



Evaluating Nutrient and Irrigation BMPs on a Tree Farm in South Florida

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Project overview

- CSREES National Integrated Water Quality Program
- 3 year project
- Goal: To improve water quality in Biscayne Bay Watershed by reducing agricultural nutrient leaching into groundwater through implementation of Best Management Practices (BMPs) by targeting high return stakeholders

Project objectives

- Develop, support, and market economically viable BMPs to high-return agricultural stakeholders addressing regional concerns
- Conduct self-auditing feed back loops to evaluate stakeholder opinion change
- Provide information (extension) using multiple avenues
- Develop an economically based, watershed management plan for sustainable agriculture

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Presentation focus

- Tree nursery study
- 10,550 acres of no-cover nursery in Miami-Dade County
- \$1,844,064,000 for Florida in nursery sales
- Date of first sampling: April 2006

Methods: treatments

Treatment	Irrigation	N-P-K fertilizer
1	Grower	Grower
2	5 cbar	Grower
3	15 cbar	Grower
4	15 cbar	50% of grower
5	Grower	75% of grower
6	Grower	50% of grower

Methods: soil sampling

- 3 times annually



Methods: plant parameters

- 6 times annually



Methods: plant tissue

- 3 times annually



Methods: water sampling

- Monthly



Methods: irrigation

- Soil moisture based irrigation using switching tensiometers and water meters: 5 and 15 cbars



Methods: statistics

- SAS
 - Test for interactions
 - PROC GLM (method of least squares to fit general linear models) and PROC TTEST (performs t tests for one sample, two samples, and paired observations)
 - $\alpha = 0.05$

Results: soil sampling

- No significant differences were observed in samples (however, only 1 sampling date has been processed)

Results: plant parameters

- No significant differences in diameter, height, or SPAD readings among treatments



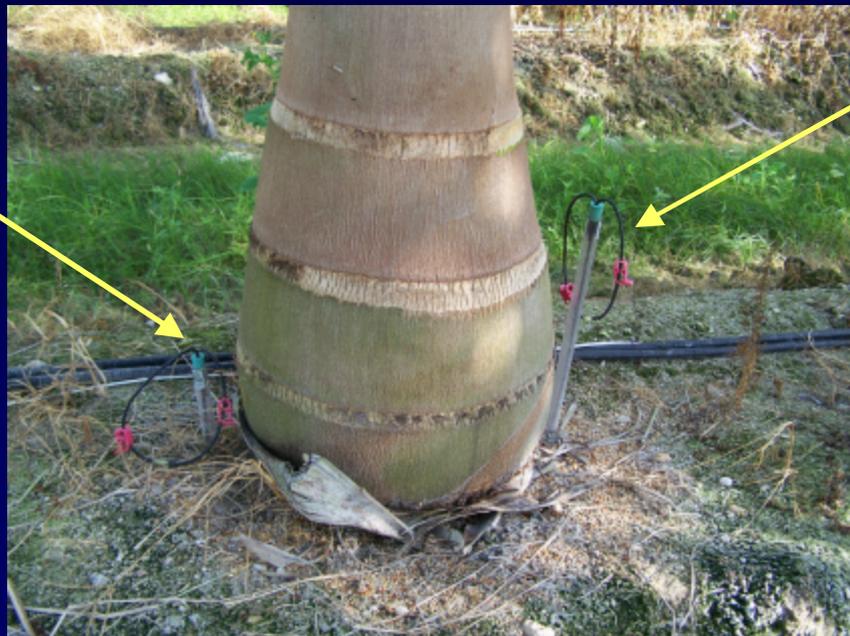
Results: plant tissue

- No significant differences were observed in samples (however, only 2 sampling dates has been processed)

Results: water quality

- Interaction between area and treatment:

B is 18
inches
deep
(under root
zone
water)



A is 10
inches
deep (root
zone
water)

