

Controlled-release fertilizers for Florida citrus production

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Topics

- Overview of Florida's citrus industry.
 - Environmental issues.
 - General citrus nutrient management.
 - Nitrogen sources and fertilizer programs – traditional and innovative.
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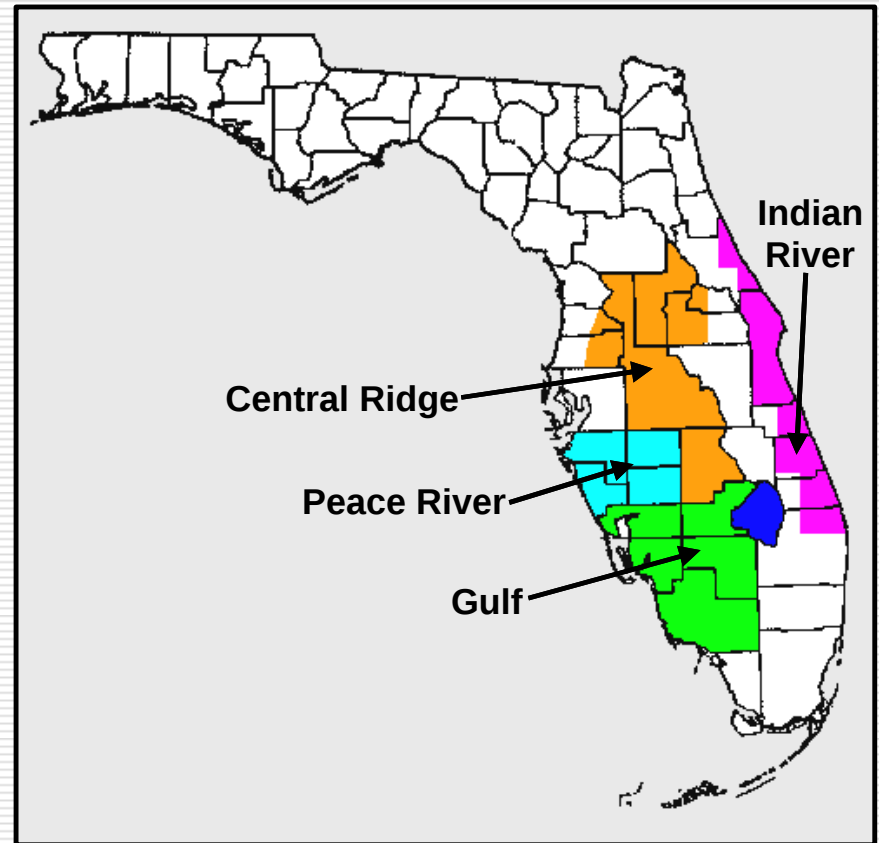
1. Citrus industry overview



Florida's commercial citrus

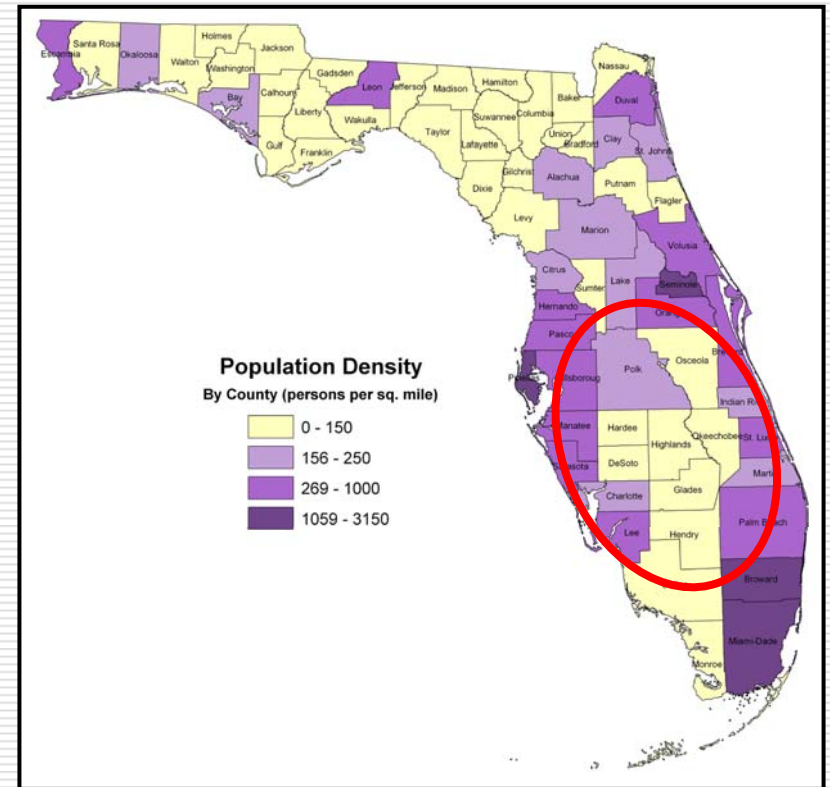
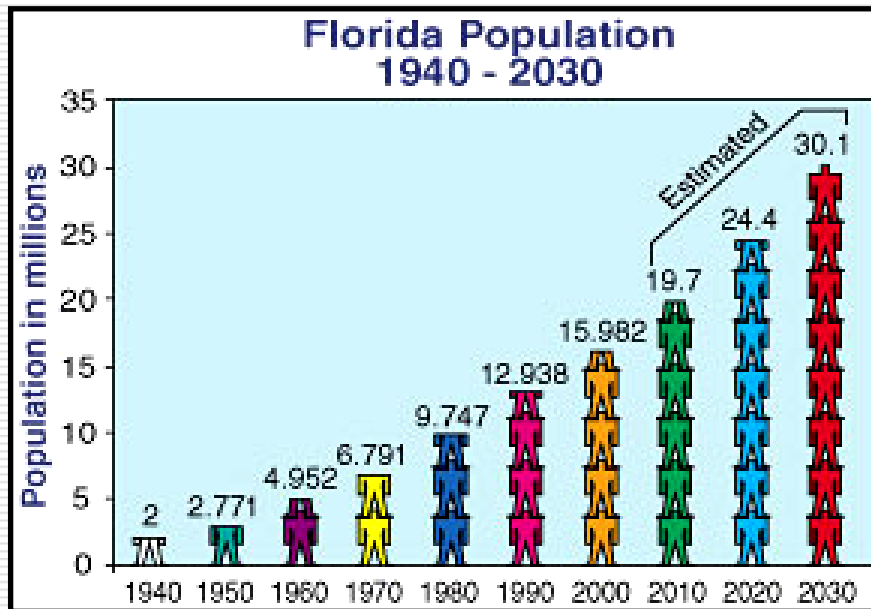
2004 statistics

