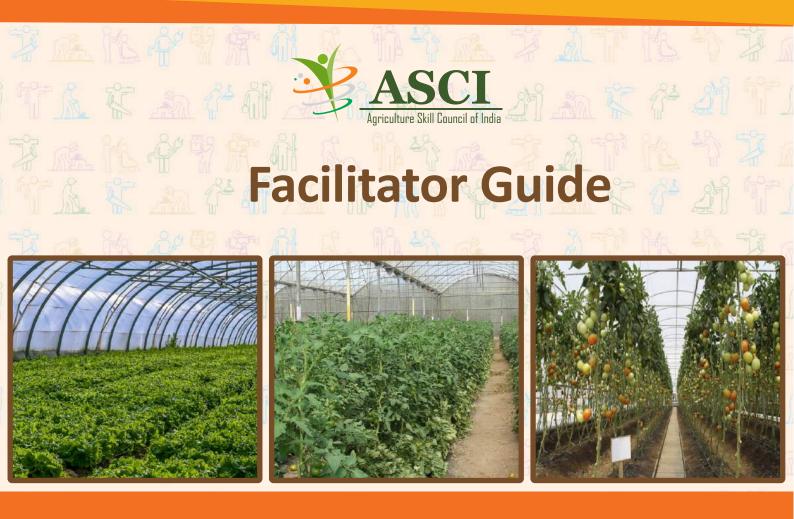




& ENTREPRENEURSHIP



Transforming the skill landscape



Sector Agriculture and Allied

Sub-Sector
Agriculture Crop Production

Occupation Precision Farming

Reference ID: AGR/Q1003, Version 1.0 NSQF Level: 3

Greenhouse Operator

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Shri Narendra Modi Prime Minister of India



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Acknowledgements

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. N. Emayavaramban** 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 Guide

Dear Trainer,

This Trainers Manual is intended to empower preparing for the Greenhouse Operator Qualification Pack (QP). Every National Occupational (NOS) is spread over Unit/s. Key Learning Objectives for the NOS check the start of the Unit/s for that NOS. The images utilized as a part of this book are portrayed beneath. Greenhouse Operator is in charge of Installation, Testing, Commissioning of Greenhouse Operator at agriculturist's field for better water administration and increment in yield of product. The National Occupational Standards indicate the measures of execution an individual must accomplish when doing a capacity in the work environment, together with the information and comprehension they have to meet that standard reliably. These word related guidelines are appropriate both in the Indian and worldwide settings. According to these measures the Greenhouse Operator rought not work freely, ought to be relentless and must be able to settle on operational choices relating to his range of work. The student ought to pick up clarity of work and ought to be result situated; The Trainee ought to likewise have the capacity to exhibit abilities to utilize different devices in the Greenhouse. The mentor should guide and prepare the students' in the accompanying abilities:

- Knowledge and Understanding: Satisfactory operational learning and comprehension to play out the required chore
- **Performance Criteria**: Pick up the required aptitudes through hands on preparing and play out the required operations inside the predetermined measures
- Professional Skills: Capacity to settle on operational choices relating to the zone of work

The course incorporates Trainer Guide including student handbook for the learners and coach's aide; appraisal guide; session arrangement; and syllabus for you. The course material likewise incorporates a couple of blurbs as showing helps in the classroom. The appraisal guide subtle elements the assessment system. As a mentor you will assess the learners' execution and grade them in light of the assessment parameters given in the aide. The system additionally incorporates field visit for the students where they will watch the method/operations and administrations of the Greenhouse. Chapter sare prepared to build up the expert abilities like – choices making, systematic and basic considering. We hope you will be able to impart your knowledge with our help to make this program a success and up-skill the workers to the recommended standards.

We trust you will have the capacity to confer your insight with our help to make this program a win and up-skill the workers to the suggested norms.

All the best!

Role of the Trainer

As a trainer, keep in mind the following guidelines: Know your job thoroughly

The Trainer ought to first know his/her learners (the students) keeping in mind the end goal to guarantee their productive contribution in the learning procedure. Fundamentally the majority of these contemplations are guided by the reasoning of participatory preparing, which advocates that preparation, not at all like instructing, is more worried with the general improvement of the human identity.

- As a Trainer, remember the accompanying rules:
- Training is not learning
- The trainer needs to learn for himself/herself, through his/her own particular activity and movement
- The trainer can just guide the understudy movement in a way that prompts a decent learning background
- The trainer can create reasonable situations fancied to deliver a powerful learning (curricular, co-curricular and additional curricular) experience
- Trainees' response with the earth is relied upon to achieve an adjustment in conduct
- The trainer is the key component, as on him/her depends the arranging of the learning circumstance for accomplishing the sought result

Practice these common courtesies

- Greet the students
- Be warm and neighborly
- Introduce yourself
- Ask their names
- Explain the reason and objectives of preparing project
- Ask their desires
- Always make inquiries
- Listen to then quietly and answer their inquiries
- In case you can't react to an inquiry say that you will hit them up
- Respect the students
- Do not hang over them, their work, or get in their work-space
- Do not take their work or move it without requesting their consent
- Be a decent onlooker
- Offer rededication for weaker students Correct the flawed practices of learners at work before they transform into propensities
- Do not condemn
- Show gratefulness where it is expected
- Always say 'please', 'thank you', and "too bad"
- Beatutor

Responsibilities

- The trainer has a unique position and assumes a few parts. He/she is a go between the student and administration.
- The trainer has moral and lawful duties and guarantees the expert advancement as well as the prosperity of the young. You need to counteract:
- Discrimination as a result of sexual orientation, race or nationality or some other kind
- Bullying and/or lewd behavior
- Abuse of liquor, prescription or whatever other substance
- Physical threats through mischance, air contamination, commotion or risky chemicals
- Overstepping the student's physical limit
- You likewise need to secure that time directions or other lawful controls are not infringing-neither by you nor by the disciple.

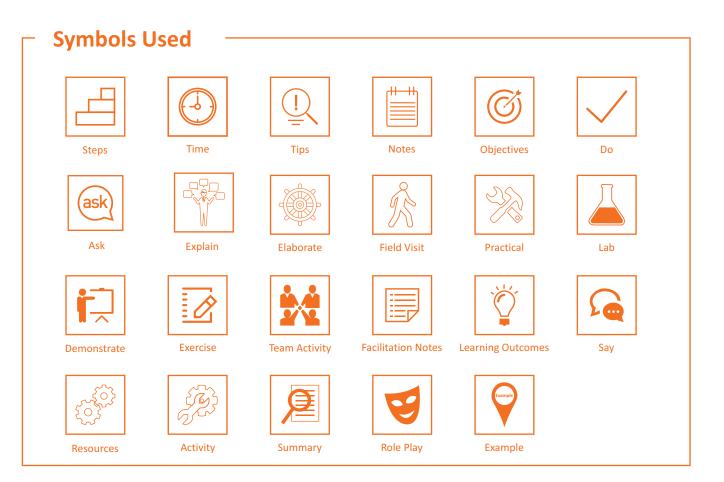


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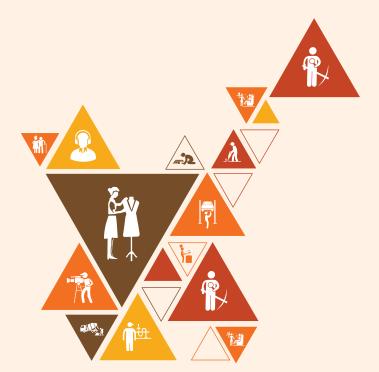


Transforming the skill landscape



1. Introduction

Unit 1.1 - Understand the working of various greenhouse components Unit 1.2 - Maintain the required environment in the greenhouse



Key Learning Outcomes 🕴

After completing this session the trainees will be able to:

- Understand various components of greenhouse: galvanized structure, covering, cooling system, exhaust fan, heating system, motorized shading net/ thermal net, fogging/sprinkler system, drip system, control panel, motorized ventilation
- Get familiarized with the working of different components of greenhouse
- Ensure personal hygiene by using of gloves, masks, goggles, boots, etc. whenever required
- Check all tools and equipment before operating them
- · Perform all procedures and follow work instructions for controlling operational risks
- Ensure the entire system is shut-off before leaving in the evening
- Take care to avoid water logging in greenhouse
- · Check the level of water in the tanks daily
- Maintain temperature, humidity, light on daily basis as per the crop requirement
- Maintain the temperature with the help of cooling pad and fan as per the crop and season
- Maintain humidity by the operation of forgers as per the crop & season
- · Ensure proper ventilation through exhaust fan/ motorized ventilation
- Position and regulate greenhouse irrigation systems to water plants
- · Set up irrigation systems in soil-less growing media
- Maintain boilers, furnaces, electrical systems and fans
- Operate & maintain various greenhouse equipment like water treatment machines, carbon dioxide generators and ultraviolet sterilizers etc.
- Clean & place all the tools & equipment at the designated places after use

UNIT 1.1: Operate & Maintain Various Greenhouse

Unit Objectives	0

After Completing This Session The Trainees Will Be Able To:

- Understand various components of greenhouse: galvanized structure, covering, cooling system, exhaust fan, heating system, motorized shading net/ thermal net, fogging/sprinkler system, drip system, control panel, motorized ventilation
- Get familiarized with the working of different components of greenhouse

Ask 💽 Understand the working of various greenhouse components -

• How many of you know about understanding the working of various greenhouse components?



