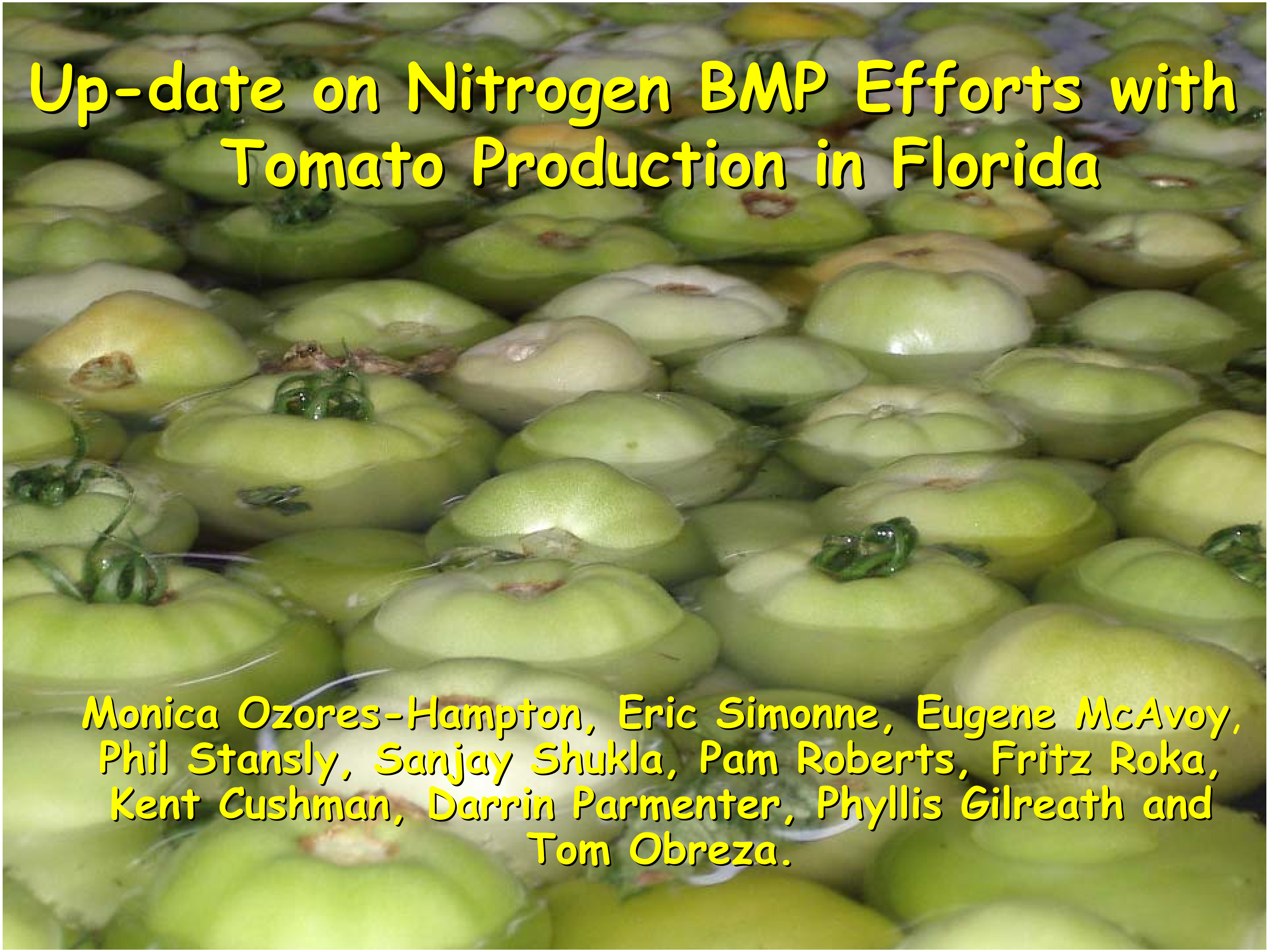


Up-date on Nitrogen BMP Efforts with Tomato Production in Florida

Monica Ozores-Hampton, Eric Simonne, Eugene McAvoy, Phil Stansly, Sanjay Shukla, Pam Roberts, Fritz Roka, Kent Cushman, Darrin Parmenter, Phyllis Gilreath and Tom Obreza.


Thanks, Thanks and Thanks
to the “tomato growers” their
high level of engagement created a popular
BMP program

