

South Florida Vegetable Nitrogen BMP Trials 2004-2009



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1. Funding: DACS (Florida Department of Agriculture and Consumer Services): Awarded \$521,700/5 years, but in reality 3.5 years.
2. Share program.
3. Industry: we developed strong successful partnerships for 12 seasons with 650 acres (U\$1,000,000 in-kind) under BMP experiments.



**Thanks, Thanks and Thanks
to the “tomato growers” for
creating a popular BMP program**

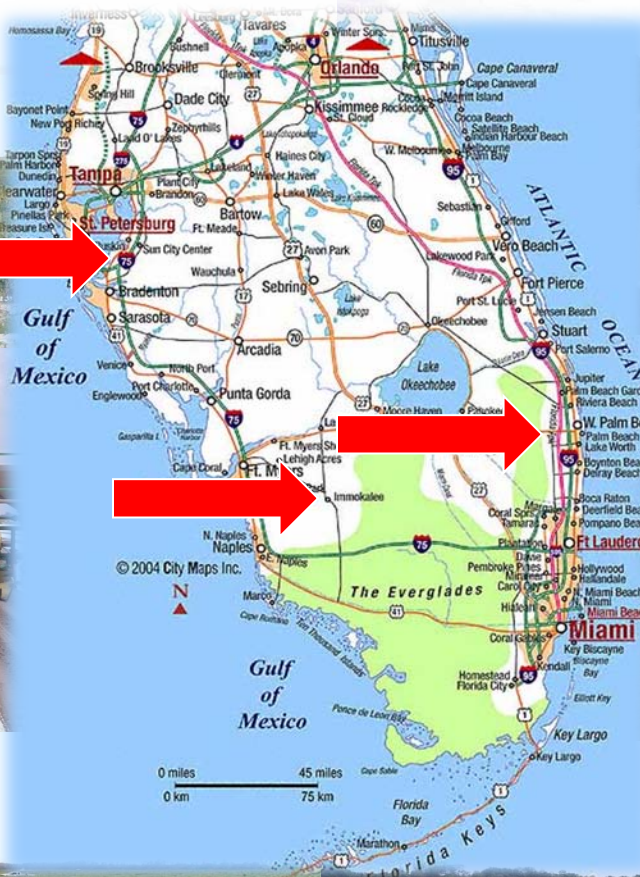
Objectives

1. Establish partnerships tomato growers to evaluate the effects of N rates under commercial growing conditions.
2. Evaluate the N rates on plant growth, disease incidences, and production.
3. Determine the optimal N rate and evaluate the cost effectiveness.
4. Propose, if needed, a change in N recommendation

- ✓ Soluble N for seepage irrigation
 - ✓ Drip (limited information)
- ✓ CRF (Controlled Release Fertilizer/N)

	Fertilizer Application (lb/acre)			
	N	P ₂ O ₅	K ₂ O	N:K
Mean	280	137	512	1:1.7
SD	36	50	94	1:0.2





70% of the tomato production is in the Southwest Florida area: Collier and Manatee County in sandy soils



36 N Trials from 2004 - 2009

Nitrogen Trials in Southwest Florida 2004-05 (60 acres)

Trial number	Location	Season	Irrigation type	N rate (lb/acre)^z	Exp. size (acres)
1	Collier	Fall, Sept. 28	Seepage	200, 240, 260, 260+BS^y	1.3
2	Collier	Fall, Oct. 5	Seepage	195 and 255	1.7
3	Collier	Fall, Oct. 5	Seepage	200 and 300	1.7
4	Collier	Fall, Oct. 11	Drip/seepage	250 and 418	0.2
5	Collier	Winter, Nov. 22	Drip	260 and 300	50
6	Collier	Winter, Dec. 3	Seepage	195 and 255	1.7
7	Collier	Spring, Jan. 28	Seepage	195 and 255	1.7
8	Manatee	Spring, Mar. 10	Seepage	200, 250, 300, 350 and 400	0.55

^z based on 6-ft spacing or 7,260 linear bed feet per acre

Nitrogen Trials in Southwest Florida 2005-06 (155 acres)

