RESEARCH ON SOIL FERTILITY IN SUGARCANE PRODUCTION

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Summary

Field trials were conducted in 2025 to evaluate cane and sugar yield response to different sulfur (S) rates and source, potassium (K)- and S-based starter and spring fertilization, and different silicon (Si) sources. Two S trials' treatments included two or three S sources (K-thiosulfate [0-0-25-16 S], ammonium (NH_4) thiosulfate [12-0-0-26 S], and gypsum [18% S]) applied at 0, 20, 40, and 60 lbs/ac. The treatments for the K trial included two rates (15 and 30 lbs/ac) of K starter, applied in fall 2020, with annual spring K application using muriate of potash (MOP, 60% K) applied at 80 lbs K/ac and Nachurs® high K additives as sources. The K and S starter fertilizer study that was established in 2023 included a mixture of premium liquid N-P-K starter, liquid micronutrients, and K-S liquid supplements then followed by either a standard fertilization vs. Nachurs high K- and S- additives applications in spring 2025 (first ratoon). A demonstration test was conducted on a producer's field in Palmetto to evaluate sources of Si for sugarcane production. The results from these studies demonstrate that the application of K, S, and Si, depending on source and rate can increase the availability of these nutrients in the soil, some resulted in higher uptake by cane subsequently affecting tonnage and juice quality. There were also changes in the dynamics of other nutrients (e.g., Mo, Mn, P) in both soil and plant systems. However, not all these changes necessarily resulted in significant increases in cane and sugar yield. Soil testing remains vital to gauge whether the application of nutrients like K, S, and Si will bring benefits to sugarcane productivity.

Objective

This research was designed to evaluate the effect of K, S, and Si on sugarcane yield and quality components with factors including rate, sources, and application timing. This annual progress report is presented to provide the latest available data on certain nutrient management practices and not as a final recommendation for growers to use.

Results

<u>Sugarcane Response to Different Sulfur Sources and Rates</u>

Sulfur application rate significantly ($p<0.1$) affected cane tonnage with 40 lbs/ac as the optimal rate for both sources (Table 1). The main effect of source and rate on sugar yield and quality component was not significant. However, there was a significant source and rate interaction effect on Brix, theoretical recoverable sugar (TRS), polarity and sucrose. With K-thiosulfate as source, TRS increased with increasing rate, but an opposite trend was observed using NH_4-thiosulfate. Similar to cane tonnage response, S rate had a more evident effect than source on leaf nutrient content (Table 2). For example, with increasing S rate leaf S increased while leaf Mo declined. The increasing S rate had a negative effect on leaf Mo, perhaps can be partly attributed to absorption site competition between sulfate and molybdate ions. In addition, the reduced leaf

Mo, and also leaf Cu, at high S rate application can be attributed to high demand for Mo and Cu-containing compound in the plant called MoCo; this compound facilitates the biosynthesis of sulfite enzyme necessary in S assimilation process. With high S supply, the S assimilation process is enhanced utilizing more sulfite enzyme in the process. While these are notable responses in the plant, soil pH and nutrient content at harvest did not respond to S source and rate and their interaction (Table 3). There was a tendency for soil S to increase with increasing S rate, but due to its mobile nature in the soil, losses from leaching and runoff within months after treatment application reduced the impact of S rate to soil S level.

For L01-299 plant cane, rate significantly affected most of the juice quality traits with 40 lbs/ac being optimal (Table 4). The effect of rate on fiber and purity was not consistent across the source. The source effect tended to impact sugar yield (*p-value* =0.120), with gypsum as a better performing source than K- and NH_4-thiosulfate. Sulfur rate also significantly affected leaf S content 30 days after treatment application. Leaf Cu and Mn content declined with increasing S rate, consistent with the observation for the L01-299 fourth ratoon crop. At harvest, there were observable differences in the levels of some nutrients in the soil due to main source and rate effect however, there was no specific trend or pattern in response to rate whereas for source, gypsum-treated soil had the lowest Cu and Mn content (Table 6). Soil P availability increased with increasing S rate using gypsum, declined using K-thiosulfate, and had no trend using NH_4-thiosulfate as source.

Effect of Potassium Starter and Spring Fertilization

The application of K-additive in spring 2025 did not result in improvement on yield and quality component of L01-299 fourth ratoon crop (Table 7). There were significant differences on stalk B, Cu, Mo, and K content however, no clear pattern with respect to starter rate application and K-additive was observed (Table 8). Stalk K tended to be higher where starter K at rate of 30 lbs/ac was applied. Soil nutrient content at harvest was not affected by the treatment as well (Table 9). For L01-299 first ratoon, the treatments influenced mainly the juice quality including fiber, purity, and sucrose that affected the lbs sugar per ton (TRS) level (Table 10). The application of K- and S- additives and/or NPKS micro at planting improved TRS but, was not impactful enough to significantly increase sugar yield. Even so, the K and S applications regardless of source tended to improve sugar yield by ~1,200 lbs/ac *(p-value* = 0.196). Only stalk Al and S content were affected by the treatment with higher levels of S being associated with NPKS micro application at planting combined with spring fertilization based on the farmer's standard with and without S- and high K additives (Table 11). Stalk Al was highest in cane under the farmer's standard practice. The only affected soil nutrient was P, with the lowest level recorded in plots without starter but received K + S additives in spring (Table 12).

Potential of Ag and Industrial By-Product as Silicon Source for Sugarcane Production

The yield and quality component of L01-299 1st ratoon, except for purity, were not affected by the treatments (Table 13). Similarly, the leaf nutrient content (Table 14) nor the soil nutrient content (Table 15) was unaffected by the treatments. Only soil Na differed among the treatment with MOP-treated soil returning the highest soil Na content. The exchangeable bases were not affected by the treatment but, the Ca/Mg and Ca/K ratio were highest in lime-treated plots (Table 16). Soil Si level at harvest increased where silicate slag was applied (Table 17). It is also evident that higher levels of soil K and Mg were associated with lime application. The change in soil pH and nutrient content, specifically Si, was minimal in response to the application of these amendments (silicate slag, fly ash, and lime) and MO thus, resulted in little to no impact on nutrient uptake and overall performance of sugarcane.

Acknowledgements
The authors wish to express appreciation for the financial support of American Sugar Cane League, Wilson Group Co., and Nachurs®.

Table 1. Effect of sulfur source and rate on yield and quality components of HoCP14-885 first ratoon crop, LSU AgCenter Sugar Research Station in St. Gabriel, 2025.

Source	**Rate lbs/ac**	**Cane tons/ac**	**Sugar lbs/ac**	**Brix %**	**TRS lbs/ton**	**Fiber %**	**Moisture %**	**Polarity %**	**Purity %**	**Sucrose %**
K-Thiosulfate	0	38.9	9718	19.7	249	9.7	72	75	86	17.3
	20	41.3	10443	19.8	253	9.9	72	76	87	17.5
	40	42.2	10859	20.3	257	10.1	72	77	87	17.9
	60	43.9	10827	19.7	246	10.0	72	74	86	17.2
NH_4-Thiosulfate	0	42.1	10980	20.1	261	9.8	72	77	87	17.8
	20	42.4	11022	20.2	259	10.1	72	78	87	17.9
	40	44.6	10798	19.5	242	9.9	73	72	84	16.7
	60	42.5	10637	19.8	250	9.9	72	75	86	17.4
p-value										
Source		0.165	0.172	0.770	0.636	0.983	0.739	0.993	0.691	0.991
Rate		**0.096**	0.601	0.611	0.227	0.634	0.704	0.309	0.213	0.295
Source x Rate		0.279	0.222	**0.058**	**0.030**	0.642	**0.078**	**0.020**	0.209	**0.020**
SE										
Source		0.91	278	0.125	2.206	0.17	0.162	0.618	0.403	0.135
Rate		1.08	329	0.169	3.100	0.20	0.210	0.874	0.571	0.192
Source x Rate		1.39	420	0.232	4.369	0.25	0.282	1.236	0.807	0.271

SE – standard error; TRS – theoretical recoverable sugar.

Table 2. Nutrient content of leaf samples collected 30 days after treatment application, LSU AgCenter Sugar Research Station in St. Gabriel, Louisiana, 2025.