BMP Background

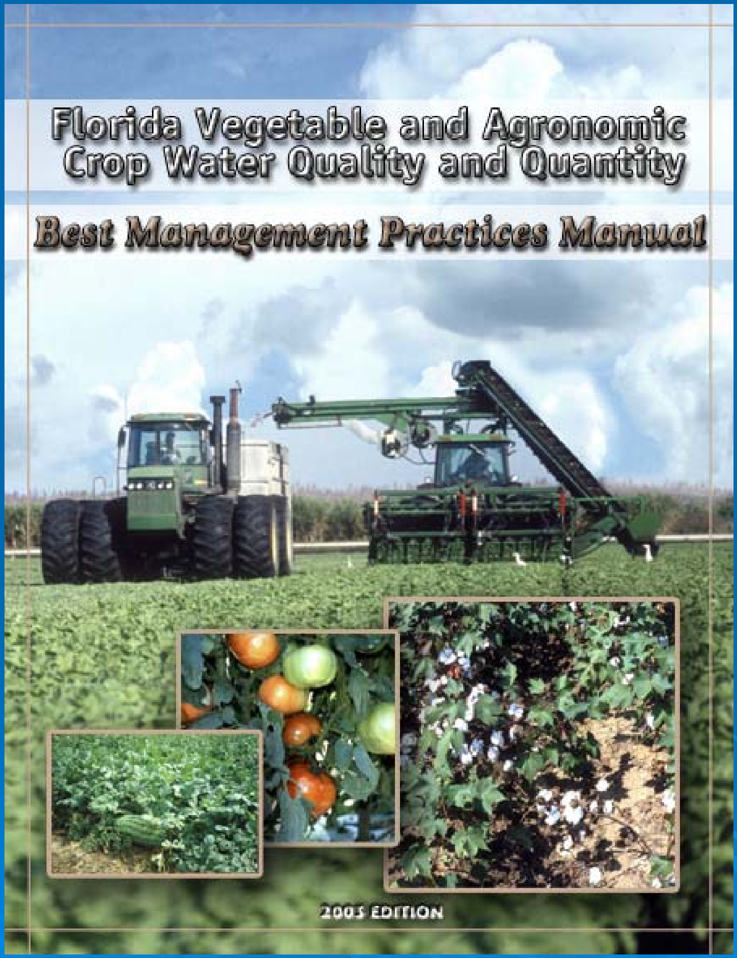
- U.S Federal Clean Water Act of 1977 required that States assess the impact of non-point source of pollution on surface and ground water and establish programs to minimize them.
- Section 303 (d) required States to identify impaired water bodies and establish Total Maximum Daily Loads (TMDL) for pollutants entering these water bodies

BMP Background

- As a response to the federal TMDL mandate, the Florida legislature passed the Florida Watershed Restoration Act.
- The legislation gave the Florida Department of Agriculture and Consumer Services (FDACS) the authority to develop BMP (Best management Practices) to reduce pollutants loads in target watershed.

BMP for Vegetables

DACS. 'The BMP manual for vegetable and agronomic crops grown in Florida has been adopted by reference and by rule 5M-8 of the Florida Administrative code on February 9, 2006.'

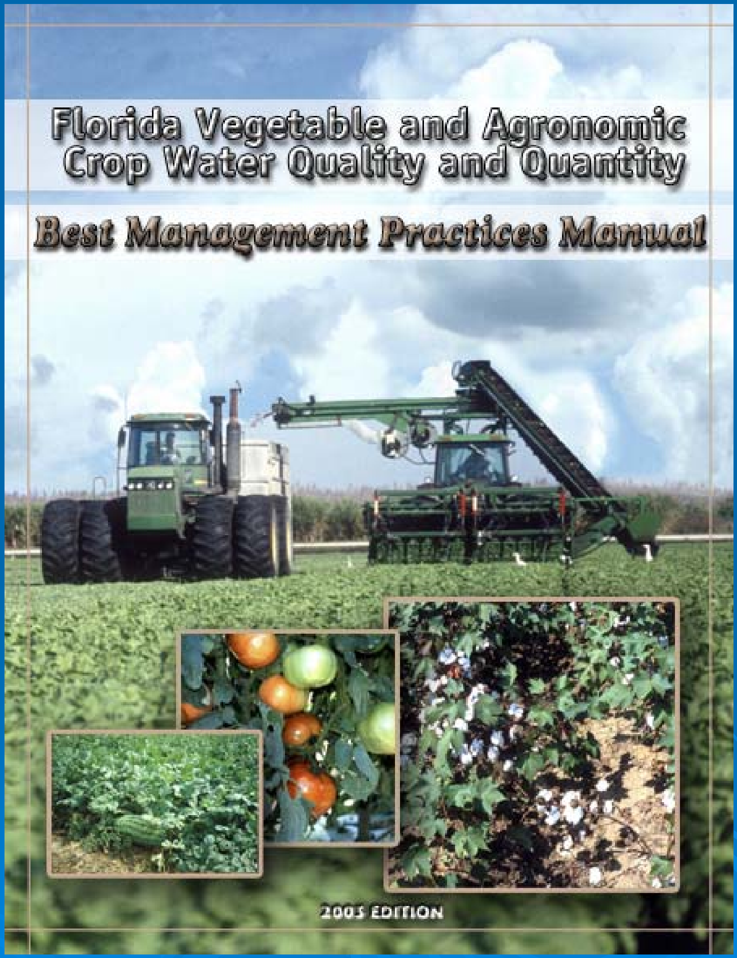


- **DACS web-site:** www.Floridaagwaterpolicy.com

The BMP program is "voluntary"

Table of Contents

- Introduction
- BMP Evaluation and Implementation
- Pesticide Management
- Conservation Practices and Buffers
- Erosion Control and Sediment Management
- Nutrient and Irrigation Management
- Water Resources Management
- Seasonal Farming Operations Management
- Appendix
- Total = 49 BMPs!