- 748,555 acres.
- 97,945,000 trees.
- 12.6 million tons of fruit.
- Crop value \$746 million.
- 73% of US production.
- 18% of world production.

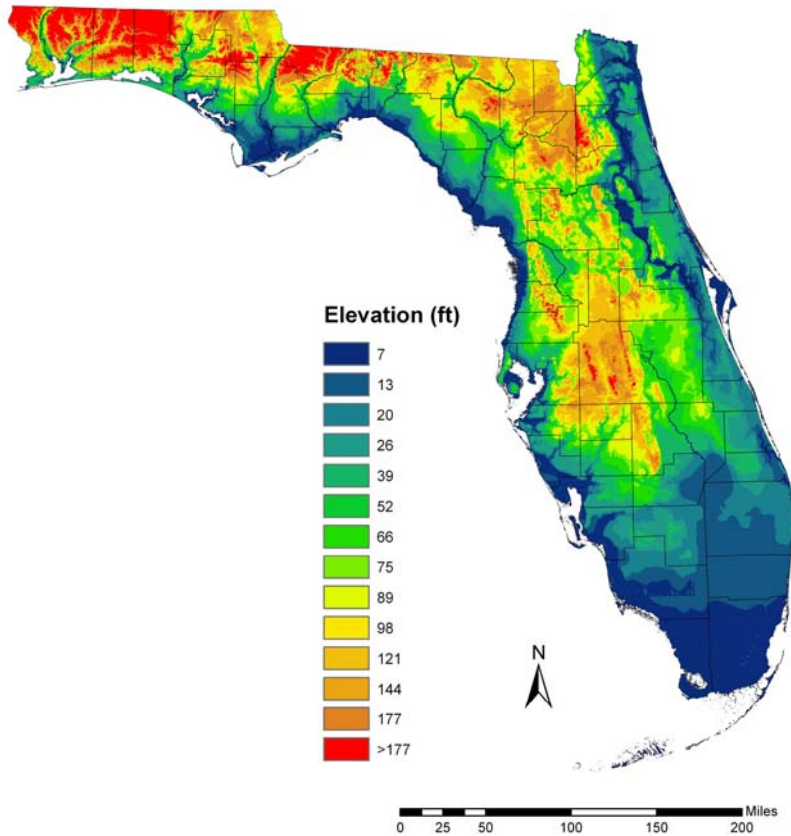


Future of the citrus industry?

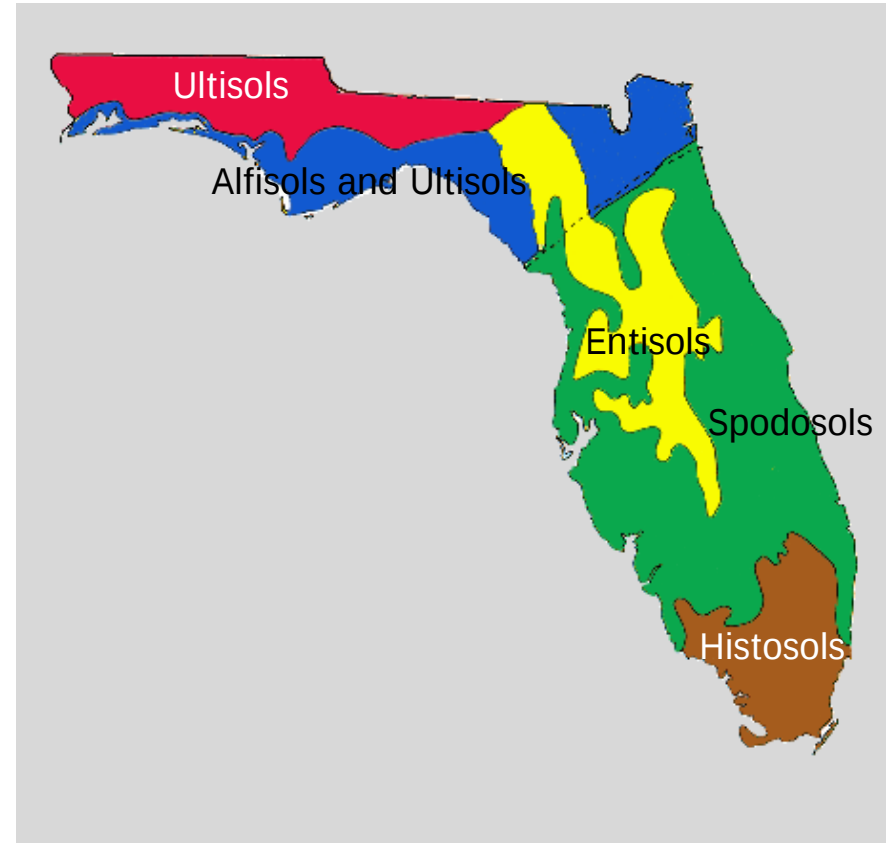
700 new residents arrive in Florida each day