Trial number	Location	Season	Irrigation type	N rate (lb/acre)	Exp. size (acres)
1	Collier	Fall, Sept. 19	Seepage	200 to 275 230 to 305	1.2 (CRD/3)
2	Collier	Fall, Sept. 15	Seepage	200 & 260 310 & 370	30 (CRD/3)
3	Collier	Fall, Oct. 5	Drip	200 & 300 260 & 345	32
4	Collier	Winter, Nov. 17	Seepage	200 and 260	18 (CRD/3)
4	Collier	Winter, Nov. 14	Drip	200 and 300	50
6	Pam Beach	Winter, Nov. 18	Seepage	200 and 330	9 (CRD/3)
7	Collier	Spring, Jan. 4	Seepage	200 and 320	5 (CRD/3)
8	Collier	Spring, Feb. 17	Seepage	200 and 260	9 (CRD/3)

Nitrogen Trials in Southwest Florida 2006-07 (218 acres)

Trial number	Location	Season	Irrigation type	N rate (lb/acre)	Exp size (acres)
1	Collier	Fall, Aug 31	Seepage	200 and 260	21 (CRD/3)
2	Collier	Winter, Oct 16	Drip	200 and 300	35
3	Collier	Winter, Oct 17	Seepage	200, 250, 200+C	1 (CRD/3)
4	Collier	Winter, Oct 26	Seepage	200 and 320	3 (CRD/3)
5	Collier	Winter, Nov 15	Seepage	200 and 260	21 (CRD/3)
6	Collier	Winter, Nov 27	Drip	200 and 300	50
7 (pepper)	Palm Beach	Winter, Nov 21	Seepage	200 and 300	5.5 (CRD/3)
8	Palm Beach	Winter, Nov 24	Seepage	200 and 300	5.5 (CRD/3)
9	Collier	Spring, Feb 12	Seepage	200 and 260	18 (CRD/3)
10	Manatee	Spring, Feb 15	Seepage	20 to 420	0.4 (RCB/4)
11	Manatee	Spring, Feb 19	Drip	225 and 330	19 (CRD/3)
12	Manatee	Spring, Feb 19	Drip	225 and 330	19 (CRD/3)
13	Manatee	Spring, Feb 19	Drip	225 and 330	13 (CRD/3)

Nitrogen Trials in Southwest Florida 2007-08 (20 acres)

Trial number	Location	Season	Irrigation type	N rate (lb/acre)	Exp. size (acres)
1	Manatee	Fall, Aug. 21	Seepage	20 to 420	0.4 (RCB/4)
2 (Urea/CRF) Tomatoes	Collier	Winter, Dec. 13	Seepage	200 (S) 266 (S) 150 (2/CRF) 200 (2/CRF)	9 (RCB/3)
3	Manatee	Spring, Feb. 5	Seepage	20 to 420	0.4 (RCB/3)
4 (Urea/CRF) Peppers	Collier	Spring, Jan. 21	Seepage	200 (S) 266 (S) 150 (2/CRF) 200 (2/CRF)	9 (RCB/3)

Nitrogen Trials in Southwest Florida 2008-09 (10 acres)

Trial number	Location	Season	Irrigation type	N rate (lb/acre)	Exp. size (acres)
1	Manatee	Fall, Aug. 21	Seepage	20 to 420	0.4 (RCB/4)
2 (KN/CRF)	Collier	Winter, Oct. 23	Seepage	200 (S) 266 (S) 150 (50/CRF) 200 (100/CRF) 250 (150/CRF)	7.5 (RCB/3)

Nitrogen Trials in Southwest Florida 2009-10 (13 acres)

Trial number	Location	Season	Irrigation type	N rate (lb/acre)	Exp. size (acres)
1 (KN/CRF)	Collier	Fall, Sept. 9	Seepage	200 (S) 266 (S) 150 (50/CRF) 200 (100/CRF) 250 (150/CRF)	15 (RCB/4)