Nutrient and Irrigation Management BMP's

- **Optimum fertilizer management/application (33)**

1. Use UF/IFAS (200 lb/acre) or reputable published fertilizer recommendation.

2. If UF/IFAS rates are exceeded, 'grower are expected to employ additional nutrient and irrigation BMP's to negate possible environmental impacts' (A-8)

3. 'For farming operations in significantly impaired basins caused by nutrients, growers must strictly adhere to all recommendations set forth by the Basin Management Action Plan'

What are we doing?

A. IFAS Vegetable Fertilization Standards Task Force

B. **Three years funding from DACS:**

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**

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

Experiment Locations

Nitrogen Rates

Trial number	Farm	Season	Irrigation type	N rate (lb/acre)[z]	Plot size (acres)
2005-06					
1	1	Fall Sep 19	Seepage	200 to 275 230 to 305	0.17 (CRD/3)
2	2	Fall Sept 15	Seepage	200 & 260 310 & 370	5 (CRD/3)
3	5	Fall Oct 5	Drip	200 & 300 260 & 345	17
4	2	Winter Nov 17	Seepage	200 and 260	3 (CRD/3)
4	5	Winter Nov 14	Drip	200 and 300	25
6	5	Winter Nov 18	Seepage	200 and 330	1.5 (CRD/3)
7	3	Spring Jan 4	Seepage	200 and 320	0.83 (CRD/3)
8	2	Spring Feb 17	Seepage	200 and 260	3 (CRD/3)

