

Recycling Agricultural Waste to Enhance Sustainable Greenhouse Agriculture: Analyzing the Cost-Effectiveness and Agronomic Benefits of Bokashi and Biochar By-Products as Soil Amendments in Citrus Nursery Production

Supplementary Materials

Survey S1. *Open and Closed-ended Questions Presented to California Nurseries Utilizing Online Surveys and Direct In-Person Interviews.*

1. How many plants, on average, do you produce per year?
2. What is the total square footage of your nursery?
3. Please denote below the brand and size of planting pots you use. For example, AB410 - 4X10" Anderson Brand in first year, Rediroot #7 Air Pruning Pot in second year. Please note that we are asking the brand of the pot so we can identify the gallons or cubic inches volume, which is important for the cost-benefit. Example: In the 2nd year my nursery uses AB410 – 4 X 10" ANDERSON BAND and RediRoot #7 AIR PRUNING POT.
 - In the first year _____
 - In the second year _____
4. What growing media do you use? Please provide the percentage of material used.

	Peat moss	Perlite	Coco coir	Other
During the first year				
During the second year				

5. How many cubic yards of growing media do you use, on average, per year? Fill in the box for the listed materials.
 - Peat moss _____
 - Perlite _____
 - Coco coir _____
 - Other _____
6. How much do you spend every year, on average, for growing media?
 - Peat moss _____
 - Perlite _____
 - Coco coir _____
 - Other _____
7. How many hours of labor/work per year, on average, is required to operate the nursery (i.e., propagation including sawing or establishing cuttings, growing, maintenance, hardening-off,

until plant is sold) plants in pots per acre operation (acre includes containers plus walkways and roadways)? Please report numbers for both seedlings and cuttings. Example: My nursery requires on average one employee per acre operation.

- Seedlings _____
 - Cuttings _____
8. How many days, on average, does a plant stay in your facility before it is sold?
9. How many days, on average, do the plants stay in each container by brand and size? (Example: 180 days in RR98 in ray leach "cone-tainers, 180 days on Redi Root RR18).
- In the first year _____
 - In the second year _____
10. What is your average annual loss rate? Please indicate the percentage loss for seedlings and cuttings from non-germinated seeds to sub-standard plants. Please include culling % in your loss rate. If your nursery does not carry out culling, please indicate #% annual loss rate followed by "Culling not performed". Example: My nursery has a 5% plant loss (Without culling) or My nursery has a 35% plant loss (Including culling).
- Seedlings _____
 - Cuttings _____
11. Do you periodically measure ammonium (NH₄), nitrate (NO₃), & nitrite (NO₂) in the soil in your cones? Skip to 13 if "Yes" is not selected.
- Yes
 - No
12. What nitrogen levels are optimal for the soil? Please note that the unit of measurement is PPM (Part per million).

	Ammonium (NH ₄)	Nitrate (NO ₃)	Nitrite (NO ₂)
In the first 12 months			
From month 12 to 24			

13. How many pounds of ammonium (NH₄) & nitrate (NO₃) do you use per year, on average?
- Ammonium (NH₄) _____
 - Nitrate (NO₃) _____
14. How much fertilizer (N,P,K in nutrient solution) do you use per volume of applied water, on average, per year? Fill in the box with the unit of measurement you prefer.

	Nitrogen	Phosphorous	Potassium
PPM			
Mg/L			

15. On average, what percentage of your irrigated water comes from leachate?
16. Of the total leachate, what percentage, on average, is recycled as irrigation water?
17. How many gallons of water in total (fertilized and not) do you use per year, on average, per container size? Please denote container brand and size in boxes. Example: My nursery uses 25 gallons per year per SC10 – RAY LEACH “SUPER CELL” or My nursery uses 56 gallons per year per AB410 – 4 X 10” ANDERSON BAND. Please note that we are asking the brand of the pot so we can identify the gallons or cubic inches volume, which is important for the cost-benefit.

	Container Brand and Size	Gallons of water (Fertilized and Not)
Container 1		
Container 2		
Container 3		

18. On average, what percentage of total water is fertilized?
19. How many gallons of fertilized water do you use, on average, per year per container? Please denote container brand and size in boxes. Example: My nursery uses 25 gallons per year per SC10 – RAY LEACH “SUPER CELL” or My nursery uses 56 gallons per year per AB410 – 4 X 10” ANDERSON BAND. Please note that we are asking the brand of the pot so we can identify the gallons or cubic inches volume, which is important for the cost-benefit.

	Container Brand and Size	Gallons of water (Fertilized)
Container 1		
Container 2		
Container 3		

20. How much does the water you use for irrigation cost per year, on average? Please do not include additional costs for pumping (they will be included in energy costs).
21. Is your irrigation system automated? Skip to 24 if “Yes” is not selected.
 - Yes
 - No
22. How much do you spend on electricity to apply the irrigation water, on average, per year? Please include costs for pumping.
23. How many kilowatts/hours of electricity do you use to apply the irrigation water, on average, per year?
24. How much do you spend per year, on average, on labor to apply irrigation water?

Table S1. *Fertilizer Peters Excel 21-5-20: Nitrogen (N) Costs (in USD) per Gallon at Different Dosages.*

Peters Excel 21-5-20 fertilizer Cost	N quantity	Fertilizer dose	Cost of Nitrogen/gallon
\$0.026/gallon	21%	700 μ S/cm	\$0.003
		1400 μ S/cm	\$0.0055

Given that Peter's Excel fertilizer costs \$0.026 per gallon and contains 21% N, the cost of N per gallon was determined to be \$0.0055 for a 1400 μ S/cm dosage and \$0.003 for a 700 μ S/cm dosage.

Subsequently, the potential monetary savings in fertilizer per gallon of water used for irrigation were computed for every treatment and time interval. This computation involved multiplying the relevant percentage change in N by \$0.0055 in case of treatments with 700 μ S/cm dosage, while by \$0.003 in case of treatments with 1400 μ S/cm dosage. This process facilitated the estimation of daily savings per one-acre greenhouse, which was achieved by multiplying the savings per gallon by 22,000. This number represents the average daily water usage in a one-acre greenhouse.

Table S2. *Fertilizer Peters Excel 21-5-20: Phosphorous (P) Costs (in USD) per Gallon at Different Dosages.*

Peters Excel 21-5-20 fertilizer Cost	P quantity	Fertilizer dose	Cost of P/gallon
\$0.026/gallon	5%	700 μ S/cm	\$0.0007
		1400 μ S/cm	\$0.001

Peter's Excel fertilizer contains 5% P, with estimated costs of \$0.0007 per gallon for a 1400 μ S/cm dosage and \$0.001 per gallon for a 700 μ S/cm dosage. Following the same approach as we did for N, this calculation allowed for the determination of daily savings per one-acre greenhouse by multiplying the savings per gallon by 22,000, representing the average daily water usage in a one-acre greenhouse.

Table S3. *Fertilizer Peters Excel 21-5-20: Potassium (K) Costs (in USD) per Gallon at Different Dosages.*

Peters Excel 21-5-20 fertilizer Cost	K quantity	Fertilizer dose	Cost of K/gallon
\$0.026/gallon	20%	700 μ S/cm	\$0.0026
		1400 μ S/cm	\$0.0052

Peter's Excel fertilizer is 20% K, so it comes with estimated expenses of \$0.0052 per gallon for a 1400 μ S/cm dosage and \$0.0026 per gallon for a 700 μ S/cm dosage. As for N and P, this computation enabled the assessment of daily savings for a one-acre greenhouse by multiplying the savings per gallon by 22,000, reflecting the typical daily water consumption in such a greenhouse.