Source	Rate lbs/ac	Al mg/kg	B mg/kg	Ca %	Cu mg/kg	Fe mg/kg	Mg %	Mn mg/kg	Mo mg/kg	P %	K %	Na mg/kg	S %	Zn mg/kg
K-Thiosulfate	0	2.36	0.380	0.022	0.251	5.8	0.0068	5.15	0.0567	0.0072	0.0526	6.12	0.0058	0.6298
	20	1.90	0.492	0.023	0.275	5.6	0.0072	6.16	0.0353	0.0078	0.0548	7.09	0.0077	0.7080
	40	2.16	0.409	0.023	0.253	5.1	0.0063	5.58	0.0289	0.0071	0.0543	5.66	0.0087	0.6478
	60	1.44	0.361	0.024	0.243	4.8	0.0071	6.15	0.0289	0.0072	0.0542	5.95	0.0091	0.7303
-Thiosulfate	0	1.52	0.443	0.021	0.272	4.9	0.0068	5.61	0.0425	0.0080	0.0590	6.74	0.0066	0.6853
	20	2.12	0.472	0.021	0.258	5.7	0.0068	5.95	0.0305	0.0071	0.0547	6.58	0.0075	0.8403
	40	2.14	0.439	0.023	0.255	5.1	0.0069	6.80	0.0249	0.0070	0.0510	6.27	0.0088	0.6230
	60	1.71	0.344	0.021	0.237	5.0	0.0063	5.75	0.0215	0.0065	0.0577	6.24	0.0088	0.6170
p-value														
Source		0.772	0.726	0.155	0.998	0.755	0.426	0.519	**0.026**	0.496	0.421	0.173	0.986	0.831
Rate		0.701	**0.080**	0.530	**0.098**	0.782	0.568	0.513	**<0.0001**	0.217	0.527	**0.011**	**<.0001**	0.247
Source x Rate		0.644	0.788	0.636	0.375	0.860	0.195	0.515	0.626	0.203	0.263	0.111	0.503	0.364
SE														
Source		0.259	0.028	0.022	0.255	0.385	0.00015	0.292	0.002	0.00020	0.0016	0.125	0.00035	0.040
Rate		0.353	0.036	0.022	0.261	0.524	0.00021	0.396	0.003	0.00028	0.0020	0.176	0.00040	0.054
Source x Rate		0.490	0.048	0.022	0.251	0.725	0.00030	0.561	0.004	0.00039	0.0027	0.250	0.00048	0.073

SE – standard error

Table 3. Soil pH and nutrient content based on Mehlich-3 extraction procedure at harvest, LSU AgCenter Sugar Research Station, St. Gabriel, Louisiana, 2025.

Source	**Rate lbs/ac**	**pH**	**B**	**Ca**	**Cu**	**Fe**	**Mg**	**Mn**	**P**	**K**	**Na**	**S**	**Zn**
			---mg/kg---										
K-Thiosulfate	0	6.77	2.91	1748	2.33	369	321	129	19.4	82	36.9	17.1	2.77
	20	6.34	2.92	1685	2.40	385	332	124	19.5	84	35.1	17.2	2.79
	40	6.56	3.64	1688	2.30	363	308	124	17.6	99	43.2	18.8	2.77
	60	6.55	4.26	1373	2.05	375	280	111	21.4	87	37.5	16.4	2.71
·Thiosulfate	0	6.59	2.57	1593	2.31	377	323	126	20.0	88	37.3	16.2	2.90
	20	6.52	3.32	1613	2.20	372	321	126	18.9	90	38.2	17.1	2.72
	40	6.45	2.85	1480	2.23	386	315	123	21.0	86	32.0	18.7	2.90
	60	6.53	3.12	1533	2.12	374	309	123	19.8	85	29.6	19.3	2.64
p-value													
Source		0.655	0.189	0.407	0.569	0.677	0.497	0.551	0.636	0.860	0.280	0.499	0.803
Rate		0.188	0.304	0.255	0.306	0.978	0.130	0.328	0.669	0.744	0.849	0.183	0.758
Source x Rate		0.416	0.440	0.414	0.792	0.589	0.572	0.602	0.269	0.473	0.454	0.247	0.870
SE													
Source		0.073	0.244	58	0.067	8.4	7.0	3.159	0.753	3.4	2.52	0.483	0.086
Rate		0.092	0.345	82	0.094	10.8	9.9	4.301	0.990	4.9	3.56	0.682	0.121
Source x Rate		0.121	0.488	115	0.133	14.4	14.0	5.961	1.345	6.9	5.03	0.965	0.171

SE – standard error

Table 4. Effect of sulfur source and rate on yield and quality components of L01-299 plant cane, LSU AgCenter Sugar Research Station in St. Gabriel, 2025.

Source	Rate lbs/ac	Yield t/ac	Sugar lbs/ac	Brix %	TRS lbs/ton	Fiber %	Moisture %	Polarity %	Purity %	Sucrose %
Gypsum	0	49.3	9123	16.6	185	11.9	73.9	57.0	79.6	13.4
	20	54.4	10079	16.3	179	12.4	73.7	55.3	78.7	13.0
	40	52.8	9774	16.7	186	12.2	73.6	57.3	79.3	13.5
	60	49.6	9297	16.8	188	12.6	73.1	57.8	79.6	13.6
K-Thiosulfate	0	49.2	9016	16.5	183	12.5	73.5	56.5	79.4	13.3
	20	47.7	8221	16.1	170	12.2	74.2	53.2	76.9	12.6
	40	50.3	9829	16.9	196	12.3	73.3	59.5	81.5	14.0
	60	52.5	9587	16.5	183	12.5	73.5	56.4	79.3	13.3
NH_4-Thiosulfate	0	50.3	8989	16.3	179	12.7	73.4	55.4	78.5	13.1
	20	51.3	9472	15.7	180	11.6	74.8	54.7	81.2	12.9
	40	45.9	8750	17.2	191	12.5	72.8	59.1	79.2	13.9
	60	48.8	8754	16.3	180	11.8	74.0	55.5	78.9	13.1
p-value										
Source		0.230	0.120	0.619	0.880	0.356	0.648	0.805	0.943	0.816
Rate		0.914	0.703	**0.005**	**0.023**	0.288	**0.004**	**0.012**	0.416	**0.013**
Source x Rate		0.259	0.121	0.634	0.495	**0.003**	0.046	0.706	**0.013**	0.687
SE										
Source		1.244	232	0.196	2.75	0.115	0.237	0.806	0.414	0.179
Rate		1.400	263	0.213	3.16	0.129	0.254	0.909	0.478	0.202
Source x Rate		2.292	436	0.319	5.42	0.211	0.359	1.498	0.828	0.335

SE – standard error; TRS – theoretical recoverable sugar

Table 5. Nutrient content of leaf samples collected 30 days after treatment application, LSU AgCenter Sugar Research Station in St. Gabriel, Louisiana, 2025.

Source	**Rate**	Al	B	Ca	Cu	Fe	Mg	Mn	Mo	**N**	P	K	Na	S	Zn
	lbs/ac	**mg/kg**	**mg/kg**	**%**	**mg/kg**	**mg/kg**	**%**	**mg/kg**	**mg/kg**	**%**	**%**	**mg/kg**	**%**	**mg/kg**	mg/kg
Gypsum	0	1.435	0.607	0.019	0.234	3.425	0.009	2.685	0.041	1.76	0.008	0.054	6.038	0.008	0.713
	20	1.515	0.545	0.020	0.238	3.725	0.009	2.690	0.028	1.76	0.008	0.058	5.870	0.012	0.776
	40	1.592	0.427	0.018	0.233	3.720	0.008	2.718	0.046	1.77	0.008	0.061	6.263	0.011	0.745
	60	1.378	0.477	0.019	0.225	3.428	0.009	2.393	0.036	2.08	0.008	0.054	5.800	0.010	0.724
K-Thiosulfate	0	1.435	0.450	0.018	0.247	3.478	0.008	2.605	0.043	1.93	0.008	0.058	6.150	0.009	0.783
	20	1.640	0.489	0.019	0.240	3.740	0.008	2.973	0.032	2.05	0.008	0.064	5.817	0.010	0.740
	40	1.312	0.420	0.018	0.228	3.570	0.009	2.575	0.039	1.96	0.008	0.056	6.108	0.010	0.784
	60	1.159	0.405	0.018	0.220	3.380	0.008	2.498	0.049	2.02	0.008	0.058	6.303	0.010	0.648
NH_4-Thiosulfate	0	1.860	0.463	0.019	0.235	4.015	0.009	2.258	0.057	1.81	0.008	0.057	6.335	0.009	0.745
	20	1.270	0.528	0.019	0.248	3.383	0.009	3.273	0.031	1.95	0.008	0.060	5.588	0.010	0.710
	40	1.266	0.522	0.019	0.233	3.348	0.010	2.293	0.043	2.07	0.008	0.051	6.545	0.010	0.663
	60	1.192	0.423	0.018	0.228	3.253	0.008	2.618	0.031	2.02	0.008	0.063	6.018	0.010	0.758
p-value															
Source		0.569	0.243	0.545	0.827	0.826	0.263	0.942	0.890	0.185	0.545	0.685	0.831	0.638	0.871
Rate		0.133	0.266	**0.060**	**0.031**	0.261	0.665	**0.023**	0.228	0.290	0.501	0.243	0.331	**<0.0001**	0.883
Source x Rate		0.311	0.628	0.990	0.776	0.134	0.197	0.171	0.734	0.645	0.267	**0.088**	0.867	0.071	0.587
SE															
Source		0.178	0.029	0.00065	0.005	0.165	0.00044	0.143	0.005	0.086	0.00019	0.00248	0.217	0.00022	0.030
Rate		0.188	0.034	0.00029	0.005	0.173	0.00046	0.154	0.006	0.093	0.00020	0.00260	0.238	0.00065	0.035
Source x Rate		0.230	0.059	0.00099	0.008	0.227	0.00057	0.224	0.010	0.143	0.00026	0.00342	0.367	0.00044	0.061

