

GREENHOUSES / PROPAGATION

Learning Objectives *The learner will...*

- Understand Greenhouse Purpose and Types
- Understand the stages of growth, what a seed needs and the propagation needs for various crops
- Set- up an efficient workspace
- Crop planning and record-keeping
- Note various pest and disease control issues related to greenhouse use.

Purpose of Greenhouses

- Propagation of plants that will be transplanted
- Raising crop from seed to harvest – season extension, increase “climate zone”
- Perennials

Types

- Fully enclosed, automated air, heat, and water systems = Greenhouse
- Hoophouses / High Tunnels
- Low tunnels aka Caterpillar Tunnels
- Cold frames
- Floating row cover

Needs

• Heating/cooling

- provide optimal temp range for germination and growth- heat mats, heated water tubing, thermal, ex: compost pile heat
- Active vs. passive heat
- Temperature ranges – cool crops 50 – 70, hot crops 60 – 85
- Shade cloth

• Air circulation

- strengthens plants
- reduces the chance for fungi and disease
- Temperature controlled automatic exhaust vents and fans
- Opening doors or roll-up sides
- Circulating fans

- **Light** – in winter, supplemental light can be used to speed growth
- **Growing infrastructure**
 - Beds – in-ground or raised – mostly used for crops to be harvested in greenhouse or perennials
 - Tables & Flats and pots/cell trays- used for crops to be transplanted
- **Water**
 - Hand watering
 - Automated sprinkler/mister systems
 - Drip irrigation for in-ground crops

High tunnel/hoop house Design considerations

- Quonset or Gothic shape?
- Quonset: cheaper Gothic: more expensive; shed snow; more usable space along walls; better ventilation b/c higher; shed interior condensation rather than drip
- Perimeter to growing area ratio: Wider structures have lower ratio and less heat loss and milder temperature swings. Wider tunnels also tend to be taller and provide improved ventilation and interior air circulation. Extra purlins allow builtin trellising options
- Account for snow load and wind load as primary design considerations
- Ballpark costs of structures (see resources below)

General management considerations:

- Manage temperature - Avoid cold damage and heat stress
- Manage humidity - Minimize conditions that promote plant diseases by providing ventilation and air movement
- Manage soil moisture - know your crops, different stages of growth needs, how temperature and moisture interact and manage salt buildup (know your water source)
- When in doubt, vent for cooler temperatures and air movement to reduce heat stress and disease pressure.
- Buffer temperature swings by providing thermal mass such as, water barrels and by strategically opening and closing the vents at the beginning and end of each day as dictated by daily weather and types of ventilation that you employ. How adaptable is your system?
- Keep the structure as moderated and dry as possible.

Plant Propagation

- **Cuttings**

- **Seeding**

- **Container Formats**

- Cell/Plug trays

- Open trays

- Traditional wooden flats/Soil Blocks

- Choosing the correct size for the crop

- Potting up

- **Soil Mixes**- Mixtures- What to think through- sustainably sourced, crop needs, cost, purchasing, making your own?

- fertility- stages

- moisture- should be like a wrung-out sponge, wet but, not dripping when squeezed

Setting up your workspace:

- **How Many trays/ Filling soil into containers** (hands-on demo?) Compaction/Air, which container? Cool crops vs Hot crops

- **# of seeds/cell**- Germination rate - time management/ space management

- **Ways to seed:** hand, index card/pencil, hand seeders, vacuum seeder, seed depth

- **Labeling trays/recordkeeping** – date, variety, amount seeded, notes

- **Covering & watering in** - check seed needs

- **Heating to aid germination** (bottom heat, plastic cover, germination chamber)

- **Irrigation of cell trays** – hand, automated sprinklers (demo watering?)

Up-Potting- When? Why? What to consider- timing, field conditions, plant health, your time, costs, space...

Transplanting

- Timing is critical: transplant when roots established but before root bound

- Hardening off – get them used to the elements before transplanting

- Water transplants in tray before transplanting

- Ideally transplant on a cloudy day or if sunny, in the afternoon

- Transplant up to seed leaves on most crops, some can be buried deeper (brassicas, solanums)

- Water in soon after transplanted

Pests and Disease Control

- Common greenhouse pests
 - Aphids — Scales — Mealybugs — White Flies — Cabbage Loopers — Flea Beetles — Mites — Slugs
- Healthy plants are most resistant when you provide the following
 - Sanitary conditions – wash flats, pots, tools, do annual cleanout — Regular monitoring – remove diseased plants immediately — Mechanical monitoring – pick or spray off insects — Biological monitoring – use of predatory insects — Healthy seed source – seeds can carry disease

Common uses of Hoophouse / High Tunnel for In-Ground Crop Production:

- Extending the season (spring, fall, & winter)
 - Plant earlier in the spring for earlier harvests (e.g. salad greens, carrots) — Plant later in the fall for later harvests & overwintering (e.g. salad greens) — Can use hooped remay inside of hoophouse for another layer of cold protection
- Increase quality, quantity, & length of harvest for Heat-Loving Crops
 - e.g. Tomato, Pepper, Eggplant, Cucumber – often trellised to structure — Increased warmth => increased production up to a point — Some control of temperature & total control of irrigation — Ability to exclude pests with insect netting on doors

Assessment/Review

- What are the basic needs to be provided for in any greenhouse?
- Describe the basic order of events from seeding to transplanting.

Resources

— OBC Northwest Nursery and Greenhouse supplies

<http://www.obcnw.com/greenhouses.php>

— Oregon Valley Greenhouse – www.ovg.com

— *The Hoophouse Handbook*, by Lynn Byczynski — Fall and Winter Vegetable Gardening in the Pacific Northwest OSU Extension

Service: [http:// extension.oregonstate.edu/catalog/pdf/pnw/pnw548.pdf](http://extension.oregonstate.edu/catalog/pdf/pnw/pnw548.pdf) — NRCS EQIP High Tunnel Initiative (helps fund high tunnels)

— “High Tunnels: Using Low-Cost Technology to Increase Yields, Improve Quality and Extend the Season” - www.sare.org/Learning-Center/SARE-Project-Products/Northeast-SARE-Project-Products/High-Tunnels