

BENCHMARKING YOUR CITRUS NURSERY

An overview of the **tools and concepts** for a solid foundation to producing high quality citrus trees

ALL POINTS DISCUSSED HERE ARE PERTINENT TO CITRUS NURSERIES IN GENERAL, HOWEVER, NO CITRUS NURSERY IS 100% IDENTICAL TO THE NEXT, THEREFORE **NOT** ALL POINTS WILL APPLY TO ALL NURSERIES ALL THE TIME. THIS IS MEANT TO GENERATE DISCUSSION AND THE SHARING OF IDEAS.

THE FOCUS IS ON THE QUALITY OF THE PRODUCT



REGARDLESS OF FINAL PRODUCT

- Seedlings
- Budwood
- Budded liners
- Trees for commercial citrus growers
- Dooryard/landscape

CHARACTERISTICS OF A HIGH-QUALITY PRODUCT

- Free of pests and diseases
- Well developed and healthy rootsystem (if applicable)
- Fully developed leaves (if applicable)
- Caliper proportional to its variety, rootstock, age, container and soil media (if applicable)



TOOLS

Structure

- Insect exclusion
- Environmental controls

Benching

- Yes or no
- Fixed or moveable/automated
- Dimensions/tree density

Container

- Plastic bag
- Plastic pot
- Ellepot

Logistics

- By hand
- Carts
- Conveyor belts
- Automated (Burros)

Fertigation

- Simple dosing
- Automated injection
- Dynamic recipes

Inventory

- Paper and hand
- Excel
- Custom software
- Commercial systems

Automation

- Seed planting
- Ellepot machine
- Pot filling
- Grading

CONCEPTS

Irrigation method

- Hand
- Individually precise
- Overhead

Monitoring nutrition

- EC/pH tracking
- Decision making

Media

- Components
- Water retention
- Drainage
- Chemical properties

Rootstock production

- Seed
- cutting
- TC
- Flats
- Cones
- Ellepots

Budding

- T budding
- Chip budding
- Cleft
- Plastic wrap or parafilm

Post budding

- Cut rootstock
- Bend and clip
- Suckering

Tree formation

- Stake and tie process
- Height vs caliper
- Prune or not

Delivery prep

- With containers
- In socks
- In ellepots
- In boxes
- Hand stacked in truck

The background of the slide is a vibrant green with abstract, organic shapes in various shades of green and yellow-green, resembling leaves or flowing liquid, framing the central text.