Results: water quality medians

Treatment	NH ₄ -N (mg/L)	NO ₃ -N (mg/L)	PO ₄ -P (mg/L)	TP (mg/L)
1a (G-G)	0.164	28.0	0.161	0.695
1b (G-G)	0.148	10.6	0.036	0.678
3a (15cb-G)	0.190	62.3	0.302	0.984
3b (15cb-G)	0.121	2.0	0.061	0.605
4a (15cb-50%NPK)	0.091	13.1	0.301	0.785
4b (15cb-50%NPK)	0.194	4.6	0.170	0.713
6a (G-50%NPK)	0.071	21.3	0.269	0.923
6b (G-50%NPK)	0.160	9.2	0.089	0.745

Results: water quality means

Treatment	NH ₄ -N mg/L)	NO ₃ -N (mg/L)	PO ₄ -P (mg/L)	TP (mg/L)
1a (G-G)	2.735	95.3	0.294	0.958
1b (G-G)	0.274	36.6	0.181	0.757
3a (15cb-G)	0.215	93.0	0.290	0.965
3b (15cb-G)	0.174	28.5	0.119	0.721
4a (15cb-50%NPK)	0.185	26.6	0.325	0.989
4b (15cb-50%NPK)	0.200	5.3	0.257	0.814
6a (G-50%NPK)	0.277	49.1	0.363	1.171
6b (G-50%NPK)	0.698	19.4	0.194	0.971

Results: water quality

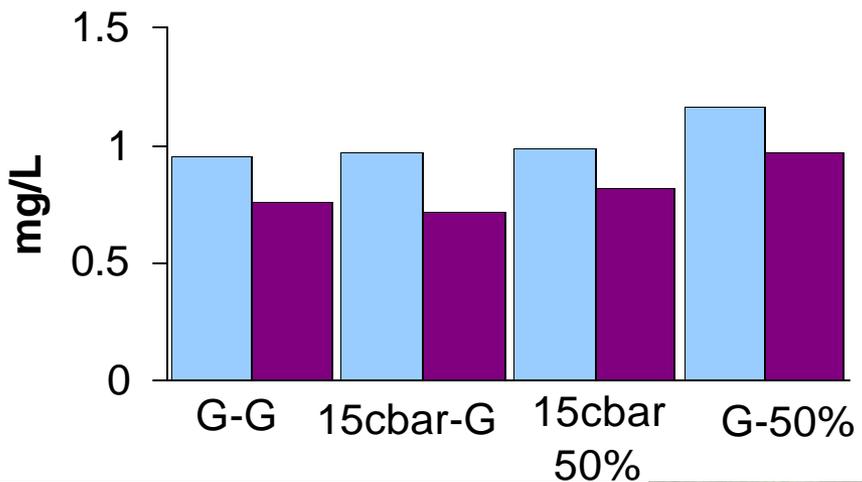
- For all treatments sorted by area: TP, PO₄P, NO₃N, NH₄N

Treatment	Irrigation	N-P-K fertilizer
1 ^a	Grower	Grower
3 ^a	15 cbar	Grower
4 ^a	15 cbar	50% of grower
6 ^a	Grower	50% of grower

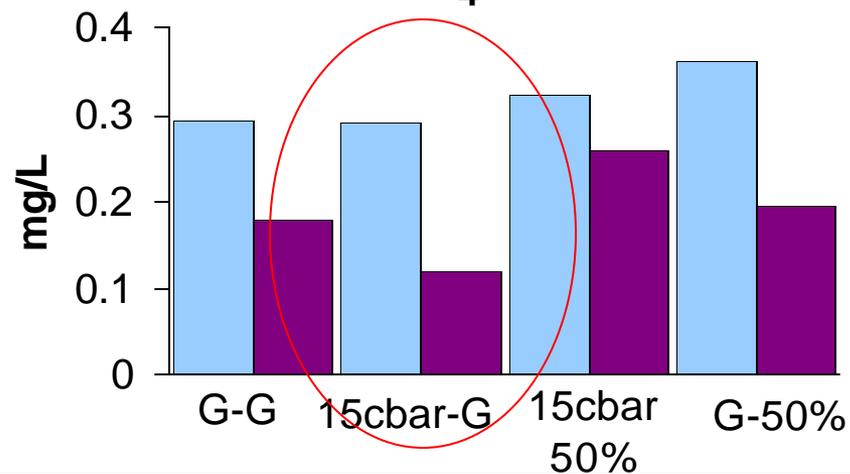
Results: water quality

- Comparing areas (a and b) for each treatment
- Only 2 significant differences:
 - Treatment 3 (grower fert; 15 cbar irrig); NO_3N and PO_4P