Understanding the working of various Greenhouse components

As a Greenhouse Operator, the person is responsible for operating various Greenhouse components, Automation and machines which enables him to control the micro-climate inside the Greenhouse and helps in irrigation and fertigation on timely basis. It is also Greenhouse Operator's responsibility to keep the machine parts and Greenhouse components in running and well maintained condition. This unit therefore tries to introduce basic knowledge of various Greenhouse components and those operations, uses, and their maintenance procedures.

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.

Greenhouses are frames of inflated structure covered with a transparent material in which crops are grown under controlled environment conditions. Green house cultivation helps to cultivate the crops with favorable micro climatic conditions and it lead to controlled environment crop cultivation 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. Temperature is primary environmental parameter which is being controlled. 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

Low cost or low tech greenhouse

Bamboo and timber will be used for constructing low cost green house structure and for cladding Ultra violet (UV) film will be taken. Unlike conventional or hi-tech greenhouses, no specific control device for regulating environmental parameters inside the greenhouse is provided. A shading material like nets can reduce the light intensity. Simple techniques will be 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.

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.

Hi-tech greenhouse

A hi-tech green house will be having a function of automatic controlling the environment parameters compared to medium tech green house.

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

- Quonset type
- Curved roof type
- Gable roof type

Classification as per glazing

- Glass glazing
- Fiberglass reinforced plastic glazing
- Plain sheet
- Corrugated sheet
- Plastic film
- Ultra violet stabilized low density poly ethylene
- Silpaulin

Classification based on number of spans

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

Classification based on environmental control

- Naturally ventilated
- Passive ventilation

Poly house

Polyhouse is able to provide the stable environment from nursery to harvesting of crop unlike open filed cultivation practice.

Naturally ventilated poly-house

These poly-houses do not have any environmental control system except for the provision of adequate ventilation and forger system to prevent basically the damage from weather aberrations and other natural agents.

Environmental controlled playhouse

This type of playhouse 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

For controlled environment for the plant growth the green house should be designed based on upon sound scientific principles. 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. Light is a necessary for the plant growth, to ensure that a transparent material will be used in green house structure as covering material. 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 eases of fabrication. Ultra violet resistant low density polyethylene (UVLDPE) single film cladding of 200micron 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 Lock should be used for fastening the sheet at structure, as this does not tear the sheet and sheet replacement is easy.



Permanent Top Ventilated type

Following loads to be carried in the structure while designing.

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. When there is a load applied at the centre of roof, 45kgs concentrated load supporting capacity to be maintained by each member of roof.

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

The compromise of wind direction, latitude of location and type of temperature makes green house orientation. 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. Green house should be oriented from north to south when the ridge of single green house id below 40°, because 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. Orientation of green house from East to West helps to avoid the shading effect from one to another green house East to West. However, the wind direction and latitude are also to be considered.

Wind effects

The advantage of the natural wind direction has to be taken to the maximum possible in the green house which is naturally ventilated. The maximum dimension (length) of greenhouse should be perpendicular to the wind direction especially in summer. The wind direction should be same in Fan and pad greenhouse structure and 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 evaporative 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 height of the green house can be reduced as per the reduced size of the green house – maximum height can be up to 5m for 50mX50m 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 green structure should be able to take all the loads like dead material, live, wind and snow loads. So, green house should be designed in such a way that it will keep safety, serviceability, general structural integrity and suitability. The foundation, columns and trusses are to be designed accordingly. Design loads prescribed by National Green House Manufactures Association (NGMA of USA) standards (1994) and to be followed while designing and constructing a green house.

Environmental factors influencing greenhouse cultivation

Plants need an optimum temperature for maximum yield and quality. The greenhouse in plain and coastal region of India needs cooling. The greenhouses in mild climates and coastal region can be naturally ventilated. Both cooling and heating of the crops (Depending on the crop) are needed in the green housed located in the Northern Plains. For controlling of temperatures a thorough ventilation is required in the greenhouses.

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. The temperature in the greenhouse was same as the ambient temperature, during hot months.

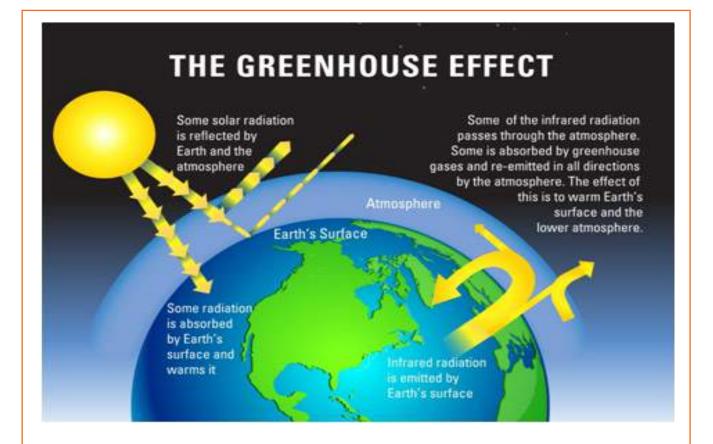
A greenhouse is a structure made of galvanized steel and covered with agricultural plastic film or shading net/thermal net on all the sides, in which plants can be grown in regulated and optimum climatic conditions. Importance of green house are better space utilization, growing crops in extreme climatic conditions and high rainfall area The plastics film used in greenhouse act as selective radiation filters. The greenhouses for northern plains may require both cooling and heating depending on the crop. The greenhouse has to be thoroughly ventilated for control of temperatur "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.

Greenhouse Effect - The role the atmosphere plays in insulating and warming the earth's surface. The atmosphere is largely transparent to incoming solar radiation. Earth's surface will get warm when these radiations strikes and absorbed. The surface of the earth emits some of this energy back out in the form of infrared radiation. Atmospheric gases (carbon dioxide, methane, nitrous oxide and water vapor) will absorb major portions of infrared radiations which travels through atmosphere.

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.

There should be a favorable environment in terrestrial region controlled by short wave length radiation transmitted by the atmosphere for the survival of living plants n the earth.



Advantages of greenhouse:

- The yield may be 10-12 times higher than that of our door cultivation 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.



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, and 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.

Citrus fruits:

Number of Winter fruits cab grown in green house (Sweet, sour, melons, oranges and lemons). They have the ability to sustain even the coldest weather.

Grapes:

Even grapes can be grown in Green house – many free greenhouse plans can highlight details for you. Varieties like "black ham burgh" and "Buckland Sweetwater" need special care.

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.

– Notes 📋 –

UNIT 1.2: Maintain the Required Environment in the Greenhouse

--Unit Objed

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After Completing This Session The Trainees Will Be Able To:

- Ensure personal hygiene by using of gloves, masks, goggles, boots, etc. whenever required
- Check all tools and equipments before operating them •
- Perform all procedures and follow work instructions for controlling operational risks
- Ensure the entire system is shut-off before leaving in the evening
- Take care to avoid water logging in greenhouse
- Check the level of water in the tanks daily
- Maintain temperature, humidity, light on daily basis as per the crop requirement •
- Maintain the temperature with the help of cooling pad and fan as per the crop and season
- Maintain humidity by the operation of foggers as per the crop & season
- Ensure proper ventilation through exhaust fan/ motorized ventilation
- Position and regulate greenhouse irrigation systems to water plants •
- Set up irrigation systems in soil-less growing media
- Maintain boilers, furnaces, electrical systems and fans
- Operate & maintain various greenhouse equipments like water treatment machines, carbon dioxide Generators and ultraviolet sterilizers etc
- Clean & place all the tools & equipments at the designated places after use



Maintaining the required environment in the Greenhouse

The Maintenance schedule of Drip Irrigation System is in 4 steps;

Current or Daily support, in the wake of beginning the pump let the weight be settled in the framework. Check for holes and right the weight at sub-primary. It ought to be according to the outline. In the event that weight is less alter it by throttle/by-pass valve.

Inspect the dribbling and guarantee that water is achieving every one of the edges of the plot/field if at some part water is not trickling effectively discover the cause and right.

If a turn, fold, cut, puncher and so forth is discovered bringing on release variety, right it instantly. Toward the end of movement assess uniform wetting design. In the event that dry patches are discovered increment length of operation.

- Inspect all through the field to recognize precipitation, scaling, if obstructing is occurring, the end drippers are the initially influenced. Take restorative activities if scales/encourages are found.
- Monitor the mechanical harms by rodents, ranch operations by work, creature or hardware, bringing on spillage; right it promptly by utilizing legitimate joiners.
- Flush every one of the laterals by opening end plug 1 to 5 in an arrangement; then close them 1-5 in the same grouping permitting flushing for 3 minutes until clean water begins streaming.
- Flush every sub-principle toward the end of each segment (shift) till soil free clear water begins streaming.
- Check gulf and outlet channel weights. Expel slurry from hydro violent wind, back flush sand channel at regular intervals; flush screen/plate channel toward the end of day's operation.
- Periodic or Fortnightly support.
- Repeat 1 to 9 operations and take restorative activities.

