UNIVERSITY OF FLORIDA

CAN WE USE CONTROLLED RELEASE FERTILIZERS (CRF) IN TOMATO AND PEPPER PRODUCTION?

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Thanks, Thanks and Thanks to the "tomato growers" for in-kind contributions to the BMP program: growing the crop and labor

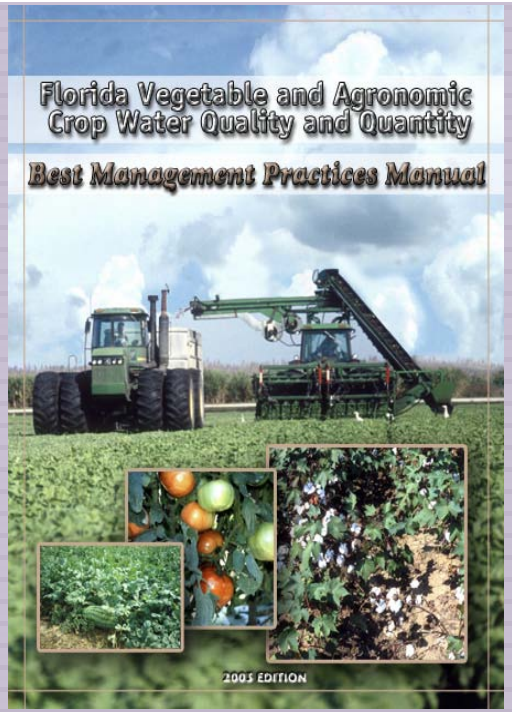
We developed strong successful partnerships since 2004 (12 seasons) with 650 acres (U$1,000,000 in-kind) under BMP experiments.

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

Enhanced Efficiency Fertilizer (EEF)

- are products with characteristics that minimize the potential of nutrient losses to the environment, as compared to “reference soluble” fertilizers (AAPFCO, 2005)

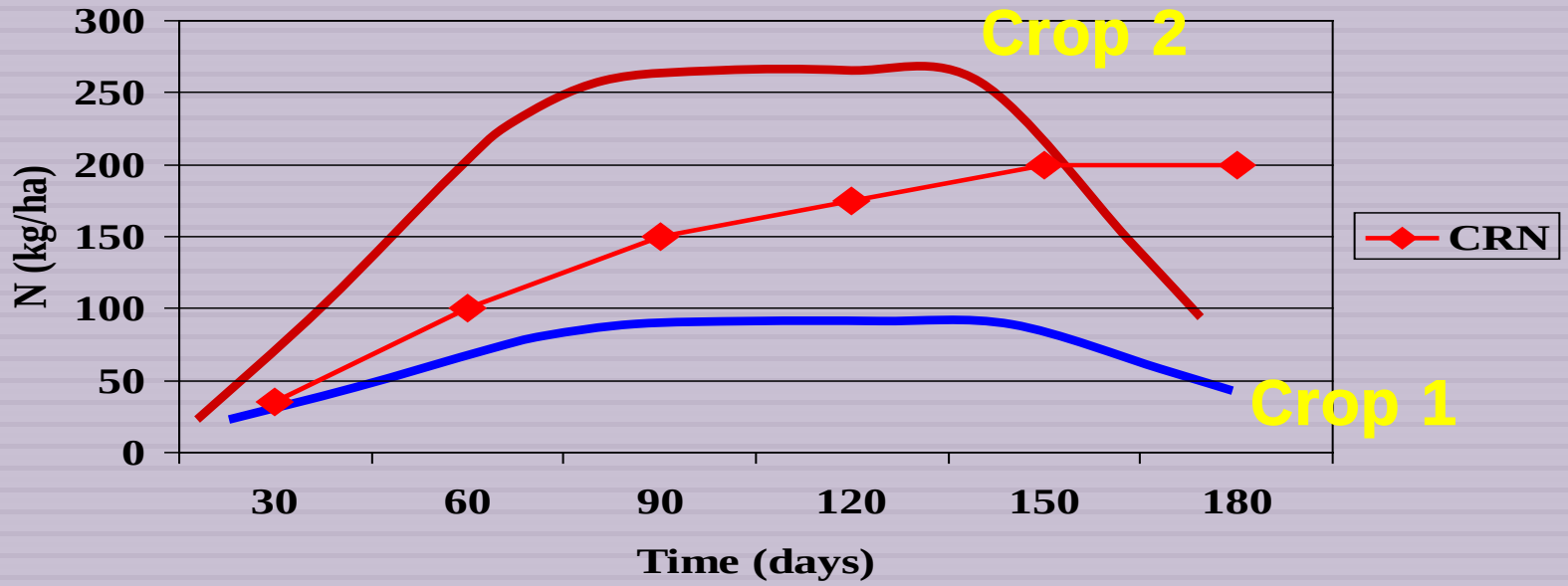
Enhanced Efficiency Fertilizer (EEF)



