

Update on Florida Nutrient Management Research

Phosphorus Study for Bean, Potato and Tomato

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All Analyses Preliminary

First Take on Data

Ongoing Data Processing, QA/QC, Compilation, Analyses

No Reproduction Please

Central Florida

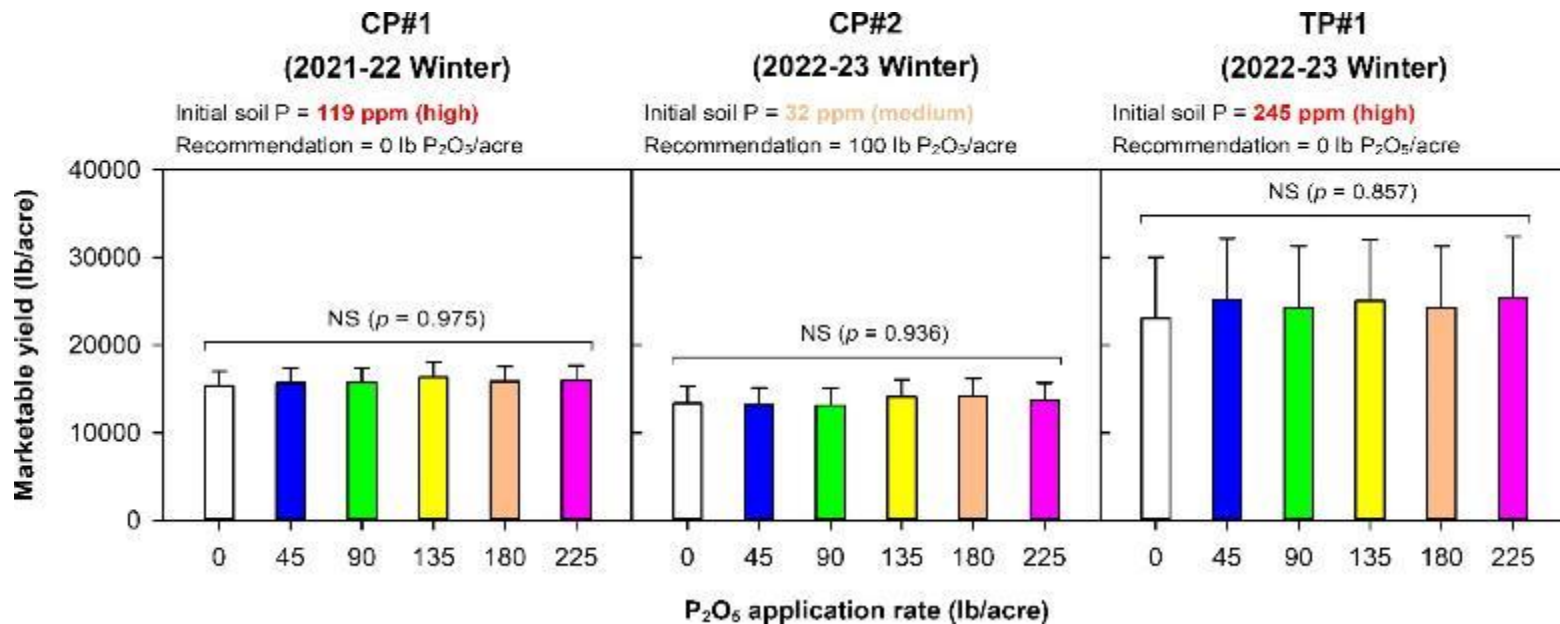
Year 1–2 Field Trials in Central FL

Crop	Year/Season (# of trials)	Total trial #
Potato (chip)	Year 1 (1) Year 2 (1)	2
Potato (table-stock)	Year 1 (1)	1
Tomato	Year 1 (3) Year 2 (1)	4
Green bean	Year 2 (1)	1

Potato

Type	ID	Yea/Season	Irrigation	P ₂ O ₅ rate (lb/acre)	Initial soil P (ppm)	P ₂ O ₅ recommendation
Chip	CP#1	2021-22 Winter	Seepage	0, 45, 90, 135, 180, 225	119 ppm (high)	0 lb/acre
	CP#2	2022-23 Winter	Seepage	0, 45, 90, 135, 180, 225	32 ppm (med)	100 lb/acre
Table-stock	TP#1	2022-23 Winter	Seepage	0, 45, 90, 135, 180, 225	245 ppm (high)	0 lb/acre