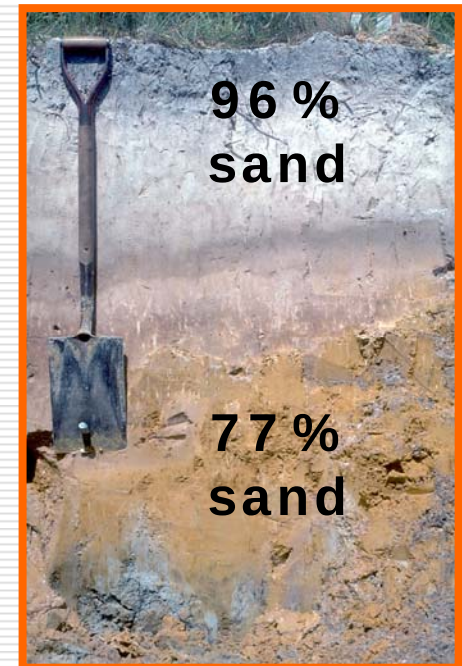
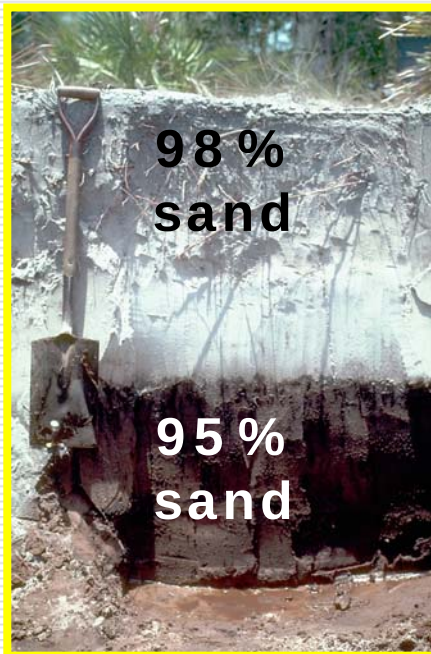
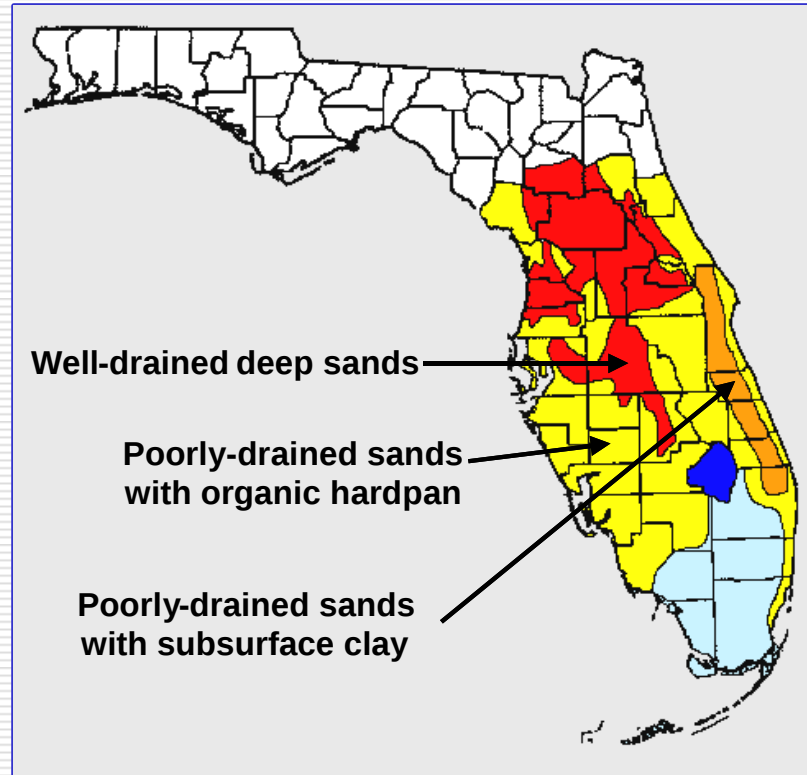
Elevation



Soils



Florida citrus soils



2. Environmental issues



Ridge



Flatwoods

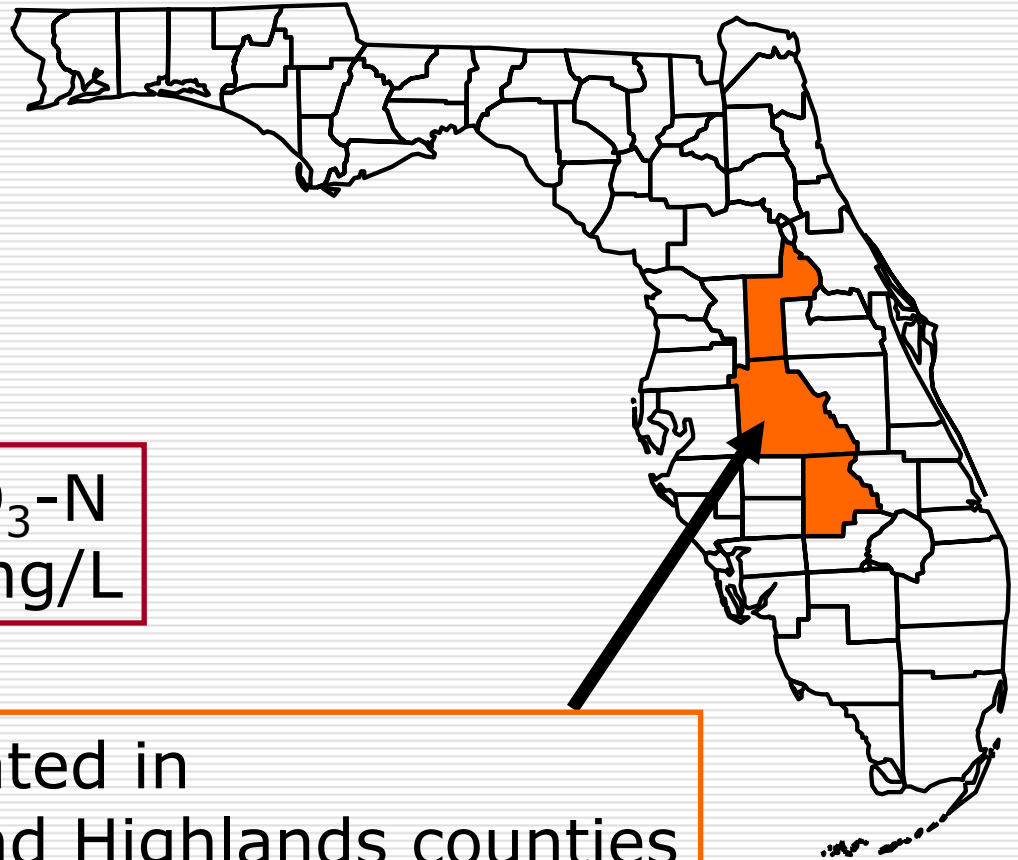
Shallow (<100 ft) drinking water well survey, circa 1990