Take out the component of screen/circle channel and clean it altogether. Open the top of sand (media) channel sewer vent, permit the water to turn out through sewer vent, blend the sand completely by moving the hand in the middle of channel mushrooms (candles) without aggravating their position for altogether isolating collected remote material with media (sand) for reviving its separating limit.

• Acid Treatment

Safeguards – Always utilize goggles and surgical/elastic hand gloves and never pour water in corrosive however dependably add corrosive into water as well-being safety measure before taking care of corrosive. Continuously utilize plastic holders for acids.

The business Grade of Acid prescribed for Acid Treatment are:

Hydrochloric Acid	HCI	-35%
Nitric Acid	HNO3	-33%
Sulfuric Acid	H2SO4	-65 %
Ortho Phosphoric Acid	H3PO4	-85%

Treatment guidelines:

1.Treatment ought to be done 1-2 times amid the water system season or when framework release drops by 5%

2. Flush all sub mains and laterals before beginning the treatment

3. Check the release of the framework before the treatment so you can later contrast this and the release of the treated framework

4. Arrangement planning: The arrangement volume (water +acid) ought to be equivalent to one quarter (¼) of the hourly release of the injector. Along these lines the infusion will keep going for 15 minutes We prescribe working with the greatest injector release so as to abstain from working with a very thought arrangement 5.Start the infusion simply after the framework is loaded with water and the drippers are transmitting 6. Control: Using a litmus marker strip, check the pH at the uttermost horizontal for remaining corrosive (pH 2.0). second application is suggested if no lingering corrosive is identified
7. Infuse amid 15 minutes
8. Continue water system for 30-a hour to guarantee the complete flushing of the framework

9. Check the release of the framework

For Example:

Acid required for accepting pH (2.0) in the 10 liter container = 12 cc 12 cc X 100 = 1200 cc = 1.2 liters Inject 1.2 liters of corrosive for each 1 m3 of the framework release System release (of the treated segment) = 30 m3/h System release amid the 15 minute treatment= 7.5 m3 Acid required = 1.2 liter X 7.5 = 9 litter Max. injector release = 200 l/h Total arrangement volume required (¼ of 200 liters) = 50 liters 50 liters of arrangement = 9 liters of corrosive + 41 liters of water Injection time = 15 minutes (50 liters infused with a 200 l/h injector)

3.2 Iron, Manganese Treatments

In the event that water investigation report indicates higher measure of iron and/or manganese taking after measures can be taken, oxidation by aeration permits iron to hasten speedier. Store the water in settlement tank after ventured air circulation to permit iron to encourage down and afterward pump the water for your framework. Chlorination alongside air circulation can upgrade rate of oxidation. It would be ideal if you take note of that manganese polluting influences respond moderate with chlorine henceforth they coagulate after the primary channels. In such cases, either permits some extra response and precipitation time or utilize plot channels as auxiliary fine channel to maintain a strategic distance from trickle per obstructing which can't be cleaned by any concoction implies.

3.3 Chlorination Treatment

Precautionary measures for chlorination – Chlorine is poisonous to human and creature. Try not to have direct contact with Skin, eyes, nose, mouth with any Chlorine substance or Cl2 gas; as it is noxious for human and creature. Wear goggles, hand gloves, wellbeing shoes and so on amid chlorination treatment. Vessels for the arrangement ought to be altogether washed to stay away from mishap by response. Never utilize Fertigation of Nitrogenous manure amid Chlorination to maintain a strategic distance from arrangement of superb compound like Ammonium Chloride and so forth. Never blend corrosive in Chlorine arrangement; utilize another gadget of infusion for corrosive preceding Chlorine. For making/weakening arrangement of Chlorine include Chlorine item into water however don't pour water in chlorine substance/arrangement. It can be in three structures: Cl2 gas (100 %Chlorine), Sodium Hypochlorite NaOCl, (10% Chlorine) or Calcium Hypochlorite Ca (OCl) 2 (50 to 65% Chlorine).

Chlorine is a biocide that slaughters smaller scale living being: bacreria, algue and so on. Chlorine infusion will decrease obstructing and help keeping the water system lines clean. It is suggested as an irregular treatment or as a progressing preventive treatment in frameworks that utilization water that contains a high grouping of natural materials. The most generally utilized material is sodium hypochlorite 10-12%.

Treatment directions:

1. Discover the required measurements, treatment recurrence and term.

2. Flush all sub mains and laterals before beginning the treatment.

3. Dosing and infusing: Use the accompanying recipe to decide infusion rate and stock arrangement fixation: If the injector can be controlled to infuse at various release levels, you may do as such, as indicated by your necessities. If not, you can adjust the stock arrangement focus. Adjusting the stock arrangement focus to a settled infusion rate.

Caution:

Dynamic Chlorine is unsafe. Take after the assembling guideline.

Capacity: Sodium hypochlorite ought to be put away under a shaded range in a spotless dull tank, with no manures deposits. Focus will debase after some time.

Greenhouse system frameworks incorporate miniaturized scale sprinklers for tree crops, trickle emitters for trees, vines, and some line harvests, and dribble tape for line and field crops. Smaller scale water system frameworks apply water to the dirt through emitters that are introduced along dribble lines and contain little stream sections. Smaller scale water system frameworks can apply water and composts more consistently than other water system techniques. This consistency brings about conceivably higher yields, higher income, and lessened water system working expenses

Consistency, an execution normal for water system frameworks, is a measure of the uniformity of the connected water all through the water system framework. Dispersion consistency (DU), now and again called outflow consistency (EU), is a list that portrays how equitably or consistently water is connected all through the field. A consistency of 100% means the same measure of water was connected all over. Lamentably, all water system frameworks apply water at a consistency of under 100%, and in this manner a few sections of a field get more water than others. Field assessments have demonstrated that miniaturized scale water system frameworks have the potential for higher consistency than other water system strategies. Be that as it may, obstructing diminishes the consistency of connected water all through a field. The little stream entries in the emitters and smaller scale sprinklers make miniaturized scale water system frameworks exceedingly helpless to stopping up. Stopping up diminishes the consistency of the connected water and reductions the measure of connected water. Obstructing likewise diminishes the measure of salt draining around the sidelong line in saline soils.

- Tending to the normal issues confronted by agriculturists in the MI System
- General Maintenance Guidelines
- Keep the detour valve "OPEN" before exchanging on the pump and change/close the same progressively to modify the required weight on the mainline.
- Always introduce reasonable pump according to outline/framework necessities.
- Always keep up the required working weight inside the framework.
- Do not under or over inundate. Continuously keep up ideal dampness level in the field.
- Always position J-Turbo Aqura with emitter confronting upwards.
- Keep the top of channel and compost tank ideally fixed while in operation.
- Backwash the media channels frequently. Channel the screen channel and hydro tornado channel day by day.
- While discharging the manual media channel, constantly first open discharge valve, then close outlet valve, after this, open the center valve and after that nearby bay valve. Take after the other way around methodology while changing over to ordinary mode.
- Root interruption can happen if plants are under-flooded or if chemicals and composts are not flushed out of the line legitimately.
- Periodically review every one of the segments introduced over the ground for physical misuse, harm by field hardware, rodents and soon.
- Do not pull the laterals while moving, laying/transferring.
- The end top/stop of laterals and flush valve toward the end of sub principle ought to dependably be in shut position. On the off chance that left open, these focuses may permit weight misfortune/drop furthermore water wastage.

- Operation of valve ought to be appropriate according to the heading given on valve. Try not to alter or exasperate the processing plant setting.
- Before rolling out any change or improvement in the framework plan, dependably counsel the specialized division of the Company or Authorized merchant. The framework intended for one harvest may not be sufficient or reasonable for another product and/or dividing.
- Always use pump according to plan necessities. Counsel Company or Authorized merchant if there should be an occurrence of any adjustment in pump HP.
- Do not change the water source without finding out the nature of water.
- Run framework every day to keep consistent wetted strip. It additionally maintains a strategic distance from salt precipitation inside the tubing/emitter.
- To keep away from harm, secure the framework appropriately while working homestead hardware in the field or completing any manual operation.
- Roll the laterals legitimately in loop structure while expelling the laterals from the field and guarantee that no harm is done to GTO while collapsing parallel tubes.
- Store the poly tube/funneling appropriately stacked and far from rodents at levels higher than ground.
- It is prudent to lead a 'rodent crusading' when rats/mice is an irritation.
- Use just 100% Water Soluble Fertilizer amid fertigation through MIS. Try not to utilize whatever other sort of manure.
- Do not blend dairy animals' excrement in suction channeling to avert/stop spillage in the foot valve, rather change elastic fold and/or clean the foot valve strainer legitimately.
- Power supplied (counting current, voltage and recurrence) to any electrical/gadgets parts (counting controllers, control board, pumps and so on.) should be directed and/or according to the particulars/necessities.