SE – standard error

Table 6. Soil pH and nutrient content based on Mehlich-3 extraction procedure at harvest, LSU AgCenter Sugar Research Station, St. Gabriel, Louisiana, 2025.

Source	**Rate**	pH	B	Ca	Cu	Fe	Mg	Mn	P	K	Na	S	Zn
	lbs/ac		**mg/kg**										
Gypsum	0	6.22	0.198	2203	3.395	483	521	149	23.4	131	45.8	18.5	3.768
	20	6.42	0.507	2168	3.278	490	500	132	28.8	140	41.3	14.6	3.840
	40	6.38	0.510	2288	3.425	487	533	146	27.9	139	47.5	14.9	3.843
	60	6.55	0.733	2150	3.388	482	498	140	25.2	125	45.5	20.2	3.685
K-Thiosulfate	0	6.49	0.572	2343	3.705	483	550	158	26.4	136	44.3	16.3	3.795
	20	6.25	0.654	2213	3.443	482	525	143	27.6	133	38.5	19.5	3.810
	40	6.51	0.669	2195	3.505	463	509	162	23.7	123	47.0	19.1	3.658
	60	6.39	0.426	2340	3.658	477	560	173	23.1	135	37.3	13.9	3.735
NH_4-Thiosulfate	0	6.37	0.252	2383	3.715	471	554	161	25.1	143	52.5	13.4	3.920
	20	6.52	0.616	2103	3.273	486	492	137	25.6	128	48.5	17.3	3.613
	40	6.79	0.841	2240	3.600	456	523	173	19.3	119	59.5	19.6	3.403
	60	6.60	0.423	2238	3.365	480	533	157	26.7	140	46.0	17.7	3.645
p-value													
Source		0.243	0.655	0.558	**0.017**	0.376	0.404	**0.005**	0.286	0.947	0.086	0.996	0.354
Rate		0.407	**0.046**	0.287	**0.013**	0.442	0.328	**0.003**	0.149	0.548	0.283	0.902	0.373
Source x Rate		0.668	0.182	0.637	0.324	0.902	0.667	0.434	**0.093**	0.251	0.984	0.397	0.516
SE													
Source		0.175	0.201	74	0.049	8.3	20	5.3	1.66	7.0	3.90	1.705	0.125
Rate		0.181	0.205	78	0.056	9.1	21	5.7	1.75	7.3	4.29	1.912	0.131
Source x Rate		0.224	0.236	108	0.097	13.8	29	8.4	2.35	9.6	6.63	3.109	0.174

SE – standard error

Table 7. Yield and quality components of L01-299 fourth ratoon in response to starter and spring K fertilizer treatments, LSU AgCenter Sugar Research Station in St. Gabriel, Louisiana, 2025.

Treatment	K Rate (lbs/ac) or Additive		Yield	Sugar	Brix	TRS	Fiber	Polarity	Purity	Sucrose
	2020 Starter	2025 Spring	tons/ac	lbs/ac	%	lbs/ton	%	%	%	%
Control	**0**	**0**	43	10031	19.1	232	12.4	70.4	84.0	16.4
Farmer's Std	**0**	**80**	43	9320	18.3	216	12.8	65.8	82.6	15.4
1	**15**	**Nachurs K-additive**	44	9890	18.6	224	13.1	68.0	83.6	15.8
2	**15**	**Nachurs K-additive**	41	8992	18.4	221	12.5	66.9	83.3	15.6
3	**15**	**80**	42	9738	18.9	228	12.8	69.0	83.7	16.1
4	**30**	**Nachurs K-additive**	42	9589	18.8	231	12.4	69.6	84.7	16.2
5	**30**	**Nachurs K-additive**	40	8937	18.7	223	12.5	67.7	83.1	15.8
6	**30**	**80**	46	10264	18.6	222	12.6	67.4	83.1	15.7
		p-value	0.165	0.445	0.631	0.726	0.413	0.695	0.844	0.703
		SE	1.53	479	0.312	6.96	0.250	1.85	0.940	0.409

SE – standard error; TRS – theoretical recoverable sugar

Table 8. Stalk nutrient content of L01-299 fourth ratoon crop at harvest, LSU AgCenter Sugar Research Station in St. Gabriel, Louisiana, 2025.

Treatment	K Rate (lbs/ac) or Additive		B	Ca	Cu	Fe	Mg	Mn	Mo	P	K	Na	S	Zn
	2020 Starter	2025 Spring	mg/kg	%	mg/kg	mg/kg	%	mg/kg	mg/kg	%	%	mg/kg	%	mg/kg
Control	**0**	**0**	0.163	0.0055	0.0752	1.57	0.0035	0.674	0.0047	0.0028	0.0069	10.50	0.0029	0.493
Farmer's Std	**0**	**80**	0.197	0.0063	0.1037	1.53	0.0040	0.619	0.0083	0.0031	0.0106	11.42	0.0035	0.553
1	**15**	**Nachurs K-additive 1**	0.264	0.0058	0.0814	1.48	0.0038	0.696	0.0041	0.0031	0.0094	11.53	0.0032	0.481
2	**15**	**Nachurs K-additive 2**	0.148	0.0060	0.0734	1.66	0.0039	0.638	0.0043	0.0029	0.0080	11.19	0.0033	0.444
3	**15**	**80**	0.167	0.0066	0.0936	1.29	0.0042	0.688	0.0050	0.0032	0.0132	12.61	0.0034	0.585
4	**30**	**Nachurs K-additive 1**	0.149	0.0063	0.0898	1.36	0.0039	0.606	0.0038	0.0032	0.0125	10.10	0.0034	0.556
5	**30**	**Nachurs K-additive 2**	0.218	0.0058	0.0893	1.69	0.0041	0.572	0.0053	0.0033	0.0120	10.78	0.0032	0.564
6	**30**	**80**	0.282	0.0056	0.0880	1.31	0.0039	0.579	0.0087	0.0030	0.0119	10.77	0.0036	0.464
		p-value	**0.031**	0.333	**0.070**	0.714	0.224	0.226	**0.065**	0.193	**0.017**	0.843	0.966	0.485
		SE	**0.032**	0.00035	**0.0070**	0.195	0.00017	0.0404	**0.0013**	0.0001	**0.0013**	1.111	0.0005	0.0543

SE – standard error

Table 9. Soil pH and nutrient content at harvest, LSU AgCenter Sugar Research Station, St. Gabriel, Louisiana, 2025.

Treatment	K Rate (lbs/ac) or Additive		B	Ca	Cu	Fe	Mg	Mn	P	K	Na	S	Zn
	2020 Starter	2023 Spring	mg/kg										
Control	**0**	**0**	0.207	1504	0.907	578	357	102	36.4	108	31.7	22.6	3.61
Farmer's Std	**0**	**80**	0.205	1444	1.033	569	345	96	33.4	108	31.9	21.9	3.68
1	**15**	**Nachurs K-additive 1**	0.203	1514	0.825	577	362	104	41.5	122	33.8	24.7	3.68
2	**15**	**Nachurs K-additive 2**	0.239	1496	0.815	581	365	105	42.5	113	32.5	24.5	3.85
3	**15**	**80**	0.192	1524	1.023	574	358	107	37.6	114	29.5	21.8	3.54
4	**30**	**Nachurs K-additive 1**	0.186	1580	0.852	588	379	107	39.8	118	33.7	23.8	3.82
5	**30**	**Nachurs K-additive 2**	0.551	1457	1.080	557	353	101	36.1	103	30.9	21.1	3.48
6	**30**	**80**	0.188	1456	1.054	572	354	105	38.3	118	28.4	22.1	3.45
		p-value	0.347	0.961	0.748	0.337	0.945	0.772	0.112	0.266	0.732	0.236	0.715
		SE	0.115	86	0.146	8.71	18.1	4.65	2.29	5.31	2.41	1.165	0.194

SE – standard error

Table 10. Yield and quality components of L01-299 first ratoon in response to starter and spring high K & S additives, LSU AgCenter Sugar Research Station in St. Gabriel, Louisiana, 2025.

