristic of an Entrepreneur, types of firms / types of enterprises): Entrepreneurs and Entrepreneurship

Anyone who is determined to start a business, no matter what the risk, is an entrepreneur. Entrepreneurs run their own start-up, take responsibility for the financial risks and use creativity, innovation and vast reserves of self-motivation to achieve success. They dream big and are determined to do whatever it takes to turn their idea into a viable offering. The aim of an entrepreneur is to create an enterprise. The process of creating this enterprise is known as entrepreneurship.

## Importance of Entrepreneurship

Entrepreneurship is very important for the following reasons:

1. It results in the creation of new organizations
2. It brings creativity into the marketplace
3. It leads to improved standards of living
4. It helps develop the economy of a country

## Characteristics of Entrepreneurs

All successful entrepreneurs have certain characteristics in common.

They are all:

- Extremely passionate about their work
- Confident in themselves
- Disciplined and dedicated
- Motivated and driven
- Highly creative
- Visionaries
- Open-minded
- Decisive

Entrepreneurs also have a tendency to:

- Have a high risk tolerance
- Thoroughly plan everything
- Manage their money wisely
- Make their customers their priority
- Understand their offering and their market in detail
- Ask for advice from experts when required
- Know when to cut their losses

## Examples of Famous Entrepreneurs

Some famous entrepreneurs are:

- Bill Gates (Founder of Microsoft)
- Steve Jobs (Co-founder of Apple)
- Mark Zuckerberg (Founder of Facebook)
- Pierre Omidyar (Founder of eBay)

## Types of Enterprises

As an entrepreneur in India, you can own and run any of the following types of enterprises:

**Sole Proprietorship**

In a sole proprietorship, a single individual owns, manages and controls the enterprise. This type of business is the easiest to form with respect to legal formalities. The business and the owner have no separate legal existence. All profit belongs to the proprietor, as do all the losses - the liability of the entrepreneur is unlimited.

**Partnership**

A partnership firm is formed by two or more people. The owners of the enterprise are called partners. A partnership deed must be signed by all the partners. The firm and its partners have no separate legal existence. The profits are shared by the partners. With respect to losses, the liability of the partners is unlimited. A firm has a limited life span and must be dissolved when any one of the partners dies, retires, claims bankruptcy or goes insane.

**Limited Liability Partnership (LLP)**

In a Limited Liability Partnership or LLP, the partners of the firm enjoy perpetual existence as well as the advantage of limited liability. Each partner's liability is limited to their agreed contribution to the LLP. The partnership and its partners have a separate legal existence.

## Tips

- Learn from others' failures.
- Be certain that this is what you want.
- Search for a problem to solve, rather than look for a problem to attach to your idea.

## 5.5.2 Leadership & Teamwork: Leadership and Leaders

Leadership means se翿 ng an example for others to follow. Se翿 ng a good example means not asking someone to do something that you wouldn't willingly want to do yourself. Leadership is about figuring out what to do in order to win as a team, and as a company.

Leaders believe in doing the right things. They also believe in helping others to do the right things. An effective leader is someone who:

- Creates an inspiring vision of the future.
- Motivates and inspires his team to pursue that vision.

## Leadership Qualities That All Entrepreneurs Need

Building a successful enterprise is only possible if the entrepreneur in charge possesses excellent leadership qualities. Some critical leadership skills that every entrepreneur must have are:

1. **Pragmatism**: This means having the ability to highlight all obstacles and challenges, in order to resolve issues and reduce risks.
2. **Humility**: This means admi翿 ng to mistakes often and early, and being quick to take responsibility for your actions. Mistakes should be viewed as challenges to overcome, not opportunities to point blame.
3. **Flexibility**: It is critical for a good leader to be very flexible and quickly adapt to change. It is equally critical to know when to adapt and when not to.
4. **Authenticity**: This means showing both, your strengths and your weaknesses. It means being human and showing others that you are human.
5. **Reinvention**: This means refreshing or changing your leadership style when necessary. To do this, it's important to learn where your leadership gaps lie and find out what resources are required to close them.
6. **Awareness**: This means taking the time to recognize how others view you. It means understanding how your presence affects those around you.

## Benefits of Effective Leadership

Effective leadership results in numerous benefits. Great leadership leads to the leader successfully:

- Gaining the loyalty and commitment of the team members
- Motivating the team to work towards achieving the company's goals and objectives
- Building morale and instilling confidence in the team members
- Fostering mutual understanding and team-spirit among team members
- Convincing team members about the need to change when a situation requires adaptability

## Teamwork and Teams

Teamwork occurs when the people in a workplace combine their individual skills to pursue a common goal. Effective teams are made up of individuals who work together to achieve this common goal. A great team is one who holds themselves accountable for the end result.

## Importance of Teamwork in Entrepreneurial Success

For an entrepreneurial leader, building an effective team is critical to the success of a venture. An entrepreneur must ensure that the team he builds possesses certain crucial qualities, traits and characteristics. An effective team is one which has:

1. **Unity of purpose:** All the team members should clearly understand and be equally committed to the purpose, vision and goals of the team.
2. **Great communication skills:** Team members should have the ability to express their concerns, ask questions and use diagrams, and charts to convey complex information.
3. **The ability to collaborate:** Every member should feel entitled to provide regular feedback on new ideas.
4. **Initiative:** The team should consist of proactive individuals. The members should have the enthusiasm to come up with new ideas, improve existing ideas, and conduct their own research.
5. **Visionary members:** The team should have the ability to anticipate problems and act on these potential problem before they turn into real problems.
6. **Great adaptability skills:** The team must believe that change is a positive force. Change should be seen as the chance to improve and try new things.
7. **Excellent organizational skills:** The team should have the ability to develop standard work processes, balance responsibilities, properly plan projects, and set in place methods to measure progress and ROI.

## Tips

- Don't get too attached to your original idea. Allow it to evolve and change.
- Be aware of your weaknesses and build a team that will complement your shortfalls.
- Hiring the right people is not enough. You need to promote or incentivize your most talented people to keep them motivated.
- Earn your team's respect.

## 5.5.3 Communication Skills: Listening & Speaking: The Importance of Listening Effectively

Listening is the ability to correctly receive and understand messages during the process of communication. Listening is critical for effective communication. Without effective listening skills, messages can easily be misunderstood. This results in a communication breakdown and can lead to the sender and the receiver of the message becoming frustrated or irritated.

It's very important to note that listening is not the same as hearing. Hearing just refers to sounds that you hear. Listening is a whole lot more than that. To listen, one requires focus. It means not only paying attention to the story, but also focusing on how the story is relayed, the way language and voice is used, and even how the speaker uses their body language. The ability to listen depends on how effectively one can perceive and understand both, verbal and non-verbal cues.

## How to Listen Effectively

To listen effectively you should:

- Stop talking
- Stop interrupting
- Focus completely on what is being said
- Nod and use encouraging words and gestures
- Be open-minded
- Think about the speaker's perspective
- Be very, very patient
- Pay attention to the tone that is being used
- Pay attention to the speaker's gestures, facial expressions and eye movements
- Not try and rush the person
- Not let the speaker's mannerisms or habits irritate or distract you

## How to Listen Effectively

How successfully a message gets conveyed depends entirely on how effectively you are able to get it through. An effective speaker is one who enunciates properly, pronounces words correctly, chooses the right words and speaks at a pace that is easily understandable. Besides this, the words spoken out loud need to match the gestures, tone and body language used.