3949 wells surveyed

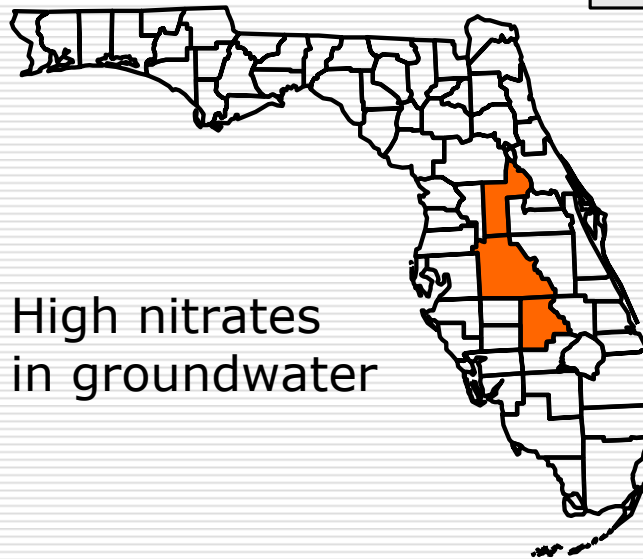
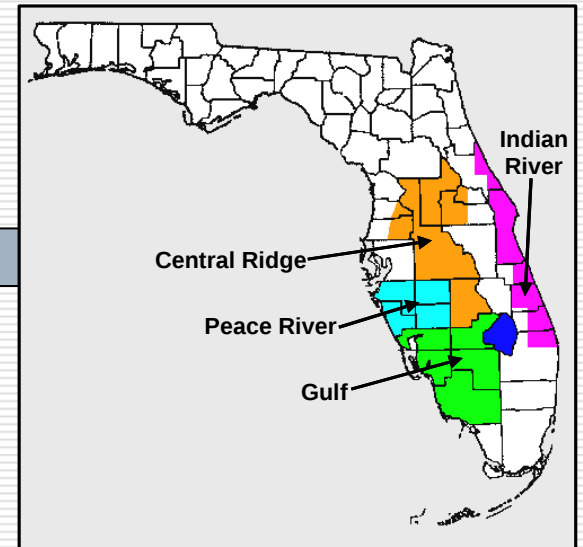
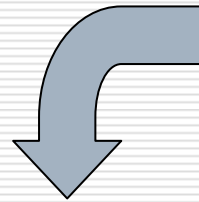
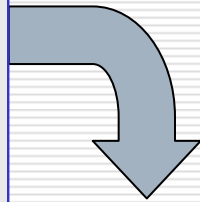
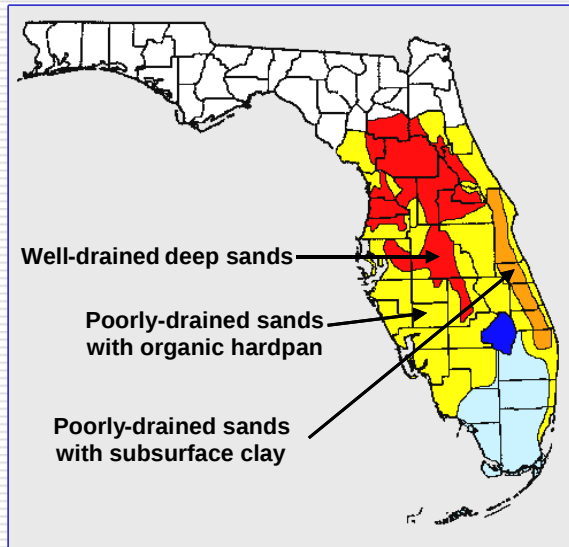
2483 contained
detectable $\text{NO}_3\text{-N}$

584 contained $\text{NO}_3\text{-N}$
greater than 10 mg/L

520 were located in
Lake, Polk, and Highlands counties



Deep sand + Citrus N fertilization = ???