- **EEFs as BMP tool** (www.floridaagwaterpolicy.com)
  - are recognized as one of the few BMPs that have a direct impact on off-site nutrient movement and water quality
- **EEFs crop yield improvement**

  can certainly minimize the losses of nutrient in the environment if opportunely applied, however, their effectiveness in increasing crop yield must be evaluate case by case. With tomatoes, there have been mixed results with older CRF materials when compared to soluble fertilizer application

Matching Nutrient Supply with Crop Demand



Type of EEF

- **Slow release fertilizer (SRF):** however the pattern of release is not well controlled such as urea-formaldehyde (UF).
- **Stabilized fertilizer (SF):**

  Nitrification inhibitor

- **Controlled release fertilizer (CRF-N)**

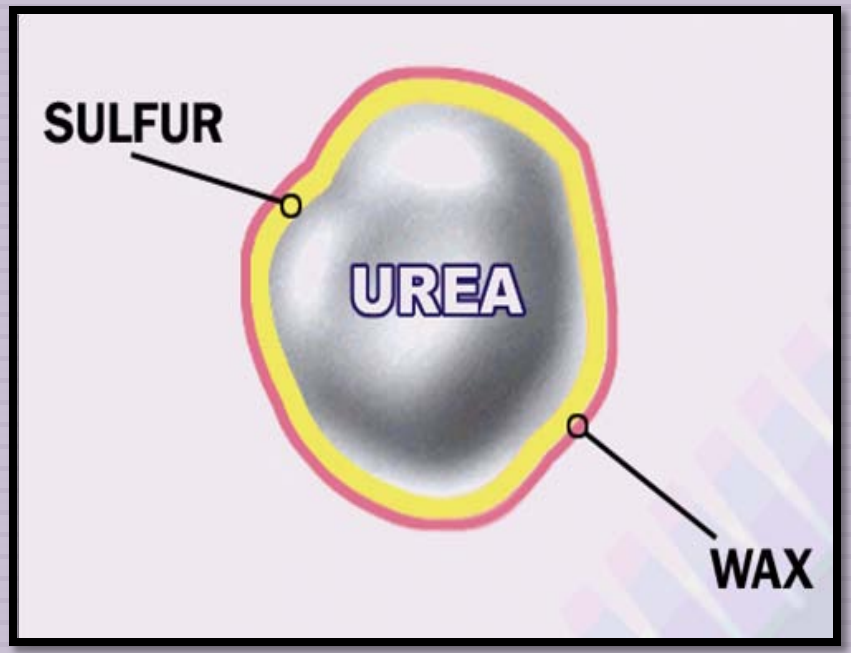
  products that release nutrient slowely than "reference soluble" fertilizers, in which the factors dominating the pattern of release are well-known and controllable during CRF preparation such as sulfur coat urea (SCU) or resin-coated products.

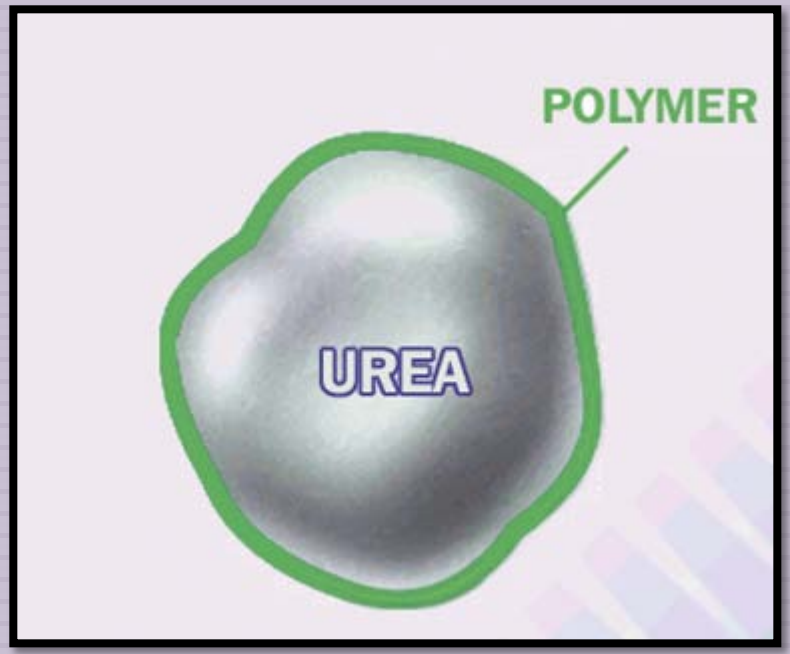
  Coating quality: thickness and uniformity, soil moisture, and temperature

CRF-N Trials

- **Four trials** (2004-08): Tomatoes. CRF-N sources, bed placement and N rates with seepage irrigation.
- **Locations**: southwest Florida at the University of Florida, Southwest Florida Research and Education Center (UF/SWFREC) and on commercial farms in the Immokalee.
- **Soil type**: Immokalee fine sand and EauGallie fine sand.
- Complete Randomized Block Design (3 to 4 replications).