What you say, and the tone in which you say it, results in numerous perceptions being formed. A person who speaks hesitantly may be perceived as having low self-esteem or lacking in knowledge of the discussed topic. Those with a quiet voice may very well be labelled as shy. And those who speak in commanding tones with high levels of clarity, are usually considered to be extremely confident. This makes speaking a very critical communication skill.

## How to Speak Effectively

To speak effectively you should:

- Incorporate body language in your speech like eye contact, smiling, nodding, gesturing etc.
- Build a draft of your speech before actually making your speech.
- Ensure that all your emotions and feelings are under control.
- Pronounce your words distinctly with the correct pitch and intensity. Your speech should be crystal clear at all times.
- Use a pleasant and natural tone when speaking. Your audience should not feel like you are putting on an accent or being unnatural in any way.
- Use precise and specific words to drive your message home. Ambiguity should be avoided at all costs.
- Ensure that your speech has a logical flow.
- Be brief. Don't add any unnecessary information.
- Make a conscious effort to avoid irritating mannerisms like fidgeting, twitching etc.
- Choose your words carefully and use simple words that the majority of the audience will have no difficulty understanding.
- Use visual aids like slides or a whiteboard.
- Speak slowly so that your audience can easily understand what you're saying. However, be careful not to speak too slowly because this can come across as stiff, unprepared or even condescending.
- Remember to pause at the right moments.

## Tips

- If you're finding it difficult to focus on what someone is saying, try repeating their words in your head.
- Always maintain eye contact with the person that you are communicating with, when speaking as well as listening. This conveys and also encourages interest in the conversation.

## 5.5.4 Problem Solving & Negotiation skills: What is a Problem?

As per The Concise Oxford Dictionary (1995), a problem is, "A doubtful or difficult matter requiring a solution"

All problems contain two elements:

1. Goals 2. Obstacles

The aim of problem solving is to recognize the obstacles and remove them in order to achieve the goals.

## How to Solve Problems

Solving a problem requires a level of rational thinking. Here are some logical steps to follow when faced with an issue:

**Step 1:** Identify the problem

**Step 2:** Study the problem in detail

**Step 3:** List all possible solutions

**Step 4:** Select the best solution

**Step 5:** Implement the chosen solution

**Step 6:** Check that the problem has really been solved

## Important Traits for Problem Solving

Highly developed problem solving skills are critical for both, business owners and their employees. The following personality traits play a big role in how effectively problems are solved:

- Being open minded
- Being proactive
- Having a positive attitude
- Asking the right questions
- Not panicking
- Focusing on the right problem

## How to Assess for Problem Solving Skills

As an entrepreneur, it would be a good idea to assess the level of problem solving skills of potential candidates before hiring them. Some ways to assess this skill are through:

1. **Application forms**: Ask for proof of the candidate's problem solving skills in the application form.
2. **Psychometric tests**: Give potential candidates logical reasoning and critical thinking tests and see how they fare.
3. **Interviews**: Create hypothetical problematic situations or raise ethical questions and see how the candidates respond.
4. **Technical questions**: Give candidates examples of real life problems and evaluate their thought process.

## What is Negotiation?

Negotiation is a method used to settle differences. The aim of negotiation is to resolve differences through a compromise or agreement while avoiding disputes. Without negotiation, conflicts are likely to lead to resentment between people. Good negotiation skills help satisfy both parties and go a long way towards developing strong relationships.

## Why Negotiate

Starting a business requires many, many negotiations. Some negotiations are small while others are critical enough to make or break a startup. Negotiation also plays a big role inside the workplace. As an entrepreneur, you need to know not only know how to negotiate yourself, but also how to train employees in the art of negotiation.

## How to Negotiate

Take a look at some steps to help you negotiate:

| | |
|---|---|
| **Step 1:** Pre-Negotiation Preparation | Agree on where to meet to discuss the problem, decide who all will be present and set a time limit for the discussion. |
| **Step 2:** Discuss the Problem | This involves asking questions, listening to the other side, putting your views forward and clarifying doubts. |
| **Step 3:** Clarify the Objective | Ensure that both parties want to solve the same problem and reach the same goal. |
| **Step 4:** Aim for a Win-Win Outcome | Try your best to be open minded when negotiating. Compromise and offer alternate solutions to reach an outcome where both parties win. |
| **Step 5:** Clearly Define the Agreement | When an agreement has been reached, the details of the agreement should be crystal clear to both sides, with no scope for misunderstandings. |
| **Step 6:** Implement the Agreed Upon Solution | Agree on a course of action to set the solution in motion |

## Tips

- Know exactly what you want before you work towards getting it
- Give more importance to listening and thinking, than speaking
- Focus on building a relationship rather than winning
- Remember that your people skills will affect the outcome
- Know when to walk away – sometimes reaching an agreement may not be possible

## 5.5.5 Business Opportunities Identification: Entrepreneurs and Opportunities

*"The entrepreneur always searches for change, responds to it and exploits it as an opportunity."*

*Peter Drucker*

The ability to identify business opportunities is an essential characteristic of an entrepreneur.

## What is an Opportunity?

The word opportunity suggests a good chance or a favourable situation to do something offered by circumstances.

A business opportunity means a good or favourable change available to run a specific business in a given environment, at a given point of time.

## Common Questions Faced by Entrepreneurs

A critical question that all entrepreneurs face is how to go about finding the business opportunity that is right for them.

Some common questions that entrepreneurs constantly think about are:

- Should the new enterprise introduce a new product or service based on an unmet need?
- Should the new enterprise select an existing product or service from one market and offer it in another where it may not be available?
- Should the enterprise be based on a tried and tested formula that has worked elsewhere?

It is therefore extremely important that entrepreneurs must learn how to identify new and existing business opportunities and evaluate their chances of success.

## When is an Idea an Opportunity?

An idea is an opportunity when:

- It creates or adds value to a customer
- It solves a significant problem, removes a pain point or meets a demand
- Has a robust market and profit margin
- Is a good fit with the founder and management team at the right time and place

## Factors to Consider When Looking for Opportunities

Consider the following when looking for business opportunities:

- Economic trends
- Changes in funding
- Changing relationships between vendors, partners and suppliers
- Market trends
- Changes in political support
- Shift in target audience

## Ways to Identify New Business Opportunities

1. Identify Market Inefficiencies

   When looking at a market, consider what inefficiencies are present in the market. Think about ways to correct these inefficiencies.

2. Remove Key Hassles

   Rather than create a new product or service, you can innovatively improve a product, service or process.

3. Create Something New

   Think about how you can create a new experience for customers, based on existing business models.

4. Pick a Growing Sector/Industry

   Research and find out which sectors or industries are growing and think about what opportunities you can tap in the same.

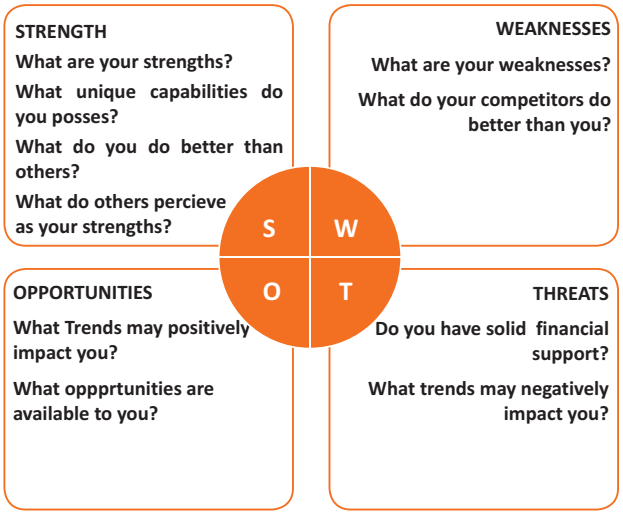
5. Think About Product Differentiation

   If you already have a product in mind, think about ways to set it apart from the existing ones.