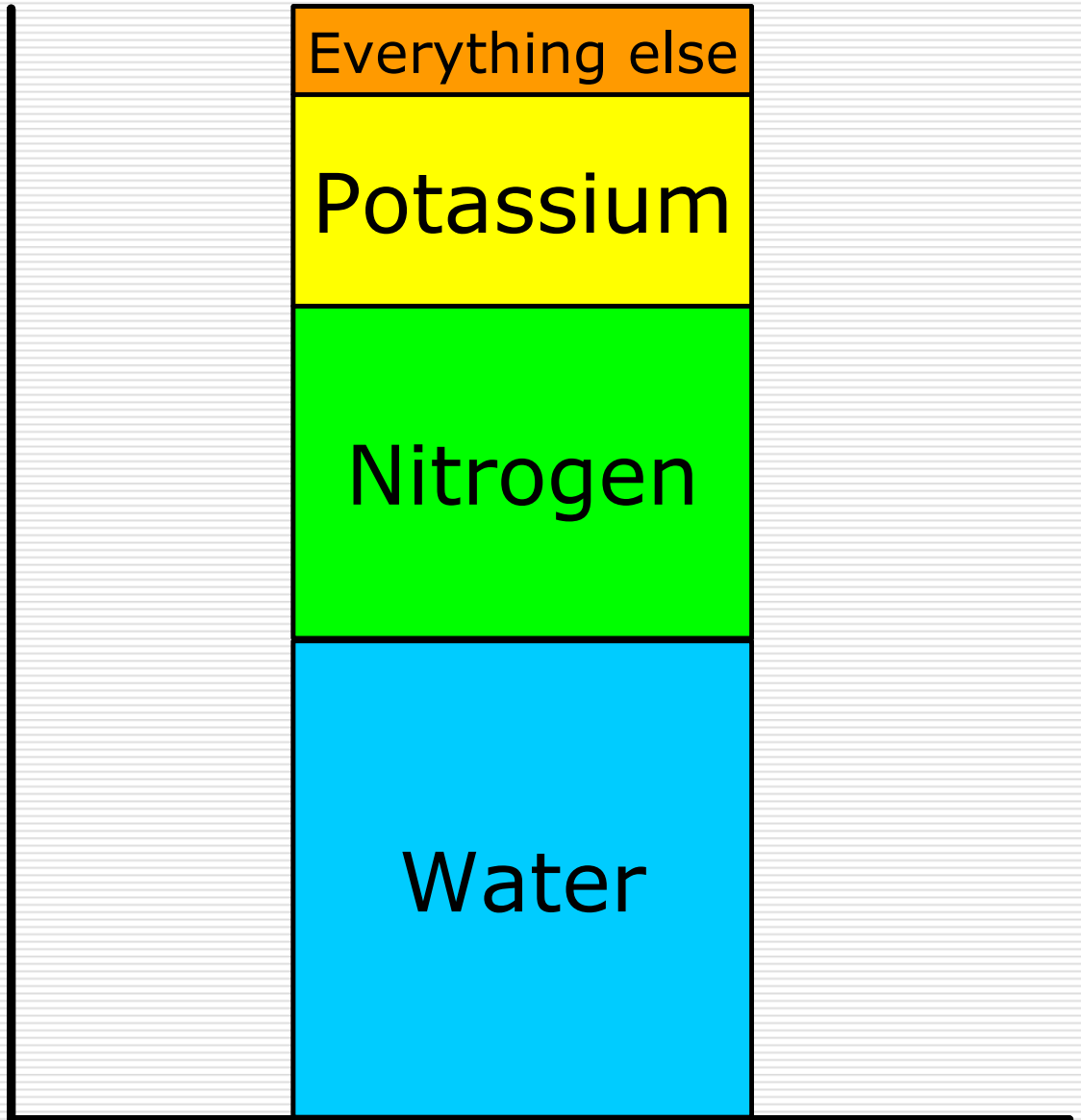


3. Citrus nutrient management

Fertilizer use in Florida, 2002-03

Nutrient	Tons	% of North American consumption
N	194,363	1.5
P ₂ O ₅	8,792	0.2
K ₂ O	43,867	0.9

Relative importance
of nutritional
factors affecting
yield of mature
Florida citrus trees.



N citrus fertilization BMPs

- ☐ Source
 - ☐ Rate
 - ☐ Frequency and timing
 - ☐ Application method
 - ☐ Irrigation management
-

N rate BMP for bearing trees (>7 years old)

NITROGEN	<u>lbs N/acre</u>
Max. yearly N rate	240
Max. single dry app., dry season	65
Max. single dry app., wet season	40
Max. single fertigation, dry season	15
Max. single fertigation, wet season	10
POTASSIUM	
Apply K ₂ O at 100 to 125% of the N rate	

4. N sources and fertilization programs

Dry granular
fertilizer



Solution
fertilizer



Typical and non-typical N sources

Dry granular



Ammonium
nitrate



Ammonium
sulfate

Solution



Urea

"Older" slow-release



IBDU



Methylene urea



SCU

"Newer" controlled-release



Osmocote



Meister

Why would a citrus grove manager be interested in CRF?

- ☐ Preference for dry fertilizer.
 - ☐ Increased N fertilizer efficiency.
 - ☐ Lower application frequency.
 - ☐ Lots of re-plants to manage.
 - ☐ Environmental advantage (potential cost-sharing BMP).
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Why would a citrus grove manager be wary of CRF?