Treatment	2023 Starter (At Planting)	2025 Spring Treatment	Yield tons/ac	Sugar lbs/ac	Brix %	TRS lbs/ton	Fiber %	Polarity %	Purity %	Sucrose %
Farmer's Std	0	120 lbs N & 80 lbs K per acre	34	5095	14.5	150	13.0	27.8	72.7	10.4
1	0	120 lbs N, 80 lbs K & S Additive	38	6649	14.2	176	15.3	10.7	78.7	10.7
2	NPKS Micro	120 lbs N & 80 lbs K per acre	38	6662	14.6	173	14.7	20.8	78.1	11.1
3	NPKS Micro	120 lbs N, 80 lbs K + S Additive	36	6226	14.0	172	14.6	10.5	78.0	10.5
4	NPKS Micro	120 lbs N, 80 lbs K + S Additive	37	6406	14.4	173	14.9	10.7	77.0	10.7
5	NPKS Micro	120 lbs N, 80 lbs K + S Additive + High K Additiv	40	6020	14.5	152	13.2	29.1	73.7	10.6
6	0	120 lbs N, 80 lbs K + S Additive	37	6765	14.7	182	15.5	11.1	78.7	11.1
		p-value	0.782	0.196	0.666	**0.016**	**0.095**	0.214	**0.042**	0.576
		SE	2.4	457	0.365	6.59	0.657	6.90	1.51	0.364

SE – standard error; TRS – theoretical recoverable sugar

Table 11. Stalk nutrient content of L01-299 fourth ratoon crop at harvest, LSU AgCenter Sugar Research Station in St. Gabriel, Louisiana, 2025.

Treatment	2023 Starter (At Planting)	2025 Spring Treatment	Al mg/kg	B mg/kg	Ca %	Cu mg/kg	Fe mg/kg	Mg %	Mn mg/kg	Mo mg/kg	P %	K %	Na mg/kg	S %	Zn mg/kg
Farmer's Std	0	120 lbs N & 80 lbs K per acre	3.26	0.154	0.0045	0.0947	3.17	0.0027	0.407	0.0117	0.0031	0.0229	6.02	0.0018	0.439
1	0	120 lbs N, 80 lbs K & S Additive	1.11	0.160	0.0043	0.0911	2.00	0.0025	0.465	0.0138	0.0034	0.0264	4.98	0.0017	0.525
2	NPKS Micro	120 lbs N & 80 lbs K per acre	1.55	0.132	0.0054	0.1113	4.69	0.0029	0.493	0.0162	0.0040	0.0344	5.42	0.0025	0.737
3	NPKS Micro	120 lbs N, 80 lbs K + S Additive	1.17	0.149	0.0049	0.1019	1.99	0.0028	0.458	0.0151	0.0036	0.0308	4.36	0.0018	0.649
4	NPKS Micro	120 lbs N, 80 lbs K + S Additive	1.01	0.149	0.0045	0.0954	2.03	0.0028	0.526	0.0127	0.0033	0.0232	6.69	0.0019	0.533
5	NPKS Micro	120 lbs N, 80 lbs K + S Additive + High K Additiv	1.68	0.171	0.0046	0.1084	8.50	0.0025	0.420	0.0141	0.0031	0.0220	5.23	0.0022	0.537
6	0	120 lbs N, 80 lbs K + S Additive	.	.	.	.	.	.	.	.	.	.	.	.	.
		p-value	**0.020**	0.854	0.342	0.448	0.597	0.687	0.606	0.194	0.167	0.116	0.631	**0.004**	0.050
		SE	**0.432**	0.025	0.0005	0.0082	2.96	0.0002	0.0644	0.0014	0.00033	0.00351	1.095	0.00018	0.063

SE – standard error

Table 12. Soil pH and nutrient content at harvest, LSU AgCenter Sugar Research Station, St. Gabriel, Louisiana, 2025.

Treatment	2023 Starter (At Planting)	2025 Spring Treatment	B	Ca	Cu	Fe	Mg	Mn	P	K	Na	S	Zn
			------------	------------	------------	------------	------------	mg/kg	------------	------------	------------	------------	------------
Farmer's Std	0	120 lbs N & 80 lbs K per acre	0.47	2645	2.42	508	664	93	51.9	250	31.7	18.93	4.11
1	0	120 lbs N, 80 lbs K & S Additive	0.46	2815	2.48	500	707	87	51.7	278	31.9	18.21	4.12
2	NPKS Micro	120 lbs N & 80 lbs K per acre	0.47	2570	2.44	491	644	90	50.4	260	32.2	13.70	4.22
3	NPKS Micro	120 lbs N, 80 lbs K + S Additive	0.44	2710	2.63	504	686	88	50.1	268	36.7	18.16	4.15
4	NPKS Micro	120 lbs N, 80 lbs K + S Additive	0.45	2683	2.47	502	683	88	53.4	250	27.3	18.07	4.03
5	NPKS Micro	120 lbs N, 80 lbs K + S Additive + High K Additiv	0.52	2650	2.36	502	669	85	54.7	247	31.7	17.98	4.44
6	0	120 lbs N, 80 lbs K + S Additive	0.53	2670	2.59	492	692	95	42.0	241	26.7	15.76	3.96
		p-value	0.761	0.790	0.975	0.651	0.762	0.425	**0.0003**	0.330	0.517	0.429	0.244
		SE	0.1016	105	0.22	15	29	3.7	**2.00**	13	3.51	4.84	0.137

SE – standard error

Table 13. Yield and quality component of L01-299 1st ratoon crop treated with silicate slag and fly ash as sources of Si, Palmetto, Louisiana, 2025.

Treatment	Cane ton/ac	Sugar lbs/ac	Brix %	TRS lbs/ton	Fiber %	Moisture %	Polarity %	Purity %	Sucrose %	Stalk Si %
Std Practice	31.6	8893	21.5	280	13.26	68.4	83.9	88.0 **A**	19.3	0.394
Silicate Slag	33.1	9414	22.3	285	12.90	68.0	86.1	87.0 **BC**	19.7	0.327
Fly Ash	31.5	8915	22.2	282	13.14	67.8	85.5	86.6 **BC**	19.6	0.328
Lime	30.6	8710	22.1	285	12.72	68.2	85.8	87.4 **AB**	19.7	0.346
MOP	32.5	9171	21.9	277	12.85	68.2	84.0	86.3 **C**	19.3	0.330
p-value	0.932	0.952	0.209	0.673	0.331	0.514	0.587	**0.078**	0.612	0.181
SE	2.19	671	0.261	4.99	0.1977	0.2479	1.43	**0.450**	0.3047	0.023

SE – standard error; TRS – theoretical recoverable sugar; MOP – muriate of potash
Values with the same uppercase letter within a column are not significantly different at $p<0.1$ level.

Table 14. Leaf nutrient content 30 days after treatment application, Palmetto, Louisiana, 2025.

Treatment	Si %	Al mg/kg	B mg/kg	Ca %	Cu mg/kg	Fe mg/kg	Mg %	Mn mg/kg	Mo mg/kg	P %	K %	Na mg/kg	S %	Zn mg/kg
Std Practice	1.216	2.9	0.485	0.019	0.236	5.060	0.0105	3.510	0.0169	0.0087	0.051	12.10	0.0131	0.736
Silicate Slag	1.177	2.6	0.565	0.017	0.241	4.568	0.0099	3.428	0.0169	0.0086	0.055	12.65	0.0134	0.699
Fly Ash	1.225	2.8	0.573	0.018	0.234	4.978	0.0107	3.698	0.0122	0.0090	0.049	13.30	0.0129	0.656
Lime	1.213	4.7	0.447	0.021	0.236	6.348	0.0106	3.490	0.0196	0.0089	0.056	12.03	0.0134	0.601
MOP	1.102	2.9	0.526	0.019	0.240	4.850	0.0103	3.770	0.0130	0.0086	0.052	13.08	0.0131	0.845
p-value	0.601	0.200	0.272	0.133	0.965	0.302	0.413	0.515	0.203	0.686	0.315	0.734	0.898	0.746
SE	0.063	0.712	0.045	0.0009	0.0093	0.630	0.00035	0.25	0.0023	0.00029	0.00281	0.888	0.0004	0.132

SE – standard error; MOP – muriate of potash

Table 15. Soil pH and nutrient content 30 days after treatment application, Palmetto, Louisiana, 2025.