## Ways to Identify Business Opportunities Within Your Business

1. SWOT Analysis

   An excellent way to identify opportunities inside your business is by creating a SWOT analysis. The acronym SWOT stands for strengths, weaknesses, opportunities, and threats. SWOT analysis framework:




Consider the following when looking for business opportunities:

By looking at yourself and your competitors using the SWOT framework, you can uncover opportunities that you can exploit, as well as manage and eliminate threats that could derail your success.

2. Establishing Your USP

Establish your USP and position yourself as different from your competitors. Identify why customers should buy from you and promote that reason.

## Opportunity Analysis

Once you have identified an opportunity, you need to analyze it.
To analyze an opportunity, you must:

- Focus on the idea
- Focus on the market of the idea
- Talk to industry leaders in the same space as the idea
- Talk to players in the same space as the idea

## Tips 

- Remember, opportunities are situational.
- Look for a proven track record.
- Avoid the latest craze.
- Love your idea.

## 5.5.6 Entrepreneurship Support Eco - System: What is an Entrepreneur?

An entrepreneur is a person who:

- Does not work for an employee
- Runs a small enterprise
- Assumes all the risks and rewards of the enterprise, idea, good or service

## Types of Entrepreneurs

There are four main types of entrepreneurs:

1. **The Traditional Entrepreneur**: This type of entrepreneur usually has some kind of skill – they can be a carpenter, mechanic, cook etc. They have businesses that have been around for numerous years like restaurants, shops and carpenters. Typically, they gain plenty of experience in a particular industry before they begin their own business in a similar field.
2. **The Growth Potential Entrepreneur**: The desire of this type of entrepreneur is to start an enterprise that will grow, win many customers and make lots of money. Their ultimate aim is to eventually sell their enterprise for a nice profit. Such entrepreneurs usually have a science or technical background.
3. **The Project-Oriented Entrepreneur**: This type of entrepreneur generally has a background in the Arts or psychology. Their enterprises tend to be focus on something that they are very passionate about.
4. **The Lifestyle Entrepreneur**: This type of entrepreneur has usually worked as a teacher or a secretary. They are more interested in selling something that people will enjoy, rather than making lots of money.

## Characteristics of an Entrepreneur

Successful entrepreneurs have the following characteristics:

- They are highly motivated
- They are creative and persuasive
- They are mentally prepared to handle each and every task
- They have excellent business skills – they know how to evaluate their cash flow, sales and revenue
- They are willing to take great risks
- They are very proactive – this means they are willing to do the work themselves, rather than wait for someone else to do it
- They have a vision – they are able to see the big picture
- They are flexible and open-minded
- They are good at making decisions

## Entrepreneur Success Stories

**Dhiru Bhai Ambani**

Dhirubhai Ambani began his entrepreneurial career by selling "bhajias" to pilgrims in Mount Girnar on weekends. At 16, he moved to Yemen where he worked as a gas-station attendant, and as a clerk in an oil company. He returned to India with Rs. 50,000 and started a textile trading company. Reliance went on to become the first Indian company to raise money in global markets and the first Indian company to feature in Forbes 500 list.

**Dr. Karsanbhai Patel**

Karsanbhai Patel made detergent powder in the backyard of his house. He sold his product door-to-door and offered a money back guarantee with every pack that was sold. He charged Rs. 3 per kg when the cheapest detergent at that time was Rs.13 per kg. Dr. Patel eventually started Nirma which became a whole new segment in the Indian domestic detergent market.

## The Entrepreneurial Process

Let's take a look at the stages of the entrepreneurial process.

**Stage 1**: Idea Generation. The entrepreneurial process begins with an idea that has been thought of by the entrepreneur. The idea is a problem that has the potential to be solved.

**Stage 2**: Germination or Recognition. In this stage a possible solution to the identified problem is thought of.

**Stage 3**: Preparation or Rationalization. The problem is studied further and research is done to find out how others have tried to solve the same problem.

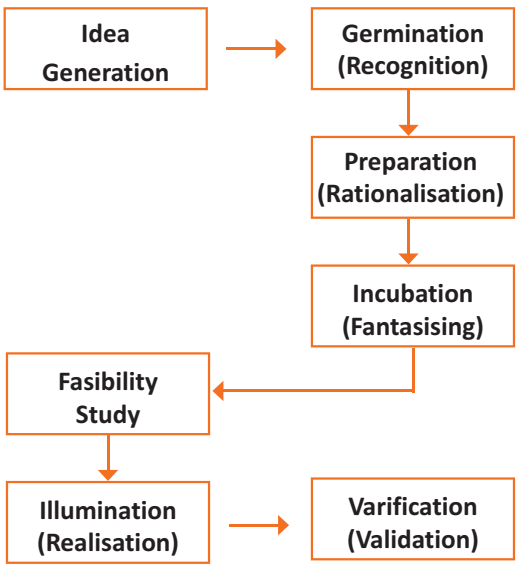
**Stage 4**: Incubation or Fantasizing. This stage involves creative thinking for the purpose of coming up with more ideas. Less thought is given to the problem areas.

**Stage 5**: Feasibility Study: The next step is the creation of a feasibility study to determine if the idea will make a profit and if it should be seen through.

**Stage 6**: Illumination or Realization. This is when all uncertain areas suddenly become clear. The entrepreneur feels confident that his idea has merit.

**Stage 7**: Verification or Validation. In this final stage, the idea is verified to see if it works and if it is useful.

Take a look at the diagram below to get a better idea of this process.



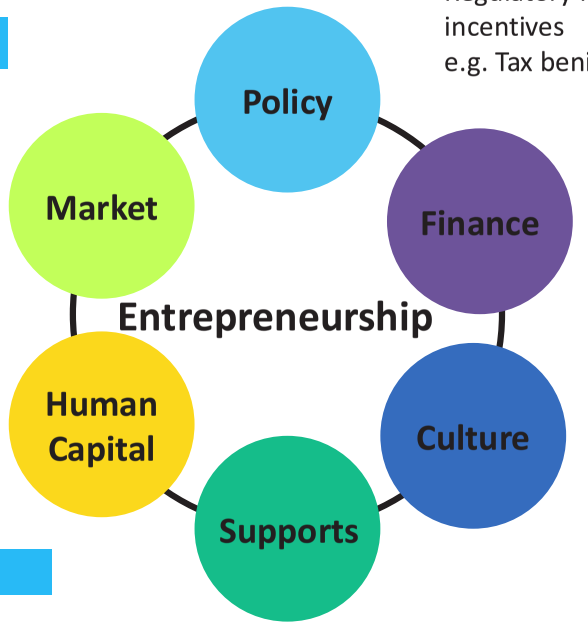
## What is an Entrepreneur?

The entrepreneurship support ecosystem signifies the collective and complete nature of entrepreneurship. New companies emerge and flourish not only because of the courageous, visionary entrepreneurs who launch them, but they thrive as they are set in an environment or 'ecosystem' made of private and public participants. These players nurture and sustain the new ventures, facilitating the entrepreneurs' efforts.

An entrepreneurship ecosystem comprises of the following six domains:

1. **Favourable Culture:** This includes elements such as tolerance of risk and errors, valuable networking and positive social standing of the entrepreneur.
2. **Facilitating Policies & Leadership:** This includes regulatory framework incentives and existence of public research institutes.
3. **Financing Options:** Angel financing, venture capitalists and micro loans would be good examples of this.
4. **Human Capital:** This refers to trained and untrained labour, entrepreneurs and entrepreneurship training programmes, etc.
5. **Conducive Markets for Products & Services:** This refers to an existence or scope of existence of a market for the product/service.
6. **Institutional & Infrastructural Support:** This includes legal and financing advisers, telecommunications, digital and transportation infrastructure, and entrepreneurship networking programmes.