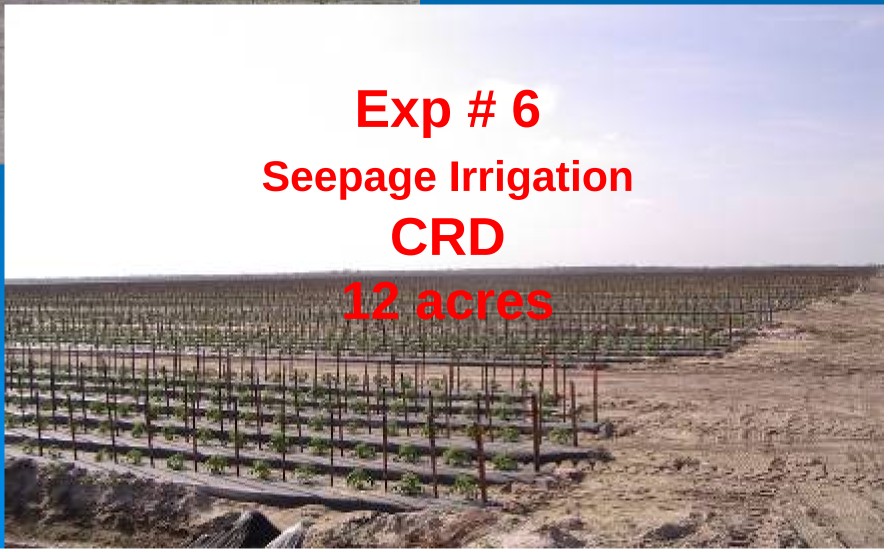
Fall Season


Exp. # 1
Seep
Irrigation
CRD
2.5 acres
200 lb/N


Exp # 2
Seep
Irrigation
CRD
30 acres


Exp # 3
Drip
Irrigation
35 acres

Winter Season



Spring Season

Seepage Experiments


2
3
1
2
3

2-12 plots per treatment with 3 reps
10 plants per plot


Sap Nitrate- NO_3- K


Wells-Water Tables

Suction Lysimeter

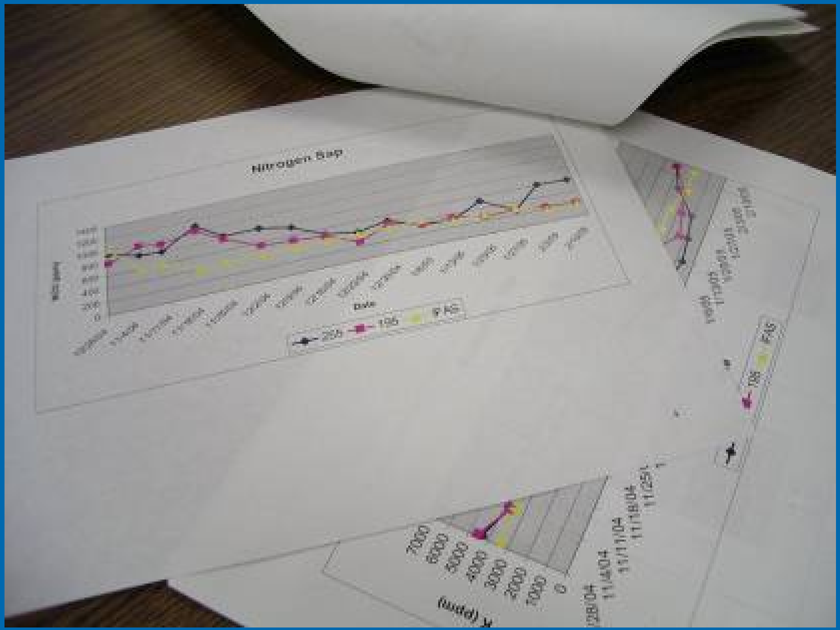
Moisture