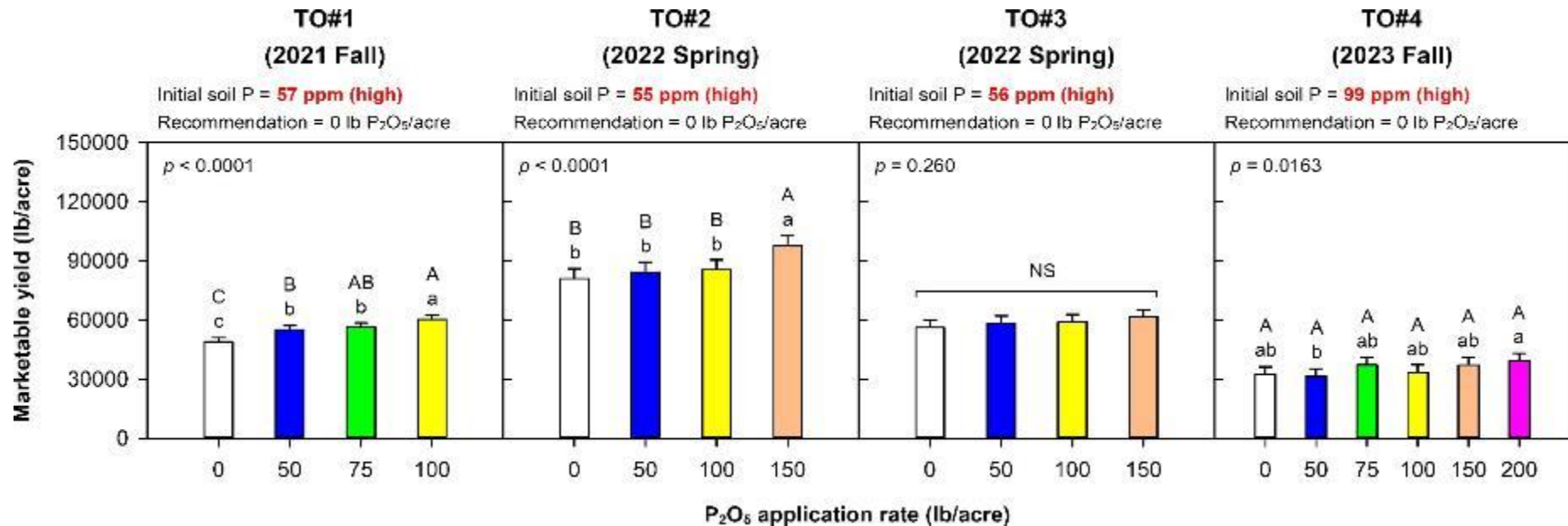
Potato Yield



Tomato

ID	Yea/Season	Irrigation	P ₂ O ₅ rate (lb/acre)	Initial soil P (Mehlich-3)	P ₂ O ₅ recommendation
TO#1	2021 Fall	Drip	0, 50, 75, 100	57 ppm (high)	0 lb/acre
TO#2	2022 Spring	Drip	0, 50, 100, 150	55 ppm (high)	0 lb/acre
TO#3	2022 Spring	Seepage	0, 50, 100, 150	56 ppm (high)	0 lb/acre
TO#4	2022 Fall	Drip	0, 50, 75, 100, 150, 200	99 ppm (high)	0 lb/acre

Tomato Yield



November 1, 2022 (70 days after planting – first harvest)