These domains indicate whether there is a strong entrepreneurship support ecosystem and what actions should the government put in place to further encourage this ecosystem. The six domains and their various elements have been graphically depicted.




### Early Customers

- Early adopters for proof-of-concept
- Expertise in productizing
- Reference customer
- First reviews
- Distribution channels

### Leadership

- Unequivocal support
- Social legitimacy
- Open door for advocate
- Entrepreneurship strategy
- urgency, crisis and challenge

### Government

- Institutions
  e.g. Investment, support
- Financial support
  e.g. for R&D, jump start funds
  Regulatory framework
  incentives
  e.g. Tax benifits
- Research institutes
- Venture-friendly legislation
- e.g. Bankruptcy, contract enforcement, property rights, and labour

### Networks

- Entrepreneure's networks
- Diaspora networks
- Multinational corporations

### Financial Capital

- Micro-loans
- Angel investors, friends and family
- Zero-stage venture capital
- Venture capital funds
- Private equity
- Public capital markets
- Debt

### Labour

- Skilled and unskilled
- Serial entrepreneures
- Later generation family

### Success Stories

- Visible successes
- Wealth generation for founders
- International reputation

### Educational Institutions

- General degrees (professional and academic)
- Specific entrepreneurship training

### Societal norms

- Tolerance of risk, mistakes, failure
- Innovation, creativity, experimentation
- Social status of entrepreneur
- Wealth creation
- Ambition, drive, hunger

### Infrastructure

- Telecommunications
- Transportation & logistics
- Energy
- Zones, incubation centers, clusters

### Non-Government Institution

- Entrepreneurship promotion in non-profits
- Conferences
- Business plan contests
- Entrepreneur- friendly association

### Support Professions

- Legal
- Accounting
- Investment bankers

Every entrepreneurship support ecosystem is unique and all the elements of the ecosystem are interdependent. Although every region's entrepreneurship ecosystem can be broadly described by the above features, each ecosystem is the result of the hundred elements interacting in highly complex and particular ways.

Entrepreneurship ecosystems eventually become (largely) self-sustaining. When the six domains are resilient enough, they are mutually beneficial. At this point, government involvement can and should be significantly minimized. Public leaders do not need to invest a lot to sustain the ecosystem. It is imperative that the entrepreneurship ecosystem incentives are formulated to be self-liquidating, hence focusing on sustainability of the environment.

## Government's Role in the Entrepreneurship Ecosystem

Encouraging new ventures is a major focus for policymakers. Governments across the world are recognizing that new businesses flourish in distinctive types of supportive environments. Policymakers should study the scenario and take into account the following points whilst they formulate policies and regulations that enable successful entrepreneurship support ecosystems.

1. Policymakers should avoid regulations that discourage new entrants and work towards building efficient methods for business startups. Policies and regulations that favour existing, dominant firms over entrepreneurial ventures, restrict competition and obstruct entry for new companies.
2. Instead of developing policies conceptually intended to correct market failures, policymakers should interact with entrepreneurs and understand the challenges faced by them. The feedback should be used to develop policies that incite idea exploration, product development and increased rates of deal flow.
3. Entrepreneurial supporters should create a database that enables identifying who the participants in the ecosystem are and how they are connected. These ecosystem maps are useful tools in developing engagement strategies.
4. Disruptions are unavoidable in economic and social life. However, it's important to note that economic disruption gives rise to entrepreneurial opportunities. Architects of the entrepreneurship ecosystems (entrepreneurs, mentors, policymakers and consumers,) should anticipate these dips, thus capitalizing on the opportunities they create.

The need for effective strategies to enable local entrepreneurship support ecosystems is a practical one. Better understanding of the actual ecosystems provides a framework within which policy makers can ask relevant questions, envisage more efficient approaches, and assess ensuing outcomes.

## Snapshot of the Entrepreneurship Ecosystem in India

Entrepreneurship has earned a newfound respect in India. Many Indians, with exposure to the world of business, who traditionally would have opted for a job, are setting up their own ventures. Many elements of the entrepreneurship ecosystem are beginning to come together. For example, increase in venture capitalists, government schemes and incubators, academia industry linkages, and emerging clusters and support to rural economy. All these initiatives are effective but there is a need to scale up and enrich the ecosystem further in the following ways:

1. We need to review our attitude towards failures and accept them as learning experiences.
2. We must encourage the educated to become entrepreneurs and provide students in schools and colleges with entrepreneurship skills.

3. Universities, research labs and the government need to play the role of enablers in the entrepreneurship support ecosystem.
4. Policymakers need to focus on reducing the obstacles such as corruption, red tape and bureaucracy.
5. We need to improve our legal systems and court international venture capital firms and bring them to India.
6. We must devise policies and methods to reach the secondary and tertiary towns in India, where people do not have access to the same resources available in the cities.

Today, there is a huge opportunity in this country to introduce innovative solutions that are capable of scaling up, and collaborating within the ecosystem as well as enriching it.

## Make in India Campaign

Every entrepreneur has certain needs. Some of their important needs are:

- To easily get loans
- To easily find investors
- To get tax exemptions
- To easily access resources and good infrastructure
- To enjoy a procedure that is free of hassles and is quick
- To be able to easily partner with other firms

The Make in India campaign, launched by Prime Minister Modi aims to satisfy all these needs of young, aspiring entrepreneurs. Its objective is to:

- Make investment easy
- Support new ideas
- Enhance skill development
- Safeguard the ideas of entrepreneurs
- Create state-of-the-art facilities for manufacturing goods

## Tips

- Research the existing market, network with other entrepreneurs, venture capitalists, angel investors, and thoroughly review the policies in place to enable your entrepreneurship.
- Failure is a stepping stone and not the end of the road. Review yours and your peers' errors and correct them in your future venture.
- Be proactive in your ecosystem. Identify the key features of your ecosystem and enrich them to ensure self-sustainability of your entrepreneurship support ecosystem.

## 5.5.7 Risk Appetite & Resilience: Entrepreneurship and Risk

Entrepreneurs are inherently risk takers. They are path-makers not path-takers. Unlike a normal, cautious person, an entrepreneur would not think twice about quitting his job (his sole income) and taking a risk on himself and his idea.

An entrepreneur is aware that while pursuing his dreams, assumptions can be proven wrong and unforeseen events may arise. He knows that after dealing with numerous problems, success is still not guaranteed. Entrepreneurship is synonymous with the ability to take risks. This ability, called risk-appetite, is an entrepreneurial trait that is partly genetic and partly acquired.

## What is Risk Appetite?

Risk appetite is defined as the extent to which a company is equipped to take risk, in order to achieve its objectives. Essentially, it refers to the balance, struck by the company, between possible profits and the hazards caused by changes in the environment (economic ecosystem, policies, etc.). Taking on more risk may lead to higher rewards but have a high probability of losses as well. However, being too conservative may go against the company as it can miss out on good opportunities to grow and reach their objectives.

The levels of risk appetite can be broadly categorized as “low”, “medium” and “high.” The company’s entrepreneur(s) have to evaluate all potential alternatives and select the option most likely to succeed. Companies have varying levels of risk appetites for different objectives. The levels depend on:

- The type of industry
- Market pressures
- Company objectives

For example, a startup with a revolutionary concept will have a very high risk appetite. The startup can afford short term failures before it achieves longer term success. This type of appetite will not remain constant and will be adjusted to account for the present circumstances of the company.