Data logger/PC-400

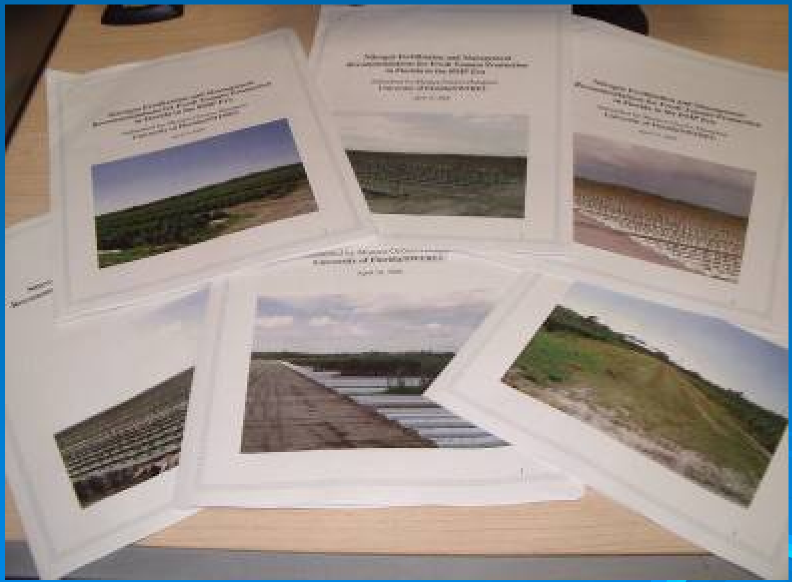
Soil Sampling
NO_3-P-K

At hot band
and center of
the bed

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



By-weekly report to growers and IFAS



Final report to growers and IFAS

Results and Discussions

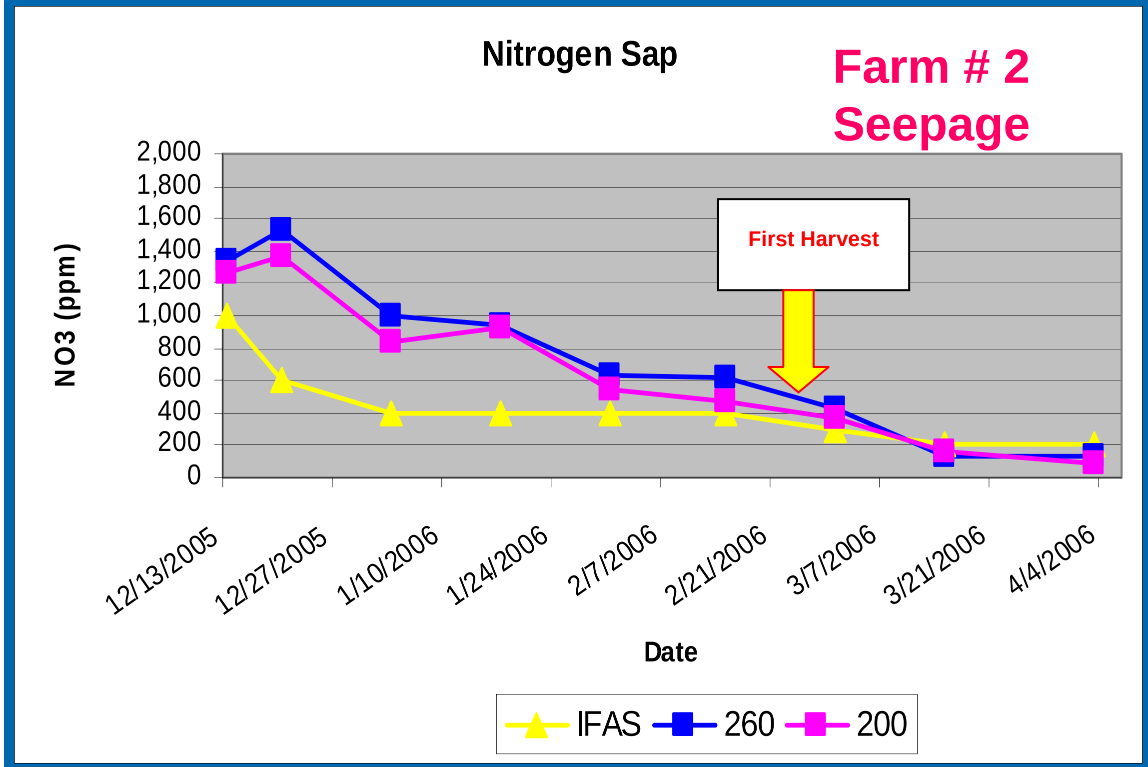
Plant Biomass

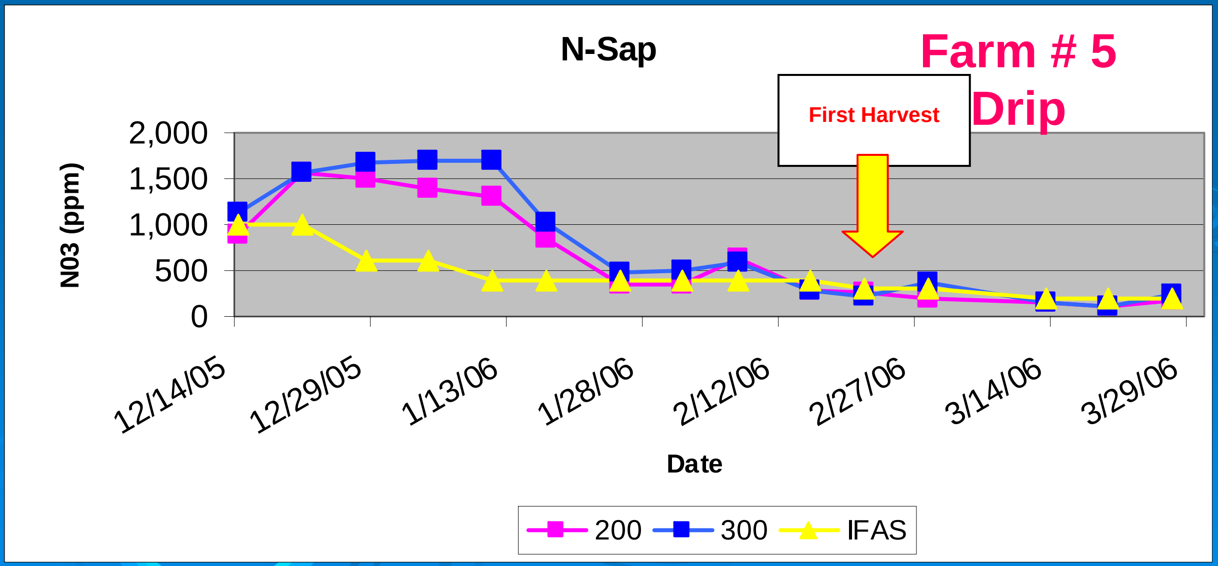
In general no differences in plant biomass