P₂O₅ application rate

0 lb/acre

50 lb/acre

100 lb/acre

150 lb/acre

200 lb/acre



Green Bean

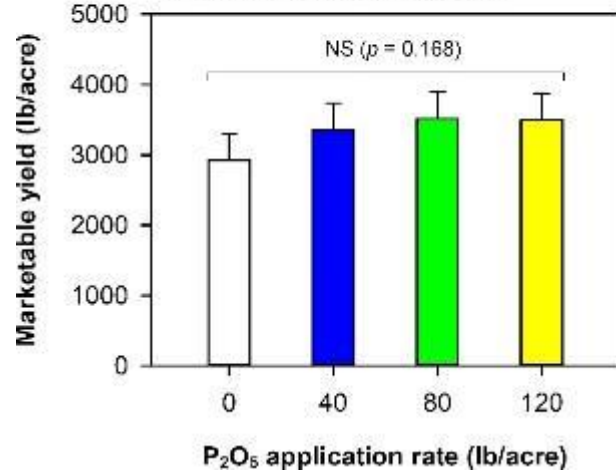
ID	Yea/Season	Irrigation	P ₂ O ₅ rate (lb/acre)	Initial soil P (Mehlich-3)	P ₂ O ₅ recommendation
GB#1	2022 Fall	Seepage	0, 40, 80, 120	140 ppm (high)	0 lb/acre

Green Bean Yield

**GB#1
(2022 Fall)**

Initial soil P = **140 ppm (high)**

Recommendation = 0 lb P₂O₅/acre



November 22, 2022 (34 days after planting)

P₂O₅ application rate



South Florida

SFL Potato Sites (2021-2022)

Site	Irrigation	Season	P ₂ O ₅ Rate (lb/acre)	M-3P (ppm)	M-3Ca (ppm)	pH
SFL#1	Seep	Winter	0, 46, 92, 137, 183, 229	209	824	7.3
SFL#2	Seep	Spring	0, 46, 92, 137, 183, 229	167	1790	7.4
SFL#3	Seep	Winter	0, 46, 92, 137, 183, 229	205	792	7.2
SFL#4	Seep	Spring	0, 46, 92, 137, 183, 229	216	-	7.4

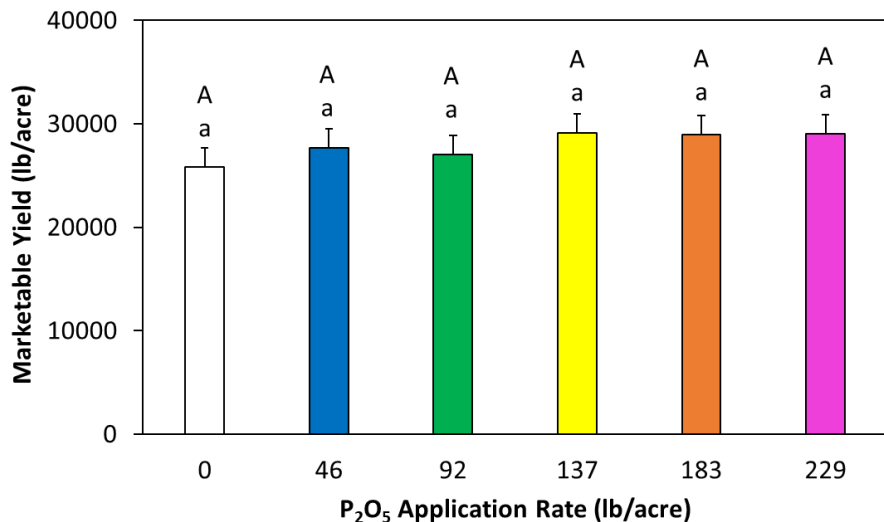
Potato (table-stock) Yield Response to Phosphorus - South FL (2021-2022)