## Risk Appetite Statement

Companies have to define and articulate their risk appetite in sync with decisions made about their objectives and opportunities. The point of having a risk appetite statement is to have a framework that clearly states the acceptance and management of risk in business. It sets risk taking limits within the company. The risk appetite statement should convey the following:

- The nature of risks the business faces.
- Which risks the company is comfortable taking on and which risks are unacceptable.
- How much risk to accept in all the risk categories.
- The desired tradeoff between risk and reward.
- Measures of risk and methods of examining and regulating risk exposures.

## Entrepreneurship and Resilience

Entrepreneurs are characterized by a set of qualities known as resilience. These qualities play an especially large role in the early stages of developing an enterprise. Risk resilience is an extremely valuable characteristic as it is believed to protect entrepreneurs against the threat of challenges and changes in the business environment.

## What is Entrepreneurial Resilience?

Resilience is used to describe individuals who have the ability to overcome setbacks related to their life and career aspirations. A resilient person is someone who is capable of easily and quickly recovering from setbacks. For the entrepreneur, resilience is a critical trait. Entrepreneurial resilience can be enhanced in the following ways:

- By developing a professional network of coaches and mentors
- By accepting that change is a part of life
- By viewing obstacles as something that can be overcome

## Characteristics of a Resilient Entrepreneur

The characteristics required to make an entrepreneur resilient enough to go the whole way in their business enterprise are:

- A strong internal sense of control
- Strong social connections
- Skill to learn from setbacks
- Ability to look at the bigger picture
- Ability to diversify and expand
- Survivor attitude
- Cash-flow conscious habits
- Attention to detail

## Tips 

- Cultivate a great network of clients, suppliers, peers, friends and family. This will not only help you promote your business, but will also help you learn, identify new opportunities and stay tuned to changes in the market.
- Don’t dwell on setbacks. Focus on what the you need to do next to get moving again.
- While you should try and curtail expenses, ensure that it is not at the cost of your growth.

## 5.5.8 Success & Failures: Understanding Successes and Failures in Entrepreneurship

Shyam is a famous entrepreneur, known for his success story. But what most people don't know, is that Shyam failed numerous times before his enterprise became a success. Read his interview to get an idea of what entrepreneurship is really about, straight from an entrepreneur who has both, failed and succeeded.

**Interviewer**: Shyam, I have heard that entrepreneurs are great risk-takers who are never afraid of failing. Is this true?

**Shyam**: Ha ha, no of course it's not true! Most people believe that entrepreneurs need to be fearlessly enthusiastic. But the truth is, fear is a very normal and valid human reaction, especially when you are planning to start your own business! In fact, my biggest fear was the fear of failing. The reality is, entrepreneurs fail as much as they succeed. The trick is to not allow the fear of failing to stop you from going ahead with your plans. Remember, failures are lessons for future success!

**Interviewer**: What, according to you, is the reason that entrepreneurs fail?

**Shyam**: Well, there is no one single reason why entrepreneurs fail. An entrepreneur can fail due to numerous reasons. You could fail because you have allowed your fear of failure to defeat you. You could fail because you are unwilling to delegate (distribute) work. As the saying goes, "You can do anything, but not everything!" You could fail because you gave up too easily – maybe you were not persistent enough. You could fail because you were focusing your energy on small, insignificant tasks and ignoring the tasks that were most important. Other reasons for failing are partnering with the wrong people, not being able to sell your product to the right customers at the right time at the right price… and many more reasons!

**Interviewer**: As an entrepreneur, how do you feel failure should be looked at?

**Shyam**: I believe we should all look at failure as an asset, rather than as something negative. The way I see it, if you have an idea, you should try to make it work, even if there is a chance that you will fail. That's because not trying is failure right there, anyway! And failure is not the worst thing that can happen. I think having regrets because of not trying, and wondering 'what if' is far worse than trying and actually failing.

**Interviewer**: How did you feel when you failed for the first time?

**Shyam:** I was completely heartbroken! It was a very painful experience. But the good news is, you do recover from the failure. And with every subsequent failure, the recovery process gets a lot easier. That's because you start to see each failure more as a lesson that will eventually help you succeed, rather than as an obstacle that you cannot overcome. You will start to realize that failure has many benefits.

**Interviewer:** Can you tell us about some of the benefits of failing?

**Shyam:** One of the benefits that I have experienced personally from failing is that the failure made me see things in a new light. It gave me answers that I didn't have before. Failure can make you a lot stronger. It also helps keep your ego in control.

**Interviewer:** What advice would you give entrepreneurs who are about to start their own enterprises?

**Shyam:** I would tell them to do their research and ensure that their product is something that is actually wanted by customers. I'd tell them to pick their partners and employees very wisely and cautiously. I'd tell them that it's very important to be aggressive – push and market your product as aggressively as possible. I would warn them that starting an enterprise is very expensive and that they should be prepared for a situation where they run out of money.

I would tell them to create long term goals and put a plan in action to achieve that goal. I would tell them to build a product that is truly unique. Be very careful and ensure that you are not copying another startup. Lastly, I'd tell them that it's very important that they find the right investors.

**Interviewer:** That's some really helpful advice, Shyam! I'm sure this will help all entrepreneurs to be more prepared before they begin their journey! Thank you for all your insight!

## Tips 

- Remember that nothing is impossible.
- Identify your mission and your purpose before you start.
- Plan your next steps – don't make decisions hastily.

# UNIT 5.6: Preparing to be an Entrepreneur

## Unit Objectives

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

1. Discuss how market research is carried out
2. Describe the 4 Ps of marketing
3. Discuss the importance of idea generation
4. Recall basic business terminology
5. Discuss the need for CRM
6. Discuss the benefits of CRM
7. Discuss the need for networking
8. Discuss the benefits of networking
9. Understand the importance of setting goals
10. Differentiate between short-term, medium-term and long-term goals
11. Discuss how to write a business plan
12. Explain the financial planning process
13. Discuss ways to manage your risk
14. Describe the procedure and formalities for applying for bank finance
15. Discuss how to manage your own enterprise
16. List important questions that every entrepreneur should ask before starting an enterprise

## 5.6.1 Market Study / The 4 Ps of Marketing / Importance of an IDEA: Understanding Market Research

Market research is the process of gathering, analyzing and interpreting market information on a product or service that is being sold in that market. It also includes information on:

- Past, present and prospective customers
- Customer characteristics and spending habits
- The location and needs of the target market
- The overall industry
- Relevant competitors

Market research involves two types of data:

- Primary information. This is research collected by yourself or by someone hired by you.
- Secondary information. This is research that already exists and is out there for you to find and use.

**Primary research**

Primary research can be of two types:

- Exploratory: This is open-ended and usually involves detailed, unstructured interviews.
- Specific: This is precise and involves structured, formal interviews. Conducting specific research is the more expensive than conducting exploratory research.

**Secondary research**

Secondary research uses outside information. Some common secondary sources are:

- Public sources: These are usually free and have a lot of good information. Examples are government departments, business departments of public libraries etc.
- Commercial sources: These offer valuable information but usually require a fee to be paid. Examples are research and trade associations, banks and other financial institutions etc.
- Educational institutions: These offer a wealth of information. Examples are colleges, universities, technical institutes etc.

## The 4 Ps of Marketing

The 4 Ps of marketing are Product, Price, Promotion and Place. Let's look at each of these 4 Ps in detail.