Sulfur coated urea (SCU) and Polymer coated Urea (PCU) and Potassium Nitrate (PCPN)





Data Collection

•Harvested 14 plants (trials 1 and 2) and 10 (trials 3 and 4).

•Plots were marked to prevent unscheduled harvest by commercial crews.

•Marketable green and colored tomatoes were graded in the field according to USDA specifications of number and weight of extra-large (5x6), large (6x6), and medium (6x7) fruit of green and color . Cull fruits were those blemished or defective and thus unmarketable.

Results CRF-N trials

Trial 1: sources CRN and rates with placement in the "hot mix" (Spring 2006).

Hot Mix:

1. Nitamin® [granular (23-0-0), methylated urea and derivatives; Georgia-Pacific Resins, Inc.],

2. Multicote® [polymer-coated urea (40-0-0); Haifa Chemical Ltd.].

2. AgroCote® [polymer-coated sulfur-coated urea (38-0-0); The Scotts Company].

N Rates:

Total N rates were 160, 230 and 300 lb/acre as a CRN and soluble at 40 lb/acre as bottom mix.

Treatment		Total Marketable Yield (Boxes/acre)				Culls
N program	Rate (lb/acre)	5/6	6/6	6/7	Total	
Soluble		1,531a	354a	333a	2,218a	463
Nitamin®		901b	197b	204b	1,303b	345
Multicote		1,020b	204b	207b	1,431b	385
AgroCote®		1,087b	224b	214b	1,524b	345
P value		0.006	0.001	0.001	0.002	0.70
	200	1,246	280 a	258	1,784	424
	270	1,172	252 ab	238	1,663	365
	340	986	202 b	222	1,410	364
P value		0.23	0.05	0.45	0.17	0.31

Trial 2: CRN release time and rates with placement in the "bottom mix" (Fall 2006).

Bottom Mix:

Multicote [polymer-coated urea (40-0-0); Haifa Chemical Ltd.], with a 2 or 4 month release rate, and the combination of the two release rates.

N Rates:

Total N rates were 100, 150 and 200 as CRN and soluble at 20, 30 and 40 lb/acre as a bottom mix.

Treatment		Total Marketable Yield (Boxes/acre)				Culls
N program	Rate (lb/acre)	5/6	6/6	6/7	Total	
Soluble		2,041	325	410	2,776b	319
2-mo/4mo (Multicote)		2,213	328	448	2,989ab	276
2-month (Multicote)		2,293	379	502	3,179a	282
4-month (Multicote)		2,304	387	511	3,201a	320
P value		0.19	0.50	0.53	0.10	0.18
	120	2,093	333	462	2,888	293
	180	2,,209	315	445	2,950	297
	240	2,340	416	516	3,271	308
P value		0.12	0.07	0.41	0.05	0.79
Contrast Linear (rate)		ns	ns	ns	*	ns

Trial 3: Sources CRN, release time mix and rates with placement in the "bottom mix" (Winter 2007).

Bottom Mix: (2.5 acres trial)

1. Polyon, polymer-coated urea (43-0-0), Agrium Advance Technology, AL.

2. Multicote Agri [polymer-coated urea (43-0-0), Haifa Nutritech, FL]

Both materials were applied in a combination of 50% 2-month and 50% 4-month time release

N Rates: Total N rates were 120 and 170 as a CRN and soluble at 30 lb/acre as a bottom mix.