10 plants per plot
3 harvests



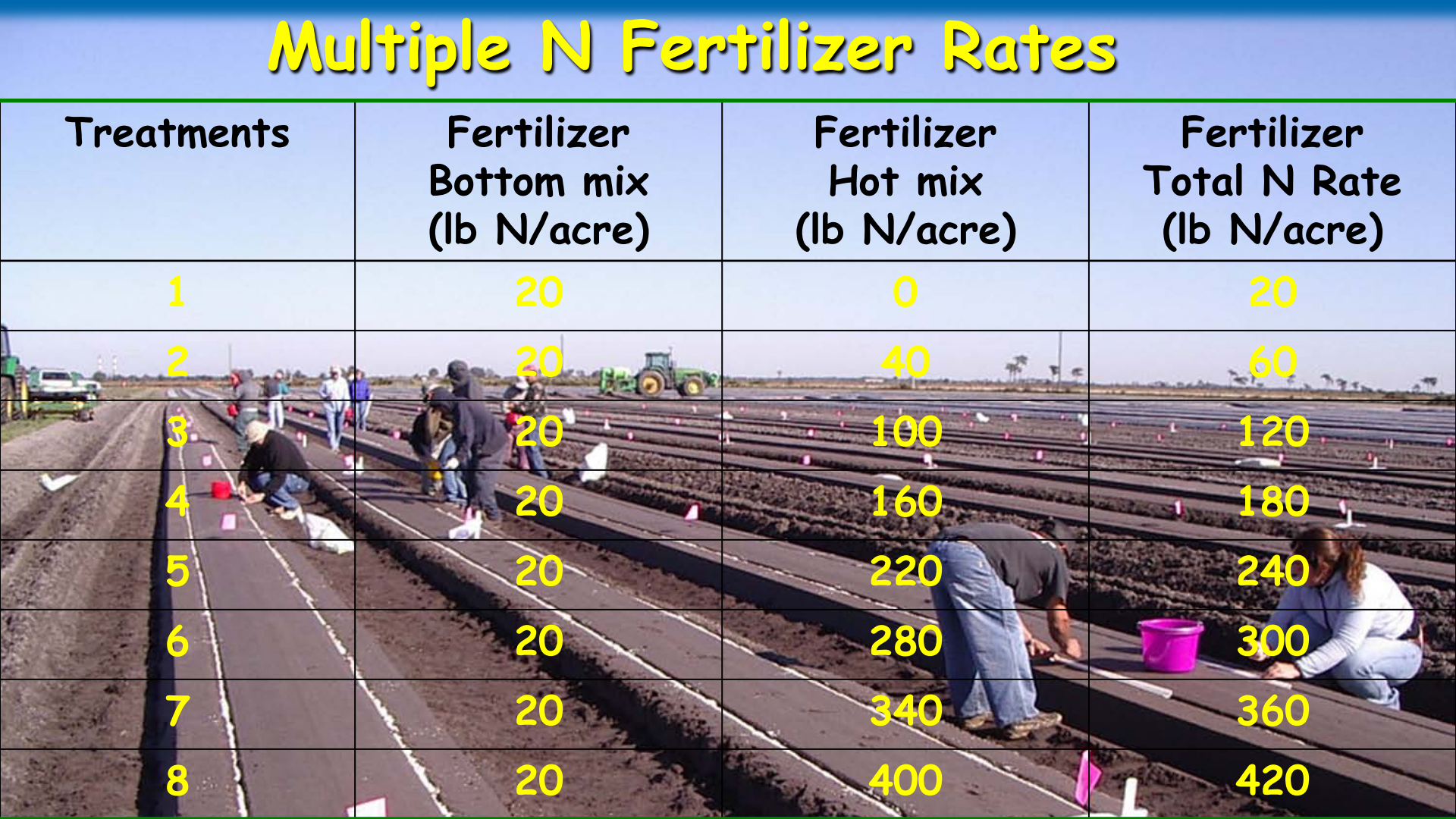


Three Harvest
5/6, 6/6, 6/7 and culls

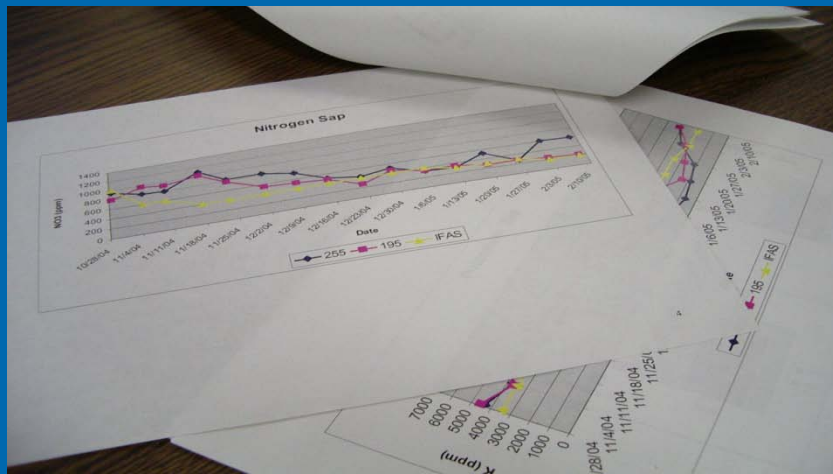


Multiple N Fertilizer Rates

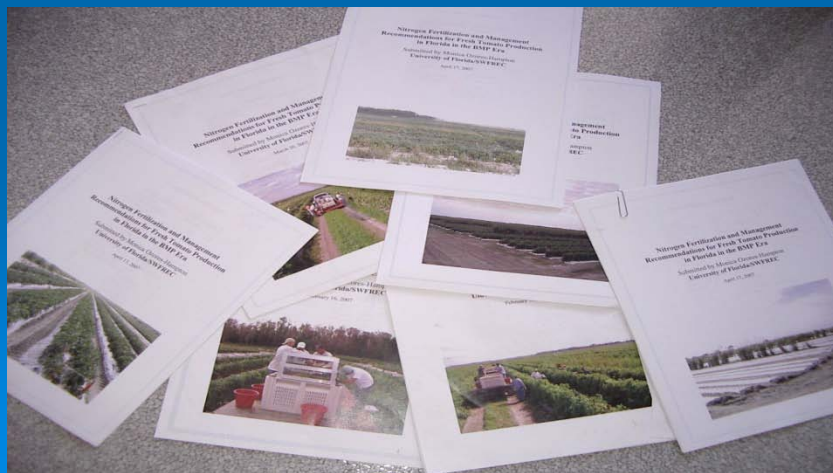
Treatments	Fertilizer Bottom mix (lb N/acre)	Fertilizer Hot mix (lb N/acre)	Fertilizer Total N Rate (lb N/acre)
1	20	0	20
2	20	40	60
3	20	100	120
4	20	160	180
5	20	220	240
6	20	280	300
7	20	340	360
8	20	400	420

A background photograph of a large agricultural field experiment. The field is divided into numerous long, narrow plots. Several people are visible, some kneeling and others standing, likely conducting measurements or applying treatments. A green tractor is visible in the distance. The sky is clear and blue. The overall scene depicts a controlled agricultural study.