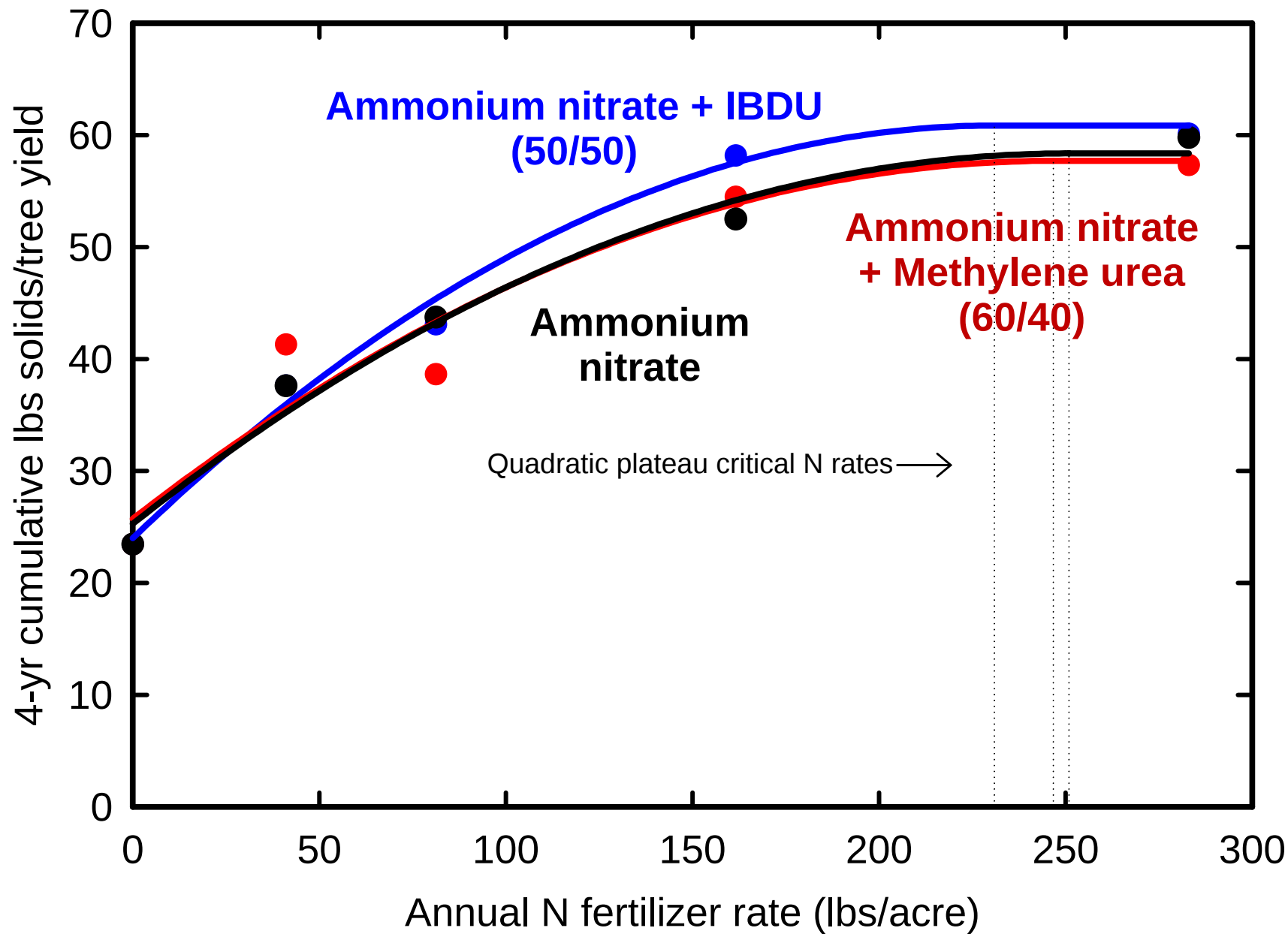
- ☐ Per-ton cost.
 - ☐ Lack of faith about performance.
 - Body of research is small.
 - Fertilizing a Florida citrus grove only once per year is unheard of.
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Experiments with CRFs



Experiment 1 – 1989 to 1996

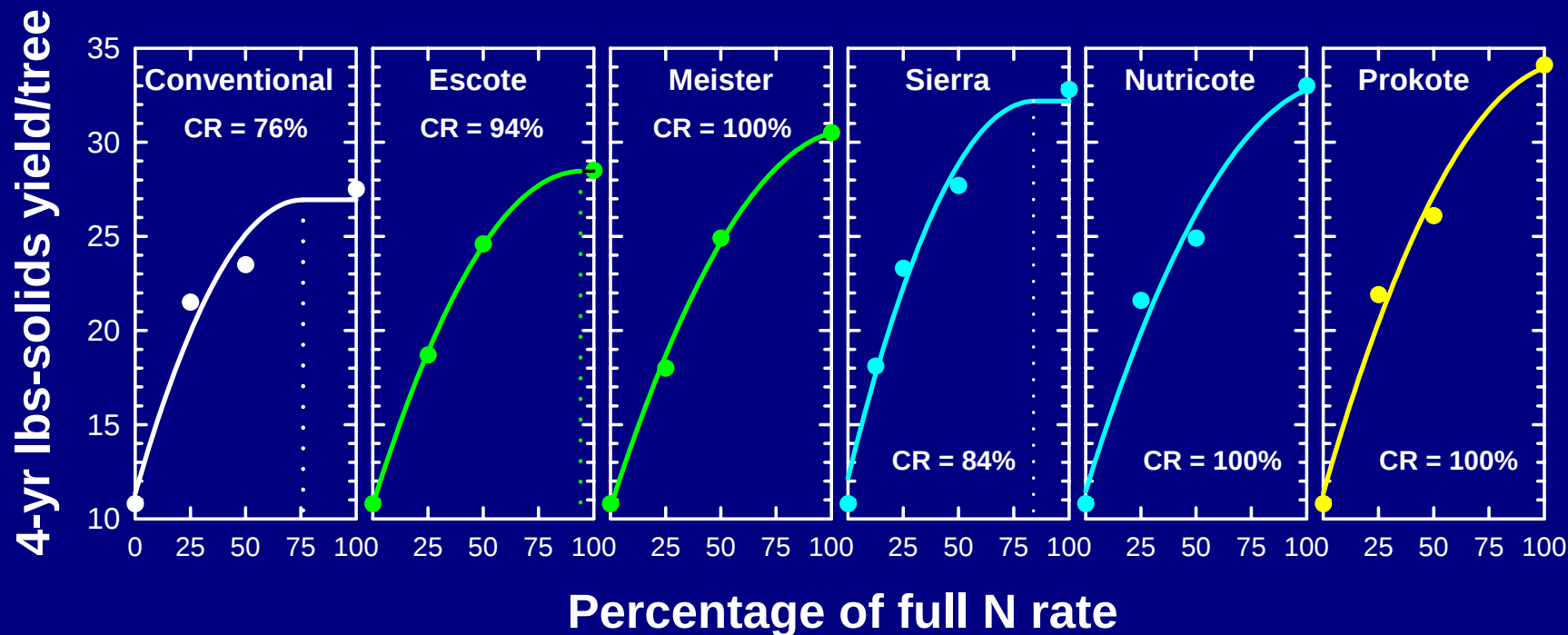
Treatment	No. of applications in 7 years	N rate range
100% Ammonium nitrate	31	
50% Ammonium nitrate 50% IBDU	16	0 to 280 lbs/acre/yr
60% Ammonium nitrate 40% Methylene urea	14	