Potato SFL #1 - Winter 2021-2022

Initial M-3 P = 209 ppm

Recommendation = 0 lb P₂O₅/acre

p = 0.12

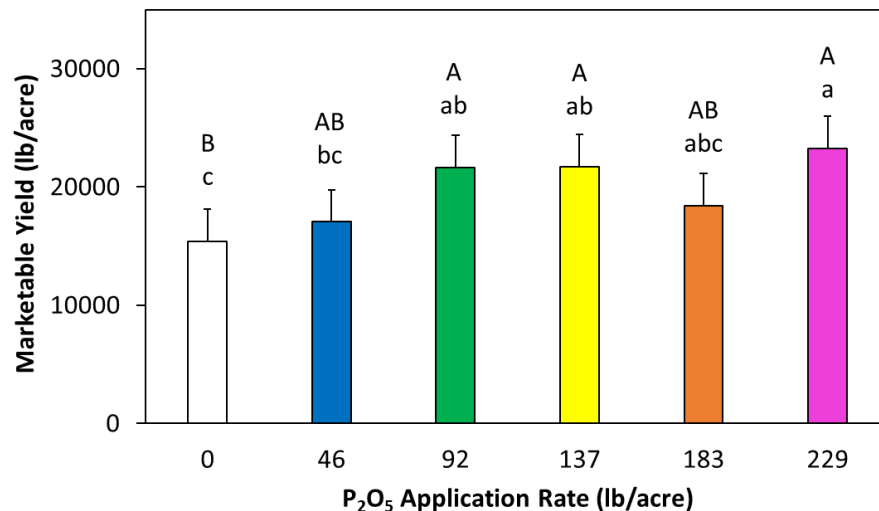


Potato SFL #2 - Spring 2022

Initial M-3 P = 167 ppm

Recommendation = 0 lb P₂O₅/acre

p < 0.01

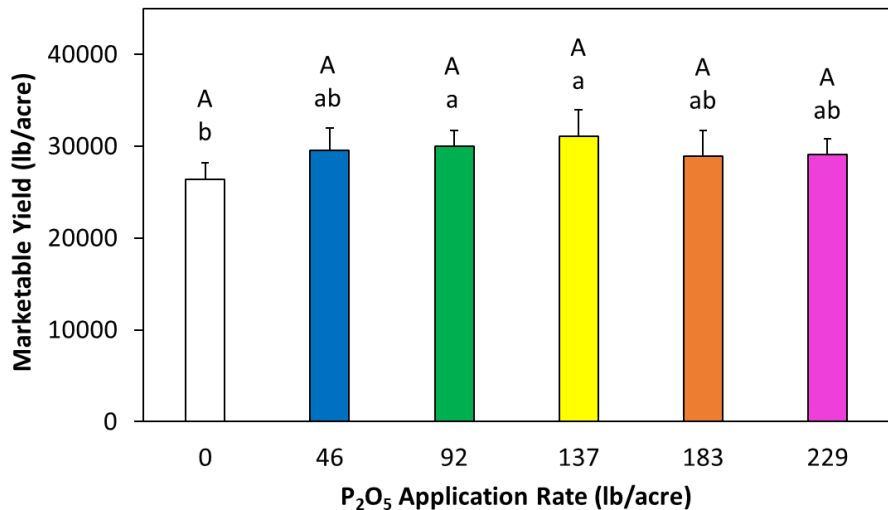


Support for Provisional Recommendation

Potato Yield Response to Phosphorus - South FL (2022-2023)