Treatment	pH	Si	B	Ca	Cu	Fe	Mg	Mn	P	K	Na	S	Zn
		--				mg/kg						--	
Std Practice	4.99	34.86	0.015	1243	1.71	486	342	30	54	89	41 **B**	35	2.28
Silicate Slag	4.96	57.75	0.094	1270	1.68	471	371	31	52	91	46 **B**	36	1.99
Fly Ash	4.96	40.43	0.015	1206	1.71	481	366	30	56	93	47 **B**	35	2.14
Lime	5.10	38.24	0.125	1440	1.82	475	368	33	57	95	40 **B**	31	2.18
MOP	4.81	40.86	0.122	1202	1.70	482	367	33	51	108	65 **A**	35	2.07
p-value	0.575	0.222	0.654	0.114	0.684	0.859	0.301	0.694	0.697	0.123	**0.018**	0.326	0.614
SE	0.185	7.43	0.0737	144	0.195	25	31	5.4	5.49	7.67	**4.9**	3.11	0.185

SE – standard error; MOP – muriate of potash

Values with the same uppercase letter within a column are not significantly different at p<0.1 level.

Table 16. Soil exchangeable bases and ratios 30 days after treatment application, Palmetto, Louisiana, 2025.

Treatment	Ca	Mg	K	Ca/Mg	Ca/K
	Exchangeable, meq/100 g			Ratio	Ratio
Std Practice	3.11	1.42	0.11	3.61 **B**	13.89 **AB**
Silicate Slag	3.18	1.54	0.12	3.41 **BC**	13.80 **AB**
Fly Ash	3.01	1.52	0.12	3.27 **C**	12.85 **BC**
Lime	3.60	1.53	0.12	3.92 **A**	15.11 **A**
MOP	3.00	1.53	0.14	3.25 **C**	11.17 **C**
p-value	0.114	0.301	0.123	**0.010**	**0.061**
SE	0.361	0.131	0.010	**0.15**	**0.91**

SE – standard error; MOP – muriate of potash

Values with the same uppercase letter within a column are not significantly different at p<0.1 level.

Table 17. Soil pH and nutrient content at harvest, Palmetto, Louisiana, 2025.

Treatment	pH	Si	B	Ca	Cu	Fe	Mg	Mn	P	K	Na	S	Zn
		--------	--------	--------	--------	--------	--------mg/kg--------	--------	--------	--------	--------	--------	--------
Std Practice	4.57	31.9 **BC**	0.092	1259 **AB**	1.72	532	346 **B**	40	53	86 **B**	52	22.5	2.39
Silicate Slag	4.68	51.8 **A**	0.089	1249 **AB**	1.65	549	358 **B**	40	62	83 **B**	54	24.9	2.54
Fly Ash	4.66	45.7 **A**	0.017	1150 **B**	1.51	555	363 **B**	35	56	84 **B**	50	22.6	2.21
Lime	4.81	40.4 **AB**	0.107	1425 **A**	1.96	546	403 **A**	43	73	103 **A**	56	24.6	2.75
MOP	4.54	28.9 **C**	0.110	1242 **AB**	1.68	519	358 **B**	37	54	85 **B**	47	23.5	2.34
p-value	0.466	**0.054**	0.450	**0.042**	0.609	0.844	**0.037**	0.398	0.301	**0.033**	0.610	0.208	0.553
SE	0.166	**6.24**	0.070	**169**	0.273	35	**29**	9.71	8.63	**4.82**	5.03	1.67	0.282

SE – standard error; MOP – muriate of potash

Values with the same uppercase letter within a column are not significantly different at p<0.1 level.

NITROGEN MANAGEMENT RESEARCH IN LOUISIANA SUGARCANE PRODUCTION SYSTEMS

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Summary

Field trials were conducted in 2025 at the LSU AgCenter Sugar and Iberia Research Station and on producers' fields in Paincourtville, New Iberia, Erath, and St. James, LA to address the objectives of this project. The effect of N sources containing different N forms, *i.e.*, nitrate (NO_3), ammonium (NH_4), and urea (46% N) on sugarcane productivity was evaluated on different soil types, with and without cover crops. The performance of sensor-based N recommendation + N-rich strip technology (hereafter termed as sensor-based N recommendation) was compared to farmers' standard N practice (FP) on producers' fields at multiple locations. Sugarcane response to increasing N rate (0, 40, 80, and 120 lbs/acre) was also evaluated to validate the LSU AgCenter current N recommendation for sugarcane. The effect of applying different biostimulant types was tested on L01-299 1st ratoon. Cane tonnage, quality components, and sugar yield were determined at harvest. As needed, soil and plant tissue (leaf or shredded stalk) were collected and analyzed for nutrient content. More than 50% increase in sugar yield was attributed to N applications rates of 80-120 lbs N/ac. Urea-S blend, UAN, and urea+foliar N application returned the highest yield among the N sources. Cover cropping provided N credits as demonstrated by having higher soil N level compared to no cover cropping; this resulted in smaller benefits from applied N as shown by lower sugar yield response to N application (+56%) compared to no cover crops (+92.6%). On average, the sensor-based N recommended 50 lbs N/ac lesser than the FP with 340 lbs/ac sugar yield loss in 3 locations and 1,062 lbs/ac sugar yield increase in 6 locations. Biostimulant applications did not have any impact on sugarcane productivity nor on soil nutrient and leaf N content. The results from the N response trials validated the current LSU AgCenter with the optimal rate at 80-120 lbs N/ac.

Objectives

This project was designed to: 1) evaluate the potential of different N sources for sugarcane production in Louisiana, (2) evaluate the performance of VRT as a N decision tool, (3) evaluate the effect of biostimulant applications on sugarcane productivity, and (4) validate the LSU AgCenter N recommendation for sugarcane.

<u>Effect of Nitrogen Sources on Sugarcane Productivity</u>

On average across N sources, the application of 80 lbs N/acre significantly increased cane yield by 83.7% or 18 tons/acre without cover crops and by 52.3% or 12.5 tons/ac with cover crops and sugar yield by 92.6% or 4,534 lbs/acre without cover crops and by 56% or 3,228 lbs/ac with cover crops (Table 1) (p<.01). Between N sources, UAN, urea+foliar N, and urea-S returned the highest cane and sugar yield (p<.01). Mean stalk N content was significantly different among the

N sources with urea and UAN+$CaNO_3$ recorded the highest levels with and without cover crops. There were no significant differences among the treatment means for all the quality components (Brix, TRS, purity and sucrose). The lack of response of quality components to treatments like N source is commonly observed in sugarcane. If there is any, the common trend is that TRS declines with N fertilizer rate or the unfertilized sugarcane having the highest TRS.

Leaf N content 30 days after fertilization was significantly lower in the check plot, more so in the no cover cropping treatment (Figure 1). In addition, leaf N content was more responsive to N application regardless of source without cover cropping than with cover cropping. The cane response to applied N was consistent with the trend on available soil N measured in plots such that the impact of N application was lesser in plots with cover crops where soil N was higher than in plots without cover crops (Figure 2). This suggests that possible mineralization from decomposing biomass of cover crops contributed to increased soil available N level. Soil N level was the lowest in the check plot and highest where foliar N was applied. Between sources, plots treated with urea and UAN blend had higher soil N than the those treated with straight urea and UAN.

Validation of the LSU AgCenter Nitrogen Recommendation for Sugarcane

Three N response trials were conducted in 2025: one on a mixture of silty clay loam and silt loam soil (Ho12-615 third ratoon), one on silty clay soil (Ho12-615 first ratoon), and on a silt loam soil (L01-299) (Table 2). For all the trials, the application of N fertilizer had significant effect on cane tonnage, sugar yield, and TRS, improving cane tonnage and sugar yield by 64% and 66% ($p<0.05$), respectively while TRS was generally reduced in cane treated with N. Brix, purity, and sucrose were not affected by the treatment. Based on the combined response of cane tonnage and sugar yield across these trials, the application rate between 80-120 lbs N/ac maximized productivity. The N rate requirement of cane to maximize yield in 2025 is generally higher than in previous years underscoring the need to account for the contributions of spatial and temporal factors (e.g., rainfall distribution, temperature, crop age, soil type, varieties) on crop N demand and available soil N.