Experiment 2 – 1991 to 1996

Treatment (Trade name and analysis)	No. of applications in 6 years	N rate range
Conventional (8-4-8)	24	
Prokote Plus (20-3-10)	6	
Nutricote 360 (17-6-8)	6	0 to 160 lbs/ac/yr
Sierra (16-6-10)	6	
Meister (17-6-12)	6	
Escote (19-6-12)	6	

Coated vs. soluble fertilizer



Economic analysis

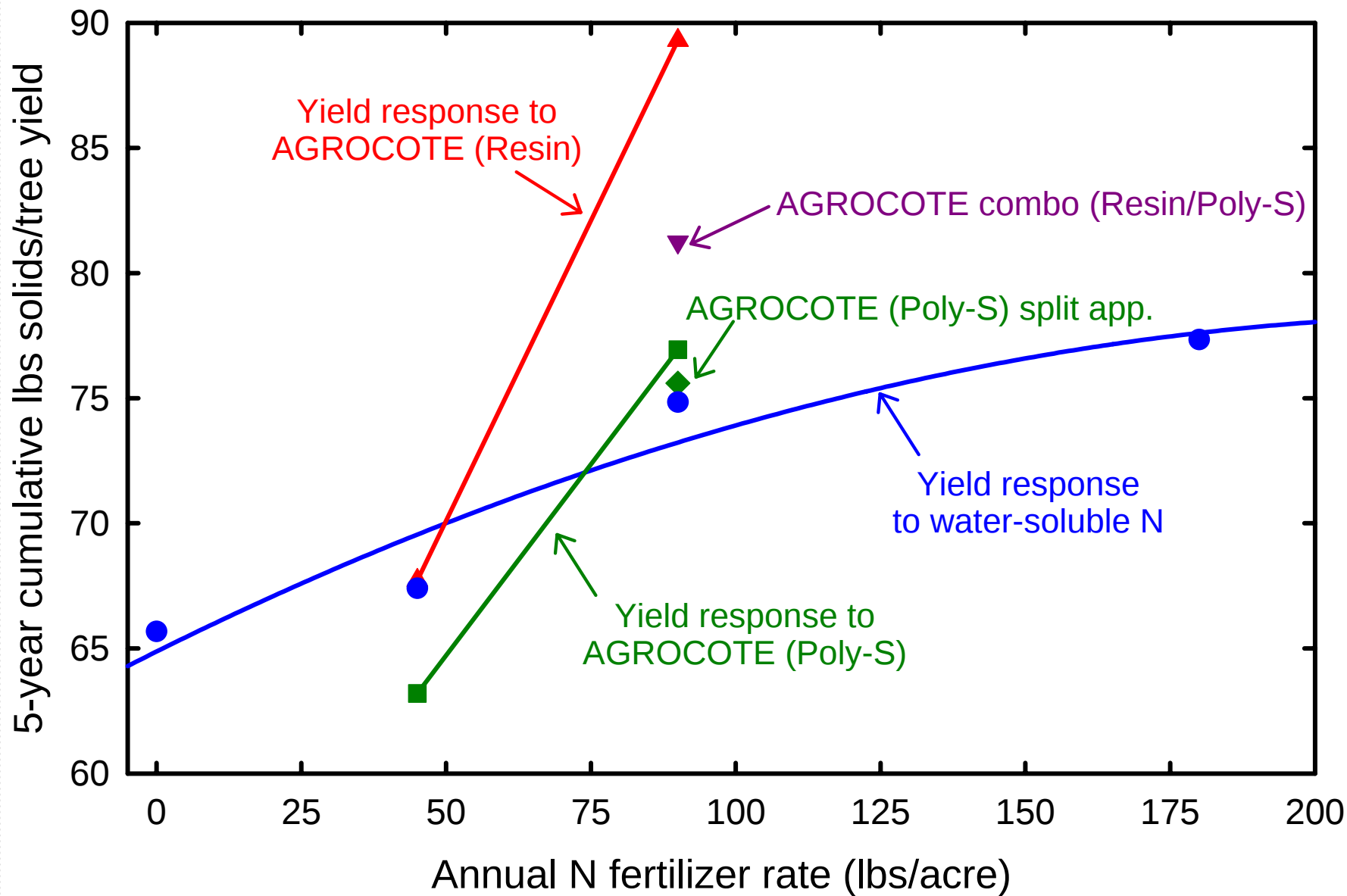
Fertilizer	6-yr fert cost (\$/tree)	Cumulative lbs sol/tree	Gross return (\$/tree)
Prokote	15.49	27.7	28.90
Sierra	19.20	27.0	28.25
Nutricote	19.85	26.5	27.47
Meister	15.81	25.8	26.41
Escote	14.90	24.9	25.98
Conventional	5.06	24.2	25.40
None	0.00	10.8	11.23

Experiment 3 – 1996 to 2000

(supported by The Scotts Company)

Fertilizer	Analysis	(lbs N/ac/yr)	App./yr
No nitrogen	0-5-16	0	3
Water-soluble N	16-5-16	45	3
	16-5-16	90	3
	16-5-16	180	3
Scotts AGROCOTE® (Resin-coated)	16-5-16	45	1
	16-5-16	90	1
Scotts AGROCOTE® (Poly-S-coated)	16-5-16	45	1
	16-5-16	90	1
	16-5-16	90	2
AGROCOTE® 50/50 combo	16-5-16	90	1

Yield response



Current research



What is Citriblen?