Table S4. *Cost Calculation (in USD) Summary for Peters Excel Fertilizer per Cone.*

Parameter	Calculation/Cone	Value/Cone
Cone volume	$\pi * (\text{diameter}/2)^2 * (\text{height}/3)$	$\pi * (1.5/2)^2 * (8.25/3) = 4.85 \text{ in}^3 = 79.48 \text{ cm}^3$
Fertilizer volume for dose 700	0.05% of cone volume	0.03974 cm ³
Cost of 1 lb of fertilizer	-	\$2.12
Cost of fertilizer dose 700 per cone	(Fertilizer volume dose 700 * Cost of 1 lb) / 1 lb expressed in grams	\$0.00019
Cost of fertilizer dose 1400 per cone	Cost of fertilizer dose 700 per cone * 2	\$0.00038

Table S5. *Annual Fertilizer Cost Calculations (in USD) for a Small Nursery.*

Parameter (for fertilizer dose of 700)	Calculation	Value
Cost of fertilizer per cone	Given cost (from Table 9)	\$0.00019
Number of cones in a small nursery	-	50,000
Cost of one fertilization for a small nursery	Cost of fertilizer per cone * Number of cones in a small nursery	\$9.50
Cost for the first month (irrigation 3 times/week for 1 month)	(Cost of one fertilization for a small nursery * 3 * 52) / 12	\$123.50
Cost for the rest of the months (irrigation 2 times/week for 11 months)	((Cost of one fertilization for a small nursery * 2 * 52) / 12) * 11	\$905.67
Total annual cost of fertilizer dose of 700 for a small nursery per year	Total cost for the first month + Total cost for the rest of the months	\$1,029.17

When using a fertilizer with a dosage of 1400 $\mu\text{S}/\text{cm}$, the total annual cost for a small nursery was obtained by doubling the total cost incurred with a fertilizer dosage of 700 $\mu\text{S}/\text{cm}$ per year ($\$1,029.17 * 2 = \$2,058.33$).

Table S6. *Annual Fertilizer Cost Calculations (in USD) for a Medium Nursery.*

Parameter (for fertilizer dose of 700)	Calculation	Value
Cost of fertilizer per cone	Given cost (from Table 9)	\$0.00019
Number of cones in a medium nursery	-	125,000
Cost of one fertilization for a medium nursery	Cost of fertilizer per cone * Number of cones in a medium nursery	\$23.75
Cost for the first month (irrigation 3 times/week for 1 month)	(Cost of one fertilization for a small nursery * 3 * 52) / 12	\$308.75
Cost for the rest of the months (irrigation 2 times/week for 11 months)	((Cost of one fertilization for a small nursery * 2 * 52) / 12) * 11	\$2,264.17
Total annual cost of fertilizer dose of 700 for a small nursery per year	Total cost for the first month + Total cost for the rest of the months	\$2,572.92

When using a fertilizer with a dosage of 1400 $\mu\text{S}/\text{cm}$, the total annual cost for a medium nursery was obtained by doubling the total cost incurred with a fertilizer dosage of 700 $\mu\text{S}/\text{cm}$ per year ($\$2,572.92 * 2 = \$5,145.83$).

Table S7. *Annual Fertilizer Cost Calculations (in USD) for a Large Nursery.*

Parameter (for fertilizer dose of 700)	Calculation	Value
Cost of fertilizer per cone	Given cost (from Table 9)	\$0.00019
Number of cones in a large nursery	-	175,000
Cost of one fertilization for a large nursery	Cost of fertilizer per cone * Number of cones in a large nursery	\$33.25
Cost for the first month (irrigation 3 times/week for 1 month)	(Cost of one fertilization for a large nursery * 3 * 52) / 12	\$432.25
Cost for the rest of the months (irrigation 2 times/week for 11 months)	((Cost of one fertilization for a large nursery * 2 * 52) / 12) * 11	\$3,169.83
Total annual cost of fertilizer dose of 700 for a large nursery per year	Total cost for the first month + Total cost for the rest of the months	\$3,602.08

When using a fertilizer with a dosage of 1400 $\mu\text{S}/\text{cm}$, the total annual cost for a large nursery was obtained by doubling the total cost incurred with a fertilizer dosage of 700 $\mu\text{S}/\text{cm}$ per year ($\$3,602.08 * 2 = \$7,204.17$).

Table S8. *Water Content Average Percentage Variations for Various Treatments over Different Weeks.*

Treatment 1	Treatment 2	Average Percentage Water Content Difference			
		Week 1	Week 2	Week 3	Weekly Mean
CK700	Bok700	-36.33%	-3.23%	-10.26%	-16.60%
CK700	BC700	6.77%	2.22%	-6.10%	0.96%
CK700	Bok_BC700	-0.23%	0.72%	-30.59%	-10.03%
CK700	Bok1400	-19.54%	-26.22%	-15.48%	-20.41%
CK700	BC1400	-6.49%	1.86%	6.53%	0.63%
CK700	Bok_BC1400	-18.33%	-16.88%	-47.90%	-27.70%
CK1400	Bok700	-25.24%	39.82%	0.01%	4.86%
CK1400	BC700	29.06%	49.93%	-2.40%	25.53%
CK1400	Bok_BC700	21.30%	50.73%	-31.16%	13.62%
CK1400	Bok1400	-3.39%	1.74%	-9.08%	-3.58%
CK1400	BC1400	12.24%	53.99%	19.70%	28.64%
CK1400	Bok_BC1400	-2.57%	19.05%	-46.76%	-10.10%

These values were computed based on the average percentage difference across treatments observed over the recorded time points.

Table S9. *Average Cost Savings (in USD) per 1,000 Gallons of Water for Various Treatments over Different Weeks.*

Treatment 1	Treatment 2	Average Cost Savings per 1,000 gallons of water			
		Week 1	Week 2	Week 3	Weekly Mean
CK700	Bok700	\$-0.94	\$-0.08	\$-0.27	\$-0.43
CK700	BC700	\$0.18	\$0.06	\$-0.16	\$0.02
CK700	Bok_BC700	\$-0.01	\$0.02	\$-0.79	\$-0.26
CK700	Bok1400	\$-0.51	\$-0.68	\$-0.40	\$-0.53
CK700	BC1400	\$-0.17	\$0.05	\$0.17	\$0.02
CK700	Bok_BC1400	\$-0.47	\$-0.44	\$-1.24	\$-0.72
CK1400	Bok700	\$-0.65	\$1.03	\$0.00	\$0.13
CK1400	BC700	\$0.75	\$1.29	\$-0.06	\$0.66
CK1400	Bok_BC700	\$0.55	\$1.31	\$-0.81	\$0.35
CK1400	Bok1400	\$-0.09	\$0.05	\$-0.24	\$-0.09
CK1400	BC1400	\$0.32	\$1.40	\$0.51	\$0.74
CK1400	Bok_BC1400	\$-0.07	\$0.49	\$-1.21	\$-0.26

Negative numbers indicate a loss.

The average cost savings per 1,000 gallons of water were determined by multiplying the average percentage water content variations from Table S1 by the cost of 1,000 gallons of water, which is \$2.59 (as per Table 1).

Table S10. Average Daily Cost Savings (in USD) in Water per One-Acre Greenhouse for Various Treatments over Different Weeks.