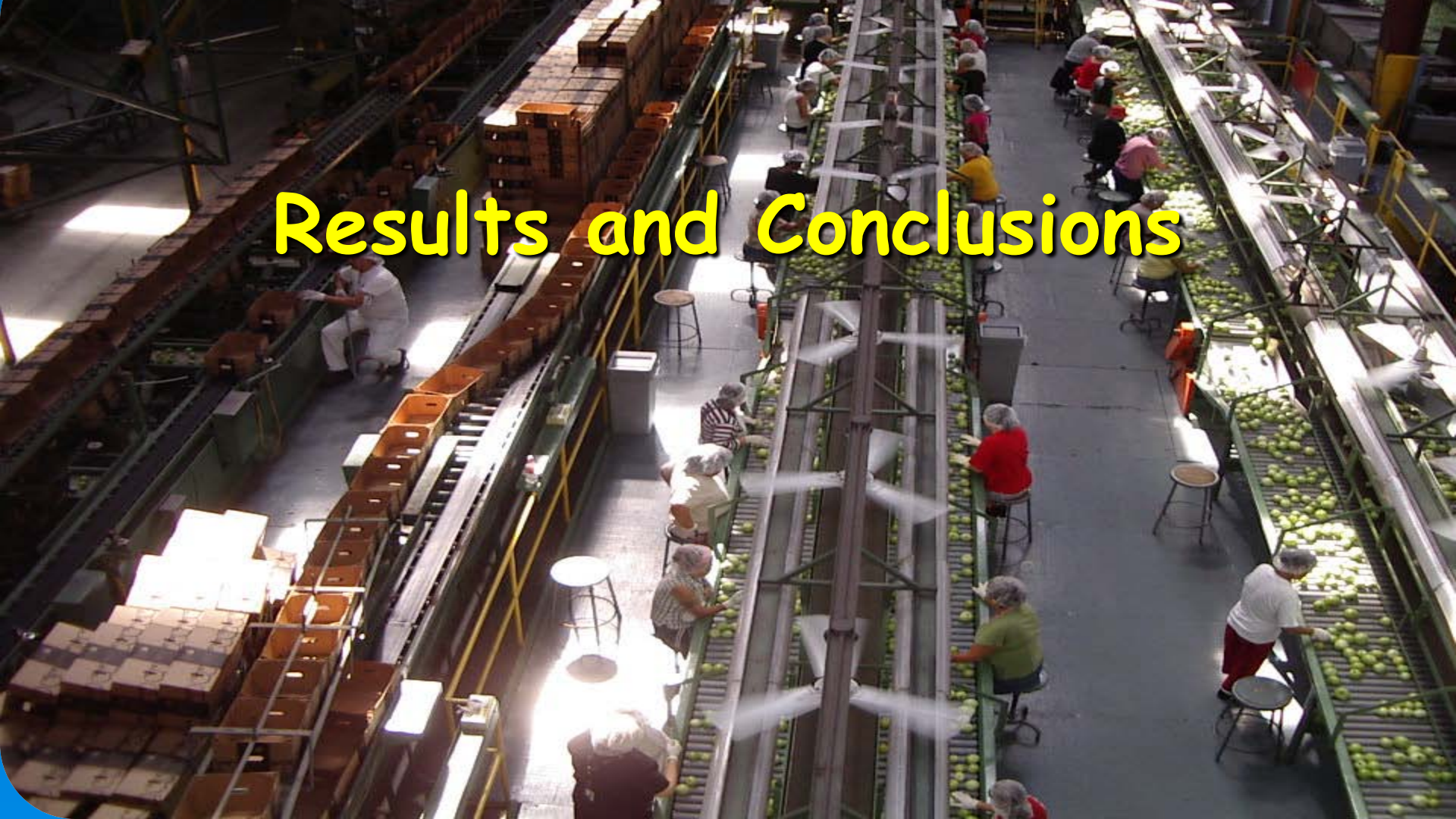


Biweekly report to growers
and IFAS

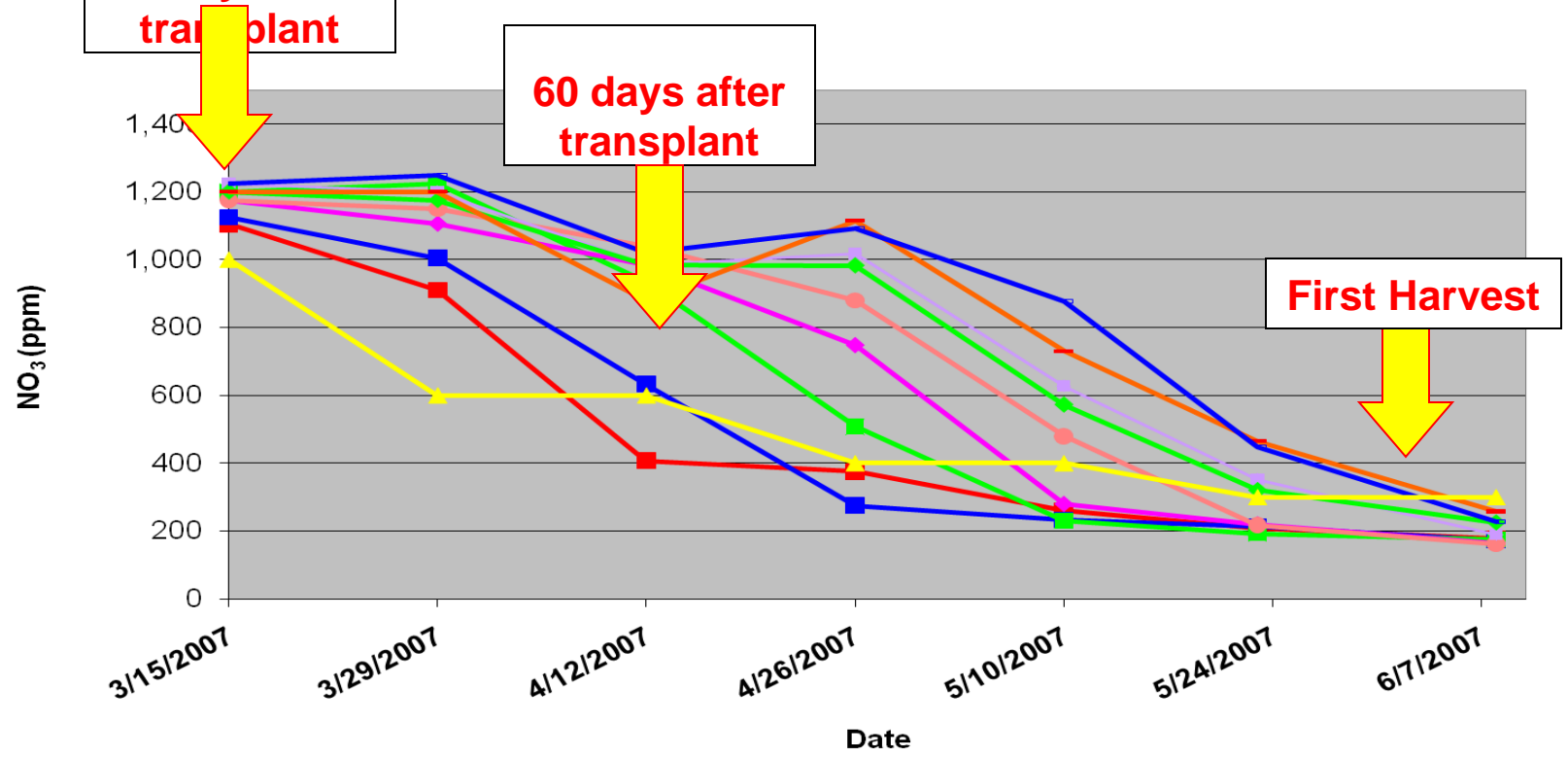


Final report to growers
and final data set to IFAS

Results and Conclusions



Nitrogen Sap



- 20
- 60
- 120