Maintenance

I So as to get most extreme effectiveness and ideal result it is important to anticipate emitter, little sprinkler and laterals from stopping up. Thus, filtration framework is the heart of water system frameworks. Appropriately kept up channels will guarantee most extreme proficiency of water system frameworks, by abstaining from obstructing. Introduce the channel/s on legitimately developed brick work or solid stage. Associate all the gathering legitimately. Guarantee that all the channel candles inside the sand/media channels are at their place before topping off the sand. On the off chance that hydro violent wind is to be associated with sand channel, introduce air discharge valve at most elevated purpose of the fitting.

Upkeep of Hydro typhoon Filters

Hydro typhoon channel requires slightest upkeep by cleaning the soil, inside the sub-current chamber at day by day interim. Flush the chamber by opening flush valve/top or open the primary valve, for careful cleaning. If it's not too much trouble take note of that hydro tornado channel gets to be inadequate once the soil gathering chamber is full. Continuously run the hydro violent wind channel at ostensible working weight. Clean the soil frequently. Abundance weight and/or un cleaned soil chamber may prompt disintegration of dividers.

Maintenance of Sand / Media Filters

Figure 3.1.1 Maintenance of Sand / Media Filters

Sand channel is compelling for expelling natural substantial and inorganic defiles. Over a period, the contaminants in water aggregate and stop up pore space in the sand informal lodging diminish the productivity of channel. Day by day discharging of your sand channel is essential. Discharging is the procedures in which water stream is turned around and sand bed is lifted and extended permitting it to discharge the gathered earth. The soil is then diverted through discharging valve. Discharge stream ought to be balanced legitimately, in light of the fact that inordinate discharge stream will prompt expulsion of sand itself out of the channel and deficient discharge stream won't perfect the sand appropriately.

Sequence of backwash operation

Step 1. Open the Backwash Valve.Step 2. Close the Outlet Valve.Step 3. Open the Bypass Valve.Step 4. Close the Inlet Valve.

If it's not too much trouble take note of that in self-loader and programmed discharge alternative. Opening and Closing of the valve is done in the meantime. The sand channel ought to likewise be cleaned consistently as takes after:

- 1) Open the cover of sand channel
- 2) Start the Back flush operation
- 3) Put your hand inside the sand channel and mix the sand completely.

Sand Filter Cleaning

4) Allow all the water alongside earth to course through the principle gap of the sand channel.

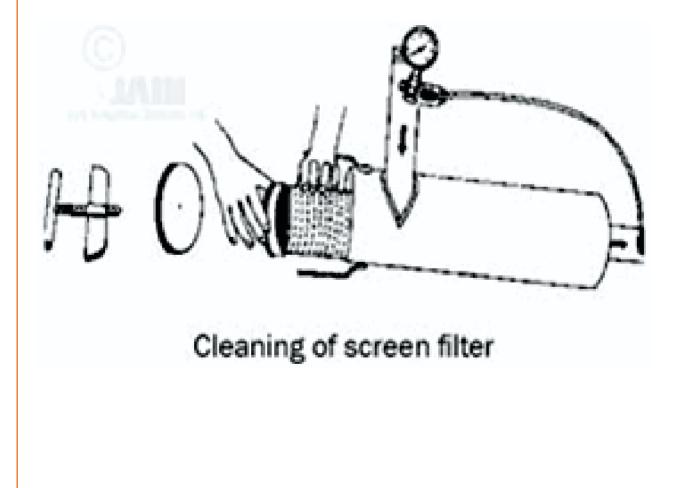
5) Close the cover for ordinary operation.

Introduce the channel/s on appropriately developed brick work or solid stage. Associate all the gathering legitimately. Guarantee that all the channel candles inside the sand/media channels are at their place before topping off the sand. On the off chance that hydro typhoon is to be associated with sand channel, introduce air discharge valve at most elevated purpose of the fitting.

Maintenance of Screen Filter

Flushing at booked every day interim is important to keep up your screen channel. It is prescribed to flush your screen channel, if weight drops more than 0.5 Kg/cm2 (5 m at water head). The weight distinction can be seen by checking gulf and outlet weight by utilizing a solitary 3-way control valve. Flushing should be possible by basic opening of the channel valve, permitting the power of water to flush the earth out through channel valve. It is additionally important to clean the screen at consistent interim. Technique of cleaning is exceptionally basic, open the screen channel cover, evacuate the screen and clean it in streaming water by rubbing with fabric or delicate nylon brush.

Ensure the metal parts of the channels from scratches, corrosive/chlorine/manure spillage and so on. Put oil paint promptly on the scratch to stay away from proliferation of setting erosion. Figure Cleaning of Screen Filter



-Notes



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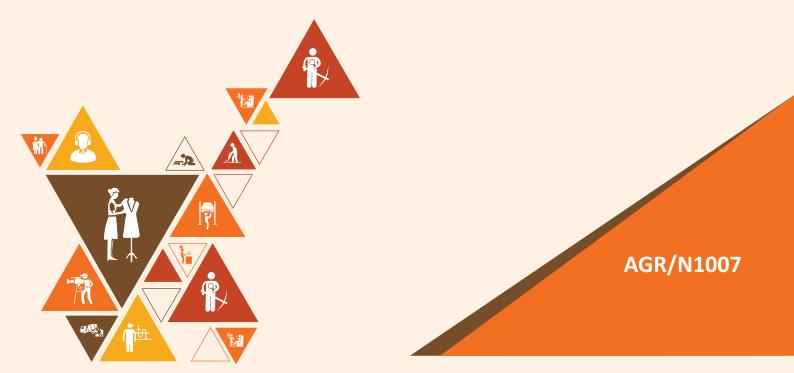
Transforming the skill landscape



2. Manage Greenhouse Operations

Unit 2.1 – Undertake various operations

Unit 2.2 - Monitor & document various operations



Key Learning Outcomes 🕴

After completing this session the trainees will be able to:

- Receive planting material
- Understand the type and quantity of plants to grow or stock (for example, cut or potted flowers, bedding plants, vegetables, plant varieties)
- Determine the environmental conditions required to grow the selected plants and set planting and care schedules accordingly
- Prepare soil or soil-less peat mix growing medium for planting
- Plant bulbs, seeds and cuttings, graft plants, transplant seedlings and rooted cuttings grade-wise
- Label each batch of plant lets indicating plant species/variety, date of transplanting etc
- Train and prune plants
- Apply irrigation and schedule fertigation according to the crop requirement
- Identify and control problems caused by insects, rodents, plant diseases or nutritional deficiencies
- Remove weeds & off types, spray plants with pesticides and apply fertilizers
- Ensure safe handling, use, storage and disposal of pesticides
- Harvest/grade the crop as per the standards/ supervisor's instructions
- Record the details of plant lets received & transplanted- plant species/ variety, Accession Number of clone/genotype, batch of production, no of plant lets, date of transplanting etc in the greenhouse register
- Monitor the plant lets regularly for their growth and presence of any infestation/infection/off types
- Remove the off types & dead plant lets promptly to avoid attack by saprophytic fungi and record the plant let mortalities in green house register
- Carry out vector monitoring at periodic intervals and record the same in the specified manner
- record any kind of treatment given to the plants such as application of fertilizers or micro-nutrient sprays or application of pesticides indicating date/time of application, fertilizer or other chemicals applied, dosage rate and if pesticides applied (including botanicals and microbial pesticides), pest against which applied and name/sign of applicator.
- Maintain the greenhouse register

UNIT 2.1: Undertake Various Operations



After Completing This Session The Trainees Will Be Able To:

- Receive planting material
- Understand the type and quantity of plants to grow or stock (for example, cut or potted flowers, bedding plants, vegetables, plant varieties)
- Determine the environmental conditions required to grow the selected plants and set planting and care schedules accordingly
- Prepare soil or soil-less peat mix growing medium for planting
- Plant bulbs, seeds and cuttings, graft plants, transplant seedlings and rooted cuttings grade-wise
- Label each batch of plant lets indicating plant species/variety, date of transplanting etc
- Train and prune plants
- Apply irrigation and schedule fertigation according to the crop requirement
- · Identify and control problems caused by insects, rodents, plant diseases or nutritional deficiencies
- · Remove weeds & off types, spray plants with pesticides and apply fertilizers
- Ensure safe handling, use, storage and disposal of pesticides
- Harvest/grade the crop as per the standards/ supervisor's instructions



Undertaking Various Operation

The Procedure

Initially plant tissue culture processes used to be developed and practiced in university and government based laboratories. In recent years, however, the process has moved beyond these research facilities to widespread use among commercial enterprises as a cost-effective tool for plant propagation, new variety introductions and research.

Plant tissue culture has revolutionized the flower and nursery markets by making valuable new hybrid clones available in commercial quantities comparatively soon after their first discovery. Excess of 250000 identical copies or clones can be created in the space of 10-12 months with a single plantlet.

Plant Propagation Methods

Plants produced by vegetative propagation – including top cutting, root divisions, pseudo bulbs, offshoots and plant lets – are genetically identical to the mother plant and thus members of a single clone. Plant tissue culture is a laboratory-based extension of these plant propagation techniques.