Treatment 1	Treatment 2	Average Water Daily Cost Savings			
		Week 1	Week 2	Week 3	Weekly Mean
CK700	Bok700	\$-20.70	\$-1.84	\$-5.84	\$-9.46
CK700	BC700	\$3.86	\$1.26	\$-3.47	\$0.55
CK700	Bok_BC700	\$-0.13	\$0.41	\$-17.43	\$-5.72
CK700	Bok1400	\$-11.13	\$-14.94	\$-8.82	\$-11.63
CK700	BC1400	\$-3.70	\$1.06	\$3.72	\$0.36
CK700	Bok_BC1400	\$-10.44	\$-9.62	\$-27.29	\$-15.79
CK1400	Bok700	\$-14.38	\$22.69	\$0.01	\$2.77
CK1400	BC700	\$16.56	\$28.45	\$-1.37	\$14.55
CK1400	Bok_BC700	\$12.14	\$28.91	\$-17.76	\$7.76
CK1400	Bok1400	\$-1.93	\$0.99	\$-5.17	\$-2.04
CK1400	BC1400	\$6.97	\$30.77	\$11.22	\$16.32
CK1400	Bok_BC1400	\$-1.47	\$10.86	\$-26.65	\$-5.75

Negative numbers indicate a loss.

The average cost savings per 1,000 gallons of water were determined by multiplying the average percentage water content variations from Table S2 by the cost of 1,000 gallons of water, which is \$2.59 (as per Table 1).

Table S11. *Average Daily Irrigation Labor Hours Savings per One-Acre Greenhouse for Various Treatments over Different Weeks.*

Treatment 1	Treatment 2	Average Daily Irrigation Labor Hours Saved			
		Week 1	Week 2	Week 3	Weekly Mean
CK700	Bok700	-0.36	-0.03	-0.10	-0.17
CK700	BC700	0.07	0.02	-0.06	0.01
CK700	Bok_BC700	0.00	0.01	-0.31	-0.10
CK700	Bok1400	-0.20	-0.26	-0.15	-0.20
CK700	BC1400	-0.06	0.02	0.07	0.01
CK700	Bok_BC1400	-0.18	-0.17	-0.48	-0.28
CK1400	Bok700	-0.25	0.40	0.00	0.05
CK1400	BC700	0.29	0.50	-0.02	0.26
CK1400	Bok_BC700	0.21	0.51	-0.31	0.14
CK1400	Bok1400	-0.03	0.02	-0.09	-0.04
CK1400	BC1400	0.12	0.54	0.20	0.29
CK1400	Bok_BC1400	-0.03	0.19	-0.47	-0.10

Negative numbers indicate a reduction in hours of labor.

After determining the average daily cost savings in water (Table S3), the gallons of water saved per day in a one-acre greenhouse were computed by multiplying the average percentage water content difference from Table 2 by 22,000 (the daily water usage in a one-acre greenhouse, as stated in Table 1).

Subsequently, the gallons of water saved per hour were calculated by dividing the daily water savings by 24 (the number of hours in a day).

This calculation allowed for the determination of labor hours saved per day by dividing the gallons saved per hour by the gallons used per hour (which is 917, as indicated in Table 1).

Table S12. *Average Daily Irrigation Labor Cost Savings (in USD) per One-Acre Greenhouse for Various Treatments over Different Weeks.*

Treatment 1	Treatment 2	Average Daily Cost Savings in Irrigation Labor			
		Week 1	Week 2	Week 3	Weekly Mean
CK700	Bok700	\$-7.19	\$-0.64	\$-2.03	\$-3.29
CK700	BC700	\$1.34	\$0.44	\$-1.21	\$0.19
CK700	Bok_BC700	\$-0.04	\$0.14	\$-6.05	\$-1.99
CK700	Bok1400	\$-3.87	\$-5.19	\$-3.06	\$-4.04
CK700	BC1400	\$-1.28	\$0.37	\$1.29	\$0.13
CK700	Bok_BC1400	\$-3.63	\$-3.34	\$-9.48	\$-5.48
CK1400	Bok700	\$-5.00	\$7.88	\$0.00	\$0.96
CK1400	BC700	\$5.75	\$9.88	\$-0.48	\$5.05
CK1400	Bok_BC700	\$4.22	\$10.04	\$-6.17	\$2.70
CK1400	Bok1400	\$-0.67	\$0.34	\$-1.80	\$-0.71
CK1400	BC1400	\$2.42	\$10.69	\$3.90	\$5.67
CK1400	Bok_BC1400	\$-0.51	\$3.77	\$-9.26	\$-2.00

Negative numbers indicate a reduction in hours of labor.

These figures were derived by multiplying the daily saved irrigation labor hours by the hourly wage for an irrigation worker, which is \$19.80, according to Table 1.

Table S13. Average Daily Water and Irrigation Labor Cost Savings (in USD) per One-Acre Greenhouse for Various Treatments over Different Weeks.

Treatment 1	Treatment 2	Average Daily Savings in Water and Irrigation Labor			
		Week 1	Week 2	Week 3	Mean Weekly
CK700	Bok700	\$-27.89	\$-2.48	\$-7.87	\$-12.75
CK700	BC700	\$5.20	\$1.70	\$-4.68	\$0.74
CK700	Bok_BC700	\$-0.17	\$0.55	\$-23.48	\$-7.70
CK700	Bok1400	\$-15.00	\$-20.13	\$-11.88	\$-15.67
CK700	BC1400	\$-4.98	\$1.43	\$5.01	\$0.49
CK700	Bok_BC1400	\$-14.07	\$-12.96	\$-36.77	\$-21.27
CK1400	Bok700	\$-19.38	\$30.57	\$0.01	\$3.73
CK1400	BC700	\$22.31	\$38.34	\$-1.85	\$19.60
CK1400	Bok_BC700	\$16.35	\$38.95	\$-23.93	\$10.46
CK1400	Bok1400	\$-2.61	\$1.34	\$-6.97	\$-2.75
CK1400	BC1400	\$9.39	\$41.45	\$15.12	\$21.99
CK1400	Bok_BC1400	\$-1.98	\$14.63	\$-35.90	\$-7.75

Negative numbers indicate a loss.

The average daily cost savings for water and irrigation labor were calculated by summing the daily cost savings attributed to reduced water usage (from Table S3) with the daily cost savings from water irrigation labor (from Table S5).