- 180
- 240
- 300
- 320-G
- 360
- 420
- IFAS



20



60



30 days

120



180



240



300



360



420



Grower

60 days

20

60

120



180



240



300



360



420



G



20



60



100 days

2 days after 2nd Harvest

120



180



240



300



360

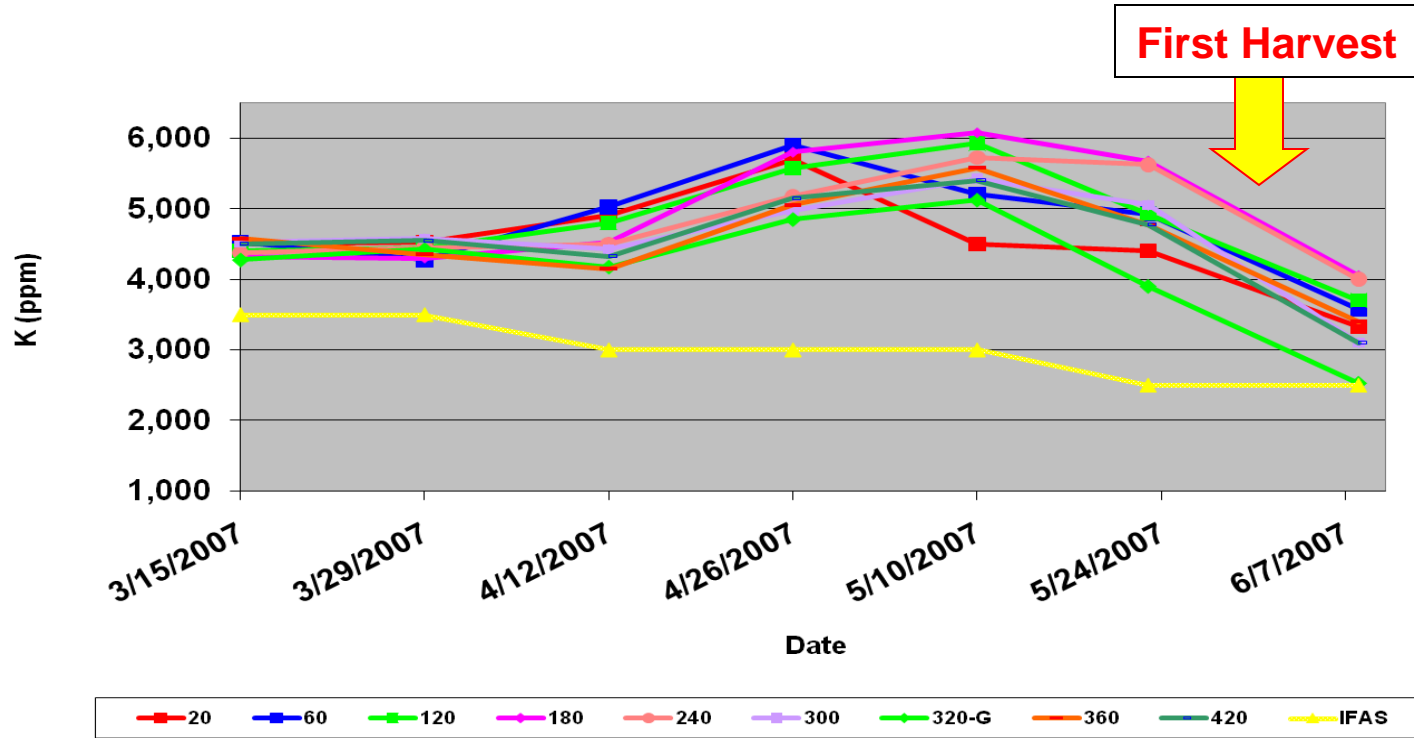


420

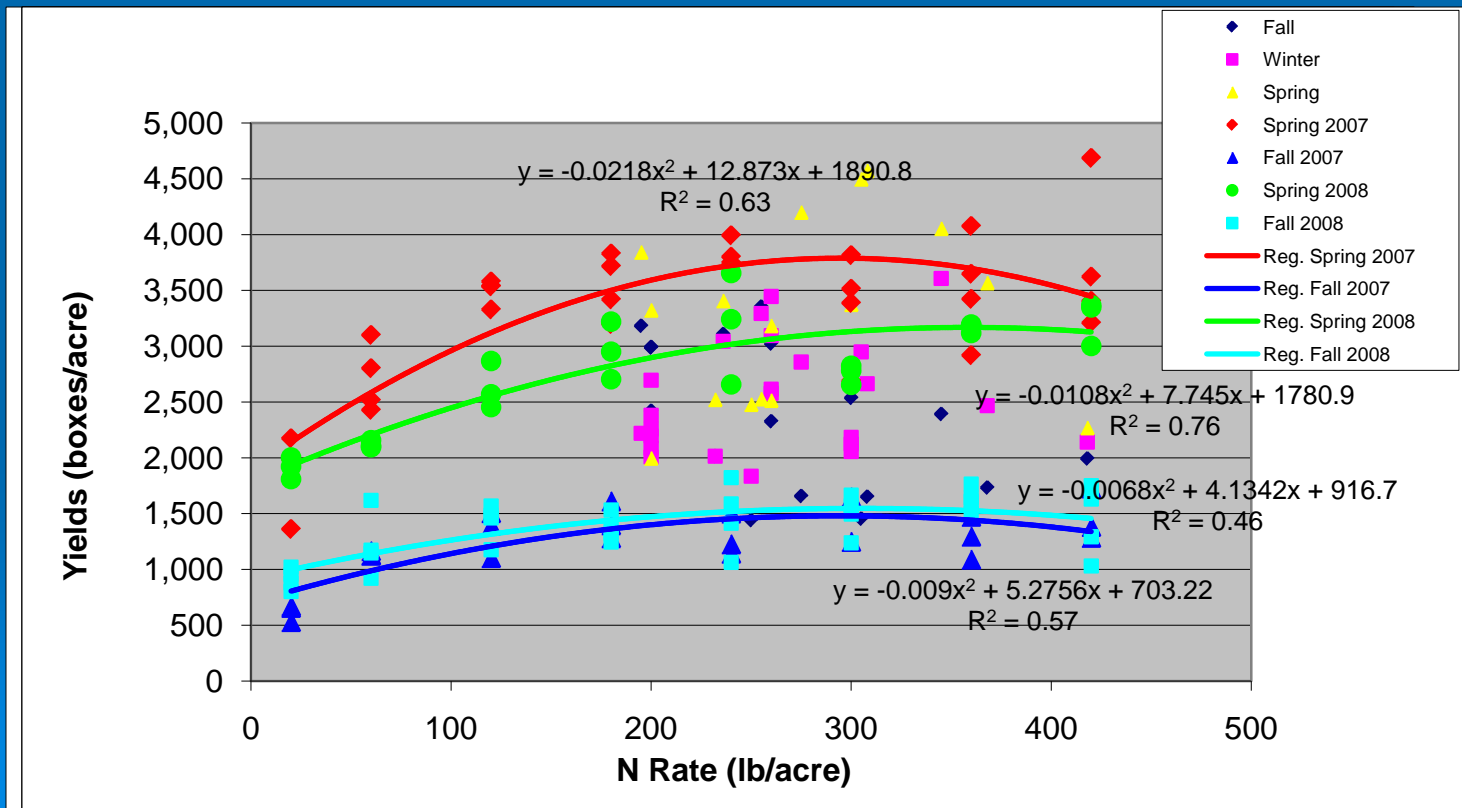


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Potassium Sap



Total Marketable Yields 32 Trials (2004-07)