Through tissue culture, very large numbers of identical plant lets can be derived from one mother plantlet. This technology and the resulting plant lets now form the basis of many plant nursery and flower trade industries.

The Tissue Culture Process

The mother plant selected should be healthy and free from all microorganisms. A Plant's live tissue will be removed and placed into appropriate nutrient media under aseptic conditions.

In successful culture, these cells will divide, multiply and differentiate into thousands of plant lets having the same characteristics as the parent plants. The growth of plant tissue will be prevented in the presence of Bacteria and fungi in tissue culture process. It is important that the plant material used is thoroughly sterilized and the procedure is carried out in an aseptic environment.

Contaminant-free environment

Laboratory techniques and specialized equipment such as a laminar flow cabinet combine to present an area for the manipulation of sterile plant tissues. A working environment that has virtually all of the bacteria and fungal spores removed is a requirement for successful plant tissue culture. Sterile instruments will be prepared to remove an apical shoot from a plant.

Tissue Culture Media

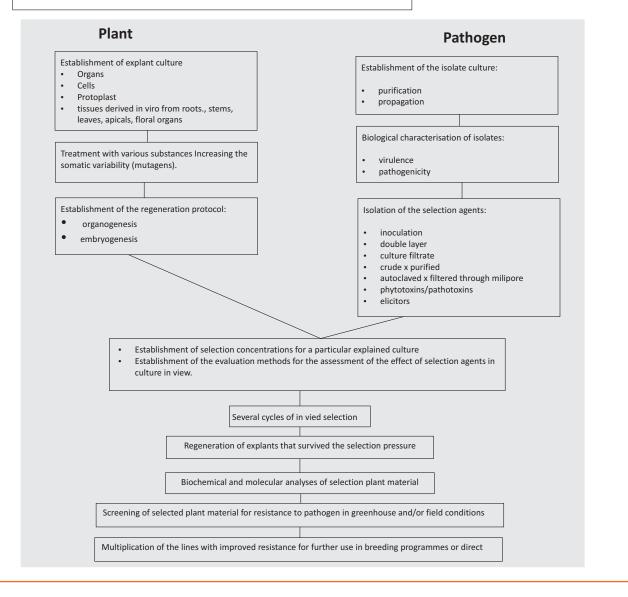
The excised bud is transferred into a tube containing a sterile nutrient medium. Sterilization period, selection of explants and culture media being used place a major role in success of tissue culture different sets of culture media. The rich tissue culture media provides a good food source for bacteria and fungi; therefore, precautions against microbial contamination must be taken in all in vitro procedures.

Propagation Rate

Multiplication program may be carried out after the successful enter in to vitro culture by a plant will yield a 4-10 fold increase in plant numbers every 18-40 days.

When sufficient plant numbers have been developed, a process to move the plant lets from the confines of the culture vessel to a greenhouse is undertaken. The following table compares a conventional propagation scheme on the left with a plant tissue culture production system on the right. Note the number of days and the number of resulting plants:

Day 1	One plant in tissue culture media
Day 40	5 plantlets cut & transplanted in media
Day 80	25 plantlets
Day 120	125 plantlets
Day 160	625 plantlets
Day 200	3,125 plantlets
Day 240	15,625 plantlets
Day 280	Transplant 15,625 plants to Greenhouse
Day 320	Transplant 15,625 plants to Field



-Notes 🗐

UNIT 2.2: Monitor and Document Various Operations

-Unit	Ob	jectives	Ø

After Completing This Session The Trainees Will Be Able To:

- Record the details of plant lets received & transplanted- plant species/ variety, Accession Number of clone/genotype, batch of production, no of plant lets, date of transplanting etc in the greenhouse register
- Monitor the plant lets regularly for their growth and presence of any infestation/infection/off types
- Remove the off types & dead plant lets promptly to avoid attack by saprophytic fungi and record the plant let mortalities in green house register
- Carry out vector monitoring at periodic intervals and record the same in the specified manner
- Record any kind of treatment given to the plants such as application of fertilizers or micro-nutrient sprays
 or application of pesticides indicating date/time of application, fertilizer or other chemicals applied,
 dosage rate and if pesticides applied (including botanical and microbial pesticides), pest against which
 applied and name/sign of applicator.
- Maintain the greenhouse register



Monitoring and documenting various operations in Greenhouse Installation Planning

The National Organic standards states that a certified operation must maintain records for production, harvesting and handling of organic agricultural products. These records must be adapted to the particular business that the certified operation is conducting; fully disclose all activities and transactions of the certified operation in sufficient detail as to be readily understood and audited; be maintained for not less than 5 years; and be sufficient to demonstrate compliance with the latest Organic Rule itself. These records must be available for inspection and copying during normal business hours by the organic inspector or other authorized representatives. Because vegetable operations vary widely in the types of crops grown, amount of acreage, number and size of fields in production, and marketing through farmers markets, on-farm stands, CSA and/or wholesale, it is difficult to create a template or system that fits all types of certified organic vegetable operations. The record keeping system presented below attempts to walk organic vegetable growers through recordkeeping options to develop systems of records pertinent to their specific operations. The requirements for each type of record are given and an example of that type of record is shown.

Vegetable farm records that meet National Standards requirements can be grouped into the following categories:

- 1. Farm and field maps
- 2. Field history sheets
- 3. Seed purchase records
- 4. Input records (soil amendments, foliar sprays, pest control products, compost production record)
- 5. Activity logs
- 6. Harvest records
- 7. Storage records
- 8. Lot numbering system for wholesale sales
- 9. Sales records
- 10. Other records

- Notes	



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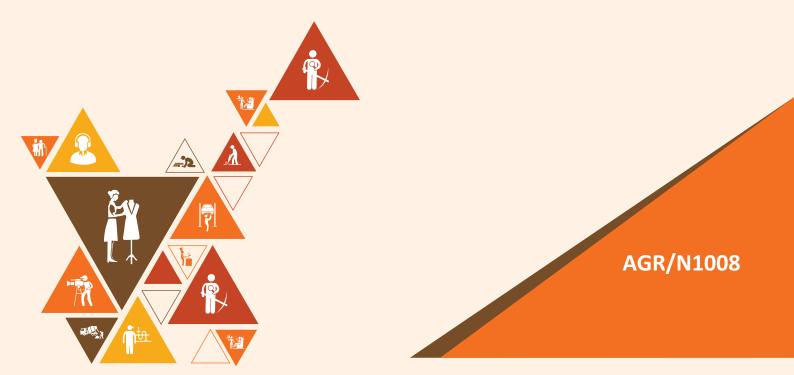


Transforming the skill landscape



3. Maintain Health & Safety at the Workplace

Unit 3.1 - Maintain clean and efficient workplace Unit 3.2 - Render appropriate emergency procedures



Key Learning Outcomes 💈

After completing this session the trainees will be able to:

- Undertake basic safety checks before operation of all machinery and vehicles and hazards are reported to the appropriate supervisor
- Work for which protective clothing or equipment is required is identified and the appropriate protective clothing or equipment is used in performing these duties in accordance with workplace policy
- Read and understand the hazards of use and contamination mentioned on the labels of pesticides/fumigants etc
- Assess risks prior to performing manual handling jobs, and work according to currently recommended safe practice
- Use equipment and materials safely and correctly and return the same to designated storage when not in use
- Dispose of waste safely and correctly in a designated area
- Recognize risks to bystanders and take action to reduce risk associated with jobs in the workplace
- Perform your work in a manner which minimizes environmental damage all procedures and work instructions for controlling risk are followed closely
- Report any accidents, incidents or problems without delay to an appropriate person and take necessary immediate action to reduce further danger
- Follow procedures for dealing with accidents, fires and emergencies, including communicating location and directions to emergency
- Follow emergency procedures to company standard / workplace requirements
- Use emergency equipment in accordance with manufacturers' specifications and workplace requirements
- Provide treatment appropriate to the patient's injuries in accordance with recognized first aid techniques
- Recover (if practical), clean, inspect/test, refurbish, replace and store the first aid equipment as appropriate
- Report details of first aid administered in accordance with workplace procedures

UNIT 3.1: Maintain Clean and Efficient Workplace

-Unit Objectives 🤇	Ì
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After Completing This Session The Trainees Will Be Able To:

- Undertake basic safety checks before operation of all machinery and vehicles and hazards are reported to the appropriate supervisor
- Work for which protective clothing or equipment is required is identified and the appropriate protective clothing or equipment is used in performing these duties in accordance with workplace policy
- Read and understand the hazards of use and contamination mentioned on the labels of pesticides/fumigants etc
- Assess risks prior to performing manual handling jobs, and work according to currently recommended safe
 practice
- Use equipment and materials safely and correctly and return the same to designated storage when not in use
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- Recognize risks to bystanders and take action to reduce risk associated with jobs in the workplace
- Perform your work in a manner which minimizes environmental damage all procedures and work instructions for controlling risk are followed closely
- Report any accidents, incidents or problems without delay to an appropriate person and take necessary immediate action to reduce further danger

-Say 🔎

Health and Safety Improvement Cycle:- The Health and Safety Improvement Cycle is a guide to lessening working environment wounds and diseases. It is an aide for building complete working environment wellbeing and security frameworks. The Health and Safety Improvement Cycle gives a nonstop procedure of change.