## Product

A product can be:

- A tangible good
- An intangible service

Whatever your product is, it is critical that you have a clear understanding of what you are offering, and what its unique characteristics are, before you begin with the marketing process.

Some questions to ask yourself are:

- What does the customer want from the product/service?
- What needs does it satisfy?
- Are there any more features that can be added?
- Does it have any expensive and unnecessary features?
- How will customers use it?
- What should it be called?
- How is it different from similar products?
- How much will it cost to produce?
- Can it be sold at a profit?

## Price

Once all the elements of Product have been established, the Price factor needs to be considered.

The Price of a Product will depend on several factors such as profit margins, supply, demand and the marketing strategy.

Some questions to ask yourself are:

- What is the value of the product/service to customers?
- Do local products/services have established price points?
- Is the customer price sensitive?
- Should discounts be offered?
- How is your price compared to that of your competitors?

## Promotion

Once you are certain about your Product and your Price, the next step is to look at ways to promote it. Some key elements of promotion are advertising, public relations, social media marketing, email marketing, search engine marketing, video marketing and more.

Some questions to ask yourself are:

- Where should you promote your product or service?
- What is the best medium to use to reach your target audience?
- When would be the best time to promote your product?
- How are your competitors promoting their products?

## Place

According to most marketers, the basis of marketing is about offering the right product, at the right price, at the right place, at the right time. For this reason, selecting the best possible location is critical for converting prospective clients into actual clients.

Some questions to ask yourself are:

- Will your product or service be looked for in a physical store, online or both?
- What should you do to access the most appropriate distribution channels?
- Will you require a sales force?
- Where are your competitors offering their products or services?
- Should you follow in your competitors' footsteps?
- Should you do something different from your competitors?

## Importance of an IDEA

Ideas are the foundation of progress. An idea can be small or ground-breaking, easy to accomplish or extremely complicated to implement. Whatever the case, the fact that it is an idea gives it merit. Without ideas, nothing is possible. Most people are afraid to speak out their ideas, out for fear of being ridiculed. However, if are an entrepreneur and want to remain competitive and innovative, you need to bring your ideas out into the light.

Some ways to do this are by:

- Establishing a culture of brainstorming where you invite all interested parties to contribute
- Discussing ideas out loud so that people can add their ideas, views, opinions to them
- Being open minded and not limiting your ideas, even if the idea who have seems ridiculous
- Not discarding ideas that you don't work on immediately, but instead making a note of them and shelving them so they can be revisited at a later date

## Tips 

- Keep in mind that good ideas do not always have to be unique.
- Remember that timing plays a huge role in determining the success of your idea.
- Situations and circumstances will always change, so be flexible and adapt your idea accordingly.

## 5.6.2 Business Entity Concepts: Basic Business Terminology

If your aim is to start and run a business, it is crucial that you have a good understanding of basic business terms. Every entrepreneur should be well versed in the following terms:

- Accounting: A systematic method of recording and reporting financial transactions.
- Accounts payable: Money owed by a company to its creditors.
- Accounts Receivable: The amount a company is owed by its clients.
- Assets: The value of everything a company owns and uses to conduct its business.
- Balance Sheet: A snapshot of a company's assets, liabilities and owner's equity at a given moment.
- Bottom Line: The total amount a business has earned or lost at the end of a month.
- Business: An organization that operates with the aim of making a profit.
- Business to Business (B2B): A business that sells goods or services to another business.
- Business to Consumer (B2C): A business that sells goods or services directly to the end user.
- Capital: The money a business has in its accounts, assets and investments. The two main types of capital are debt and equity.
- Cash Flow: The overall movement of funds through a business each month, including income and expenses.
- Cash Flow Statement: A statement showing the money that entered and exited a business during a specific period of time.
- Contract: A formal agreement to do work for pay.
- Depreciation: The degrading value of an asset over time.
- Expense: The costs that a business incurs through its operations.
- Finance: The management and allocation of money and other assets.
- Financial Report: A comprehensive account of a business' transactions and expenses.
- Fixed Cost: A one-time expense.
- Income Statement (Profit and Loss Statement): Shows the profitability of a business during a period of time.
- Liabilities: The value of what a business owes to someone else.
- Marketing: The process of promoting, selling and distributing a product or service.
- Net Income/Profit: Revenues minus expenses.
- Net Worth: The total value of a business.
- Payback Period: The amount of time it takes to recover the initial investment of a business.
- Profit Margin: The ratio of profit, divided by revenue, displayed as a percentage.
- Return on Investment (ROI): The amount of money a business gets as return from an investment.

- Revenue: The total amount of income before expenses are subtracted.
- Sales Prospect: A potential customer.
- Supplier: A provider of supplies to a business.
- Target Market: A specific group of customers at which a company's products and services are aimed.
- Valuation: An estimate of the overall worth of the business.
- Variable Cost: Expenses that change in proportion to the activity of a business.
- Working Capital: Calculated as current assets minus current liabilities.

## 5.6.3 CRM & Networking: What is CRM?

CRM stands for Customer Relationship Management. Originally the expression Customer Relationship Management meant managing one's relationship with customers. However, today it refers to IT systems and software designed to help companies manage their relationships.

## The Need for CRM

The better a company can manage its relationships with its customers, the higher the chances of the company's success. For any entrepreneur, the ability to successfully retain existing customers and expand the enterprise is paramount. This is why IT systems that focus on addressing the problems of dealing with customers on a daily basis are becoming more and more in demand.

Customer needs change over time, and technology can make it easier to understand what customers really want. This insight helps companies to be more responsive to the needs of their customers. It enables them to modify their business operations when required, so that their customers are always served in the best manner possible. Simply put, CRM helps companies recognize the value of their clients and enables them to capitalize on improved customer relations.

## Benefits of CRM

CRM has a number of important benefits:

- It helps improve relations with existing customers which can lead to:
  - Increased sales
  - Identification of customer needs
  - Cross-selling of products
- It results in better marketing of one's products or services
- It enhances customer satisfaction and retention
- It improves profitability by identifying and focusing on the most profitable customers

## 5.3.4 What is Networking?

In business, networking means leveraging your business and personal connections in order to bring in a regular supply of new business. This marketing method is effective as well as low cost. It is a great way to develop sales opportunities and contacts. Networking can be based on referrals and introductions, or can take place via phone, email, and social and business networking websites.

## 5.3.5 The Need for Networking

Networking is an essential personal skill for business people, but it is even more important for entrepreneurs. The process of networking has its roots in relationship building. Networking results in greater communication and a stronger presence in the entrepreneurial ecosystem. This helps build strong relationships with other entrepreneurs.

Business networking events held across the globe play a huge role in connecting like-minded entrepreneurs who share the same fundamental beliefs in communication, exchanging ideas and converting ideas into realities. Such networking events also play a crucial role in connecting entrepreneurs with potential investors. Entrepreneurs may have vastly different experiences and backgrounds but they all have a common goal in mind – they all seek connection, inspiration, advice, opportunities and mentors. Networking offers them a platform to do just that.

## Benefits of Networking

Networking offers numerous benefits for entrepreneurs. Some of the major benefits are:

- Getting high quality leads
- Increased business opportunities
- Good source of relevant connections
- Advice from like-minded entrepreneurs
- Gaining visibility and raising your profile
- Meeting positive and enthusiastic people
- Increased self-confidence
- Satisfaction from helping others
- Building strong and lasting friendships

## Tips

- Use social media interactions to identify needs and gather feedback.
- When networking, ask open-ended questions rather than yes/no type questions.

## 5.6.4 Business Plan: Why Set Goals

Setting goals is important because it gives you long-term vision and short-term motivation. Goals can be short term, medium term and long term.