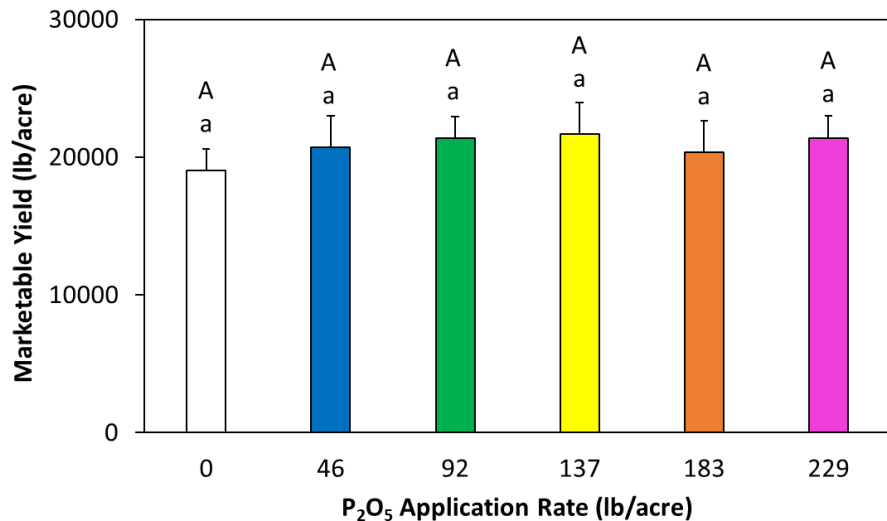
Potato SFL #3 - Winter 2022-2023

Initial M-3 P = 205 ppm
 Recommendation = 0 lb P₂O₅/acre
 p < 0.01



Potato SFL #4 - Spring 2023

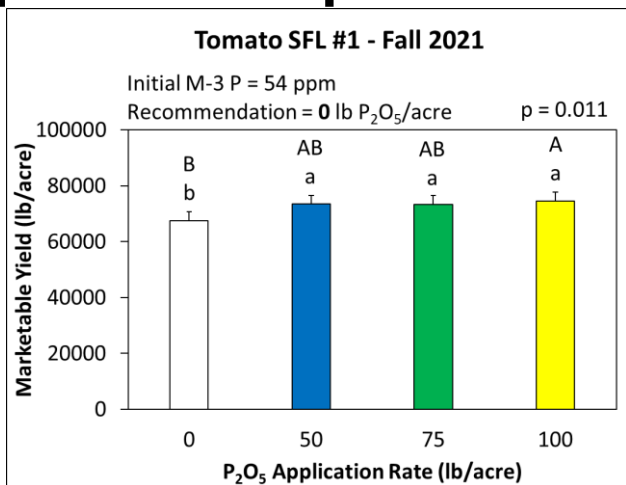
Initial M-3 P = 216 ppm
 Recommendation = 0 lb P₂O₅/acre
 p = 0.23



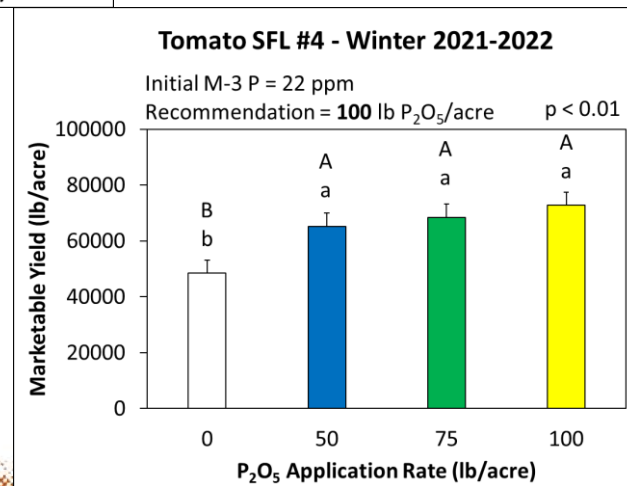
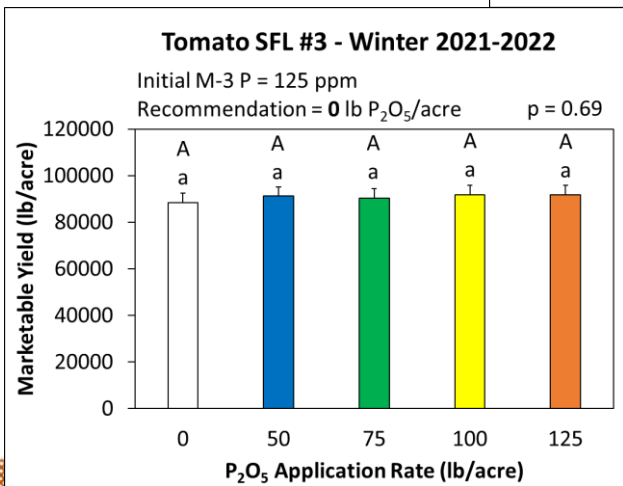
SFL Tomato Sites (2021-2023)

Site	Irrigation	Season	P ₂ O ₅ Rate (lb/acre)	M-3P (ppm)	M-3Ca (ppm)	pH
SFL#1	Drip	Fall	0, 50, 75, 100	54	722	7.3
SFL#2	Drip	Fall	0, 25, 50, 75, 100, 125	145	3136	7.9
SFL#3	Drip	Winter	0, 50, 75, 100, 125	125	6692	8.0
SFL #4	Seep	Winter	0, 50, 75, 100	22	5350	8.1
SFL#5	Drip	Fall	0, 50, 75, 100, 150, 200	48	613	7.8
SFL#6	Drip	Winter	0, 50, 75, 100, 120, 200	100	2574	7.8
SFL#7	Drip	Winter	0, 50, 75, 100, 150, 200	140	1009	6.6

Tomato Yield Response to Phosphorus - South FL (2021-2022)