Peril identification, assessment, control and monitoring:- Peril administration is the establishment of any well-being and security framework. Recognizing, evaluating and controlling dangers are the way to work environment well-being and security. Great peril administration will push you to:

- Develop and deal with a sheltered workplace
- Keep you, staff and any guests to your work environment safe
- Reduce the number and seriousness of work environment wounds

Steps |

How do you establish specific health and safety policies and procedures?

There are five stages to setting up particular well-being and security arrangements and techniques:

Step 1: Identify work environment risks and issues.

Step 2: Collect data about the unsafe movement or issue.

Step 3: Prepare the strategy or methodology.

Step 4: Implement the arrangement or technique.

Step 5: Review the arrangement or technique and roll out improvements if required.

Step 1: | 레 Identify workplace hazards and issues.

Despite the sort of work, numerous work environments have particular strategies which bolster their general well-being and security strategy and identify with all representatives. Regular approaches include:

- non-smoking arrangement;
- policy on utilization of medications and liquor; and housekeeping arrangement

There are numerous parts of your workplace where composed techniques will forestall working environment ailment and wounds and control risks at their source. A few cases where composed systems might be required are:

Specific work environment risks

- Identification and evaluation of the dangers
- Risk control
- Reporting risks;
- issue determination;
- consultation on proposed change;
- workplace reviews;

Investigating episodes and issues, with restorative activities; reactive and reaction exercises, for example

- First help and medicinal crises
- Reporting ailment, damage
- Reporting episodes and unsafe events;

Administrative exercises, for example, record keeping and acquiring; legal duties in connection to:

- Contractors
- Visitors
- Injury records
- Health observing
- Complying with new directions which apply to the work environment

To decide needs, it will inquire:

- Is the action or peril bringing about incessant or serious occurrences or sick well-being?
- Is the peril or action new to the work environment?
- How essential is the issue to representatives?

Step 2: Collect information about the activity

What sort of information do you need?

The sort of data you need is controlled by the action concerned and whether you are building up an approach or a strategy. As a rule, you require data which will let you know or permit you to work out:

- The reasons for the peril and variables making the danger;
- Relevant legitimate principles or prerequisites;
- Possible control measures; and
- Workplace components which will influence execution of the strategy or technique

There are a wide range of well springs of data. A significant part of the data is accessible in your working environment; however some might be accessible remotely. Conceivable sources include:

- Health and well-being delegates
- Employees
- Regulations, principles, codes of practice
- Investigation reports E advisors' reports
- Your records, information and experience
- Product and gear details
- Publications and diaries on well-being and security

Well-being and security delegates and workers will likely be your most imperative data source. Without their commitment administration won't have the capacity to guarantee the strategy or system is reasonable.

Step 3: A Prepare the policy or procedure

It is critical to counsel with workers while planning arrangements and techniques. Representatives will be included with executing any new courses of action, and as a result of their everyday "hands on" part, they are liable to know whether the proposed plans will work. On the off chance that the general populations who are influenced by the systems or approaches are included in their advancement, it is additionally likely that their dedication to making those strategies and methods work will take after.



Approaches can be utilized to give data about specific well-being and security objectives. They are an announcement to all representatives and in this way should be imparted to all workers. Systems are utilized as a part of an assortment of ways. They are utilized for guideline, supervision and danger control exercises, inc lauding examine

actions. Since strategies must be comprehended before they can be actualized, an essential piece of usage is working out the most ideal approach to impart the data to representatives. Actualizing a methodology may likewise require assets and changes to existing managerial strategies.

How do you inform employees?

Everybody ought to know about the arrangements and methods which have been created for the working environment. Representatives straightforwardly included will require point by point information of all applicable strategies and techniques. You could do this by:

- Explaining arrangements and methodology amid enlistment preparing;
- Including data on arrangements and methodology in refresher preparing; and
- Filming and exhibiting data in a video

Step 5: 卢 Review and make changes if required

Arrangements and methodology should be inspected frequently. You have to ensure they are accomplishing their motivation, they are still significant to your working environment, and they are giving quality to cash. You will need to know how well they accomplish your objectives for peril recognizable proof or hazard control. You likewise need to know whether the arrangements and methodology are supporting your preventive methodologies. Make an arrangement or a timetable for looking into each strategy in your work environment

Why should you evaluate health and safety performance?

When you have set up anticipation systems, for example, approaches and methods, you have to ensure they keep on working to keep your work environment safe and without dangers to well-being. Assessment is a vital piece of viably keeping up well-being and security in your work environment.

The point of assessment is to check how well you are going towards accomplishing your expressed wellbeing and security destinations or objectives. You utilize the data you get from your execution assessment to roll out improvements to the way you oversee well-being and security. This empowers you to motivate nearer to accomplishing your objectives.

How do you evaluate health and safety performance?

There are five steps 🖆 to evaluating health and safety performance:

Step 1: Know what your health and safety objectives are

Step 2: Develop performance measures which indicate achievement of your objectives

Step 3: Collect information on your measures of effectiveness

Step 4: Analyze the results and decide upon improvements

Step 5: Implement changes and start again



Fig.3.1 is depicted as example for learning purpose only

- Notes 📋

UNIT 3.2: Render Appropriate Emergency Procedures

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-Unit	Ob	jectives	ျဖ

After Completing This Session The Trainees Will Be Able To:

- Follow procedures for dealing with accidents, fires and emergencies, including communicating location and directions to emergency
- Follow emergency procedures to company standard / workplace requirements
- Use emergency equipment in accordance with manufacturers' specifications and workplace requirements
- Provide treatment appropriate to the patient's injuries in accordance with recognized first aid techniques
- Recover (if practical), clean, inspect/test, refurbish, replace and store the first aid equipment as appropriate
- Report details of first aid administered in accordance with workplace procedures

Render appropriate emergency procedures

Take after these means to begin on, or enhance, the administration of well-being and security in your work environment:

Assign well-being obligations regarding all levels of your business, from representatives on the work floor to senior administrators. Keep in touch with them into the sets of expectations.

Regularly share your execution in well-being and security enhancements. Measure things, for example, the nature of the occurrence examinations completed and the quantity of security change recommendations got. Report back to representatives on how things are going.

Build a common vision of well-being and security objectives among your directors and chiefs. Be clear about the need of well-being and security among other imperative business needs.

Make your administrators and bosses responsible for being seen to be included, setting a legitimate illustration and driving your business' well-being and security upgrades.

Create a well-being and security panel. Guarantee it works well e.g. gatherings are all around went to, obligations/capacities are shared, and the advisory group is approved to decide.

Provide representatives with approaches to take an interest and contribute recommendations – ready to raise concerns or issues. Urge them to impart these and thoughts for development to bosses and chiefs responsible for their reactions.

Develop a framework that screens/audits peril controls with every remedial move made speedily. Watch that remedial activities are checked with the goal that risks are controlled.

Constantly screen all work environment wounds, hurt and close misses and guarantee that they are recorded in your mishap register. Representatives must comprehend the significance of reporting even minor episodes and close misses. Toward the begin, this may bring about an expansion in the occurrence reporting rate – so be readied. Be that as it may, this will level off and after that abatement as your enhancements produce results. Regularly survey the way you explore occurrences. Examinations finished at the opportune time are viable. They ought to recognize the certifiable sources and fundamental reasons for episodes, and not accuse representatives.

Scanning for safety

Filtering to guarantee well-being is a basic Health and Safety methodology that can help you create danger acknowledgment aptitudes. The point is to have staff promptly aware of potential dangers, which should be possible by taking after these means:

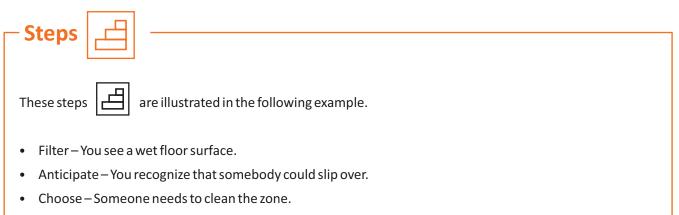
1. Scan for potential dangers when strolling through your administration:

Keep your eyes moving, taking in what is in the zone. While examining, distinguish everything that could be a potential peril.

2. Anticipate what could happen, and quickly audit in your psyche what could turn out badly if the danger is not amended.

3. Choose what move ought to be made to correct the danger.

4. Execute the required activity; you should will to act to keep conceivable mischance from happening.



• Execute – Mop the region.

You can observe from this case leftover danger stays after the first risk circumstance has been managed utilizing control techniques. Some remaining dangers will happen consistently; for instance:

Bodily liquids will be disseminated by means of kids onto the hardware, materials and yourself

Water will be spilt

Toys will make stumbling risks

Equipment may harm youngsters. Lingering dangers will be recognized amid your progressing hazard evaluation and control measures, yet may likewise be distinguished when you are observing new control measures

Communicating correct use of Individual defensive gear

Individual defensive gear is hardware worn by a man to give security from perils. It gives a physical boundary between the individual and the danger. Some PPE that may be utilized as a part of your administration incorporates:

- face and eye insurance, for example, shades and caps hand security, for example, expendable gloves
- garments and footwear, for example, level soled, shut shoes and cook's garments
- head assurance, for example, protective caps and caps
- Childcare settings incorporates:
- respiratory insurance, for example, face veils to secure against airborne contamination, chemicals or scents
- listening to security, for example, ear plugs

Your administration approaches and techniques ought to incorporate points of interest of PPE use, clarifying when, how and why it ought to be utilized. This data ought to likewise give clear rules to moves to make when PPE is not accessible or is not filling in as it ought to.