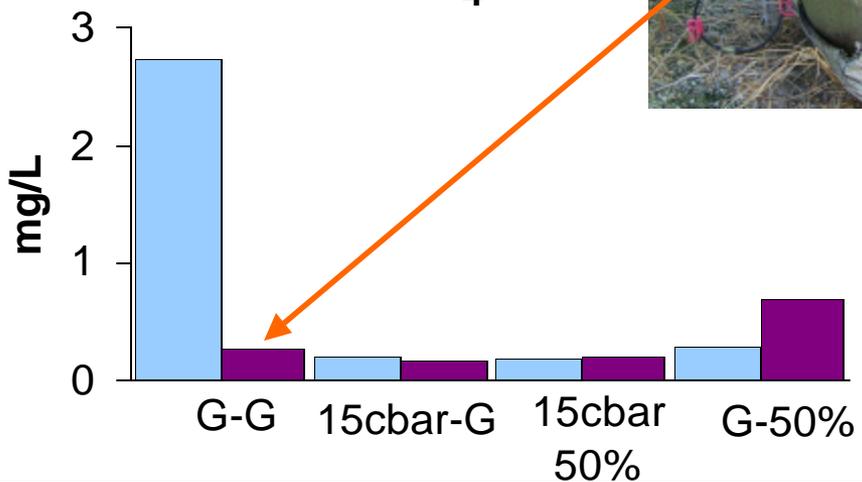
TP



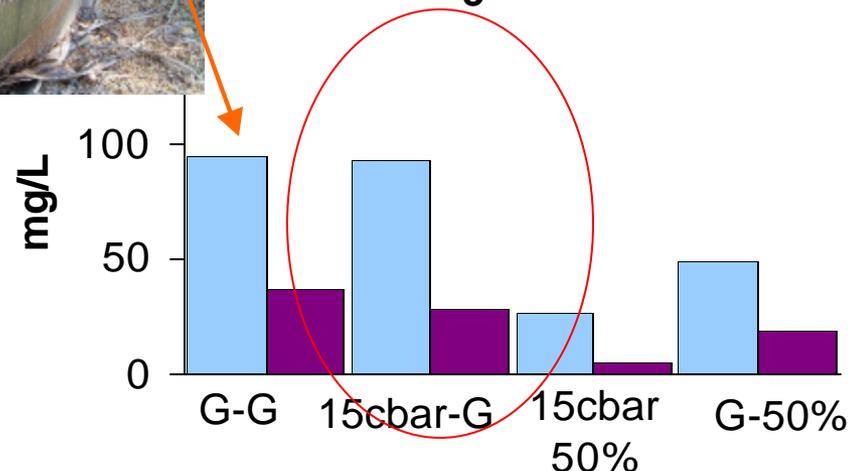
PO₄-P



NH₄-N



NO₃-N



Results: irrigation

Irrigation treatment	% irrigation water reduction from grower volume
5 cbar	80
15 cbar	94

Conclusions

- Tissue and soil sampling: initial indication of no significant difference, which was expected
- Water quality data is starting to show significant differences among treatments, it appears that PO_4P and NO_3N are likely more influenced by the nutrient treatment than the irrigation treatment

Conclusions

- So far, N-P-K has been reduced by 50% and water by at least 84% with no observed significant differences in palm diameters, height, or SPAD

Future

- We still have 1 yr left for data collection
- We will be installing tensiometers (3 depths) to investigate capillary rise which is believed to be contributing water to the palms

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