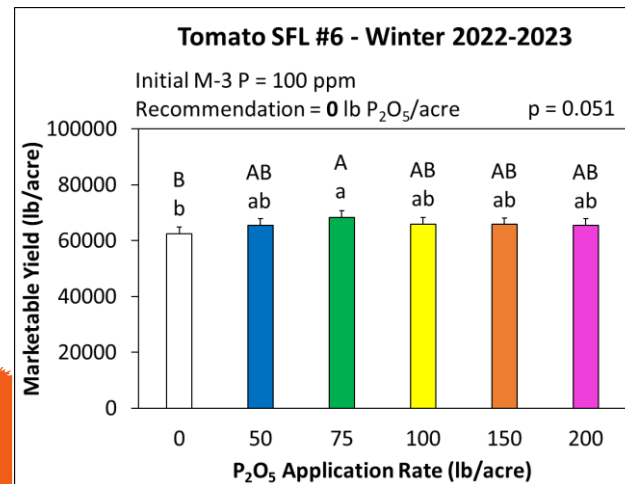
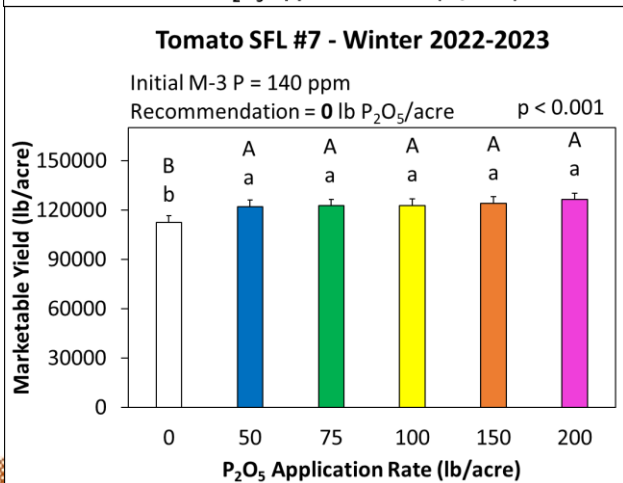
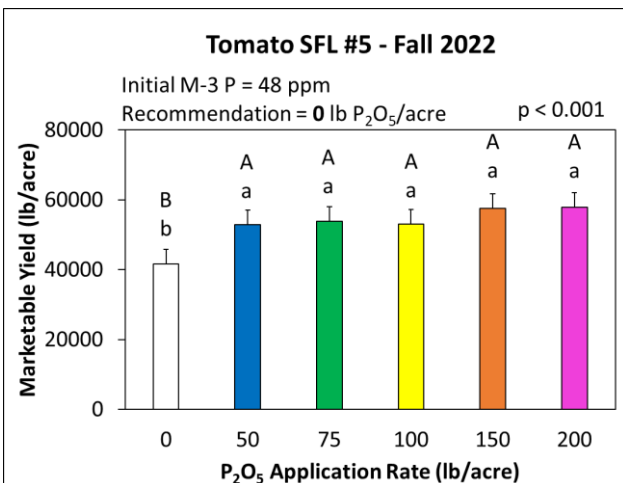


Seepage



Tomato Yield Response to Phosphorus - South FL (2022-2023)