Table S14. *Calculations of Plant Density, Cones, and Daily Water Usage in Small, Medium, and Large Nurseries.*

Parameter	Source/Calculations	Value
Average Plants per Square Foot	California Nurseries Interviews	1.81
Area of 1 Acre (in Square Feet)	-	43,560
Total Plants in one-acre-greenhouse	Average Plants per Square Foot * Area of 1 Acre (in Square Feet)	78,843.6
Total Cones in one-acre-greenhouse	Total Plants in one-acre-greenhouse / 2	39,421.8
Daily Water Usage for a one-acre-greenhouse	[37]	22,000 gallons
Number of Cones in a small nursery	-	50,000
Daily water usage for a small nursery	(Number of Cones in a small nursery * Daily Water Usage for a one-acre-greenhouse) / Total Cones in one-acre-greenhouse	27,903.34 gallons
Number of Cones in a medium nursery	-	125,000
Daily water usage for a medium nursery	(Number of Cones in a medium nursery * Daily Water Usage for a one-acre-greenhouse) / Total Cones in one-acre-greenhouse	68,758.36 gallons
Number of Cones in a large nursery	-	175,000
Daily water usage for a large nursery	(Number of Cones in a large nursery * Daily Water Usage for a one-acre-greenhouse) / Total Cones in one-acre-greenhouse	195,323.40 gallons

Table S15. *Annual Water Cost (in USD) Calculations for Small, Medium, and Large Nurseries.*

Parameter	Source/Calculation	Value for Small Nurseries	Value for Medium Nurseries	Value for Large Nurseries
Water Cost per 1,000 Gallons	Pitton et al. 2018	\$ 2.59	\$ 2.59	\$ 2.59
Daily water usage for a nursery (gallons)	Table 13	27,903.34	68,758.36	195,323.40
Water cost for one day of irrigation	(Daily water usage for a nursery * Water Cost per 1,000 Gallons) / 1,000	\$72.27	\$178.08	\$505.89
Water cost for the first month (irrigation 3 times/week for 1 month)	(Water cost of one day of irrigation * 3 *52) / 12	\$939.51	\$2,348.76	\$6,576.54
Water cost for the rest of the months (irrigation 2 times/week for 11 months)	(Cost of one day of irrigation * 2 *52) / 12 * 11	\$6,889.71	\$17,224.27	\$48,227.95
Total water cost for a small nursery per year	Water cost for the first month + Water cost for the rest of the months	\$7,829.21	\$19,573.03	\$54,804.49

Table S16. *Nursery Sizes and Yearly Irrigation Labor Hours per Acre.*

Nursery Dimension	# Plants	Plants/Square Feet	# Square Feet	# Acres	Hours of Labor/Acre/Year	Total Yearly Hours of Labor
Small	100,000	1.81	55,248.62	1.268	5.5	6.98
Medium	250,000	1.81	138,121.55	3.171	5.5	17.44
Large	350,000	1.81	193,370.17	4.439	5.5	24.42

The surface area of each nursery size, in both square feet and acres, was determined based on the proportion of plants produced. This calculation stems from the information gathered during nursery interviews, which indicated an average plant density of approximately 1.81 plants per square foot.

The University of California Cooperative Extension (2021) [53] offers insights into the hours of labor necessary per acre annually. According to the study, the irrigation labor cost per acre is \$115, and the general labor rate is \$20.77 per hour. Therefore, the calculation for hours of labor per acre per year is: $115 / 20.77 = 5.5$.

Table S17. *Costs (in USD) for a Small Nursery in Control Treatment.*

	Cost/Unit	Number of Units	Cost/Cone	Cost/Year
Carrizo Seeds (100,000)	\$112.00/Quart	39	-	\$4,368.00
Cones (50,000) ^a	\$190/Case (1,000 cones/case)	50	-	\$9,500
Tray for cones ^b	\$1,102.20/Pallet (132 trays/pallet)	4	-	\$4,408.80
Peters Excel Fertilizer 21-5-20 (700 dosage) ^c	\$2.12/Lb	-	\$0.00019	\$924.67
Peters Excel Fertilizer 21-5-20 (1400 dosage) ^c	\$2.12/Lb	-	\$0.00038	\$1,849.33
Irrigation (water) ^d	\$0.00259/Gal	27,903.34	-	\$7,829.21
Irrigation (labor) ^e	\$19.80/Hour	6.98	-	\$138.12
Peat moss	\$0.22/Lb	-	\$0.01	-
Perlite	\$1.01/Lb	-	\$0.07	-
Coco coir	\$2.27/Lb	-	\$0.13	-
Total soil ^f	\$1.17/Lb	-	\$0.21	\$10,500
Total Costs (with 700 fertilizer dose)	-	-	-	\$37,773.30
Total Costs (with 1400 fertilizer dose)	-	-	-	\$38,802.47

^a As the experiment involved two seeds per cone, the analysis accounted for 50,000 cones, considering a small nursery that yields 100,000 plants. ^b Each tray can contain 98 cones. ^c See Tables S4 for Calculations per Cone and S5 for Calculations per Year. ^d See Tables S14 and S15 for Calculations per Day and Calculations per Year. ^e See Table 1. ^f Total soil is formed by three equal parts of peat moss, perlite and coco coir; one cone can contain 79.48 grams (See Table S4 for calculations on the volume of the cone).

Table S18. *Costs (in USD) for a Medium Nursery in Control Treatment.*

	Cost/Unit	Number of Units	Cost/Cone	Cost/Year
Carrizo Seeds (250,000)	\$112.00/Quart	97	-	\$10,864
Cones (125,000) ^a	\$180/Case (1,000 cones/case)	125	-	\$22,500
Tray for cones ^b	\$1,036.20/Pallet (132 trays/pallet)	10	-	\$10,362
Peters Excel Fertilizer 21-5-20 (700 dosage) ^c	\$2.12/Lb	-	\$0.00019	\$2,311.67
Peters Excel Fertilizer 21-5-20 (1400 dosage) ^c	\$2.12/Lb	-	\$0.00038	\$4,623.33
Irrigation (water) ^d	\$0.00259/Gal	69,758.36	-	\$19,573.03
Irrigation (labor) ^e	\$19.80/Hour	17.44	-	\$345.30
Peat moss	\$0.22/Lb	-	\$0.01	-
Perlite	\$1.01/Lb	-	\$0.07	-
Coco coir	\$2.27/Lb	-	\$0.13	-
Total soil ^f	\$1.17/Lb	-	\$0.21	\$26,250
Total Costs (with 700 fertilizer dose)	-	-	-	\$82,105.25
Total Costs (with 1400 fertilizer dose)	-	-	-	\$84,678.17

^a As the experiment involved two seeds per cone, the analysis accounted for 125,000 cones, considering a medium nursery that yields 250,000 plants. ^b Each tray can contain 98 cones. ^c See Tables S4 for Calculations per Cone and S6 for Calculations per Year. ^d See Tables S14 for Calculations per Day and S15 for Calculations per Year. ^e See Table 1.

^f Total soil is formed by three equal parts of peat moss, perlite and coco coir; one cone can contain 79.48 grams (See Table S4 for calculations on the volume of the cone).

Table S19. Costs (in USD) for a Large Nursery in Control Treatment.

	Cost/Unit	Number of Units	Cost/Cone	Cost/Year
Carrizo Seeds (350,000)	\$110.00/Quart	135	-	\$14,850
Cones (175,000) ^a	\$170/Case (1,000 cones/case)	175	-	\$29,750
Tray for cones ^b	\$1,036.20/Pallet (132 trays/pallet)	14	-	\$14,506.80
Peters Excel Fertilizer 21-5-20 (700 dosage) ^c	\$2.12/Lb	-	\$0.00019	\$3,602.08
Peters Excel Fertilizer 21-5-20 (1400 dosage) ^c	\$2.12/Lb	-	\$0.00038	\$7,204.17
Irrigation (water) ^d	\$0.00259/Gal	69,758.36	-	\$54,804.49
Irrigation (labor) ^e	\$19.80/Hour	17.44	-	\$483.43
Peat moss	\$0.22/Lb	-	\$0.01	-
Perlite	\$1.01/Lb	-	\$0.07	-
Coco coir	\$2.27/Lb	-	\$0.13	-
Total soil ^f	\$1.17/Lb	-	\$0.21	\$36,750.00
Total Costs (with 700 fertilizer dose)	-	-	-	\$154,746.80
Total Costs (with 1400 fertilizer dose)	-	-	-	\$158,348.88

^a As the experiment involved two seeds per cone, the analysis accounted for 175,000 cones, considering a large nursery that yields 350,000 plants. ^b Each tray can contain 98 cones. See Tables S4 for Calculations per Cone and S7 for Calculations per Year. ^d See Tables S14 for Calculations per Day and S15 for Calculations per Year. ^e See Table 1. ^f Total soil is formed by three equal parts of peat moss, perlite and coco coir; one cone can contain 79.48 grams (See Table S4 for calculations on the volume of the cone).

