# High Tunnel Advisory Panel Meeting Report – 3/28/19

*NOTE: All objectives are in the context of organic vegetable production in high tunnels. The objectives are listed in the same order discussed in the meeting.*

# Objective 1 – efficacy of environmental control measures (shading, ventilation, etc.) on crop growth, yield and quality

Generally, the panel agreed that shading is a more common and less expensive technique to reduce heat stress compared to misting and fogging. Misting and fogging additionally has potential to cause diseases. One panel member mentioned the percentage of shading being considered based on what crops are grown. Fans were suggested as a technique to move air through the high tunnel, although no growers on the panel are using fans currently. One panel member mentioned choosing crops that can withstand high temperatures on purpose because they know it gets very hot inside of the high tunnel. One panel member uses bird netting with the sides of the high tunnel rolled up to prevent pests and animals. For cold temperatures, one panel member uses propane heaters inside the high tunnel and monitors the temperature inside the high tunnel. Two panel members mentioned different techniques using water to collect solar heat as working well during the cold season. Another member mentioned using a floating row cover on top of cages to keep the cover off of the leaves of plants while keeping the plants from freezing.

# Objective 2 – optimize planting time for early production and season extension

One panel member mentioned consumer demand driving decision making on farms with regard to timing. Another panel member mentioned the aesthetic appeal and flavor driving decision making for them the most. The quality of the fruit drives all of the management techniques (application of micronutrients, irrigation, pruning) for a third panel member.

# Objective 3: influence of nutrient management practices on crop performance and assessment of nutrient use efficiency and soil health

Every panel member has experience using cover crops and applying compost. There were different levels of experience among panel members with regard to different kinds of fertilizers, compost and crop rotations. There was consensus of using side dressing as a way of suppressing weeds, although the techniques for using side dressing along with fertilizer and compost applications varied among panel members. There was consensus among panel members that management in their high tunnels is contingent

upon the interrelated nature of the short-term and long-term benefits of soil quality and fertility. Additionally, no one technique stood out as a preference among panel members with regard to interest in further research out of the following: growing cover crops, applying compost, soil fertilizer, in-season fertigation and crop rotations.

# Objective 4: plant pathogens and disease management

Three panel members mentioned powdery mildew being an issue in their high tunnels. Two panel members mentioned Cercospora present on crops in their high tunnels.

Other issues mentioned without corroboration from other panel members included: grey leaf spot (caused by Stemphylium solani), Fusarium, target leaf spot (Corynespora) and root-knot nematode (pest, not disease). Generally, the choice of crops was contingent upon the nature of management of potential disease pressure for the whole panel. One panel member mentioned consumer market in addition to what can be grown well. Two panel members named cucumbers as not being worth planting due to the pest and disease pressure associated with growing them. Tomatoes, squash and eggplant were also named by individual panel members as being problematic to grow.

Two panel members mentioned applying compost as a management technique for problem pathogens. One panel member named the following management techniques specific to problem pathogens: watering early in the day, hand weeding, compost application, spacing between plans, side dressing and only irrigating when plant appears to need it. A different panel member named the following management techniques specific to problem pathogens: adding root shield to tomatoes (trichoderma fungus) at various stages (seeding, grafting, planting and every 12 weeks thereafter), grafting a Fusarium resistant graft, removing target leaf spot on everything where it is present, using a mill stop combined with a beneficial like CEEC and double nickel, spraying peroxide, putting out broad and swirski mites on a schedule (for flowers) and soil solarization. One panel member mentioned considering landscape fabric and cover crops as techniques they would try in the future.

# Objective 5: monitoring population of pests and beneficial insects

In general, the panel mentioned the following insects present in their high tunnel systems: stink bugs, thrips, parasitic wasps and lady bugs. Two panel members mentioned that screens did not help much and one panel member added that screens can restrict air flow to the high tunnel. Other insects mentioned by individual panel members included: armyworms, caterpillars, lacewings, assassin wheel bugs, margin beetles, spider mites, aphids and white flies. One panel mentioned planting as early as possible as a management technique for avoiding pest issues. Another panel member mentioned weeding as a management technique for curbing pests.

# Objective 6 – alternatives to managing whiteflies and aphids

A couple of panel members had experience using strategies related to planting certain crops around other crops to attract certain pests and repel others. Generally, the panel agreed that more investigation needs to be done into the effectiveness of these strategies and would be interested in adopting if effective.

# Objective 7 – economic viability of high tunnels and identification of factors influencing high tunnel adoption

Two panel members agreed that there are more labor costs associated with high tunnels. Reasons named were: more intensive production than in the field, more extended season than in the field, tomatoes being particularly more labor intensive, priority given to crops in the high tunnel and being able to continue work in high tunnel during inclement weather. Accumulation of mold in high tunnel structures was discussed with regard to attracting pests and disease and what to use to get rid of the mold. Two panel members mentioned the plastic lasting 3-4 years depending on weather and circumstances of each farm (eg., proximity to trees and thus, pollen). Hurricane preparation and damage and cost of steel was mentioned by one panel member as economic considerations. One panel member mentioned use of shade cloth and life span being about 5 years. The life span of the high tunnel structure itself is about 20 years with maintenance likely in that period of time. One panel member had insurance for high tunnel as an inclusive plan for entire farm and market while another panel member opted out of high tunnel coverage because of the high cost and not including wind coverage. Another panel member mentioned that some insurance options only cover large or total losses and have smaller premiums as a result.

# Miscellaneous – additional topics discussed with useful information not directly related to research objectives

**Timeline of planting in high tunnel at Citra:**

* 8/15/18: Half of the high tunnel was planted with a cover crop and the rest remained fallow.
* 10/5/18: Cover crop was mowed and incorporated into the soil.
* 10/15/18: Pac choi was transplanted into all plots.
* 11/16/18: Final pac choi harvest.
* 11/19/18: Spinach was direct seeded into all plots.
* 1/18/19: Final spinach harvest.
* 1/30/19: Tomatoes were transplanted into all plots.

# Fertilizers used in high tunnel at Citra:

* + Nature Safe Organic Fertilizer 10-2-8, matching it NPK: nitrogen, phosphorus and potassium (focus on these 3 major micronutrients)
	+ Fish liquid fertilizer 5-1-1 coupled with potassium sulfate (same 10:8 ratio)

# Design of high tunnel at Citra:

* + Three bays/three hoops connected by gutters.
	+ Gutters help control water flow so it is not eroding the ground.
	+ Water flows into boxes for collection or distribution.
	+ The sidewalk height (ground to gutters) is 10 ft.
	+ Sides will roll up for air flow based on temperature from thermometer reading.
	+ 30 x 84 ft. for each bay and total square footage is just over 7500.
	+ High tunnel would provide minimal structural support to crops grown on trellises attached to structure.

# Construction costs of high tunnel at Citra:

* + Structure and construction costs of 3-bay high tunnel at Citra is $47,685
	+ Shade cloth cost is $3,448 (not included in high tunnel cost above)