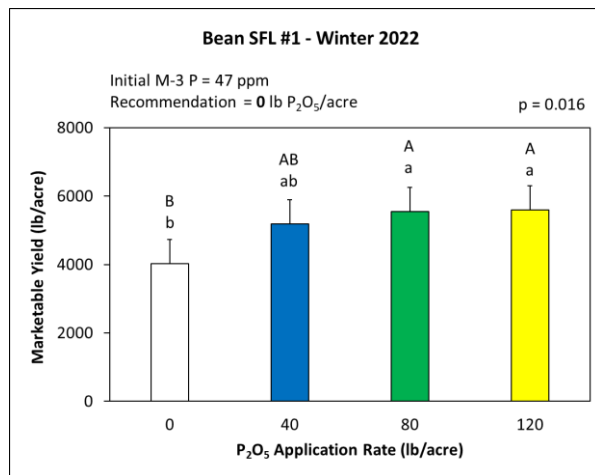
Hurricane Ian



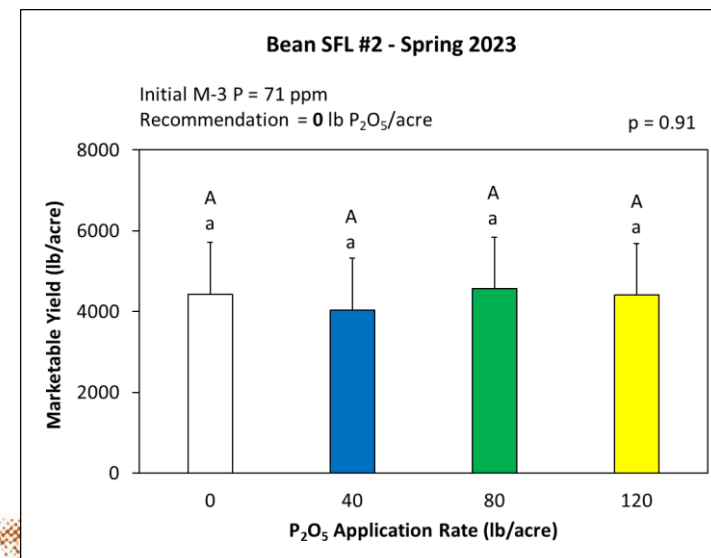
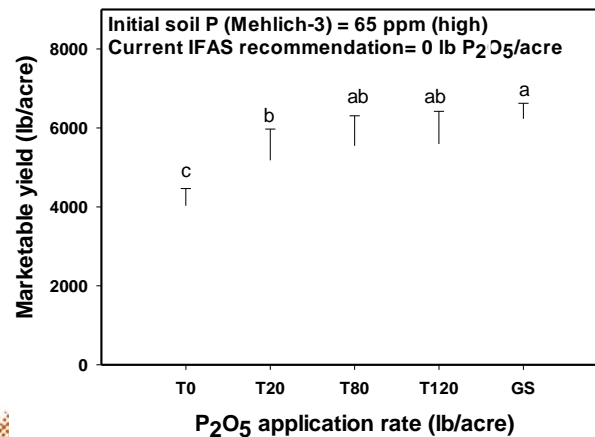
Bean Yield Response to Phosphorus - South FL (2022-2023)



P source effect: SFL growers - liquid P – highest yield
Evidence for water (ditch) effect



BF1



OVERALL SUMMARY

- **Tomato**
 - **Positive yield response to P fertilizer on most sites with “high” M3-P soil test.**
 - **P₂O₅ fertilizer rate around 50 lbs/ac was needed for maximum yield at majority of sites.**
 - **The critical value of M3 soil test P for tomato may be 100 ppm or higher.**
- **Potato**
 - **Positive yield response to P fertilizer where soil test P was “high.” (Support for the current provisional recommendation).**
 - **In Central-South FL, 92-137 lbs/ac P₂O₅ needed for max. yield even at >150 ppm M3-P**
 - **M3-P critical value is being investigated.**
- **Bean**
 - **1-year data shows some positive yield response to P fertilizer where M3-P test was “high.”**
 - **40-120 lbs/ac (dry) or 80 lbs/ac (liquid) produced maximum yield in South FL.**
- **Soil moisture (ditch) effect was observed with bean and tomato, confirming earlier (Shukla et al) USDA study on tomato. Row position (outer vs. inner) may need to be considered in site-specific recommendations to avoid yield loss**
- **More data, especially for some M3-P ranges, are needed to develop a robust recommendation.**

FUTURE

- **Continue processing, QA/QC, and analyses of plant, soil and water data.**
- **Continue third year of potato and tomato experiments and second year of bean experiments.**
- **Analyze interactions with soil chemical (pH, Ca, etc) & physical factors, irrigation, and hydrology.**
- **Field-verify hydrologic model for three crops to evaluate the effect of weather factors.**
- **Presentation of tomato analyses to IFAS Plant Nutrient Oversight Committee.**
- **Combine field data with results from hydrologic and AI models and economic analyses, to develop fertilizer recommendation tool**

Acknowledgement

- **Bean, Potato and Tomato Growers of FL**
 - **Farmland 5-45 Acres, Packinghouse**
 - **Personnel, yield loss, material, transport/logistics,**
 - **Planning, executing, managing, harvesting, grading**



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CENTRAL/SOUTH FL BEAN, POTATO, TOMATO TEAM: SYSTEMS APPROACH

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