Table S20. *Costs (in USD) for a Small Nursery in Bokashi Treatment.*

	Cost/Unit	Number of Units	Cost/Cone	Cost/Year
Bokashi bran ^a	\$7.68/lb	-	\$0.14	\$7,000
Anaerobic Fermentation Bin (55 gallons)	\$254.95	4	-	\$1,019.80
Carrizo Seeds (100,000)	\$112.00/Quart	39	-	\$4,368.00
Cones (50,000) ^b	\$190/Case (1,000 cones/case)	50	-	\$9,500
Tray for cones ^c	\$1,102.20/Pallet (132 trays/pallet)	4	-	\$4,408.80
Peters Excel Fertilizer 21-5-20 (700 dosage) ^d	\$2.12/Lb	-	\$0.00019	\$514.58
Peters Excel Fertilizer 21-5-20 (1400 dosage) ^d	\$2.12/Lb	-	\$0.00038	\$1,029.17
Irrigation (water) ^e	\$0.00259/Gal	27,903.34	-	\$7,829.21
Irrigation (labor) ^f	\$19.80/Hour	6.98	-	\$138.12
Peat moss	\$0.22/Lb	-	\$0.01	-
Perlite	\$1.01/Lb	-	\$0.07	-
Coco coir	\$2.27/Lb	-	\$0.13	-
Total soils ^g	\$1.17/Lb	-	\$0.21	\$9,450
Total Costs (with 700 fertilizer dose)	-	-	-	\$44,228.52
Total Costs (with 1400 fertilizer dose)	-	-	-	\$44,743.10

^a 10% of Bokashi bran is utilized - in addition to citrus waste material - for blending it into the soil mixture; at 10%, one hold can hold 7.948 grams of Bokashi bran (See Table S4 for calculations on the volume of the cone). ^b As the experiment involved two seeds per cone, the analysis accounted for 50,000 cones, considering a small nursery that yields 100,000 plants. ^c Each tray can contain 98 cones. ^d See Tables S4 for Calculations per Cone and S5 for Calculations per Year; final results from Table S5 were then halved because a pilot experiment demonstrated that 10% of Bokashi functions equivalently to 50% of fertilizer. ^e See Tables S14 for Calculations per Day and S15 for Calculations per Year. ^f See Table 1. ^g The composition, constituted by equal parts of peat moss, perlite and coco coir,

represents 90% of the total soil, with 10% attributed to Bokashi; one cone can hold 79.48 grams (See Table S4 for calculations on the volume of the cone).

Table S21. *Costs (in USD) for a Medium Nursery in Bokashi Treatment.*

	Cost/Unit	Number of Units	Cost/Cone	Cost/Year
Bokashi bran ^a	\$7.68/lb	-	\$0.14	\$17,500
Anaerobic Fermentation Bin (55 gallons)	\$254.95	11	-	\$2,804.45
Carrizo Seeds (250,000)	\$112.00/Quart	97	-	\$10,864.00
Cones (125,000) ^b	\$180.00/Case (1,000 cones/case)	125	-	\$22,500.00
Tray for cones ^c	\$1,036.20/Pallet (132 trays/pallet)	10	-	\$10,362.00
Peters Excel Fertilizer 21-5-20 (700 dosage) ^d	\$2.12/Lb	-	\$0.00019	\$1,286.46
Peters Excel Fertilizer 21-5-20 (1400 dosage) ^d	\$2.12/Lb	-	\$0.00038	\$2,572.92
Irrigation (water) ^e	\$0.00259/Gal	69,758.36	-	\$19,573.03
Irrigation (labor) ^f	\$19.80/Hour	17.44	-	\$345.30
Peat moss	\$0.22/Lb	-	\$0.01	-
Perlite	\$1.01/Lb	-	\$0.07	-
Coco coir	\$2.27/Lb	-	\$0.13	-
Total soils ^g	\$1.17/Lb	-	\$0.21	\$23,625.00
Total Costs (with 700 fertilizer dose)	-	-	-	\$108,860.25
Total Costs (with 1400 fertilizer dose)	-	-	-	\$110,146.70

^a 10% of Bokashi bran is utilized - in addition to citrus waste material - for blending it into the soil mixture; at 10%, one cone can hold 7.948 grams of Bokashi bran (See Table S4 for calculations on the volume of the cone). ^b As the experiment involved two seeds per cone, the analysis accounted for 125,000 cones, considering a medium nursery that yields 250,000 plants. ^c Each tray can contain 98 cones. ^d See Tables S4 for Calculations per Cone and S6 for Calculations per Year; final results from Table S6 were then halved because a pilot experiment demonstrated that 10% of Bokashi functions equivalently to 50% of fertilizer. ^e See Tables S14 for Calculations per Day and S15 for Calculations per Year. ^f See Table 1. ^g The composition, constituted by equal parts of peat moss, perlite and coco coir,

represents 90% of the total soil, with 10% attributed to Bokashi; one cone can hold 79.48 grams (See Table S4 for calculations on the volume of the cone).

Table S22. *Costs (in USD) for a Large Nursery in Bokashi Treatment.*

	Cost/Unit	Number of Units	Cost/Cone	Cost/Year
Bokashi Bran ^a	\$7.68/lb	-	\$0.14	\$24,500
Anaerobic Fermentation Bin (55 gallons)	\$254.95	15	-	\$3,824.25
Carrizo Seeds (350,000)	\$110.00/Quart	135	-	\$14,850.00
Cones (175,000) ^b	\$170.00/Case (1,000 cones/case)	175	-	\$29,750.00
Tray for cones ^c	\$1,036.20/Pallet (132 trays/pallet)	14	-	\$14,506.80
Peters Excel Fertilizer 21-5-20 (700 dosage) ^d	\$2.12/Lb	-	\$0.00019	\$1,801.04
Peters Excel Fertilizer 21-5-20 (1400 dosage) ^d	\$2.12/Lb	-	\$0.00038	\$3,602.08
Irrigation (water) ^e	\$0.00259/Gal	195,323.40	-	\$54,804.49
Irrigation (labor) ^f	\$19.80/Hour	24.42	-	\$483.43
Peat moss	\$0.22/Lb	-	\$0.01	-
Perlite	\$1.01/Lb	-	\$0.07	-
Coco coir	\$2.27/Lb	-	\$0.13	-
Total soil ^g	\$1.17/Lb	-	\$0.21	\$33,075.00
Total Costs (with 700 fertilizer dose)	-	-	-	\$177,595.01
Total Costs (with 1400 fertilizer dose)	-	-	-	\$179,396.05

^a 10% of Bokashi bran is utilized - in addition to citrus waste material - for blending it into the soil mixture; at 10%, one cone can hold 7.948 grams of Bokashi bran (See Table S4 for calculations on the volume of the cone). ^b As the experiment involved two seeds per cone, the analysis accounted for 175,000 cones, considering a large nursery that yields 350,000 plants. ^c Each tray can contain 98 cones. ^d See Tables S4 for Calculations per Cone and S7 for Calculations per Year; final results from Table S7 were then halved because a pilot experiment demonstrated that 10% of Bokashi functions equivalently to 50% of fertilizer. ^e See Tables S14 for Calculations per Day and S15 for Calculations per Year. ^f See Table 1. ^g The composition, constituted by equal parts of peat moss, perlite and coco coir,

represents 90% of the total soil, with 10% attributed to Bokashi; one cone can hold 79.48 grams (See Table S4 for calculations on the volume of the cone).

