



# Participant 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

“ Skilling is building a better India.  
If we have to move India towards  
development then Skill Development  
should be our mission. ”



## Certificate

### COMPLIANCE TO QUALIFICATION PACK – NATIONAL OCCUPATIONAL STANDARDS

is hereby issued by the

**AGRICULTURE SECTOR SKILL COUNCIL**

for

**SKILLING CONTENT : PARTICIPANT HANDBOOK**

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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.

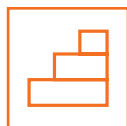
The handbook incorporates well-defined roles of Green House Operator like operating and maintaining the various components of Green House, manage the green house operations and maintain the Health & Safety at the Green House etc. The participant should be result oriented and responsible for his/her own 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 Objectives



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.

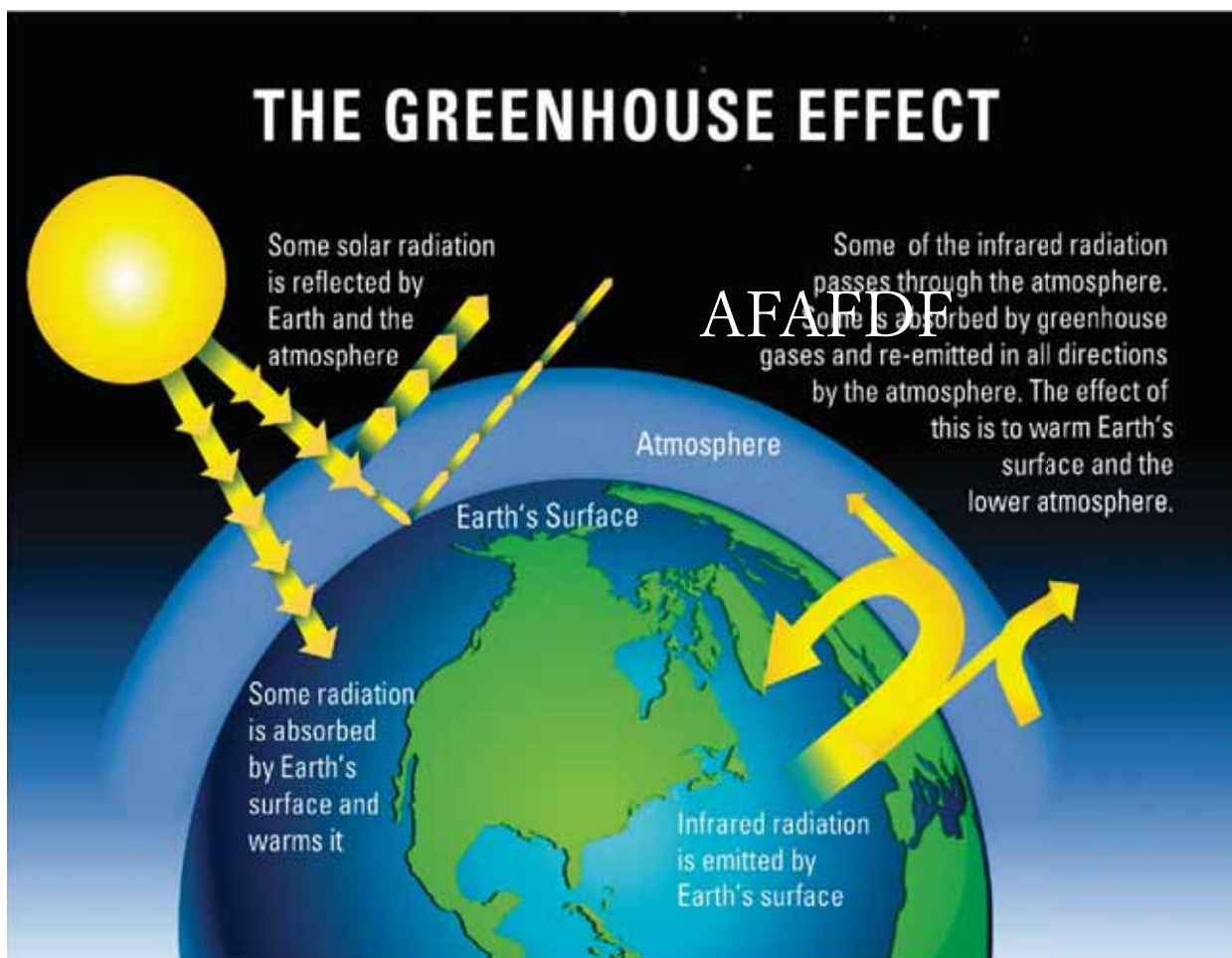


Fig 1.1.2 Green House Effect

### 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 limitations of 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 has demonstrated 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 and average 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*