Evaluation of Nitrogen Recommendation Approach

The performance of sensor-based N recommendation applied in uniform or variably using variable rate coulter applicator (sensor-based N recommendation) and uniform application at 110-130 lbs N/ac rates (FP) was evaluated at the Sugar Model Farm in Paincourtville and strip trials in New Iberia, Erath, St. James, and St. Gabriel (Table 3). Except for St. Gabriel, sensor-based N recommendation on average was 46 lbs N/ac lesser than the FP. Only three locations incurred a reduction in sugar yield with lesser N applied; an average of 340 lbs/ac sugar yield loss with 39 lbs N/ac saved. Six locations under the sensor-based N recommendation averaged 1,062 lbs/ac higher sugar yield and 50 lbs/ac lesser N applied than FP. In 2025, the performance of sensor-based N recommendation demonstrates the potential of need-based N application in improving return on (N) investment in sugarcane production.

Biostimulant Cluster Testing

The evaluation on the potential of biostimulant applications in sugarcane was continued in 2025 using L01-299 1st ratoon crop. Several types of biostimulant were tested which included nutrient-, organic-, plant hormone-, and microorganisms-based products. Biostimulant applications had no significant effect on yield and juice quality components (Table 4). Both leaf N 30 days after the last foliar/soil application of biostimulant product and soil nutrient content after harvest (Table 5) did not respond as well to the treatments. Biostimulant cluster testing should expand to include different varieties and challenging growing conditions for sugarcane.

Acknowledgements

The authors wish to express appreciation for the financial support provided by the American Sugar Cane League, USDA-NRCS Conservation Innovation Grant, and Patrick F. Taylor Foundation.

Table 1. Effect of N source and inter-cover cropping on L01-299 4th ratoon cane tonnage, quality juice traits, and stalk N content, LSU AgCenter Sugar Research Station, St. Gabriel, LA, 2025.

Treatment	Cane ton/ac		Sugar lbs/ac		Brix %	TRS lbs/ton	Purity %	Sucrose %	Stalk N %	
No CC										
Check	21.5	**C**	4894	**D**	18.96	227	83.1	16.0	0.148	**C**
Urea	33.6	**B**	7702	**B**	18.88	230	84.2	16.2	0.210	**A**
Urea-S	32.9	**B**	7601	**B**	18.65	230	84.8	16.1	0.183	**B**
Urea+foliar N	36.6	**A**	8965	**A**	19.71	245	85.4	17.1	0.153	**C**
UAN + $CaNO_3$	31.8	**B**	7756	**B**	19.66	245	85.5	17.1	0.185	**A**
UAN	39.5	**A**	9428	**A**	19.22	239	85.2	16.7	0.168	**BC**
mean	**32.7**		**7724**		**19.18**	**236**	**84.7**	**16.5**	**0.174**	
With CC										
Check	23.9	**C**	5761	**CD**	19.53	242	85.1	16.9	0.158	**BC**
Urea	27.6	**BC**	6842	**B**	19.41	246	86.6	17.1	0.215	**A**
Urea-S	35.4	**A**	8083	**A**	18.96	228	83.5	16.1	0.168	**BC**
Urea+foliar N	30.9	**B**	7425	**B**	19.50	239	84.6	16.8	0.163	**BC**
UAN + $CaNO_3$	30.3	**B**	7414	**BC**	19.40	247	86.6	17.1	0.188	**A**
UAN	36.4	**A**	8989	**A**	19.92	248	85.4	17.3	0.188	**A**
mean	**31.0**		**7491**		**19.45**	**242**	**85.3**	**16.9**	**0.180**	
CC	**NS**		**NS**		**NS**	**NS**	**NS**	**NS**	**NS**	
Source	**$p<.01$**		**$p<.001$**		**NS**	**NS**	**NS**	**NS**	**$p<.1$**	

NS – not significant at 0.1 level of confidence; CC – cover crops; TRS – theoretical recoverable sugar; UAN – urea ammonium nitrate solution

Values with the same letter within a column within the CC treatment are not significantly different at 0.1 level.

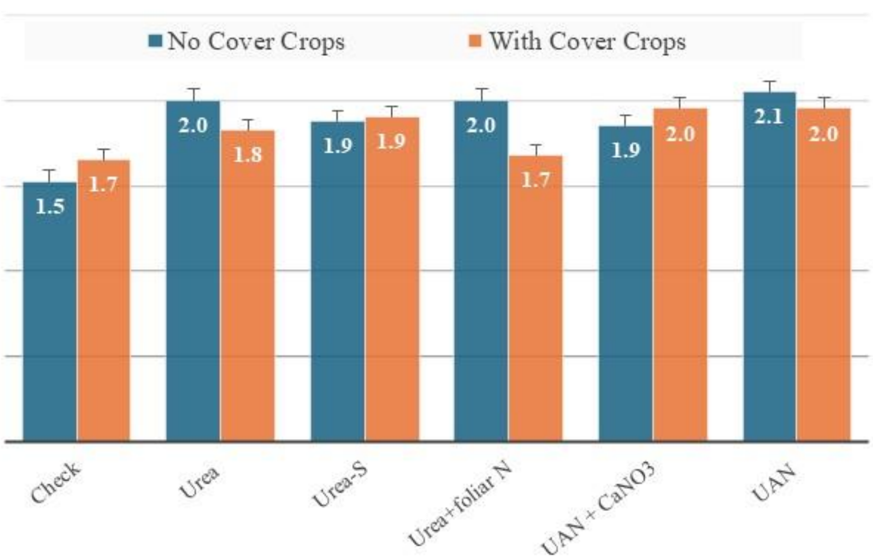

Figure 1. Nitrogen content of leaf collected 30 days after N application using different sources from blocks with and no cover crops, LSU AgCenter Sugar Research Station, St. Gabriel, LA, 2025.

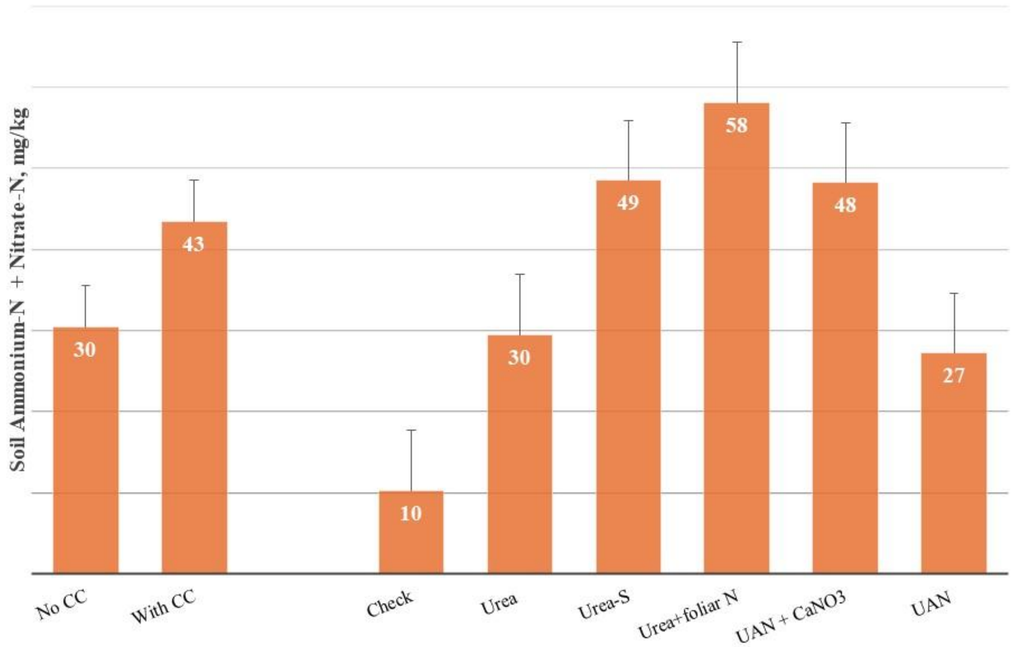

Figure 2. Soil ammonium-N and nitrate-N content 30 days after N application, LSU AgCenter Sugar Research Station, St. Gabriel, LA, 2025.

Table 2. Effect of N rate on cane tonnage, sugar yield, and juice quality traits of varieties Ho12-615 and L01-299 ratoon crops, LSU AgCenter Sugar Research Station, St. Gabriel, LA. 2025.