Table S23. *Costs (in USD) for a Small Nursery in Biochar Treatment.*

	Cost/Unit	Number of Units	Cost/Cone	Cost/Year
Biochar ^a	\$600/ton	-	\$0.005	\$250
Anaerobic Fermentation Bin (55 gallons)	\$254.95	4	-	\$1,019.80
Carrizo Seeds (100,000)	\$112.00/Quart	39	-	\$4,368
Cones (50,000) ^b	\$190.00/Case (1,000 cones/case)	50	-	\$9,500
Tray for cones ^c	\$1,102.20/Pallet (132 trays/pallet)	4	-	\$4,408.80
Peters Excel Fertilizer 21-5-20 (700 dosage) ^d	\$2.12/Lb	-	\$0.00019	\$1,029.17
Peters Excel Fertilizer 21-5-20 (1400 dosage) ^d	\$2.12/Lb	-	\$0.00038	\$2,058.33
Irrigation (water) ^e	\$0.00259/Gal	27,903.34	-	\$7,829.21
Irrigation (labor) ^f	\$19.80/Hour	6.98	-	\$138.12
Peat moss	\$0.22/Lb	-	\$0.01	-
Perlite	\$1.01/Lb	-	\$0.07	-
Coco coir	\$2.27/Lb	-	\$0.13	-
Total soil ^g	\$1.17/Lb	-	\$0.21	\$9,450
Total Costs (with 700 fertilizer dose)	-	-	-	\$30,163.89
Total Costs (with 1400 fertilizer dose)	-	-	-	\$31,193.05

^a 10% of biochar is utilized for blending it into the soil mixture; at 10% one cone can hold 7.948 grams of biochar (See Table S4 for calculations on the volume of the cone). ^b As the experiment involved two seeds per cone, the analysis accounted for 50,000 cones, considering a small nursery that yields 100,000 plants. ^c Each tray can contain 98 cones. ^d See Tables S4 and S5 for Calculations per Cone and Calculations per Year. ^e See Tables S14 for Calculations per Day and S15 for Calculations per Year. ^f See Table 1. ^g The composition, constituted by equal parts of peat moss, perlite

and coco coir, represents 90% of the total soil, with 10% attributed to Biochar; one cone can hold 79.48 grams (See Table S4 for calculations on the volume of the cone).

Table S24. *Costs (in USD) for a Medium Nursery in Biochar Treatment.*

	Cost/Unit	Number of Units	Cost/Cone	Cost/Year
Biochar ^a	\$600/ton	-	\$0.005	\$625
Anaerobic Fermentation Bin (55 gallons)	\$254.95	11	-	\$2,804.45
Carrizo Seeds (250,000)	\$112.00/Quart	97	-	\$10,864.00
Cones (125,000) ^b	\$180.00/Case (1,000 cones/case)	125	-	\$22,500.00
Tray for cones ^c	\$1,036.20/Pallet (132 trays/pallet)	10	-	\$10,362.00
Peters Excel Fertilizer 21-5-20 (700 dosage) ^d	\$2.12/Lb	-	\$0.00019	\$2,572.92
Peters Excel Fertilizer 21-5-20 (1400 dosage) ^d	\$2.12/Lb	-	\$0.00038	\$5,145.83
Irrigation (water) ^e	\$0.00259/Gal	69,758.36	-	\$19,573.03
Irrigation (labor) ^f	\$19.80/Hour	17.44	-	\$345.30
Peat moss	\$0.22/Lb	-	\$0.01	-
Perlite	\$1.01/Lb	-	\$0.07	-
Coco coir	\$2.27/Lb	-	\$0.13	-
Total soil ^g	\$1.17/Lb	-	\$0.21	\$23,625.00
Total Costs (with 700 fertilizer dose)	-	-	-	\$73,698.67
Total Costs (with 1400 fertilizer dose)	-	-	-	\$76,271.59

^a 10% of biochar is utilized for blending it into the soil mixture; at 10% one cone can hold 7.948 grams of biochar (See Table S4 for calculations on the volume of the cone). ^b As the experiment involved two seeds per cone, the analysis accounted for 125,000 cones, considering a medium nursery that yields 250,000 plants. ^c Each tray can contain 98 cones. ^d See Tables S4 for Calculations per Cone and S6 for Calculations per Year. ^e See Tables S14 for Calculations per Day and S15 for Calculations per Year. ^f See Table 1. ^g The composition, constituted by equal parts of peat moss,

perlite and coco coir, represents 90% of the total soil, with 10% attributed to Biochar; one cone can hold 79.48 grams (See Table S4 for calculations on the volume of the cone).

Table S25. *Costs (in USD) for a Large Nursery in Biochar Treatment.*

	Cost/Unit	Number of Units	Cost/Cone	Cost/Year
Biochar ^a	\$600/ton	-	\$0.005	\$875.00
Anaerobic Fermentation Bin (55 gallons)	\$254.95	15	-	\$3,824.25
Carrizo Seeds (350,000)	\$110.00/Quart	135	-	\$14,850.00
Cones (175,000) ^b	\$180.00/Case (1,000 cones/case)	175	-	\$29,750.00
Tray for cones ^c	\$1,036.20/Pallet (132 trays/pallet)	14	-	\$14,506.80
Peters Excel Fertilizer 21-5-20 (700 dosage) ^d	\$2.12/Lb	-	\$0.00019	\$3,602.08
Peters Excel Fertilizer 21-5-20 (1400 dosage) ^d	\$2.12/Lb	-	\$0.00038	\$7,204.17
Irrigation (water) ^e	\$0.00259/Gal	195,323.40	-	\$54,804.49
Irrigation (labor) ^f	\$19.80/Hour	24.42	-	\$483.43
Peat moss	\$0.22/Lb	-	\$0.01	-
Perlite	\$1.01/Lb	-	\$0.07	-
Coco coir	\$2.27/Lb	-	\$0.13	-
Total soil ^g	\$1.17/Lb	-	\$0.21	\$33,075.00
Total Costs (with 700 fertilizer dose)	-	-	-	\$100,966.56
Total Costs (with 1400 fertilizer dose)	-	-	-	\$104,568.64

^a 10% of biochar is utilized for blending it into the soil mixture; at 10% one cone can hold 7.948 grams of biochar (See Table S4 for calculations on the volume of the cone). ^b As the experiment involved two seeds per cone, the analysis accounted for 175,000 cones, considering a large nursery that yields 350,000 plants. ^c Each tray can contain 98 cones. ^d See Tables S4 for Calculations per Cone and S7 for Calculations per Year. ^e See Tables S14 for Calculations per Day

and S15 for Calculations per Year. [†] See Table 1. [§] The composition, constituted by equal parts of peat moss, perlite and coco coir, represents 90% of the total soil, with 10% attributed to Biochar; one cone can hold 79.48 grams (See Table S4 for calculations on the volume of the cone).