200 lb N/acre

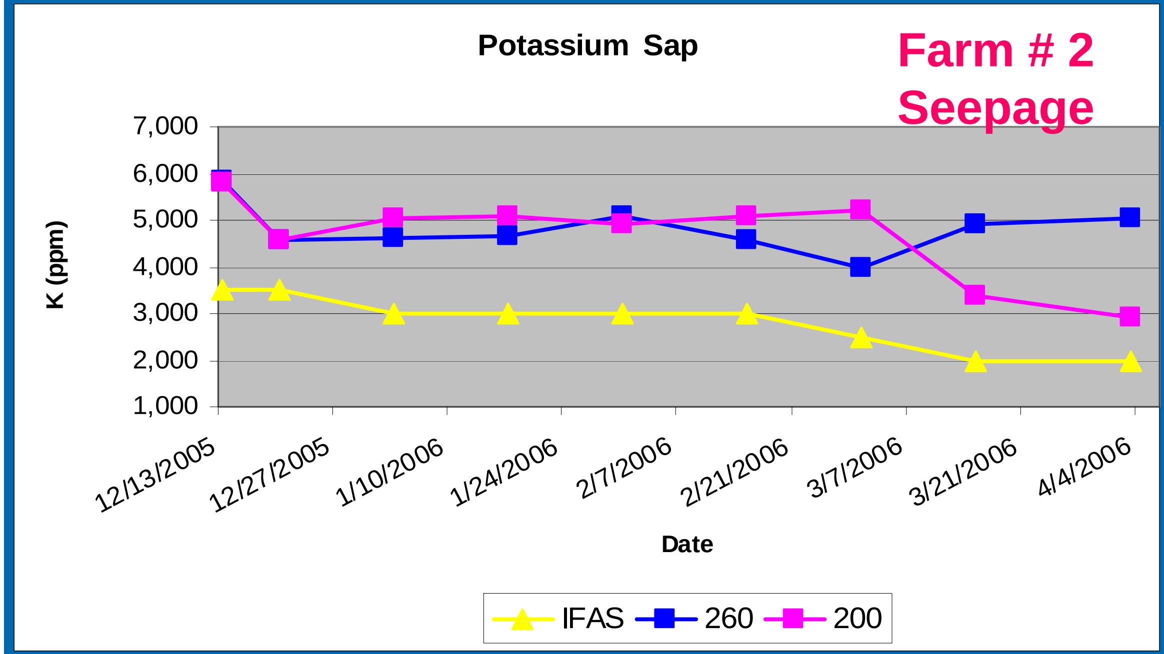
300 lb N/acre

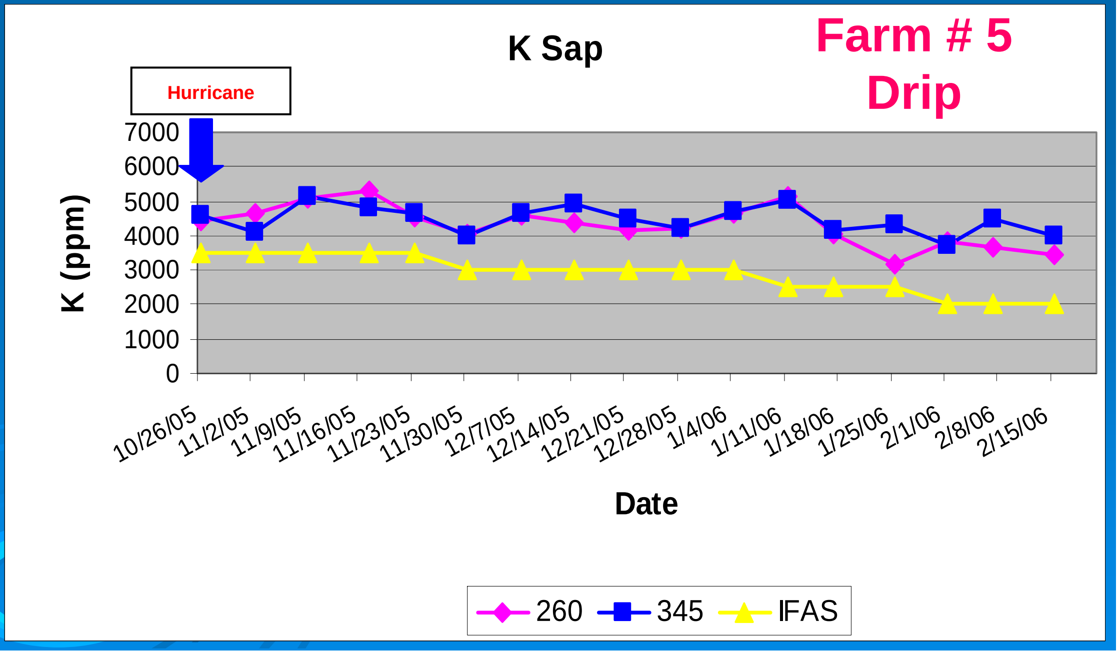
Nitrogen SAP





Potassium SAP



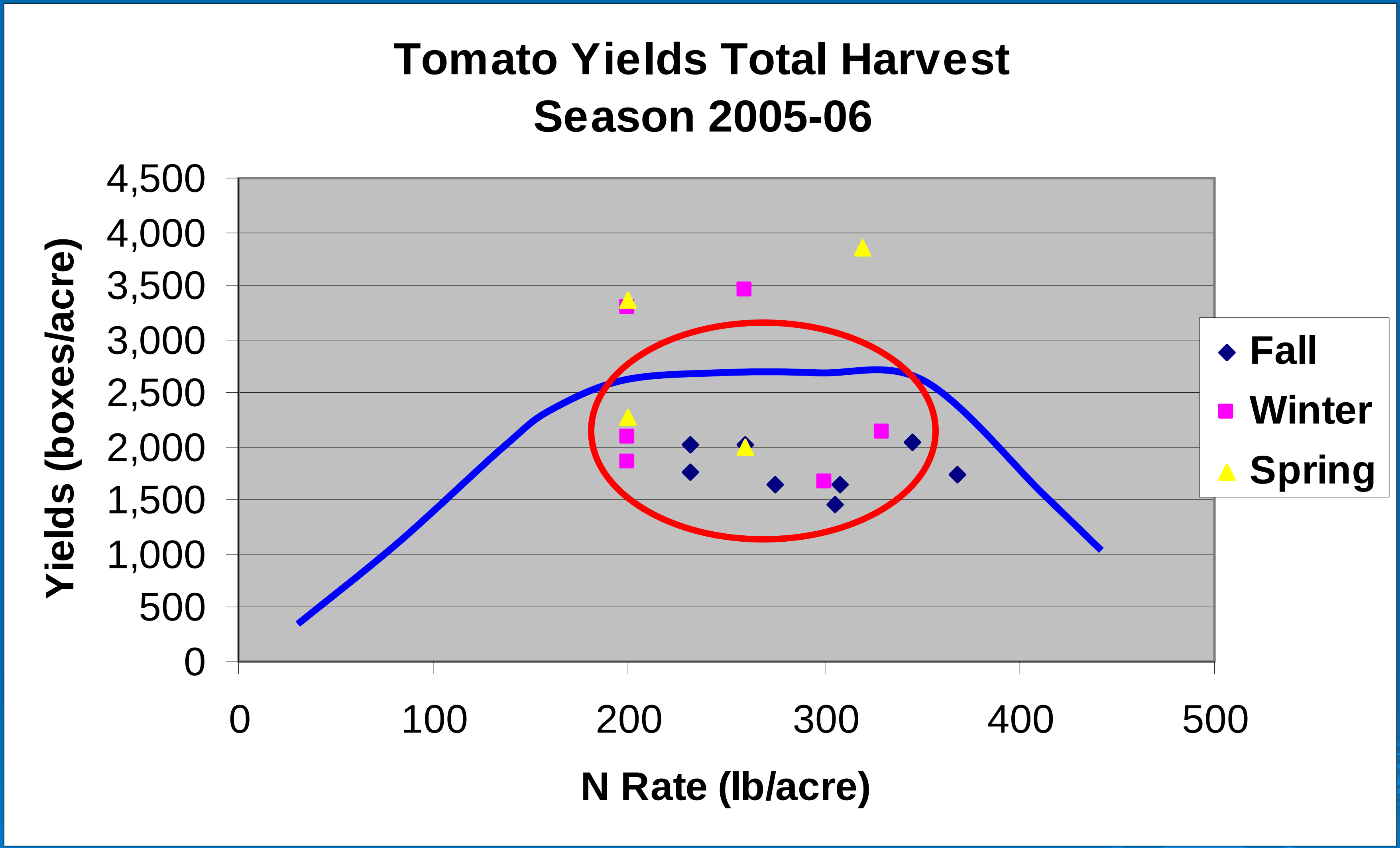


First Harvest (boxes/acre)		5x6	6x6	6x7	Total
		Fall			
1	230 to 305	ns	ns	ns	ns
2	305 vs. 370	ns	ns	ns	ns
3	260 vs. 345 (Drip)	ns	ns	ns	ns
		Winter			
4	200 vs. 260	ns	ns	ns	ns
5	200 vs. 300 (Drip)	IFAS	ns	ns	IFAS
6	200 vs. 330	ns	ns	ns	ns
		Spring			
7	200 vs. 320	ns	GROWER	ns	GROWER
8	200 vs 260	ns	ns	ns	ns

Second Harvest (boxes/acre)		5x6	6x6	6x7	Total
		Fall			
1	230 to 305	ns	ns	ns	ns
2	305 vs. 370	IFAS	ns	ns	ns
3	260 vs. 345 (Drip)	ns	ns	ns	ns
		Winter			
4	200 vs. 260	ns	ns	ns	ns
5	200 vs. 300 (Drip)	ns	ns	ns	ns
6	200 vs. 330	ns	ns	ns	ns
		Spring			
