Proposed Changes to Sugarcane Fertilizer Recommendations for Transitional Soils (N, P, Si) and Sands (Elemental S)

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Two General Changes are Proposed to Complete Sugarcane Nutrient Recommendations

- Include an option to calculate N, P, and K recommendations for transitional soils (sandy mucks and mucky sands) by using actual soil organic matter content to interpolate between recommendations for sands and mucks
- Update elemental sulfur recommendations for sands and mucky sands

Current Sugarcane Nitrogen Recommendations

Table 1. Nitrogen fertilizer recommendations for Florida sugarcane by soil type.

Crop	Sands	Mucky sands	Sandy mucks	Mucks
	<6% OM	6-12% OM	13-20% OM	>20% OM
	----------lb N/acre----------			
Plant cane	220	110	30	0
Ratoon crops	200	110	30	0
Split applications: For soluble N programs on sands, 5 splits for plant cane and 4 splits for ratoon crops are suggested. Fewer splits are needed with a controlled release program. For soluble N programs on mucky sands, 2 splits are recommended.				
Soluble N/application: For sands, each split application should include no more than 50 lb soluble N/acre.				
Rainfall exception: For sands, an additional 30 lb N/acre is allowed for the annual N total for a specific location when ≥ 4 inches rainfall is received in a 2-day period and within 20 days after a soluble N application.				

Current Sugarcane Phosphorus Recommendations

Table 2. Recommended phosphorus fertilizer for each sugarcane crop for mucks and sandy mucks based on pre-plant Mehlich 3-extractable soil P.

Pm (g/m^3)	Plant	Ratoon 1	Ratoon 2	Ratoon 3+
	----------lb P_2O_5/acre----------			
≤ 8	75	75	60	50
9-15	60	60	50	50
16-20	50	50	40	40
21-25	40	40	40	40
26-30	0	30	30	40
31-35	0	0	20	30
36-40	0	0	0	20
>40	0	0	0	0

Table 3. Recommended phosphorus fertilizer for each sugarcane crop for sands and mucky sands based on pre-plant Mehlich 3-extractable soil P.

Pm (g/m^3)	Plant	Ratoon 1	Ratoon 2+
	---------- P_2O_5/acre----------		
≤30	75	75	60
31-55	60	60	50
56-80	40	40	40
81-100	0	40	40
101-120	0	0	40
>120	0	0	0

Current Sugarcane Calcium Silicate Recommendations

Table 6. Calcium silicate recommendations for sugarcane grown on mucks and sandy mucks based on acetic acid-extractable soil Si.

Acetic acid Si	Ca Silicate
g Si/m^3	tons/acre
0-5	3.0
6-10	2.5
11-15	2.0
16-20	1.5
21-25	1.0
>25	0

Table 7. Calcium silicate recommendations for Florida sugarcane grown on sands and mucky sands based on acetic acid-extractable soil Si.

Acetic acid Si	Ca Silicate
g Si/m^3	tons/acre
0-20	3.0
21-40	2.5
41-75	2.0
76-110	1.5
111-150	1.0
>150	0