**Short-Term Goals**

- These are specific goals for the immediate future.

**Example**: Repairing a machine that has failed.

**Medium-Term Goals**

- These goals are built on your short term goals.
- They do not need to be as specific as your short term goals.

**Example**: Arranging for a service contract to ensure that your machines don't fail again.

**Long-Term Goals**

These goals require time and planning.

They usually take a year or more to achieve.

**Example**: Planning your expenses so you can buy new machinery

## Why Create a Business Plan

A business plan is a tool for understanding how your business is put together. It can be used to monitor progress, foster accountable and control the fate of the business. It usually offers a 3-5 year projection and outlines the plan that the company intends to follow to grow its revenues. A business plan is also a very important tool for getting the interest of key employees or future investors.

A business plan typically comprises of eight elements.

## Elements of a Business Plan

**Executive Summary**

The executive summary follows the title page. The summary should clearly state your desires as the business owner in a short and businesslike way. It is an overview of your business and your plans. Ideally this should not be more than 1-2 pages.

Your Executive Summary should include:

- The Mission Statement: Explain what your business is all about.

  **Example: Nike's Mission Statement**

  Nike's mission statement is "To bring inspiration and innovation to every athlete in the world."
- Company Information: Provide information like when your business was formed, the names and roles of the founders, the number of employees, your business location(s) etc.
- Growth Highlights: Mention examples of company growth. Use graphs and charts where possible.
- Your Products/Services: Describe the products or services provided.
- Financial Information: Provide details on current bank and investors.
- Summarize future plans: Describe where you see your business in the future.

**Business Description**

The second section of your business plan needs to provide a detailed review of the different elements of your business. This will help potential investors to correctly understand your business goal and the uniqueness of your offering.

Your Business Description should include:

- A description of the nature of your business
- The market needs that you are aiming to satisfy
- The ways in which your products and services meet these needs
- The specific consumers and organizations that you intend to serve
- Your specific competitive advantages

**Market Analysis**

The market analysis section usually follows the business description. The aim of this section is to showcase your industry and market knowledge. This is also the section where you should lay down your research findings and conclusions.

Your Market Analysis should include:

- Your industry description and outlook
- Information on your target market
- The needs and demographics of your target audience
- The size of your target market
- The amount of market share you want to capture
- Your pricing structure
- Your competitive analysis
- Any regulatory requirements

**Organization & Management**

This section should come immediately after the Market Analysis.

Your Organization & Management section should include:

- Your company's organizational structure
- Details of your company's ownership
- Details of your management team
- Qualifications of your board of directors
- Detailed descriptions of each division/department and its function
- The salary and benefits package that you offer your people
- The incentives that you offer

**Service or Product Line**

The next section is the service or product line section. This is where you describe your service or product, and stress on their benefits to potential and current customers. Explain in detail why your product of choice will fulfill the needs of your target audience.

Your Service or Product Line section should include:

- A description of your product/service
- A description of your product or service's life cycle
- A list of any copyright or patent filings
- A description of any R&D activities that you are involved in or planning

**Marketing & Sales**

Once the Service or Product Line section of your plan has been completed, you should start on the description of the marketing and sales management strategy for your business.

Your Marketing section should include the following strategies:

- **Market penetration strategy**: This strategy focuses on selling your existing products or services in existing markets, in order to increase your market share.
- **Growth strategy**: This strategy focuses on increasing the amount of market share, even if it reduces earnings in the short-term.
- **Channels of distribution strategy**: These can be wholesalers, retailers, distributers and even the internet.
- **Communication strategy**: These can be written strategies (e-mail, text, chat), oral strategies (phone calls, video chats, face-to-face conversations), non-verbal strategies (body language, facial expressions, tone of voice) and visual strategies (signs, webpages, illustrations).

Your Sales section should include the following information:

- **A salesforce strategy**: This strategy focuses on increasing the revenue of the enterprise.
- **A breakdown of your sales activities**: This means detailing out how you intend to sell your products or services – will you sell it offline or online, how many units do you intend to sell, what price do you plan to sell each unit at, etc.

Funding Request

This section is specifically for those who require funding for their venture.

The Funding Request section should include the following information:

- How much funding you currently require.
- How much funding you will require over the next five years. This will depend on your long-term goals.
- The type of funding you want and how you plan to use it. Do you want funding that can be used only for a specific purpose, or funding that can be used for any kind of requirement?
- Strategic plans for the future. This will involve detailing out your long-term plans – what these plans are and how much money you will require to put these plans in motions.
- Historical and prospective financial information. This can be done by creating and maintaining all your financial records, right from the moment your enterprise started, to the present day. Documents required for this are your balance sheet which contains details of your company's assets and liabilities, your income statement which lists your company's revenues, expenses and net income for the year, your tax returns (usually for the last three years) and your cash flow budget which lists the cash that came in, the cash that went out and states whether you had a cash deficit (negative balance) or surplus (positive balance) at the end of each month.

**Financial Planning**

Before you begin building your enterprise, you need to plan your finances. Take a look at the steps for financial planning:

**Step 1**: Create a financial plan. This should include your goals, strategies and timelines for accomplishing these goals.

**Step 2**: Organize all your important financial documents. Maintain a file to hold your investment details, bank statements, tax papers, credit card bills, insurance papers and any other financial records.

**Step 3**: Calculate your net worth. This means figure out what you own (assets like your house, bank accounts, investments etc.), and then subtract what you owe (liabilities like loans, pending credit card amounts etc.) the amount you are left with is your net worth.

**Step 4**: Make a spending plan. This means write down in detail where your money will come from, and where it will go.

**Step 5**: Build an emergency fund. A good emergency fund contains enough money to cover at least 6 months' worth of expenses.

**Step 6**: Set up your insurance. Insurance provides long term financial security and protects you against risk.

**Risk Management**

As an entrepreneur, it is critical that you evaluate the risks involved with the type of enterprise that you want to start, before you begin setting up your company. Once you have identified potential risks, you can take steps to reduce them. Some ways to manage risks are:

- Research similar business and find out about their risks and how they were minimized.
- Evaluate current market trends and find out if similar products or services that launched a while ago are still being well received by the public.
- Think about whether you really have the required expertise to launch your product or service.
- Examine your finances and see if you have enough income to start your enterprise.
- Be aware of the current state of the economy, consider how the economy may change over time, and think about how your enterprise will be affected by any of those changes.
- Create a detailed business plan.

## Tips

- Ensure all the important elements are covered in your plan.
- Scrutinize the numbers thoroughly.
- Be concise and realistic.
- Be conservative in your approach and your projections.
- Use visuals like charts, graphs and images wherever possible.

## 5.6.5 Procedure and Formalities for Bank Finance: The Need for Bank Finance

For entrepreneurs, one of the most difficult challenges faced involves securing funds for startups. With numerous funding options available, entrepreneurs need to take a close look at which funding methodology works best for them. In India, banks are one of the largest funders of startups, offering funding to thousands of startups every year.

## What Information Should Entrepreneurs Offer Banks for Funding?

When approaching a bank, entrepreneurs must have a clear idea of the different criteria that banks use to screen, rate and process loan applications. Entrepreneurs must also be aware of the importance of providing banks with accurate and correct information. It is now easier than ever for financial institutions to track any default behaviour of loan applicants. Entrepreneurs looking for funding from banks must provide banks with information relating to their general credentials, financial situation and guarantees or collaterals that can be offered.