7	200 vs. 320	ns	GROWER	ns	ns
8	200 vs 260	IFAS	ns	GROWER	ns

Third Harvest (boxes/acre)		5x6	6x6	6x7	Total
		Fall			
1	230 to 305	ns	ns	ns	ns
2	305 vs. 370	ns	ns	ns	ns
3	260 vs. 345 (Drip)	ns	ns	ns	ns
		Winter			
4	200 vs. 260	ns	GROWER	GROWER	GROWER
5	200 vs. 300 (Drip)	ns	ns	GROWER	GROWER
6	200 vs. 330	ns	ns	ns	ns
		Spring			
7	200 vs. 320	GROWER	GROWER	GROWER	GROWER
8	200 vs 260	ns	ns	ns	ns

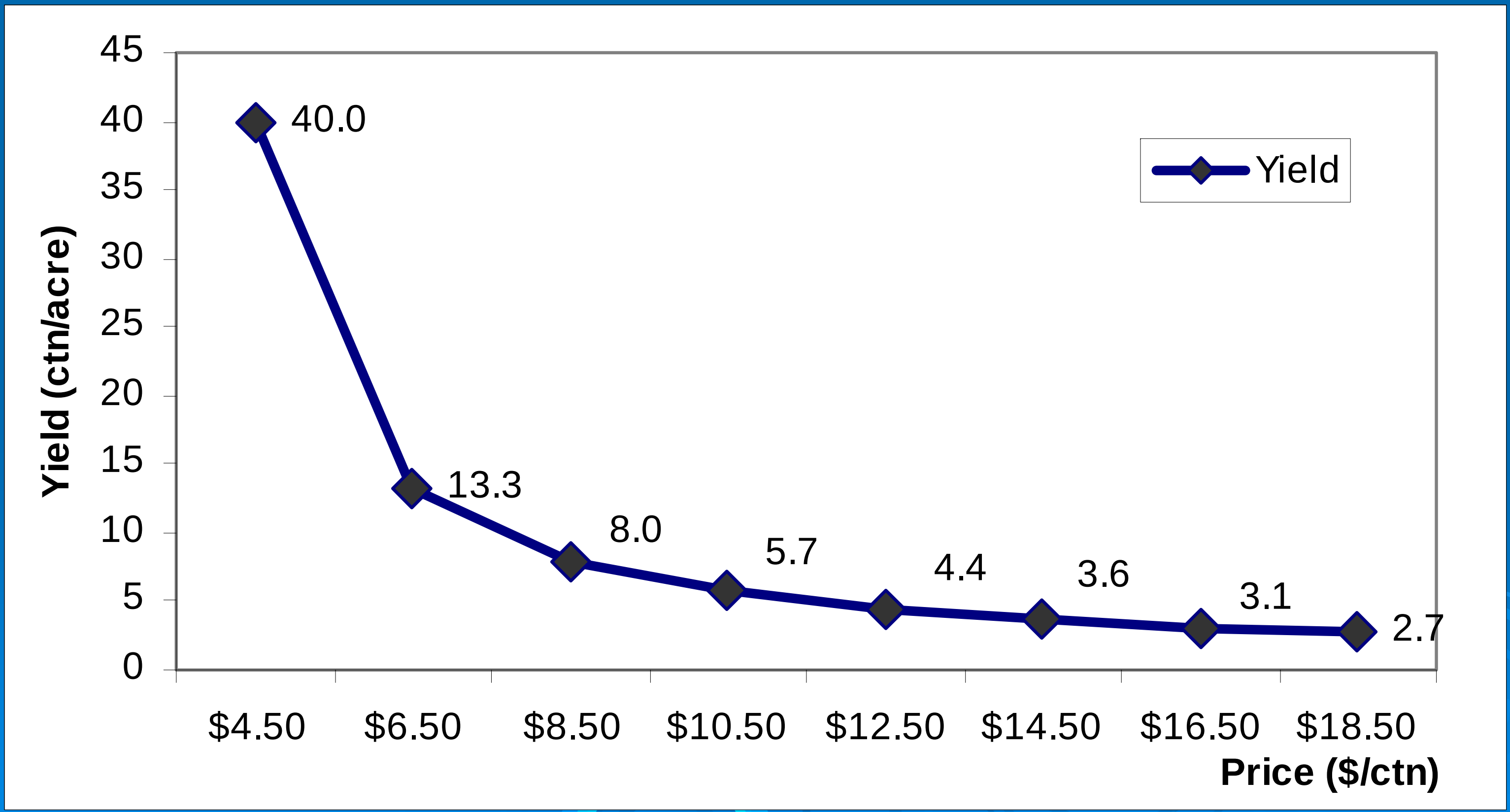
Total Harvest (boxes/acre)		5x6	6x6	6x7	Total
		Fall			
1	230 to 305	ns	ns	ns	ns
2	305 vs. 370	ns	ns	GROWER	ns
3	260 vs. 345 (Drip)	ns	ns	ns	ns
		Winter			
4	200 vs. 260	ns	ns	ns	ns
5	200 vs. 300 (Drip)	IFAS	ns	GROWER	ns
6	200 vs. 330	ns	ns	ns	ns
		Spring			
7	200 vs. 320	ns	GROWER	GROWER	GROWER
8	200 vs 260	IFAS	ns	ns	ns



