

# Cut Flower Production in A High Tunnel



# High Tunnel Production

- Growing in a High Tunnel offers a controlled environment compared to exposed field grown crops
- More favorable growing condition, while also bringing unique challenges.
- Understanding how to best utilize and maintain your CEA (Controlled Environmental Agriculture) structure can elevate your business and produce more valuable crops.

- Season Extension
- Element Control
- Irrigation Regulation
- Soil Fertility
- Seed Saving
- Integrated Pest Management



# What is a High Tunnel?

- A tunnel is any sized hoop unheated structure covered in a single layer of greenhouse plastic.
- Most have roll up sides and vents, some may have built end walls, or open ends to allow equipment to enter.
- Low Tunnels are mobile, smaller and can span 1-4 rows, where High Tunnels are larger and more permanent
- Made accessible through NRCS EQIP Grants
- More grants are covering low tunnels now



# Challenges

- Nutrients and pH imbalance
  - Nitrogen, Phosphorous, Potassium, Micronutrients
  - Any compost added should be cured and balanced before applied to avoid harmful pathogens
  - Initial and ongoing soil tests and recommended based on crops
  - Fertilizers can be added pre planting or through irrigation systems
  - Soil pH is important for maximizing nutrient availability to plants (between 6-7)
  - Lack of rain water and natural “leaching” process can lead to high salt build up, either by irrigation water or fertilizers used

# Challenges

- Irrigation during shoulder season
  - when outside temps are freezing and irrigation may be shut off
  - If doing Fall Planting, offer a deep soak before you “close” tunnel for winter
  - Sprayers or Manual methods for Winter irrigation
  - Black drums to warm up with water during warmer days
  - Use of white plastic, fabric, or other mulch to help maintain soil moisture
  - Ensure young plants are established before winter
  - Use of Row Cover not only helps manage temperature, but also retains soil moisture

# Challenges

- Early Spring temperature fluctuations with use of row cover inside can lead to very high unstable temperatures under row cover

For example : Nights are 20 degree F, Days are 50 degree F with sun, under row cover, the environment can raise in temperature very quickly!

Absolutely necessary to utilize roll up sides and ventilation during day, and closing them down during evening.

All High Tunnels should also have vents.



# Challenges

- IPM - managing pest and disease outbreaks in contained space
  - Important to know the crops you're planting and the types of disease or pests they bring
  - In Cut Flowers specifically, High Valued Crops are often adored by various pests and disease
  - Very Important to perform continual scouting and monitoring on indication of pests and disease
  - After Crop is harvested, clear out debris as soon as possible to limit bacteria and pests in the breakdown and decomposition of foliage
  - Ideally, short lived crops, quick turn around are best for High Tunnels
  - If use of Perennial crops, manage with keeping clean environment and mulching
  - Keep weeds down by using fabric, plastic, or other mulch methods
  - Keep walkways clean, vacuumed, or swept
  - Utilize drip irrigation methods versus overhead water to limit wet foliage

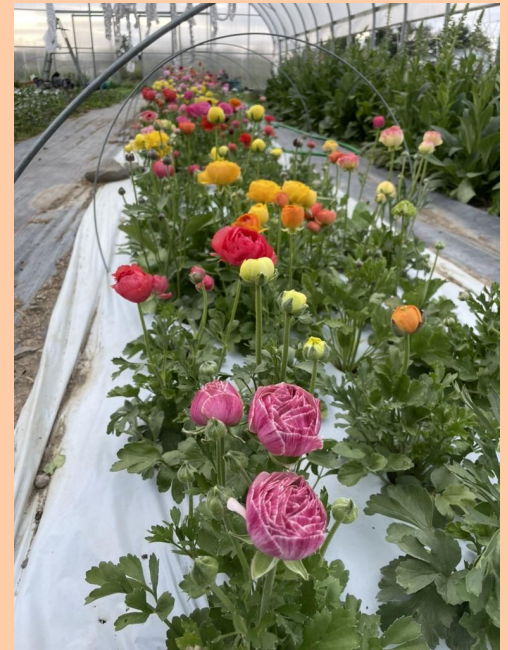
# Challenges

- Quick turnover of growing space to maximize rotation potential
  - If growing in 1 High Tunnel for duration of each season, it's necessary to maintain nutrients and soil health prior to each planting and rotation
  - Low tillage ideal for conserving soil structure
  - Add Compost and other soil amendments to help maintain adequate nutrient, drainage



# Season Extension

- Hardy Annuals can be planted in Fall and held dormant through Winter months and begin blooming Early Spring before field annuals are even planted
- Mother's Day is a huge holiday in Florals!
- Use of Row Cover is essential
- Fall extension is helpful in extending later in Fall season
- Thanksgiving is another huge holiday to increase Sales



# Protection Against Elements

- Field Crops are subject to heavy rain and wind which can be detrimental to ornamental crops
- High Tunnel Production helps preserve quality of bloom
- Plants grown in High Tunnel can grow quicker, stronger, and less damaged by weather
- Use of Shade Cloth after strength and vigor of plants are established can help lengthen stems, and lengthen flowering times of early spring blooms that require cooler temperatures for higher production
- Staking is still recommended even in High Tunnel for strong straight stems and cleaner/organized use of space.

