Best Management Practices for Citrus Nursery Stock

Most important practice:

Profit
Water management

- PH (6.0-5.5) Ideal 5.8
- Pathogen Free
- Volume Control per pot
- Uniformity
- EC
- Sodium Carbonates & Chlorides
- Watering appropriately based on substrate type and plants needs by plant size
- Example - Pine vs Coco require different water amounts
- Water Source
- Reuse of tail water
- Database decision making

Managing insects - things can get out of control fast
Surveying the nursery regularly looking for insects
What methods other than hose and spray gun - most are using this method
Closing house - using thermal fogger quite effective
Biologic controls - things go well until something else breaks.
Mites good, then the thrips show up.
Have been successful using IPM for mites. Tightrope to kill the insects without killing the beneficials
Cannon on a tractor
Grass / other plants host beneficials in proximity to Citrus

Stopped mowing / discing the grass, leaving it to host beneficial insects
Variety of grass used varies depending on the citrus variety
Side blower / air cannon sprayer used in Israel
Israel growing in Ellie pots on blocks
Plant a secondary host in the soil in the container to attract the pest away from the citrus tree.

Is automated grafting of interest to the Citrus community?

Ground drones for spraying:
Trialed a drone in Australia, did a good job, didn't knock over too many trees. Does require a license to operate.Ground drone uses a hose, interested in buying one. Ground drone safer. Impressed with the opportunity - its the future. The drone follows a programmed route, picks up where it left off. You have to map the farm, the vendor will do that when they sell you the drone. Requires a base station. Flies very level. Capacity of tank is 13 liters 3.5 gallons - adjustable nozzles depending on chemical. Electrostatic. Covered his nursery in 3-4 refills of tank. A concern would be as you increase the intensity of the spay you may end up with resistant insects.

When plants are overfertilized - may attract more pest.

Labor - managing your people is critical. How to attract employees and promote efficient work practises. If you can offer more flexible opportunities you can attract from a larger pool of potential employees.

Employees are more apt to stay if they feel invested in, and part of the organization.

Flowvision says take breaks close to where the work is happening. Helped during COVID as crews were already spread out. Important to minimize unproductive walking.

First thing FlowVision does is bring all your nursery leaders into a room for training. Writing down SOPs and training from them is important.

In greenhouses the space is fixed, as labor rates increase and as grower clients push back on increases it is so important to control cost. 63% of the cost of production for BriteLeaf is hourly labor. That is increasing. No way around that. Super important to be more labor efficient, staff needs to be properly paid but units per hour needs to go up. Automation needed. This requires standardization of pots and systems. Pot filling for example can be automated. Fertigation. All this ties together as a system. Grafting is Briteleaf's largest single labor event in the growing of a tree. He would gladly pay $150K for a grafting machine if it worked. No choice but to invest in automation.

TreeSource incentive program in 2019 - put up posters all over facility - started measuring every week the amount of labor it took to produce the crop. Tracked hours and put the numbers up on the wall. Work smarter - not harder. No training for first six months but everyone could see the weekly numbers. Over time interest

grew in the numbers. When you reach your employees hearts - goal was 8% reduction (to match min wage increase). Ended up saving 13% based on working smarter and having the tools to be more efficient. Employees have to buy into it. Human interface critical. Employees were bonused based on the saving.

In Australia - they have training opportunities for growers & nurseries. Might be good for CA to follow.

Bar Coding on each row, employee scans when they are working on that row.

South Africa - have rating system to rate growers procedures and quality. How does your nursery rate / benchmark against other growers? Incorporating BMP's into your system, fertility, etc.

What is in your contract with customers / growers to allow sufficient grow time? TreeSource requires contract on every order. Be ok saying NO to customers - it will train them to order earlier. Fastest trees are the most profitable.

In Brazil - by managing the light they have increased production by 30% - by opening and closing the roof netting. Very important to manage the sunlight. Citrus love the sun.

Traps to monitor pest, are more efficient traps available?

Better for workers to have quick access to break rooms.

In Milan - a nursery requires each employee to punch in and out for each task to track cost - and rewards productivity.

Training is lacking in our industry. Expensive, but needed. Lack of training can hurt bottom line. Why do we do things? Do the managers even know? Don't do things just because we have always done it that way. Eliminate waste by working smart.

Clean / appropriate soil media

- Optimal substrates:
    - Locally sourced media
    - Redwood is accessible to Northern Cal growers
    - Coir when available (ocean freight cost…)
    - Air space & water holding capacity is important
    - Coir & Peat are prohibited in Chile
    - Coconut fiber (100%)
    - Coir as a mix (majority of the room)
    - Almost everyone in room has Coir in their mix
    - River sand & Peat moss 50/50 (prefer sand over Coir because it is cheap.)
    - Soil & Sand & Rice Hulls - prefer it as the plant is adapted to local soil where plant will be planted
    - Larger pots need more poracity since the column of soil it taller / shorter
    - Sand for seed beds used in Mexico
    - Sawdust and sand & Clay used in Mexico

- Choice of container - important in screenhouse w limited / expensive space. Treesource prioritized the pot when designing the structure.
- Container / Nutrition delivery method / Soil Media are interconnected. Depending on your system will dictate your choices.
- Plastic has been the standard - but is it sustainable?
- Is it recyclable?
- Pots that promote air pruning of roots to produce high quality tree
- Labor cost for grower - Ellie pots are more efficient when planting on-farm
- TreeSource still using PropTek pot
- Pots that can be used with multiple soil media
- Pot has to fit your system to be profitable
- Could a pot be manufactured that can grow larger as the tree grows.
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All inputs are important

Sanitation

Clean foundation material

Need broad compliance with regulations to ensure clean Citrus (industry support)