N Rate lbs/ac	Cane ton/ac		Sugar lbs/ac		TRS lbs/ton		Brix %	Purity %	Sucrose %
			Ho12-615, first ratoon						
0	16.0	B	4196	B	263	A	20.7	86.7	18.3
80	25.2	A	4666	AB	255	B	20.9	84.2	17.9
120	24.0	A	6108	A	252	B	20.8	83.8	17.7
			L01-299, first ratoon						
0	21.7	C	2361	C	138	AB	15.1	70.3	10.8
40	28.4	BC	3542	B	146	A	15.2	72.2	11.2
80	32.2	AB	3802	AB	137	AB	15.0	70.0	10.7
120	34.4	A	4949	A	132	B	14.8	69.1	10.4
			Ho12-615, third ratoon						
0	13.7	B	2177	B	159	A	15.4	75.7	11.9
80	22.4	A	2888	AB	129	B	14.1	70.1	10.1
120	24.1	A	3129	A	130	B	14.2	70.4	10.1

TRS – theoretical recoverable sugar. Values with the same letter within a column within each variety are not significantly different at 0.05 level of confidence.

Table 3. On-farm testing of sensor-based N recommendation and farmer's standard N practice as N decision tools on growers' field and strip trials at the LSU AgCenter research stations, Louisiana, 2025.

Location	Variety	Method	Farmers' Standard Practice			Sensor-Based N Recommendation				
			N Applied lbs/ac	Cane tons/ac	Sugar lbs/ac	N Applied lbs/ac	Cane tons/ac	Sugar lbs/ac	N Save lbs/ac	Sugar lbs/ac
New Iberia	HoCP14-885	Knife-in	110	39.7	12042	82	39.5	12033	**28**	**(9)**
New Iberia	L01-299	Knife-in	110	34.4	10341	71	32.4	9518	**39**	**(893)**
New Iberia	L01-299	Knife-in	120	24.6	4546	86	25.4	6824	**34**	**2278**
Erath	HoCP14-885	Coulter	120	41.1	9859	50	40.2	10327	**70**	**468**
Erath	HoCP14-885	Knife-in	120	41.1	9859	72	39.1	10071	**48**	**212**
Erath	L01-299	Knife-in	120	36.0	8870	100	38	9375	**20**	**505**
Erath	L15-306	Knife-in	130	45.3	10558	82	41.8	10440	**48**	**(118)**
St. James	L01-299	Knife-in	120	32.0	7129	40	42.6	9347	**80**	**2218**
St. Gabriel	L01-299	Coulter	120	25.2	2818	120	26.9	3302	**0**	**484**
Paincourtville	Mixes	Knife-in	120	33.3	9033	71	35.2	9721	**49**	**688**

Table 4. Cane tonnage, sugar yield, and stalk nutrient content of L01-299 1st ratoon treated with different types of biostimulant, LSU AgCenter Sugar Research Station in St. Gabriel, LA, 2025.

Product	**Type/Composition**	**Cane** ton/ac	**Sugar** lbs/ac	**Brix** %	**TRS** lbs/ton	**Purity** %	**Sucrose** %	**Leaf N** %
Control	-	41.7	7670	17.7	184	75.9	13.7	1.98
ZumSil	Silicic Acid	43.5	8295	18.0	190	76.8	14.1	1.95
TerraTrove	Biofertilizer + Bacillus	41.1	7825	18.1	191	76.8	14.1	1.95
Generate	Microbial Catalyst	42.8	7816	17.6	183	75.9	13.6	1.89
Sosdia	Abiotic Stress Mitigator	40.9	7798	18.0	191	77.0	14.1	1.90
Fortified	Plant Hormones	41.8	7812	17.9	188	76.6	13.9	1.88
Symbiosis	Micronutrient	41.8	7245	17.5	173	73.5	13.1	1.89
Accomplish Max	Kepl Extraction + Bacillus	41.1	7806	18.2	191	76.4	14.2	1.85
MoneyBall	Micronutrient + Fulvic Acid	41.8	7991	18.0	196	77.0	14.1	1.87
HumiFlex	Humic Acids	43.3	7864	17.6	183	75.8	13.6	1.95
	p-value	0.991	0.970	0.857	0.697	0.623	0.730	0.647
	SE	2.330	479	0.328	7.5	1.26	0.435	0.05

Table 5. Soil nutrient content based on Mehlich-3 extraction procedure for samples collected at harvest, LSU AgCenter Sugar Research Station in St. Gabriel, LA, 2025.

Product	**Type/Composition**	**B**	**Ca**	**Cu**	**Fe**	**Mg**	**Mn**	**P**	**K**	**Na**	**S**	**Zn**
		--mg/kg--										
Control	-	0.334	1808	3.978	429	427	112	31.6	174	37.7	16.6	3.26
ZumSil	Silicic Acid	0.886	1748	3.065	458	412	102	34.6	171	36.5	14.7	3.23
TerraTrove	Biofertilizer + Bacillus	0.917	1728	3.005	432	414	103	31.5	162	36.8	20.3	3.25
Generate	Microbial Catalyst	0.518	1880	3.295	453	446	112	35.4	172	30.8	13.7	3.35
Sosdia	Abiotic Stress Mitigator	0.498	1775	3.043	424	418	115	28.9	160	31.9	15.4	3.12
Fortified	Plant Hormones	1.018	1738	3.023	412	405	114	29.2	155	31.1	20.5	3.31
Symbiosis	Micronutrient	1.008	1853	3.12	425	435	108	32.7	164	35.8	17.3	3.20
Accomplish Max	Kepl Extraction + Bacillus	0.763	1763	3.01	426	411	108	32.8	157	32.3	18.2	3.40
MoneyBall	Micronutrient + Fulvic Acid	0.595	1785	3.063	446	421	113	32.6	172	31.8	17.8	3.23
HumiFlex	Humic Acids	0.749	1903	3.228	438	445	112	32.8	171	32.6	13.5	3.27
	p-value	0.909	0.580	0.231	0.918	0.722	0.984	0.975	0.963	0.880	0.117	0.829
	SE	0.435	78	0.251	25	20.5	10.11	4.58	12.165	3.8351	1.8702	0.1124

NUTRIENTS APPLIED BEFORE RIPENER: EFFECTS ON SUGARCANE QUALITY

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Introduction

Sucrose is produced by photosynthesis in the sugarcane leaves. During the ripening phase of sugarcane, sucrose is transported from the leaves to the stalk where it is stored, increasing the theoretical recoverable sugar (TRS). Nutrients are essential for the transport of sucrose from the leaves to the stalk, mainly boron (B) which works in the loading and unloading of sucrose in the phloem, so, its deficiency may limit the accumulation of sucrose in the stalk. Other nutrients such as potassium (K), magnesium (Mg), and sulfur (S) are also important in sucrose metabolism, with functions related to the transport, production, and assimilation of sucrose by the plant. Therefore, nutrients applied before the ripener is a strategy that has been tested worldwide and might be investigated in Louisiana.

Procedure

A pilot trial was set up at Cheneyville, LA in a plant cane field with HoCP 14-885. The experimental design was a completely randomized block design with four repetitions. Treatments were represented by control (T1, without application of B, nutrients, fulvic acid, or biostimulant), T2. B + fulvic acid (Smart B-Mo® + Bio-Flex®, 1 pint A^{-1} + 3.6 oz A^{-1}), T3. B + nutrients (Smart B-Mo® + Smart Trio®, 1 pint A^{-1} + 1 qt A^{-1}), and T4. B + nutrients + biostimulant (Smart B-Mo® + Bio-Master®, 1 pint A^{-1} + 1 qt A^{-1}). Foliar nutrients application was done 30 days before ripener (2.5 oz A^{-1} of Glyphosate [RoundUp PowerMax®] + 11 oz A^{-1} of Trinexapac-ethyl [Mazata®]). Both treatments and ripener were applied with a drone (2 GPA). Surfactant was added to the solutions (Super 7®, 0.3 oz gallon). Plots were 6 rows wide and 500 ft in length. Sugarcane diagnostic leaves were sampled before nutrient application to determine the plant nutritional status. TRS was evaluated at harvesting, 45 days after ripener application.