# Irrigation Regulation

- Drip irrigation used under mulch system rather than overhead watering is helpful in mitigating spread of disease on wet foliage
- Most blooms would rather develop in dry conditions versus wet moist environment
- Drip irrigation can be method for fertigation and delivering nutrients through immediate irrigation methods
- Lack of rain water can lead to nutrient and pH imbalance, so very important to perform annual soil test
- Control the amount of water for crop specific needs
- Pulse watering is an example of a controlled method in retaining soil moisture

# Soil Fertility

- Compost
  - Any compost should be cured and balanced if introduced to High Tunnel
- Cover Crop
  - Use of appropriate cover crops with accessible termination method
  - I.e. Phacelia, Buckwheat are quick growing, quick and easy to terminate
  - Fall grown Rye is helpful to germinate during colder months, but can be more difficult to terminate in Spring
- If resting rows or tunnels is an option, Tarping is an effective method in preserving a space and inhibiting weed growth until row is ready to be used
- Imbalance in soil nutrients, accumulation of Salt, can be seen over accumulation of multiple years and isn't always immediate

# Seed Saving

- The dryer environment is a favorable condition for allowing plants to mature to end for Seed Saving
- Seeds should only be saved from healthy plants
- If saving seeds, make sure to terminate plant after use as quickly as possible to inhibit decay and breakdown in High Tunnel
- High Tunnels can be used to isolate certain types of plants to not be cross pollinated if specific seed variations are desired

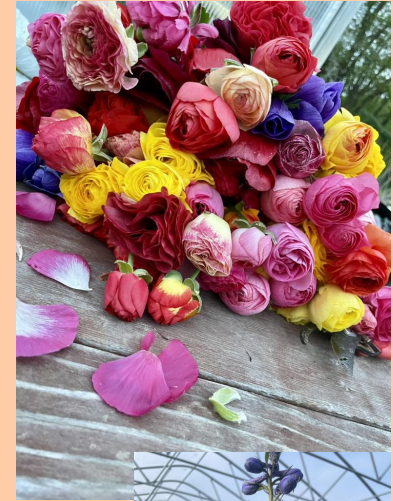
# IPM- Integrated Pest Management

- Familiarity of crop varieties is helpful before introducing them to High Tunnel, as certain varieties attract more pest and disease than others
  - I.e. Snapdragons- thrips;
  - Gladiolus- thrips;
  - Delphinium- Powdery Mildew
  - Foxglove - Aphids
  - Dahlias- Tarnished Plant Bug, Thrips
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- Utilizing mulch and clean environment can help deter pests and disease from developing
  - Drop irrigation rather than Overhead watering
  - Proper airflow
  - Spacing and Planting Density
  - Shorter crops and quicker crop rotations



# Crop Plan Example- Fall Plant → Spring Harvest

- Ranunculus
- Anemone
- Icelandic Poppy
- Sweet William
- Foxglove
- Delphinium
- Larkspur
- Campanula
- Feverfew
- Phacelia



# Crop Plan Example- Spring Plant → Summer Harvest

- Lisianthus
- Statice
- Delphinium
- Feverfew
- Celosia
- Sunflower





# Crop Plan Example- Summer Plant → Fall Harvest

- Dahlia
- Mums
- Eucalyptus
- Dusty Miller



# Proper Growing Practice/ Methods Examples

- Use of White Mulch to help maintain cooler soil temps and suppress weeds, retain moisture
- Drip Irrigation
- Keep clean environment and clear out old debris and dead plants quickly
- Limit plant density and over crowding
- Roll Up Sides for Temperature Regulation and Adequate Air Flow
- Utilize Row Cover for Season Extension
- Scout regularly for pest and disease prevention
- Annual soil test
- Input compost and soil amendments to maintain soil health

# What to “look for” in challenges of High Tunnel Production

- Salt Build up
  - Nutrient Deficiency
  - Pest Outbreak
  - Mold, Bacteria, Virus Outbreak
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- Will express through unhealthy discolored foliage, curled leaves, smaller plants, altered blooms, visible pests