Monitoring housekeeping practices

Effectual housekeeping can kill some work environment risks and guarantee errands are finished securely. Poor housekeeping adds to mishaps by concealing risks that cause wounds.

Housekeeping practices

Well-being and security housekeeping practices are your immediate duty, pretty much as they are the obligation of all staff in the administration. Well-being and security housekeeping incorporates undertakings, for example, guaranteeing:

- All work environment territories are spotless and clean
- Walkways and crisis ways out are kept clear from checks
- Underneath conditions are reasonable and safe
- Hardware is perfect, working and kept up and put away accurately
- Work space around hardware and apparatus is clear, perfect and safe
- Utilities are working, for example, lighting, wind stream and ventilation, and crisis lighting
- Capacity ranges are perfect, protected and reasonable
- PPE is effectively available and in great working request
- signage is present, unmistakably noticeable and comprehended by all staff

Numerous mischance is brought on by poor housekeeping rehearses. Checking housekeeping hones through perception, cleaning schedules and support for the duration of the day can bring down the effect and expenses connected with wounds and mishaps.

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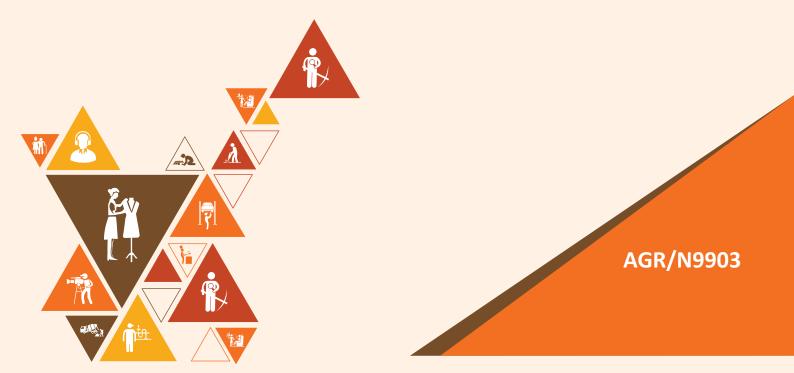


Transforming the skill landscape



4. Annexures

Annexure I - Training Delivery Plan Annexure II- Assessment Criteria



Annexure I Training Delivery Plan

Training Delivery Plan						
Program Name:	Certificate Course in Greenhouse Operator					
Qualification Pack Name & Ref. ID	Greenhouse Operator AGR/Q1003, AGR/N1007, AGR/N1008, AGR/N9903					
Version No.	1.0	Version Update Date	21-01-2016			
Pre-requisites to Training (if any)	•	h Standard Passed preferable e in field (crop) operations				
Training Outcomes	competencies: 1. Increased understandi 2. Increased knowledge 3. Enhanced knowledge 4. Increased motivation 5. Increased awareness a Schemes	 Increased understanding of Greenhouse Operator Increased knowledge about various aspects of Greenhouse Operator system Enhanced knowledge of Greenhouse Operator components Increased motivation to take up Greenhouse Operator as livelihood options Increased awareness about schemes like - NHM, NHB, NABARD, Central & State 				

S. No	Module Name	Session Name	Session Objectives	NOS Reference	Methodology	Training Tools/Aids	Duration
I.	Internal Assessment	Pre-training Assessment	 Assess the current knowledge of the participants on Greenhouse Operator 	Bridge module	Theory Test (Pre Test)	Trainer's Guide	1 hours
ii.	lce Breaker	Ice Breaker	 Get introduced to one another to build rapport with their fellow participants and the trainer 	Bridge module	Activity	Trainer's Guide	30 min
1.	Understand the working of various Greenhouse components	Session 1.1 Understanding GH components	 Pc1. understand various components of greenhouse: galvanized structure, covering, cooling system, exhaust fan, heating system, motorized shading net/ thermal net, fogging sprinkler system, drip system, control panel, motorized ventilation 	Bridge module	Theory Test (Pre Test)	Trainer's Guide	1 hours

I.	Internal Assessment	Pre-training Assessment	 Assess the current knowledge of the participants on Greenhouse Operator 	Bridge module	Theory Test (Pre Test)	Trainer's Guide	1 hours
ii.	Ice Breaker	Ice Breaker	Get introduced to one another to build rapport with their fellow participants and the trainer	Bridge module	Activity	Trainer's Guide	30 min
1.	Understand the working of various Greenhouse components	Session 1.1 Understanding GH components	 Pc1. understand various components of greenhouse: galvanized structure, covering, cooling system, exhaust fan, heating system, motorized shading net/ thermal net, fogging sprinkler system, drip system, control panel, motorized ventilation. PC2. get familiarized with the working of different components of greenhouse 	Bridge module	Theory Test (Pre Test)	Trainer's Guide	1 hours
		Session 1.2 Maintaining Required Environment in GH	 PC3. ensure personal hygiene by using of gloves, masks, goggles, boots, etc. whenever required PC4. check all tools and equipment before operating them PC5. perform all procedures and follow work instructions for controlling operational risks PC6. ensure the entire system is shut-off before leaving in the evening PC7. take care to avoid water logging in greenhouse PC8. check the level of water in the tanks daily 	AGR/N1007, PC3, PC4, PC5 PC6, PC7, PC8, PC9,PC10, PC11, PC12, PC13, PC14, PC15, PC16, PC17	Theory Test (Pre Test)	Trainer-led Discussion Demonstration	4 hours

2.	Manage greenhouse operations	Undertake various operations	 PC1. receive planting material PC2. understand the type and quantity of plants to grow or stock (for example, cut or potted flowers, bedding plants, vegetables, plant varieties) PC3. determine the environmental conditions required to grow the selected plants and set planting and care schedules accordingly PC4. prepare soil or soil-less peat mix growing medium for planting PC5. plant bulbs, seeds and cuttings, graft plants, transplant seedlings and rooted cuttings grade-wise PC6. Label each batch of plant lets indicating plant species/ variety, date of transplanting etc. PC7. train and prune plants PC8. apply irrigation and schedule fertigation according to the crop requirement PC9. identify and control problems caused by insects, rodents, plant diseases or nutritional deficiencies PC10. remove weeds & off types, spray plants with pesticides and apply fertilizers PC11. ensure safe handling, use, storage and disposal of pesticides PC12. harvest/grade the crop as per the standards/ supervisor's instructionsAGR/N1008, PC1, 	AGR/N1008, PC1, PC2, PC3, PC6, PC7, PC8, PC9,PC10, PC11, PC12	Trainer-led Discussion Demonstration	Participant Handbook, Trainer's Guide and other Required materials for Demonstration	4 hours
			as per the standards/				

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		 PC13. record the 	AGR/N1008,	Trainer-led Discussion	Participant	4 hours
Manage greenhouse	Monitor &	details of plant lets	PC13, PC14,	Demonstration	Handbook,	
operations	document various	received &	PC15, PC16,	Demonstration	Trainer's Guide	
operations	operations	transplanted- plant	PC17,Pc18,		and other	
	operations	species/ variety,			Required	
		Accession Number of			materials for	
		clone/genotype,				
		batch of production,			Demonstration	
		no of plant lets, date				
		of transplanting etc.				
		in the greenhouse				
		register				
		• PC14. monitor the				
		plant lets regularly for				
		their growth and				
		presence of any				
		infestation/infection/				
		off types				
		PC15. remove the off				
		types & dead plant				
		lets promptly to avoid				
		attack by saprophytic				
		fungi and record the				
		plant let mortalities in				
		green house register • PC16. carry out vector				
		monitoring at periodic intervals and				
		· ·				
		record the same in				
		the specified manner				
		PC17. record any kind				
		of treatment given to				
		the plants such as				
		application of				
		fertilizers or micro-				
		nutrient sprays or				
		application of				
		pesticides indicating				
		date/time of				
		application, fertilizer				
		or other chemicals				
		applied, dosage rate				
		and if pesticides				
		applied (including				
		botanical and				
		microbial pesticides),				
		pest against which				
		applied and				
		name/sign of				
		applicator.				
		PC18. maintain the				
		greenhouse register				

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			• PC1. undertake basic	AGR/N9903,	Trainer-led Discussion	Trainer's Guide	30 mn
_	Maintain Health &	3.1 Maintain clean	safety checks before	PC1, PC2, PC3,	Demonstration		
3.	Safety at the	and efficient	operation of all	PC4, PC5	Demonstration		
	-	workplace	machinery and	PC6, PC7, PC8,			
	workplace		vehicles and hazards	PC9			
			are reported to the	FCJ			
			appropriate				
			supervisor				
			PC2. Work for which				
			protective clothing or				
			equipment is required				
			is identified and the				
			appropriate				
			protective clothing or				
			equipment is used in				
			performing these				
			duties in accordance				
			with workplace policy.PC3. Read and				
			understand the				
			hazards of use and				
			contamination				
			mentioned on the				
			labels of				
			pesticides/fumigants				
			etc.				
			PC4. Assess risks prior				
			to performing manual				
			handling jobs, and				
			work according to				
			currently				
			recommended safe				
			practice.				
			PC5. use equipment				
			and materials safely				
			and correctly and				
			return the same to				
			designated storage				
			when not in use				
			PC6. dispose of waste				
			safely and correctly in				
			a designated area				
			PC7. recognize risks to				
			bystanders and take				
			action to reduce risk associated with jobs				
			in the workplace				
			PC8. Perform your				
			work in a manner				
			which minimizes				
			environmental				
			damage all				
			procedures and work				
			instructions for				
			controlling risk are				
			followed closely.				
			PC9. Report any				
			accidents, incidents				
			or problems without				
			delay to an				
			appropriate person				
			and take necessary				
			immediate action to				
			reduce further				
			danger.				