Table S26. *Costs (in USD) for a Small Nursery in Bokashi and Biochar Treatment.*

	Cost/Unit	Number of Units	Cost/Cone	Cost/Year
Biochar ^a	\$600/ton	-	\$0.005	\$250
Aerobic Fermentation Bin (55 gallons)	\$254.95	4	-	\$1,019.80
Bokashi Bran ^b	\$7.68/lb	-	\$0.14	\$7,000
Anaerobic Fermentation Bin (55 gallons)	\$254.95	4	-	\$1,019.80
Carrizo Seeds (100,000)	\$112.00/Quart	39	-	\$4,368
Cones (50,000) ^c	\$190.00/Case (1,000 cones/case)	50	-	\$9,500
Tray for cones ^d	\$1,102.20/Pallet (132 trays/pallet)	4	-	\$4,408.80
Peters Excel Fertilizer 21-5-20 (700 dosage) ^e	\$2.12/Lb	-	\$0.00019	\$514.58
Peters Excel Fertilizer 21-5-20 (1400 dosage) ^e	\$2.12/Lb	-	\$0.00038	\$1,029.17
Irrigation (water) ^f	\$0.00259/Gal	27,903.34	-	\$7,829.21
Irrigation (labor) ^g	\$19.80/Hour	6.98	-	\$138.12
Peat moss	\$0.22/Lb	-	\$0.01	-
Perlite	\$1.01/Lb	-	\$0.07	-
Coco coir	\$2.27/Lb	-	\$0.13	-
Total soil ^h	\$1.17/Lb	-	\$0.21	\$8,400
Total Costs (with 700 fertilizer dose)	-	-	-	\$44,448.32
Total Costs (with 1400 fertilizer dose)	-	-	-	\$44,962.90

^a 10% of biochar is utilized for blending it into the soil mixture; at 10% one cone can hold 7.948 grams of biochar (See Table S4 for calculations on the volume of the cone). ^b 10% of Bokashi bran is utilized - in addition to citrus waste

material - for blending it into the soil mixture; at 10%, one cone can hold 7.948 grams of Bokashi bran (See Table S4 for calculations on the volume of the cone). ^c As the experiment involved two seeds per cone, the analysis accounted for 50,000 cones, considering a small nursery that yields 100,000 plants. ^d Each tray can contain 98 cones. ^e See Tables S4 for Calculations per Cone and S5 for Calculations per Year; final results from Table S5 were then halved because a pilot experiment demonstrated that 10% of Bokashi functions equivalently to 50% of fertilizer. ^f See Tables S14 for Calculations per Day and S15 for Calculations per Year. ^g See Table 1. ^h The composition, constituted by equal parts of peat moss, perlite and coco coir, represents 80% of the total soil, with 10% attributed to Biochar and another 10% to Bokashi; one cone can hold 79.48 grams (See Table S4 for calculations on the volume of the cone).

Table S27. *Costs (in USD) for a Medium Nursery in Bokashi and Biochar Treatment.*

	Cost/Unit	Number of Units	Cost/Cone	Cost/Year
Biochar ^a	\$600/ton	-	\$0.005	\$625
Aerobic Fermentation Bin (55 gallons)	\$254.95	11	-	\$2,804.45
Bokashi bran ^b	\$7.68/lb	-	\$0.14	\$17,500.00
Anaerobic Fermentation Bin (55 gallons)	\$254.95	11	-	\$2,804.45
Carrizo Seeds (250,000)	\$112.00/Quart	97	-	\$10,864.00
Cones (125,000) ^c	\$180.00/Case (1,000 cones/case)	125	-	\$22,500.00
Tray for cones ^d	\$1,036.20/Pallet (132 trays/pallet)	10	-	\$10,362.00
Peters Excel Fertilizer 21-5-20 (700 dosage) ^e	\$2.12/Lb	-	\$0.00019	\$1,286.46
Peters Excel Fertilizer 21-5-20 (1400 dosage) ^e	\$2.12/Lb	-	\$0.00038	\$2,572.92
Irrigation (water) ^f	\$0.00259/Gal	69,758.36	-	\$19,573.03
Irrigation (labor) ^g	\$19.80/Hour	17.44	-	\$345.30
Peat moss	\$0.22/Lb	-	\$0.01	-
Perlite	\$1.01/Lb	-	\$0.07	-
Coco coir	\$2.27/Lb	-	\$0.13	-
Total soil ^h	\$1.17/Lb	-	\$0.21	\$21,000.00
Total Costs (with 700 fertilizer dose)	-	-	-	\$109,664.70

Total Costs (with 1400 fertilizer dose)	-	-	-	\$110,951.15
--	---	---	---	---------------------

^a 10% of biochar is utilized for blending it into the soil mixture; at 10% one cone can hold 7.948 grams of biochar (See Table S4 for calculations on the volume of the cone). ^b 10% of Bokashi bran is utilized - in addition to citrus waste material - for blending it into the soil mixture; at 10%, one cone can hold 7.948 grams of Bokashi bran (See Table 4 for calculations on the volume of the cone). ^c As the experiment involved two seeds per cone, the analysis accounted for 125,000 cones, considering a medium nursery that yields 250,000 plants. ^d Each tray can contain 98 cones. ^e See Tables S4 for Calculations per Cone and S6 for Calculations per Year; final results from Table S6 were then halved because a pilot experiment demonstrated that 10% of Bokashi functions equivalently to 50% of fertilizer. ^f See Tables S14 for Calculations per Day and S15 for Calculations per Year. ^g See Table 1. ^h The composition, constituted by equal parts of peat moss, perlite and coco coir, represents 80% of the total soil, with 10% attributed to Biochar and another 10% to Bokashi; one cone can hold 79.48 grams (See Table S4 for calculations on the volume of the cone).

Table S28. *Costs (in USD) for a Large Nursery in Bokashi and Biochar Treatment.*

	Cost/Unit	Number of Units	Cost/Cone	Cost/Year
Biochar ^a	\$600/ton	-	\$0.005	\$875.00
Aerobic Fermentation Bin (55 gallons)	\$254.95	15	-	\$3,824.25
Bokashi bran ^b	\$7.68/lb	-	\$0.14	\$24,500.00
Anaerobic Fermentation Bin (55 gallons)	\$254.95	15	-	\$3,824.25
Carrizo Seeds (250,000)	\$110.00/Quart	135	-	\$14,850.00
Cones (125,000) ^c	\$170.00/Case (1,000 cones/case)	175	-	\$29,750.00
Tray for cones ^d	\$1,036.20/Pallet (132 trays/pallet)	14	-	\$14,506.80
Peters Excel Fertilizer 21-5-20 (700 dosage) ^e	\$2.12/Lb	-	\$0.00019	\$1,801.04
Peters Excel Fertilizer 21-5-20 (1400 dosage) ^e	\$2.12/Lb	-	\$0.00038	\$3,602.08
Irrigation (water) ^f	\$0.00259/Gal	195,323.40	-	\$54,804.49
Irrigation (labor) ^g	\$19.80/Hour	24.42	-	\$483.43
Peat moss	\$0.22/Lb	-	\$0.01	-
Perlite	\$1.01/Lb	-	\$0.07	-
Coco coir	\$2.27/Lb	-	\$0.13	-
Total soil ^h	\$1.17/Lb	-	\$0.21	\$29,400.00
Total Costs (with 700 fertilizer dose)	-	-	-	\$178,619.26