Regular Anova shows few statistical differences.
Does 'No difference" mean "equality"?
Perhaps the Power of our experiment is "low"
One way to increase the power is to increased the number of replications

Based on economics, we need to be able to detect yield differences of 3, 10, 100 boxes

Increasing N - 200 to 300 lb/acre @ $40/acre



Non-parametric approach
Binomial Distribution

Because we will never be able to pick up these differences, we can look at trends: that's where we do the +/- approach which really equates to a non-parametric approach

We assign the +/- and do the binomial distribution calculations

Trial	N Rates	Yield (boxes/acre)								
		Extra large			Large			Medium		
		First	Second	Third	First	Second	Third	First	Second	Third
4	200	797	511	248	350	542	290	87	273	195
	260	769	544	251	328	544	372	93	232	312
Sig.		ns	ns	ns	ns	ns	*	ns	ns	*
5	200	495	283	68	240	207	81	80	160	147
	300	355	244	97	220	221	110	91	184	245
Sig.		**	ns	ns	ns	ns	ns	ns	ns	**
6	200	347	114	94	313	223	269	71	210	445
	330	338	130	82	292	229	296	89	250	437
Sig.		ns	ns	ns	ns	ns	ns	ns	ns	ns
7	200	1,392	723	130	311	252	196	38	163	169
	320	1,423	679	240	408	328	312	46	151	255
Sig.		ns	ns	**	*	*	**	ns	ns	**
8	200	871	505	41	63	347	51	17	62	138
	260	659	347	31	122	340	35	33	123	131
Sig.		ns	*	ns	ns	ns	ns	ns	*	ns

Trial	N Rates	Yield (boxes/acre)								
		Extra large			Large			Medium		
		First	Second	Third	First	Second	Third	First	Second	Third
4	200	797	511	248	350	542	290	87	273	195
	260	769	544	251	328	544	372	93	232	312
Sig.		-	+	+	-	+	+	+	-	+
5	200	495	283	68	240	207	81	80	160	147
	300	355	244	97	220	221	110	91	184	245
Sig.		-	-	+	-	+	+	+	+	+
6	200	347	114	94	313	223	269	71	210	445
	330	338	130	82	292	229	296	89	250	437
Sig.		-	+	-	-	+	+	+	+	-
7	200	1,392	723	130	311	252	196	38	163	169
	320	1,423	679	240	408	328	312	46	151	255
Sig.		+	-	+	+	+	+	+	-	+
8	200	871	505	41	63	347	51	17	62	138
	260	659	347	31	122	340	35	33	123	131
Sig.		-	-	-	+	-	-	+	+	-

Non-parametric approach Trends with higher N rates P<0.05

- Extra-Large 6 (+) & 9 (-) = P 0.15 ns
- Large 10 (+) & 5 (-) = P 0.09 ns
- Medium 11 (+) & 4 (-) = P 0.04 Sig.
- First harvest 8 (+) & 7 (-) = P 0.19 ns
- Second harvest 9 (+) & 6 (-) = P 0.15 ns
- Third harvest 11 (+) & 4 (-) = P 0.04 Sig.

Conclusions

- Growers interest has increased participation (more trials, more regions)
- Seepage tests are larger and able to run statistics
- Petiole sap test not useful for routine analysis in seepage
- Still more work to do in drip fields
- Significant difference were found at the third harvest for winter and spring seasons
- Because we are working at the top of the curve, high field variability and low power, it is experimentally difficult to detect these differences
- Economics call for detecting differences of 3 to 40 boxes/acre
- So, when differences were not significant a non-parametric approach skewed toward grower's rate.
- Options to look at to reduce risk of leaching: - cover crops; - turn off valves on fertilizer spreaders; – spreaders calibration

Monica Ozores-Hampton

ozores@ifas.ufl.edu

- Website:

http://swfrec.ifas.ufl.edu/bmp/vegetable/