**General Credentials**

This is where you, as an entrepreneur, provide the bank with background information on yourself. Such information includes:

- Letter(s) of Introduction: This letter should be written by a respected business person who knows you well enough to introduce you. The aim of this letter is set across your achievements and vouch for your character and integrity.
- Your Profile: This is basically your resume. You need to give the bank a good idea of your educational achievements, professional training, qualifications, employment record and achievements.
- Business Brochure: A business brochure typically provides information on company products, clients, how long the business has been running for etc.
- Bank and Other References: If you have an account with another bank, providing those bank references is a good idea.
- Proof of Company Ownership or Registration: In some cases, you may need to provide the bank with proof of company ownership and registration. A list of assets and liabilities may also be required.

**Financial Situation**

Banks will expect current financial information on your enterprise. The standard financial reports you should be prepared with are:

- Balance Sheet
- Cash-Flow Statement
- Business Plan
- Profit-and-Loss Account
- Projected Sales and Revenues
- Feasibility Study

**Guarantees or Collaterals**

Usually banks will refuse to grant you a loan without security. You can offer assets which the bank can seize and sell off if you do not repay the loan. Fixed assets like machinery, equipment, vehicles etc. are also considered to be security for loans.

## The Lending Criteria of Banks

Your request for funding will have a higher chance of success if you can satisfy the following lending criteria:

- Good cash flow
- Adequate shareholders' funds
- Adequate security
- Experience in business
- Good reputation

## The Procedure

To apply for funding the following procedure will need to be followed.

1. Submit your application form and all other required documents to the bank.
2. The bank will carefully assess your credit worthiness and assign ratings by analyzing your business information with respect to parameters like management, financial, operational and industry information as well as past loan performance.
3. The bank will make a decision as to whether or not you should be given funding.

## Tips 

- Get advice on funding options from experienced bankers.
- Be cautious and avoid borrowing more than you need, for longer than you need, at an interest rate that is higher than you are comfortable with.

## 5.6.6 Enterprise Management - An Overview: How to Manage Your Enterprise

To manage your enterprise effectively you need to look at many different aspects, right from managing the day-to-day activities to figuring out how to handle a large scale event. Let's take a look at some simple steps to manage your company effectively.

**Step 1: Use your leadership skills and ask for advice when required.**

Let's take the example of Ramu, an entrepreneur who has recently started his own enterprise. Ramu has good leadership skills – he is honest, communicates well, knows how to delegate work etc. These leadership skills definitely help Ramu in the management of his enterprise. However, sometimes Ramu comes across situations that he is unsure how to handle. What should Ramu do in this case? One solution is for him to find a more experienced manager who is willing to mentor him. Another solution is for Ramu to use his networking skills so that he can connect with managers from other organizations, who can give him advice on how to handle such situations.

**Step 2: Divide your work amongst others – realize that you cannot handle everything yourself.**

Even the most skilled manager in the world will not be able to manage every single task that an enterprise will demand of him. A smart manager needs to realize that the key to managing his enterprise lies in his dividing all his work between those around him. This is known as delegation. However, delegating is not enough. A manager must delegate effectively if he wants to see results. This is important because delegating, when done incorrectly, can result in you creating even more work for yourself. To delegate effectively, you can start by making two lists. One list should contain the things that you know you need to handle yourself. The second list should contain the things that you are confident can be given to others to manage and handle. Besides incorrect delegation, another issue that may arise is over-delegation. This means giving away too many of your tasks to others. The problem with this is, the more tasks you delegate, the more time you will spend tracking and monitoring the work progress of those you have handed the tasks to. This will leave you with very little time to finish your own work.

**Step 3: Hire the right people for the job.**

Hiring the right people goes a long way towards effectively managing your enterprise. To hire the best people suited for the job, you need to be very careful with your interview process. You should ask potential candidates the right questions and evaluate their answers carefully. Carrying out background checks is always a good practice. Running a credit check is also a good idea, especially if the people you are planning to hire will be handling your money. Create a detailed job description for each role that you want filled and ensure that all candidates have a clear and correct understanding of the job description. You should also have an employee manual in place, where you

put down every expectation that you have from your employees. All these actions will help ensure that the right people are approached for running your enterprise.

**Step 4: Motivate your employees and train them well.**

Your enterprise can only be managed effectively if your employees are motivated to work hard for your enterprise. Part of being motivated involves your employees believing in the vision and mission of your enterprise and genuinely wanting to make efforts towards pursuing the same. You can motivate your employees with recognition, bonuses and rewards for achievements. You can also motivate them by telling them about how their efforts have led to the company's success. This will help them feel pride and give them a sense of responsibility that will increase their motivation.

Besides motivating your people, your employees should be constantly trained in new practices and technologies. Remember, training is not a one-time effort. It is a consistent effort that needs to be carried out regularly.

**Step 5: Train your people to handle your customers well.**

Your employees need to be well-versed in the art of customer management. This means they should be able to understand what their customers want, and also know how to satisfy their needs. For them to truly understand this, they need to see how you deal effectively with customers. This is called leading by example. Show them how you sincerely listen to your clients and the efforts that you put into understand their requirements. Let them listen to the type of questions that you ask your clients so they understand which questions are appropriate.

**Step 6: Market your enterprise effectively.**

Use all your skills and the skills of your employees to market your enterprise in an effective manner. You can also hire a marketing agency if you feel you need help in this area.

Now that you know what is required to run your enterprise effectively, put these steps into play, and see how much easier managing your enterprise becomes!

## Tips

- Get advice on funding options from experienced bankers.
- Be cautious and avoid borrowing more than you need, for longer than you need, at an interest rate that is higher than you are comfortable with.

## 5.6.7. 20 Questions to Ask Yourself Before Considering Entrepreneurship

1. Why am I starting a business?
2. What problem am I solving?
3. Have others attempted to solve this problem before? Did they succeed or fail?
4. Do I have a mentor[1] or industry expert that I can call on?
5. Who is my ideal customer[2]?
6. Who are my competitors[3]?
7. What makes my business idea different from other business ideas?
8. What are the key features of my product or service?
9. Have I done a SWOT[4] analysis?
10. What is the size of the market that will buy my product or service?
11. What would it take to build a minimum viable product[5] to test the market?
12. How much money do I need to get started?
13. Will I need to get a loan?
14. How soon will my products or services be available?
15. When will I break even[6] or make a profit?
16. How will those who invest in my idea make a profit?
17. How should I set up the legal structure[7] of my business?
18. What taxes[8] will I need to pay?
19. What kind of insurance[9] will I need?
20. Have I reached out to potential customers for feedback?

## Tips

- It is very important to validate your business ideas before you invest significant time, money and resources into it.
- The more questions you ask yourself, the more prepared you will be to handle to highs and lows of starting an enterprise.

**Footnotes:**

1. A mentor is a trusted and experienced person who is willing to coach and guide you.
2. A customer is someone who buys goods and/or services.
3. A competitor is a person or company that sells products and/or services similar to your products and/or services.
4. SWOT stands for Strengths, Weaknesses, Opportunities and Threats. To conduct a SWOT analysis of your company, you need to list down all the strengths and weaknesses of your company, the opportunities that are present for your company and the threats faced by your company.

5. A minimum viable product is a product that has the fewest possible features, that can be sold to customers, for the purpose of getting feedback from customers on the product.
6. A company is said to break even when the profits of the company are equal to the costs.
7. The legal structure could be a sole proprietorship, partnership or limited liability partnership.
8. There are two types of taxes – direct taxes payable by a person or a company, or indirect taxes charged on goods and/or services.
9. There are two types of insurance – life insurance and general insurance. Life insurance covers human life while general insurance covers assets like animals, goods, cars etc.

## Notes

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