Total Costs (with 1400 fertilizer dose)	-	-	-	\$180,420.30
--	---	---	---	---------------------

^a 10% of biochar is utilized for blending it into the soil mixture; at 10% one cone can hold 7.948 grams of biochar (See Table S4 for calculations on the volume of the cone). ^b 10% of Bokashi bran is utilized - in addition to citrus waste material - for blending it into the soil mixture; at 10%, one cone can hold 7.948 grams of Bokashi bran (See Table S4 for calculations on the volume of the cone). ^c As the experiment involved two seeds per cone, the analysis accounted for 175,000 cones, considering a large nursery that yields 350,000 plants. ^d Each tray can contain 98 cones. ^e See Tables S4 for Calculations per Cone and S7 for Calculations per Year; final results from Table S7 were then halved because a pilot experiment demonstrated that 10% of Bokashi functions equivalently to 50% of fertilizer. ^f See Tables S14 for Calculations per Day and S15 for Calculations per Year. ^g See Table 1. ^h The composition, constituted by equal parts of peat moss, perlite and coco coir, represents 80% of the total soil, with 10% attributed to Biochar and another 10% to Bokashi; one cone can hold 79.48 grams (See Table S4 for calculations on the volume of the cone).

Table S29. Daily Nitrogen (N) Savings (in USD) Across Various Nursery Sizes for Each Treatment Compared to the CK1400 Treatment.

Treatment	Average Daily Savings for a Small Nursery	Average Daily Savings for a Medium Nursery	Average Daily Savings for a Big Nursery
CK700	\$0.69	\$1.73	\$4.83
Bok700	\$14.20	\$35.51	\$99.42
BC700	\$11.45	\$28.63	\$80.16
Bok_BC700	\$39.15	\$97.87	\$274.03
Bok1400	\$52.86	\$132.16	\$370.05
BC1400	\$41.66	\$104.15	\$291.61
Bok_BC1400	\$98.26	\$245.64	\$687.80

Table S30. Daily Phosphorous (P) Savings (in USD) Across Various Nursery Sizes for Each Treatment Compared to the CK1400 Treatment.

Treatment	Average Daily Savings for a Small Nursery	Average Daily Savings for a Medium Nursery	Average Daily Savings for a Big Nursery
CK700	-\$4.11	-\$13.03	-\$14.39
Bok700	\$4.67	\$14.81	\$16.35
BC700	\$0.83	\$2.64	\$2.92
Bok_BC700	\$16.08	\$50.97	\$56.26
Bok1400	\$0.00	\$0.00	\$0.00
BC1400	\$34.14	\$108.25	\$119.48
Bok_BC1400	\$12.26	\$38.89	\$42.93

Negative numbers indicate a loss.

Table S31. Daily Potassium (K) Savings (in USD) Across Various Nursery Sizes for Each Treatment Compared to the CK1400 Treatment.

Treatment	Average Daily Savings for a Small Nursery	Average Daily Savings for a Medium Nursery	Average Daily Savings for a Big Nursery
CK700	-\$0.77	-\$1.93	-\$5.40
Bok700	\$2.52	\$6.29	\$17.62
BC700	\$10.63	\$26.58	\$74.42
Bok_BC700	\$7.07	\$17.68	\$49.49
Bok1400	\$0.00	\$0.00	\$0.00
BC1400	\$19.90	\$49.75	\$139.29
Bok_BC1400	\$23.90	\$59.75	\$167.29

Negative numbers indicate a loss.

Table S32. Average Percentage Change in Water Content and Daily Savings derived from Water (in USD) for a Small Nursery for Each Treatment Compared to the CK1400 Treatment.

Treatment	Percentage Change in Water Content compared to the CK1400 Treatment	Savings/Day compared to the CK1400 Treatment
Bok700	4.86%	\$3.51
Bok1400	-3.58%	\$-2.58
BC700	25.53%	\$18.45
BC1400	28.64%	\$20.70
Bok_BC700	13.62%	\$9.85
Bok_BC1400	-10.1%	\$-7.30

Negative numbers indicate a loss.

Table S33. *Average Daily Savings derived from Water Content (in USD) for a Medium Nursery for Each Treatment Compared to the CK1400 Treatment.*

Treatment	Savings/Day compared to the CK1400 Treatment
Bok700	\$8.66
Bok1400	\$-6.37
BC700	\$45.47
BC1400	\$51.01
Bok_BC700	\$24.26
Bok_BC1400	\$-17.98

Negative numbers indicate a loss.

Table S34. *Average Daily Savings derived from Water Content (in USD) for a Big Nursery for Each Treatment Compared to the CK1400 Treatment.*

Treatment	Savings/Day compared to the CK1400 Treatment
Bok700	\$24.60
Bok1400	\$-18.09
BC700	\$129.16
BC1400	\$144.90
Bok_BC700	\$68.92
Bok_BC1400	\$-51.07

Negative numbers indicate a loss.

Table S35. *Average Daily Savings derived from Water Irrigation Labor (in USD) for a Small Nursery for Each Treatment Compared to the CK1400 Treatment.*

Treatment	Savings/Day compared to the CK1400 Treatment
Bok700	\$29.30
Bok1400	\$-21.55
BC700	\$153.83
BC1400	\$172.57
Bok_BC700	\$82.08
Bok_BC1400	\$-60.82

Negative numbers indicate a loss.

Table S36. *Average Daily Savings derived from Water Irrigation Labor (in USD) for a Medium Nursery for Each Treatment Compared to the CK1400 Treatment.*

Treatment	Savings/Day compared to the CK1400 Treatment
Bok700	\$72.19
Bok1400	\$-53.10
BC700	\$379.05
BC1400	\$425.24
Bok_BC700	\$202.26
Bok_BC1400	\$-149.88

Negative numbers indicate a loss.

Table S37. *Average Daily Savings derived from Water Irrigation Labor (in USD) for a Big Nursery for Each Treatment Compared to the CK1400 Treatment.*

Treatment	Savings/Day compared to the CK1400 Treatment
Bok700	\$205.08
Bok1400	\$-150.83
BC700	\$1,076.79
BC1400	\$1,208
Bok_BC700	\$574.57
Bok_BC1400	\$-425.77

Negative numbers indicate a loss.

Table S38. *Average Germination Rate and Percentage Change for Each Treatment Compared to the CK1400 Treatment.*

Treatment	Average Germination Rate	Percentage Change in Average Germination Rate compared to the CK1400 Treatment
Bok700	86.9%	66.99%
Bok1400	85.88%	65.03%
BC700	80.44%	54.57%
BC1400	83.67%	60.78%
Bok_BC700	79.93%	53.59%
Bok_BC1400	80.95%	55.55%

Table S39. *Average Plant Heights (in cm) and Percentage Change for Each Treatment Compared to the CK1400 Treatment.*

Treatment	Average Plant Height (cm)	Percentage Change in Average Plant Height compared to the CK1400 Treatment
Bok700	18.97	29.66%
Bok1400	17.85	21.98%
BC700	17.66	20.69%
BC1400	19.33	21.98%
Bok_BC700	15.6	6.62%
Bok_BC1400	17.02	16.36%

Reference

49. University of California Agriculture and Natural Resources Cooperative Extension, UC Davis Department of Agricultural and Resource Economics. Sample Costs to Establish an Orchard and Produce Oranges: Navels, San Joaquin Valley - South; 2021.