APPLYING TOOLS AND CONCEPTS

STRUCTURE

Visalia, CA, USA



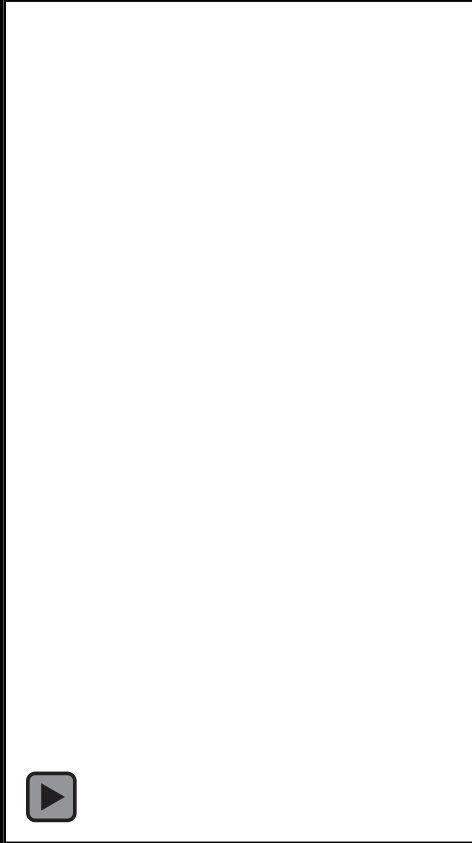
Brazil



BENCHING



LOGISTICS



FERTIGATION



INVENTORY

Account	Branch	Inventory / Substock	History	No use	Day	Wings	Qty Badded	Costal added	Transferred In	Shipped Out	Ready to Ship	At Stake	Medium	Small	No / Packed	Dead	Th own Out	Transferred Out	U / UPDATED
Hub	w/Rangpur	SA/Libru/Hubi w/ Rangpur	RN1			RIS-0-0	05/06/22	3,947			912								7/6/22
Carroz		Gusfett a/Carroz	RN1			SA-AND-10A	01/01/21	3,144			2,994			4					7/6/22
Macrophylla		ES.1/Macrophylla	RN1			SA/Libru 1A8	11/03/20	104	2,836	48	84	336	8			146	32		7/6/22
Hub		Tangpa/Hubi	RN1			D3	01/01/21	148	119	18								56	7/6/22
Hub		Caro Cami/Hubi	RN1			D1 THRU D3	01/01/21	1,000	2	7/6/22						4		600	7/6/22
Macrophylla		ES.2/Macrophylla	RN1			18	01/01/21	4,272	2,815		125	10	40				272		7/6/22
Carroz		Caro Cami/Carroz	RN1	P10		W1-W10	11/03/20	8,558	4,967							102			4/4/22
Carroz		Jeann/Carroz	RN1	P4		W10	11/07/20	8,308	8,305							603			4/4/22
Carroz		AB/Carroz	RN1			01/01/21	01/01/21	4,005			30					3,996			7/26/22
Hub		Krivness d Redi/Hubi	RN2	A3		W10-W15-W16	07/08/21	118		21	87								8/2/22
Carroz		Tangpa/Carroz	RN2	P6	04N	W16	08/02/21	16			16								8/4/22
Carroz		Scar Ruby a/Carroz	RN2	P6	04N	W1-W2	10/05/21												8/4/22
Carroz		Ruby Valencia/Carroz	RN2	P6	04N	W2	10/05/21												8/4/22
VEB		Scar Ruby a/VEB	RN2	P6	04N	W3-W8	4/05/21	127											8/4/22
Carroz		SA/RSA/Carroz	RN2	P6	04N	W7	10/05/21			5							2		8/4/22
Macrophylla		ES.2/Macrophylla	RN2	P6	04N	W7	10/05/21		16	18							1		8/4/22
Hub		W. Murocari/Hubi	RN2	P6	04N	W7-W10	08/10/21	528											8/4/22
VEB		Villa 11/VEB9	RN2	P6	04N	W7-W8	10/05/21	132											8/4/22
VEB		ES.2/VEB	RN2	P6	04N	W8	08/07/21				8								8/4/22
VEB		ES.1/VEB	RN1	P1		W5 THRU W9	01/01/21	2,690											8/5/22
VEB	w/Macrophylla	Gusfett a/VEB9 w/ Macrophylla	RN2	P2		W10	10/08/22	16			16								8/5/22



IRRIGATION METHOD



EC/PH MONITORING



Bay	Date	Drip			Leach			Leach % Diff.
		Drip	pH	EC	Leach	pH	EC	
	8/13/2022	200	5.8	1.6	0	0	0	0%
1N	8/16/2022	200	5.7	1.4	0	0	0	0%
	8/13/2022	250	5.7	1.5	50	6.3	2.1	20%
	8/14/2022	140	6.3	1.4	60	6.1	1.3	43%
1S	8/16/2022	110	6.4	1.5	25	6.9	1.1	23%
	8/18/2022	110	6.4	1.5	0	0	0	0%
	8/14/2022	170	6.8	1.6	0	0	0	0%
2N	8/16/2022	370	5.5	1.1	100	6.6	2.1	27%
	8/18/2022	200	6.1	1.4	80	6.5	2.2	40%
	8/14/2022	250	5.9	0.8	60	6	4.4	24%
2S	8/16/2022	360	5.7	1.1	155	5.5	3.2	43%
	8/18/2022	250	5.8	0.8	110	5.5	3.9	44%

SUBSTRATE



SEEDLING PRODUCTION



BUDDING



POST BUDDING



TREE STAKING



TREE DELIVERY



REAL CASE STUDY AS BASE FOR DISCUSSION

TOOLS

- Insect exclusion structure with negative pressure cooling and under bench heating with boilers
- Seedling production: ellepots with peat + coir + perlite
- Trees produced in 3 lt pots, 8 units/trays on benches
- Substrate: 100% coir
- Irrigation: drip
- Product: commercial trees for citrus growers

- Avg. temperatures:

	Day		Night	
	Fahrenheit	Celsius	Fahrenheit	Celsius
Spring	75	23.9	65.3	18.5
Summer	90.4	32.4	80.7	27.1
Fall	64.3	17.9	54.9	12.7
Winter	58.5	14.7	46.7	8.2

CONCEPTS

- Seedling production:
 - From seed 90-150 days
- Seedling and tree production all done with fertigation.
- Timelines:
 - From transplant to bud : 60 days
 - Remove by hand 14-16 DAB
- T budding
- Conventional plastic film wrap
- Bend and clip to hold in place IMMEDIATELY after budding
- Suckering once a week for 6-8 weeks
- Cut rootstock “tail” 60 DAB
- Stake and tie
- Finish for caliper in 4-5 months