Results

Leaf analysis demonstrated that plants were deficient in B (9 ppm), and slightly deficient in nitrogen and phosphorus, respectively, 2 and 0.22 % (https://ask.ifas.ufl.edu/publication/SC075). Other nutrients were at the optimum level, that is, 1, 0.15, 0.2, and 0.13 % of K, Mg, calcium, and S, respectively, and 16, 12, 50, and 4 ppm of zinc, manganese, iron, and copper, respectively. TRS, Brix, and sucrose increased at T3 and T4 compared to the control (Table 1). TRS increased by 20.14 lbs ton^{-1} of sugarcane on average. These results demonstrate that B deficiency might be limiting the transport of sucrose to the stalk and that foliar B application before ripening can bypass it, increasing sucrose accumulation. However, it is important to highlight that this result was obtained in one field and must be tested in different sugarcane varieties, locations, and years to validate this management.

Table 1. Sugarcane quality parameters at harvesting.

Treatment	Brix %		TRS lbs ton^{-1}		Fiber %	Purity %	Sucrose %	
T1. Control	21.44	b	271.45	b	10.59	86.41	18.85	b
T2. Smart B-Mo + BioFlex	21.99	ab	285.68	ab	10.47	87.93	19.67	ab
T3. Smart B-Mo + Smart Trio	22.13	a	290.71	a	10.67	88.60	19.95	a
T4. Smart B-Mo + Bio-Master	22.30	a	292.47	a	10.99	88.50	20.08	a
p-value	0.013		0.010		0.546	0.070	0.008	

The data represents the average of four independent biological replicates. Lowercase letters indicate differences among the treatments according to Tukey post-hoc test ($p < 0.05$).

Acknowledgements

The authors wish to express appreciation for field use permission provided by Mr. Michael Harper.

SUGARCANE STRAW MANAGEMENT

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Introduction

Sugarcane straw consists of dry leaves and tops and it is burned after harvesting in Louisiana. This straw management is done to expose the soil to sunlight increasing soil temperature (favoring the stubble sprouting), to bypass potential allelopathic effects promoted by straw decomposition due to flooding, to control weeds, among others. On the other hand, keeping the straw on the soil can bring benefits, increasing soil organic matter and nutrient availability to the plant, attenuating the thermal amplitude (favoring the activity of soil microorganisms), and reducing water evaporation and soil erosion. To investigate these effects, long-term trials should be carried out, mainly in the central region of Louisiana, which faces extreme weather conditions such as several freezing events. Therefore, in 2024, a trial was set up at Dean Lee Research and Extension Center (DLREC) to investigate straw management systems.

Procedure

A field trial was set up at Dean Lee Research and Extension Center (DLREC) in a 2nd stubble sugarcane field with sugarcane variety L01-299. The field was divided into three straw management strategies, that is, Burned, maintenance of straw (namely Straw), and sweeping of straw to the interrow (namely Top raked). Six repetitions were set up within each straw management strategy. Sensors (SoilVUE 10, Campbell Scientific) were placed in the Straw and Burned treatments to record soil temperature and moisture over the winter. Over the growing season, sugarcane tillering was investigated as well as weed infestation. At harvesting, stalk yield and quality were determined. The trial will be kept over the years to investigate the long-term effect on soil fertility, and stalk yield and quality; a second trial was initiated in 2025 at DLREC in a plant-cane field in which Burned vs Straw will be compared.

Results

During the winter of 2025, sugarcane fields faced 2 freezing events (air temperature below 32 ºF). The first one was in January, and the second one was in February. In January, the minimum temperature was 32.54 and 36.47 ºF at 2 in, and 35.14 and 38.24 ºF at 4 in, respectively, for Burned and Straw treatments (Figure 1). In February, the minimum temperature was 34.2 and 37.32 ºF at 2 in, and 36.93 and 39.42 ºF at 4 in, respectively, for Burned and Straw treatments (Figure 1). On the other hand, during the Spring, straw attenuated soil temperature amplitude in the first 8 in (Figure 1). Moreover, fewer weeds (population and diversity) were observed in the straw treatment compared to the burned treatment. At harvesting, there was no difference among treatments on tillering, stalk yield, TRS, and sugar yield (Table 1).

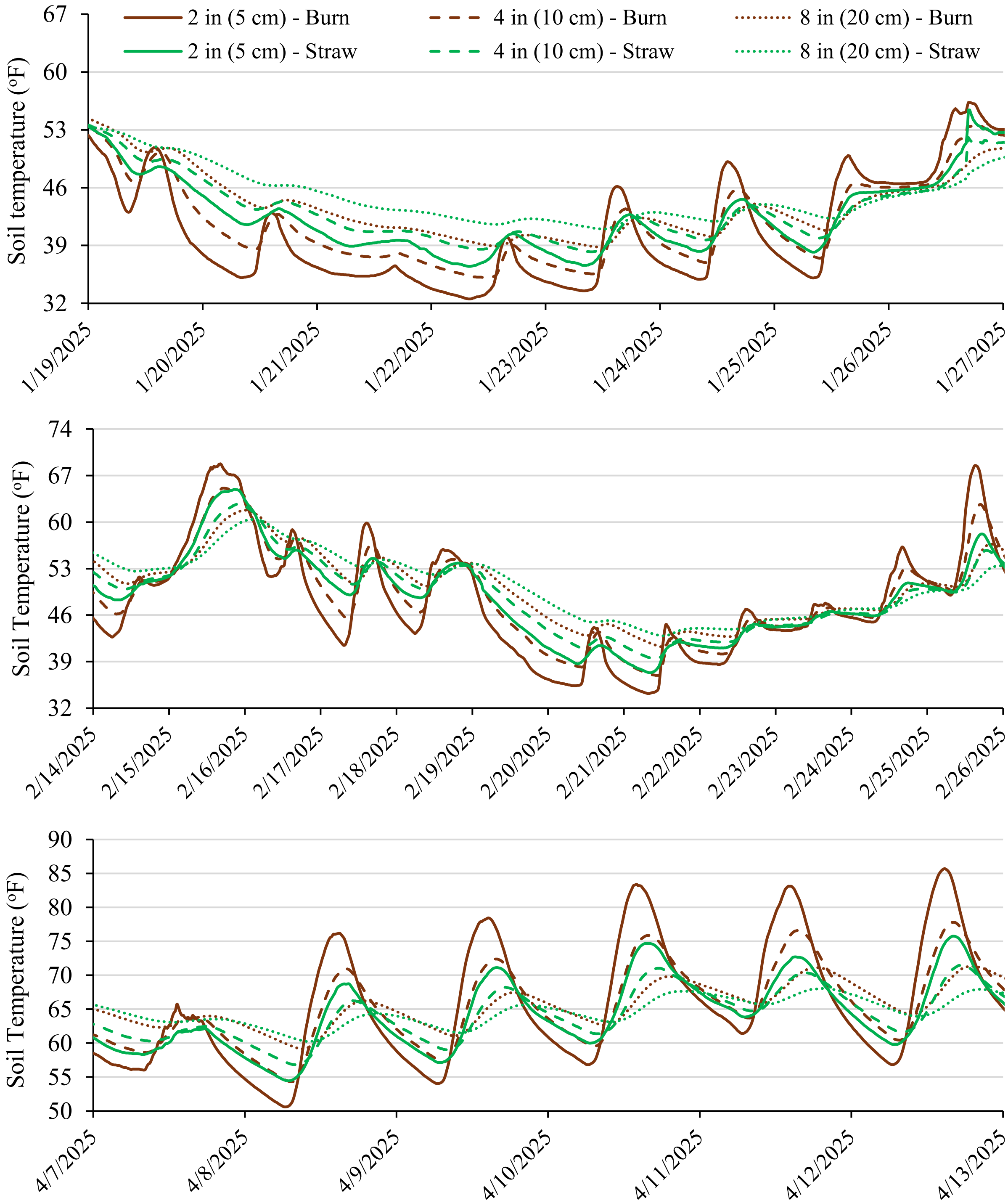

Figure 1. Soil temperature behavior at 2, 4, and 8 inches depth in the burned and straw treatments during the freezing events faced in the winter of 2025, that is, January (A), and February (B), and before soil cultivation which was done in April (C).

Table 1. Number of tillers, sugarcane yield, theoretical recoverable sugar (TRS, lbs ton^{-1}), and sugar yield at harvesting.

Treatment	Tillers (# 3 ft^{-1})	Stalk yield (tons A^{-1})	TRS (lbs ton^{-1})	Sugar yield (tons A^{-1})
Burned	24.25 a	36.00 a	227.54 a	6925.53 a
Straw	25.75 a	36.59 a	223.08 a	6929.93 a
Top raked	21.83 a	33.81 a	209.31 a	6105.76 a
p-value	0.339	0.857	0.168	0.673

The data represents the average of six replicates. Lowercase letters indicate differences among the treatments according to Tukey post-hoc test ($p < 0.05$).