Regression with Extractable Soil Silicon

Relative Sucrose Yield = 0.704 + 0.001 (Acetic Si)*** + 0.046 (Soil OM)**

R^2 = 0.54, n = 20, treatment means for all years for 3 Si trials

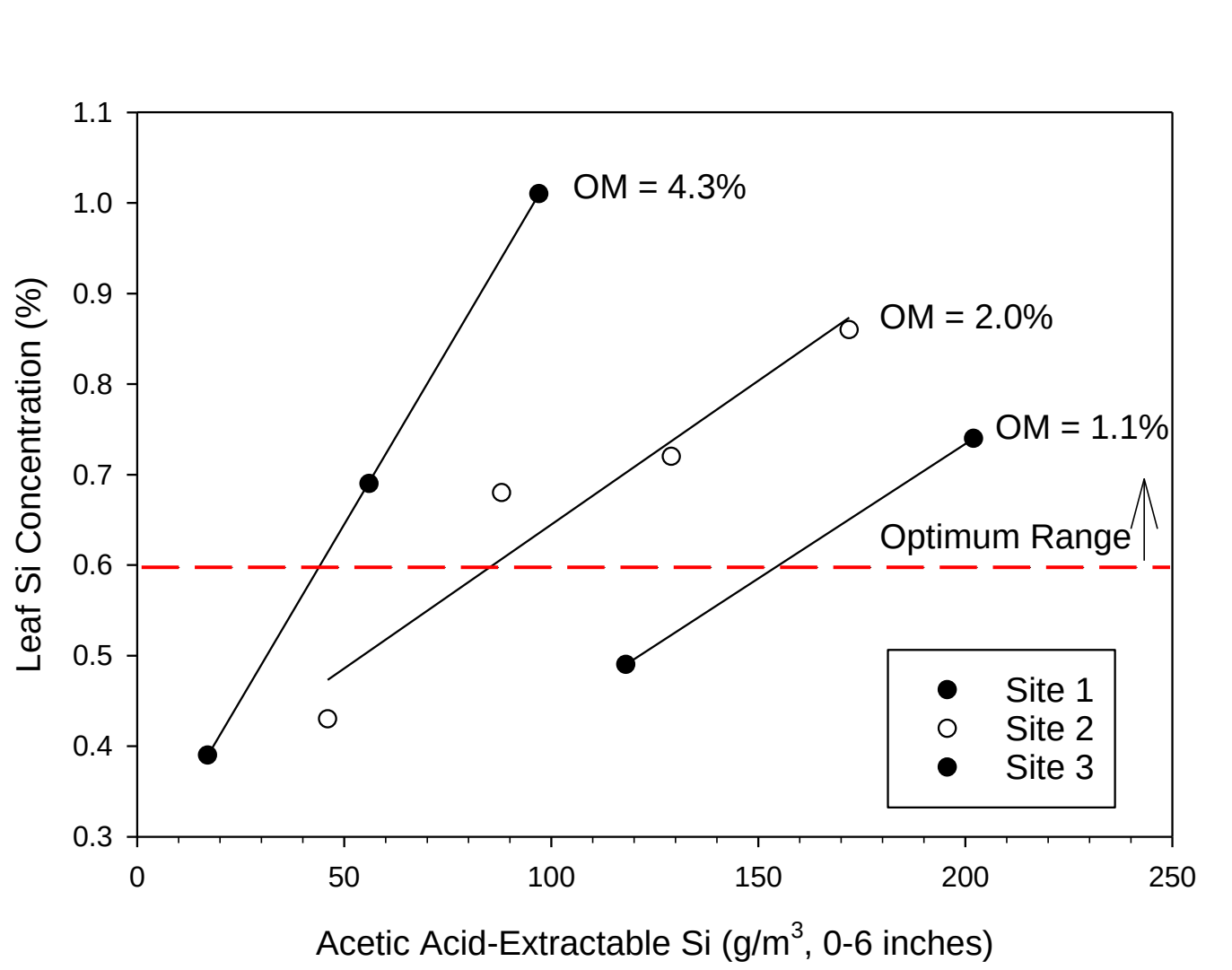
Leaf Si = 0.017 + 0.004 (Acetic Si)*** + 0.107 (Soil OM)**

R^2 = 0.66, n = 20, treatment means for all years for 3 Si trials

Leaf Si = 0.288 + 0.001 (Acetic Si)*** + 0.151 (Soil OM)***

R^2 = 0.20, n = 101, individual plot values from fully fertilized treatments from 17 sandland experiments

Relationship between Leaf Si Concentration and Acetic Soil Si Shifts with Organic Matter



Interpolate to Determine Nutrient Rate for Transitional Soils

$y = y1 + ((y2 - y1)/(x2 - x1) \times (x - x1))$

x = actual soil OM%
y = N rate at actual OM%
y1 = N rate at 3% OM (3% OM is used as the upper end of the range of typical true sands)
y2 = N rate at 20% OM (20% OM is used as the lower end of the range of muck soils)
x1 = 3% OM
x2 = 20% OM

Example calculation of plant cane N rate for a soil with 8% OM:

$y = 220 + ((0-220)/(20-3) \times (8-3))$
$y = 220 + (-12.9 \times 5)$
$y = 220 - 64.5$
y = 155.5 lb N/acre for a soil with 8% OM

Elemental Sulfur Recommendations for Sands and Mucky Sands

- IFAS Bulletin 809 from 1979 (Gary Gascho and Gerald Kidder) recommended 500 lb elemental sulfur/acre for sugarcane on mucks and sandy mucks and 300 lb/acre for sands and mucky sands with soil pH $\geq$ 6.5. This is a pre-plant furrow application.
- In 2018 the elemental sulfur application for mucks and sandy mucks was changed with sulfur only recommended with pH $\geq$ 7.0. This was based on field trials and yield responses to elemental sulfur in addition to leaf Mn data in relation to soil pH.
- Based on field observations and published field survey data (McCray et al., 2010), we know that fewer Mn deficiency symptoms are observed on sands and that soil Ca values are generally much lower on sands. These are indications that less elemental sulfur is needed on sand soils.
- However, there are situations on sands and mucky sands with high pH and high concentrations of Ca carbonate where application of elemental sulfur may be beneficial.
- The proposed new elemental sulfur recommendations for sands and mucky sands use the pH break points for mucks and sandy mucks with the highest recommendation being 300 lb/acre as in the 1979 bulletin.

Proposed New Elemental Sulfur Recommendations for Sugarcane on Sands and Mucky Sands

Table 8. Elemental sulfur recommendations for Florida sugarcane for each soil type for furrow application based on pre-plant soil pH.

Soil pH	Granular Elemental Sulfur	
	Mucks, sandy mucks	Sands, mucky sands
	----------lb/acre----------	
7.0-7.1	100	100
7.2	150	150
7.3-7.4	200	200
$\geq$ 7.5	250-500	250-300