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Greenhouse Technical Management Course – a Masterclass in Protected Cropping Topic Overview

1. Greenhouse Plant Physiology
Explores the way light, temperature and humidity interacts with horticultural crops and their connection to greenhouse plant physiology & environmental management inc:
 - light a plants eye view (UV, PAR, LUX, Global, Radiation Intensity, DLI & Sum)
 - basic plant processes
 - temperature & photosynthesis
 - respiration
 - plant transpiration principles
 - mollier diagram (psychometric chart)
 - relative humidity vs. humidity deficit
 - plant development
2. Water Quality, EC & pH
participants will be able to assess water quality, characteristics of different treatment systems and their application, and understand the principal factors involving EC & pH inc:
 - hydroponic system requirements
 - types of hydroponic systems
 - factors influencing water demand
 - osmosis and other root influences
 - EC & pH change thru systems
 - practical management
 - raw water treatment systems
 - water treatment options (RO, UV, UF, Chemical, etc)
3. Greenhouse Environmental Management & Physics
participants will be able to understand the principal factors affecting environmental management principles, systems and their management inc:
 - outside conditions effects on inside conditions (temp, rH, wind, radiation, rain)
 - grower's tools to influence environment (heating, cooling, fans, screens, climate control systems, fogging, etc)
 - ventilation principles
 - practical grower examples (case studies)
 - temperature integration
4. Plant Structure, Nutrition & Nutrient Management
participants will be able to assess plant structure, photosynthesis, nutrition, characteristics of different root-zone factors and their application, and understand the principal factors involving Nutrient Management (including basic formula calculations) inc:
 - functions of nutrient elements

- nutrient uptake principles
 - plant disorder symptoms, deficiencies & toxicities
 - nutrient management
 - difference between root zone & input solutions
 - interpretation of root zone nutrient analysis
 - adjusting input solution based on drain analysis
5. Irrigation, Growing Media's Manager
Explores the impact irrigation strategies have on growing media and crop production (includes EC, pH, Water Content & Drain %) inc:
- irrigation strategies to match growing media
 - irrigation strategies to match water uptake and drainage
 - irrigation strategies to control root-zone Water Content & EC
 - plant evaporation & transpiration
 - practical calculations for irrigation capacity, required pump capacity, maximum number of irrigation valves
6. Media Types and their Characteristics
participants will be able to assess media types, characteristics, and their application, and understand the principal factors affecting their selection inc:
- ideal media properties
 - void space, porosity, aeration, CEC, pH, etc
 - commercial hydroponic media types and their characteristics
7. Crop Registration & Plant Balance, A Professional Approach to Growing
Explores the monitoring, recording & responding approach to good crop balance (includes 'reading' a crop and tools to change balance) inc:
- managing plant balance
 - crop assessment (evaluating a crop)
 - crop steering (changing crop balance)
 - crop reading (what a crop tells a grower)
 - crop data collection and measurements
 - plant vigour and balance chart
8. Common Greenhouse Pests, Diseases, & IPM
participants will be able to assess common pests and characteristics of different diseases, and understand the principal factors involving Integrated Pest Management and how to implement bio-controls to control common greenhouse pests (i.e. spider mites, whitefly, thrips, fungus gnats, aphid, russet mite, broad mite, caterpillars, etc, inc:
- integrated pest management program
 - sources of plant pests & diseases
 - crop hygiene - insect life cycles
 - plant fungal, bacterial & virus conditions
 - common physiological problems and their treatments
9. CO₂ Enrichment of Greenhouses
Explores the benefits, costs, geometry and equipment required to correctly enrich a greenhouse with carbon dioxide for maximum crop growth & quality inc:
- CO₂ enrichment principles
 - influence of light & temperature on CO₂ enrichment
 - enrichment: technology options; targets & strategies; and modelling with 'Tomsim' (CO₂ crop

modelling software

10. Recirculation, how to Convert to a Closed System

Explores how to convert a media based free-drainage system to a closed recirculation system. Demonstrates how growers can easily save 40% on water use, 60% on fertilizer use, maintain a balanced root-zone nutrition and become environmentally sound & responsible inc:

- design principles for closed systems
- savings and costs estimates
- calculate annual water and fertiliser savings
- pre EC set-points calculations for various crops
- nutrition in closed systems
- comparing analysis with standard reference
- basis for corrective action
- sterilisation options costings
- sterilisation types (heat, UV, slow biological, Ozone and other chemical systems)

11. Greenhouse Crop Protection Principles

understand basic principles of crop spraying (calculate volume, speed and pressure) for high volume, low volume and ultra-low volume systems and a suitable vertical & horizontal spray system for greenhouses crops inc:

- chemical crop protection options (Dripping, Spraying / Fogging / LVM, Dusting, Sulphur Evaporators, Traps (lamps, lights, glue, pheromones)
- spray techniques and assessments
- calculate walking speed for vertical and horizontal spraying
- characteristics of a good greenhouse spray system

12. Implement a Hydroponic Maintenance Program

monitor plant health, monitor the Hydroponic environment, monitor the nutrient solution, perform routine maintenance checks, maximising greenhouse efficiency and energy conservation inc:

- daily measurement schedule
- fertiliser measurement
- routine weekly, monthly & annual maintenance tasks
- preventative maintenance and frequency plan & log
- asset registers

13. NFT Systems

explores best practice model for modern NFT systems

- fundamental principles and system types
- Gulley Profiles (length, width, slope, etc)
- control & dosing equipment
- water, EC, pH, nutrition, oxygen management
- disease management & sterilisation options
- NFT Seedling Propagation
- NFT system design principles

14. Greenhouse Visits for Masterclass Practical Sessions:

greenhouse visits to a nearby commercial facility are part of the course for practical application of the classroom theory that includes:

- Measuring plant temperature and light transmission characteristics in the greenhouse to demonstrate impacts on plant photosynthesis and transpiration rates. (using infrared thermometers, UVB, PAR & LUX meters)

- assessing greenhouse technology and sensors for correct positioning and understanding their readings (e.g. weather station, temperature and pressure gauges, aspirated screens, etc)
- assessing greenhouse heating systems for efficiency
- assessing plant production system with associated irrigation systems
- inspecting misc technology (e.g. CO₂ enrichment, screens, greenhouse structure, recirculation, etc)