- AGROCOTE® poly-S coated and resin-coated technologies;
- Blended with local non-coated N-P-K and micronutrient sources;
- Marketed for young and mature citrus trees.



+



+

other
stuff

=



Field trials with commercial growers



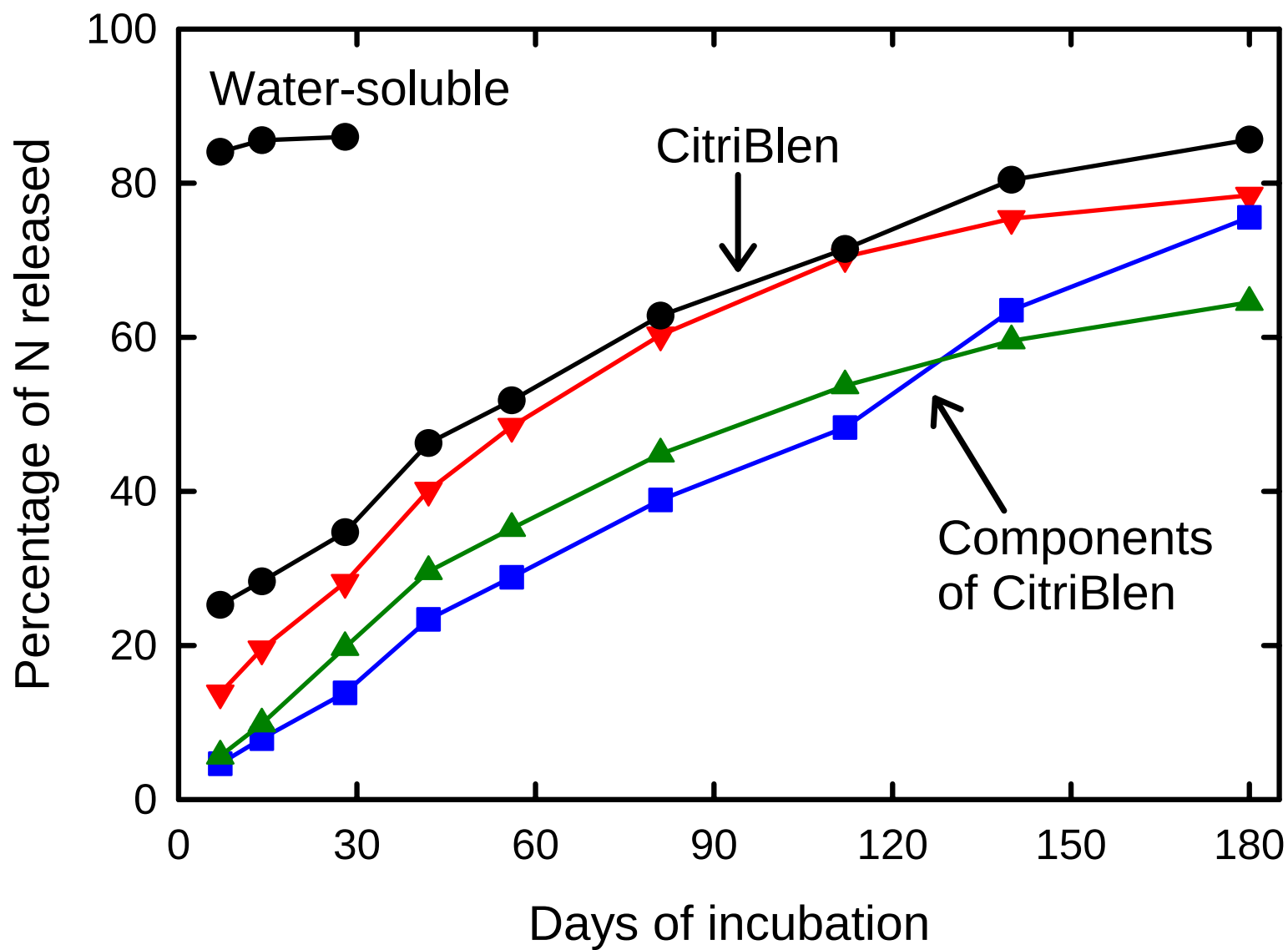
- Yield
 - Fruit and juice quality
 - Leaf tissue nutrients
 - Economics
-

Nitrogen release rate field study



Nitrogen release rate lab study





Summary

- ❑ Florida's citrus industry will remain strong.
 - ❑ Citrus growers are always looking for ways to improve production efficiency.
 - ❑ Environmental issues are driving the way nutrients (N and P) are managed.
 - ❑ Florida soils hold water and nutrients poorly.
 - ❑ N and K are the top two mineral nutrients affecting citrus yield and quality.
 - ❑ The way citrus groves are fertilized is changing.
 - ❑ Modern CRFs are both horticulturally and environmentally effective.
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Summary

Florida soils
+ Climate
+ Citrus nutrient demand
+ Environmental issues

= Need for more efficient nutrient management.

∴ Greater potential market for economical CRF programs.



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