PC10. Follow AGR/N9903, Trainer-led Di	iscussion Trainer's Guide 30 mn
3.2 Render procedures for PC10, PC11, Demonstration	
PCI2, PCI3,	
emergency accidents, fires and	
including	
communicating	
location and	
directions to	
emergency.	
PC11. follow	
emergency	
procedures to	
company standard /	
workplace	
requirements	
PC12. use emergency	
equipment in	
accordance with	
manufacturers'	
specifications and	
workplace	
requirements	
PC13. provide	
treatment	
appropriate to the	
patient's injuries in	
accordance with	
recognized first aid	
techniques	
PC14. recover (if	
practical), clean,	
inspect/test,	
refurbish, replace and	
store the first aid	
equipment as	
appropriate	
PC15. Report details	
of first aid	
administered in	
accordance with	
workplace	
procedures.	

Annexure II

Assessment Criteria

CRITERIA FOR ASSESSMENT OF TRAINEES

Assessment Criteria for ASCI- Greenhouse Operator	
Job Role	Greenhouse Operator
Qualification Pack	AGR/Q1003
Sector Skill Council	Agriculture

S.No. Guidelines for Assessment Criteria for assessment for each Qualification Pack will be created by the Sector Skill Council. Each 1. Performance Criteria (PC) will be assigned marks proportional to its importance in NOS. SSC will also lay down proportion of marks for Theory and Skills Practical for each PC. The assessment for the theory part will be based on knowledge bank of questions created by the 2. SSC. Individual assessment agencies will create unique question papers for theory part for each 3. candidate at each examination/training center (as per assessment criteria below). Individual assessment agencies will create unique evaluations for skill practical for every student at 4. each examination/training center based on this criteria. To pass the Qualification Pack, every trainee should score a minimum of 50% in aggregate. 5. In case of successfully passing only certain number of NOS's, the trainee is eligible to take 6. subsequent assessment on the balance NOS's to pass the Qualification Pack. The marks are allocated PC wise, however, every NOS will carry a weight age in the total marks 7. allocated to the specific QP.

				M	Marks Allocation	
Assessment Outcome	Element	Assessment Criteria	Total Marks (200)	Out of	Theory	Skills Practical
1. AGR/N1007 Operate & maintain various greenhouse components	Understand the working of various greenhouse components	Pc1. Understand various components of greenhouse: galvanized structure, covering, cooling system, exhaust fan, heating system, motorized shading net/ thermal net, fogging/sprinkler system, drip system, control panel, motorized ventilation		5	3	2
	Maintain the required	Pc2. get familiarized with the working of different components of greenhouse	85	5	3	2
	environment in the greenhouse	PC3.ensure personal hygiene by using of gloves, masks, goggles, boots, etc. whenever required		5	2	3
		PC4.check all tools and equipment's before operating them		5	3	2

Pc5. Perform all procedures and follow work instructions for controlling operational risks	5	2	3
Pc6. ensure the entire system is shut-off before leaving in the evening.	2	1	1
Pc7. take care to avoid water logging in greenhouse	5	3	2
Pc8. check the level of water in the tanks daily.	5	3	2
Pc9. Maintain temperature, humidity, light on daily basis as per the crop requirement	5	2	3
Pc10. Maintain the temperature with the help of cooling pad and fan as per the crop and season	5	3	2
Pc11. Maintain humidity by the operation of foggers as per the crop & season	5	2	3
Pc12. ensure proper ventilation through exhaust fan/motorized ventilation	5	2	3
Pc13. Position and regulate greenhouse irrigation systems to water plants	5	2	3
Pc14. set up irrigation systems in soil-less growing media	5	3	2
Pc15. Maintain boilers, furnaces, electrical systems and fans.	5	2	3
Pc16. Operate & maintain various greenhouse equipment's like water treatment machines, carbon dioxide generators and ultraviolet sterilizers etc.	8	2	6
Pc17. clean & place all the tools & equipment's at the designated places after use.	5	3	2
	85	41	44

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2. AGR/N1008 Manage	Undertake various	Pc1. receive planting material		5	2	3
greenhouse operations	operations	Pc2. understand the type and quantity of plants to grow or stock (for example, cut or potted flowers, bedding plants, vegetables, plant varieties)		5	4	1
		Pc3. determine the environmental conditions required to grow the selected plants and set planting and care schedules accordingly		5	3	2
		Pc4. prepare soil or soil-less peat mix growing medium for planting		5	2	3
		Pc5. plant bulbs, seeds and cuttings, graft plants, transplant seedlings and rooted cuttings grade-wise		10	4	6
		Pc6. label each batch of plant lets indicating plant species/ variety, date of transplanting etc.	100	5	2	3
		Pc7. train and prune plants		5	2	3
		Pc8. apply irrigation and schedule festination according to the crop requirement		5	2	3
		Pc9. identify and control problems caused by insects, rodents, plant diseases or nutritional deficiencies		5	2	3
		Pc10. remove weeds & off types, spray plants with pesticides and apply fertilizers		5	2	3
		Pc11. ensure safe handling, use, storage and disposal of pesticides		5	2	3
		Pc12. harvest/grade the crop as per the standards/ supervisor's instructions		10	4	6
		Pc13. record the details of plantlets received & transplanted- plant species/ variety, Accession Number of clone/genotype, batch of production, no of plant lets, date of transplanting etc. in the greenhouse register		5	2	3
		Pc14. monitor the plantlets regularly for their growth and presence of any infestation/infection/off types		5	2	3
		Pc15. remove the off types & dead plantlets promptly to avoid attack by saprophytic fungi and record the plantlet mortalities in green house		5	2	3

	document	Pc16. carry out vector monitoring at periodic intervals and record the same in the specified manner	5	2	3
	operations	Pc17. record any kind of treatment given to the plants such as application of fertilizers or micro- nutrient sprays or application of pesticides indicating date/time of application, fertilizer or other chemicals applied, dosage rate and if pesticides applied (including botanicals and microbial pesticides), pest against which applied And name/sign of applicator.	5	2	3
		Pc18. maintain the greenhouse register.	5	2	3
			100	43	57
3. AGR/N9903 Maintain Health and safety at the workplace	Maintaining clean and efficient workplace	Pc1. undertake basic safety checks before operation of all machinery and vehicles and hazards are reported to the appropriate supervisor	1	0	2
		Pc2. work for which protective clothing or equipment is required is identified and the appropriate protective clothing or equipment is used in performing these duties in accordance with Workplace policy.	1	1	0
		Pc3. read and understand the hazards of use and contamination mentioned on the labels of pesticides/fumigants etc.	1	1	0
		Pc4. assess risks prior to performing manual Handling jobs, and work according to currently recommended safe practice.	1	0	1
		PC5.use equipment and materials safely and correctly and return the same to designated storage when not in use	1	0	1
		Pc6. dispose of waste safely and correctly in a designated area	1	0	1
		Pc7. recognize risks to bystanders and take action to reduce risk associated with jobs in the workplace.	1	1	0

		Total	200	90	110
			15	6	9
		Pc15. Report details of first aid administered in accordance with workplace procedures.	1	1	0
		Pc14. recover (if practical), clean, inspect/test, refurbish, replace and store the first aid equipment as appropriate	1	0	1
		Pc13. provide treatment appropriate to the patient's injuries in accordance with recognized first aid techniques	1	0	1
	procedures	Pc12. use emergency equipment in accordance with manufacturers' specifications and workplace requirements	1	0	1
	Render appropriate emergency procedures	Pc11. follow emergency procedures to company standard / workplace requirements	1	1	0
		Pc10. follow procedures for dealing with accidents, fires and emergencies, including communicating location and directions to Emergency.	1	1	0
		Pc9. report any accidents, incidents or problems without delay to an appropriate person and take necessary immediate action to reduce further Danger.	1	0	1
		Pc8. perform your work in a manner which minimizes environmental damage all procedures and work instructions for controlling risk are Followed closely.	1	0	1