Spring 2007

Harvest	N rate (lb/acre)	No Boxes/acre	R ²
Total	295	3,791	0.63
X-large	283	3,055	0.43

Spring 2008

Harvest	N rate (lb/acre)	No Boxes/acre	R ²
Total	359	3,169	0.76
X-large	371	2,343	0.64

Fall 2007

Harvest	N rate (lb/acre)	No Boxes/acre	R ²
Total	293	1,476	0.57
X-large	348	1,007	0.52

Fall 2008

Harvest	N rate (lb/acre)	No Boxes/acre	R ²
Total	304	1,545	0.46
X-large	380	777	0.36

Tomato Biomass and Fruit N Partitioning under Two Nitrogen Rates

Treatment	Biomass	Marketable Yield	Total	N Uptake Efficiency
	-----N (lb/acre)-----			(%)
-----Spring 2006-----				
320	83.4	140.2	223.6	70
200	66.1	105.4	171.5	86
-----Winter 2006-----				
320	108.7	97.2	205.9	64
200	96.1	77.1	173.2	87

Effect of Nitrogen Rate on Yield of Tomato Grown with Seepage Irrigation and Reclaimed Water



NO₃ (lb/acre)

70
60
50
40
30
20
10
0

Feb

Mar

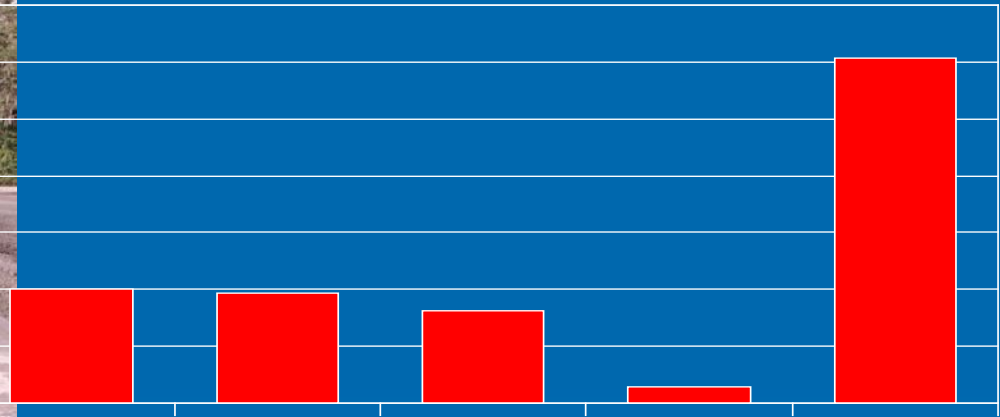
Apr

May

Jun

Total

Time



Ozores-Hampton, et al., 2007. Effect of nitrogen rate on yield of tomato grown with seepage irrigation and reclaimed water. Proc. Fla. State Hort. Soc. 120:184-188.

Conclusions

- On farm trials continue to be a growers preferred research for N BMP studies.
- The data indicated an increase in total marketable yield, first harvest extra-large and total extra-large fruit from 20 to 240 lb/acre N, but a plateau with higher rates of N.
- **N Rate Strategies:** may be possible to reduce N rates especially when the risk of rainfall is low (winter, spring and dry year), or when only two harvests are expected (late spring).

Nitrogen Leaching Potential and Non-rate Strategies

	Fall	Winter	Spring
Leaching potential	High	Medium-Low	Medium-Low
When	Making beds Pulling plastic Rain events Hurricane	Making beds Pulling plastic Rain events Freeze events	Making beds Pulling plastic Rain events Freeze events
Control action	Cover crop Compost application CRF Additives Water retention area Drip	Cover crop Compost application CRF Additives Water retention area Drip	Cover crop Compost application CRF Additives Water retention area Drip

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