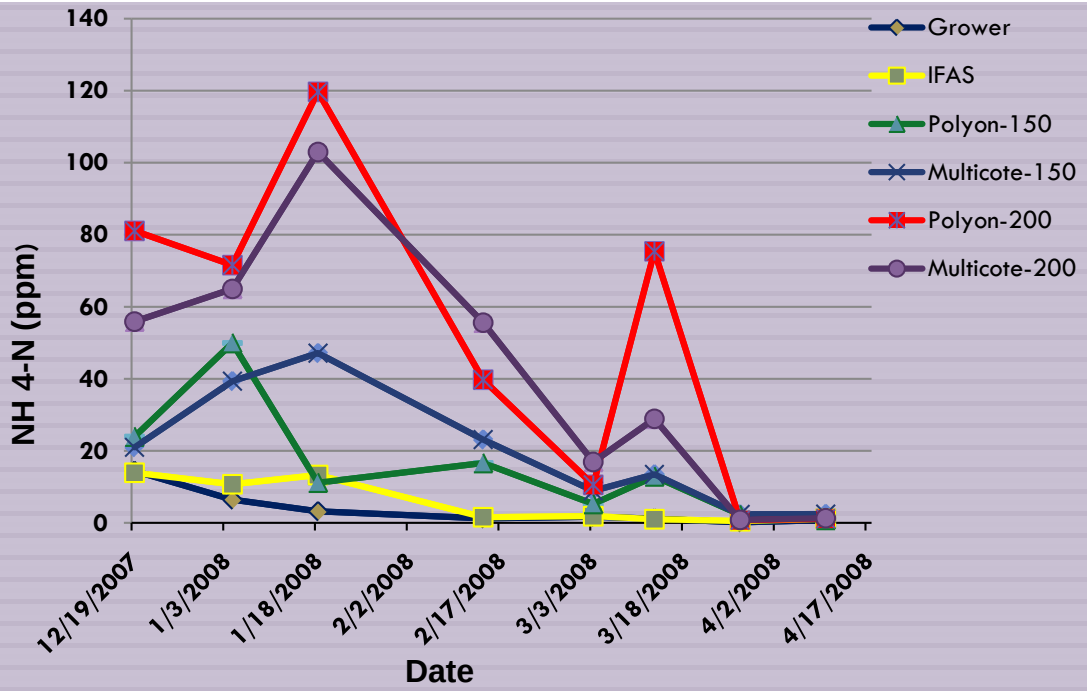
Treatment	Marketable Yield (Boxes/acre)									
	First harvest					Total				
N (lb/acre) CRN/Soluble	5/6	6/6	6/7	Total	Cs	5/6	6/6	6/7	Total	Culls
Grower (0/266)	492a	197b	138	828	108	981	652	623	2,256	421
IFAS (0/200)	515a	233b	128	877	124	984	622	578	2,184	493
Polyon (120/30)	370b	304a	154	828	98	672	632	596	1,900	374
Multicote (120/30)	434b	282a	174	889	125	810	586	500	1,896	372
P value	0.03	0.04	0.68	0.51	0.5	0.13	0.5	0.19	0.09	0.25


Polyon & Multicote
170/30

Center of the bed soil NH_4-N content at four inches depth winter 2007.

Risks of polymer-coated urea and with ammonium toxicity during the winter.

- It is possible an extreme cold temperature event, saturated soil conditions resulting from the use of surface water as freeze protection, and the reduction of microbe activity in converting NH_4-N due to fumigation (methyl bromide/chloropicrin) all worked to increase the risk of plant NH_4-N toxicity, especially when used under VIF-type film.



Trial 4: CRN potassium nitrate and rates (bottom mix) and soluble N "hot mix" (Winter 2008).

Bottom Mix: (3 acres trial)

Multicote Agri [polymer-coated potassium nitrate (12-0-43), Haifa Nutritech, FL].

In a combination of 50% 2-month and 50% 4-month time release.

N Rates:

N rates were 50, 100 and 150 lb/acre of CRN plus 100 lb/acre of soluble N as a hot mix.

Treatment	Marketable Yield (Boxes/acre)									
	First harvest					Total				
N (lb/acre) CRN/Soluble	5/6	6/6	6/7	Total	H1&H2 Total	5/6	6/6	6/7	Total	Culls
Grower (0/255)	783	359	138	1,280	2,042ab	1,152	837	625	2,614	404
IFAS (0/200)	861	286	95	1,243	2,119a	1,182	737	739	2,658	350
50/100	791	325	124	1,240	2,042ab	1,170	767	624	2,561	347
100/100	877	284	108	1,269	2,209a	1,296	740	580	2,616	399
150/100	672	282	117	1,070	1,852b	1,024	703	716	2,443	360
P value	0.25	0.35	0.60	0.08	0.05	0.40	0.33	0.10	0.38	0.82
Contrast Linear (CRN only)	0.23	0.33	0.80	0.08	0.07	0.31	0.30	0.33	0.34	0.83


CRN 150


13 acres Fall CRN trial

Conclusions

- The best placement as a “bottom” or “cold” mix.
- **Caution** polymer-coated urea on mulched crops during the winter in South Florida because of risks associated with ammonium toxicity.
- 50 or 100 lb/acre of CRN polymer-coated potassium nitrate as bottom mix can be a more suitable source with 100 lb/acre of soluble N fertilizer as ‘hot mix’ for the winter.

Question?

TO BE CONTINUED……