BILLET PLANTING RESEARCH

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Yields were obtained from field experiments on commercial farms comparing billet and whole-stalk planting for two experiments in plant cane, one in first stubble and one in second stubble. These experiments were conducted with the American Sugar Cane League and cooperating growers. Results also were obtained from three plant cane and two first stubble experiments at the Sugar Research Station. The plant cane experiments evaluated the effects of date and rate of billet planting and compared various combinations of fungicides, antitranspirants, and other chemical treatments in a dip-inoculation experiment. The two experiments in first stubble compared billet planting rate and billets and whole stalks with and without starter fertilizer and two rates of billet planting. In addition, an experiment was conducted to evaluate the effect of different chopper harvester settings on physical billet damage. All experiments were conducted with LCP 85-384.

In the two plant cane experiments on farms, stalk population and tonnage and sugar yields were higher in whole-stalk planted rows in only the experiment conducted in Ascension Parish (Table 1). In this experiment, the application of 15-45-45 starter fertilizer did not increase yield (data not shown). Slightly higher yields were recorded in whole-stalk planted rows in the experiment in St. Mary Parish, but the differences were not significant. In another experiment conducted in Ascension Parish, first stubble yields were reduced compared to plant cane, but the yields obtained from billet and whole-stalk planted rows were similar (Table 2). In the experiment in second stubble, one billet treatment was lower and one was similar to whole-stalk planting, and there was no benefit from initial treatments with fungicide, soil insecticide/nematicide, or application of a film coating to billets at planting (Table 3).

In experiments conducted at the Sugar Research Station, the date of billet planting had an effect on stalk population and yield (Table 4), as did the rate of billet planting (Table 5). Five planting dates were compared. Favorable weather conditions allowed plantings to be established at two-week intervals extending over the planting season. The highest yields were obtained from the mid-season planting dates. Tonnage yields were highest for the 31 August and 18 September dates (Table 4). Increasing the rate of billet planting from one to 12 running billets resulted in progressively higher millable stalk populations (Table 5). There were two planting dates in the rate of planting experiment, and stands were higher for the 22 August planting date compared to 18 September. As a result, more yield differences were detected among planting dates in the later planting. The lowest yield was obtained from plots planted with only one running billet at both planting dates. At the 18 September planting date, sugar per acre was higher with the six, nine, and 12 billet planting rates than for the three billet planting rate. Despite the higher stalk population obtained, there was no advantage from planting at the highest two rates. The rate of billet planting was examined in two additional experiments in first stubble. In a small scale experiment comparing four rates of billet planting, first stubble yields were similar for all planting rates (Table 6). In an experiment comparing whole-stalk planting to billets planted at two rates with and without starter fertilizer, the higher yields due to whole-stalk planting and addition of fertilizer detected in plant cane were no longer evident in first stubble (Table 7); yields in all treatments were similar. A high rate of billet planting did not increase yield in either season. In the dip-inoculation experiment, four antitranspirants and two fungicides applied singly and in combinations along with two additional chemical treatments did not improve millable stalk population in plant cane (Table 8).

In the experiment to evaluate the effect of different harvester settings on the amount of physical damage billets sustain while being cut, differences were detected in number of damaged buds per billet, number of wounds per billet, and frequency of buds with no damage (Table 9). A total of 50 billets were examined with each setting combination. Billet length and bud number per billet did not vary significantly across treatments. Length ranged from 23-24 inches, and the number of buds per billet ranged from 3.2-3.7. Factors associated with lower rates of damage were use of "leg-wraps" around the base-cutter shafts and the special "seed chopper" drums designed to cut longer billets. These two factors also were effective in the experiment conducted in 2000. The effect of the secondary extractor fan was inconsistent. In two previous experiments, damage increased when the secondary fan was engaged in one experiment but not the other. The overall results suggest the secondary fan can cause billet damage, but it is not a major causal factor. The angle of the elevator did not affect billet damage. This factor did not affect billet damage last year, so it appears that the elevator angle is not an important factor affecting damage. A final factor evaluated for the first time this year was the presence or absence of the football-shaped fins on the knock-down roller. There was no apparent benefit from removing the fins. This comparison was included based on observations in previous experiments of damage to stalks evident when the harvester backed away at the conclusion of a treatment. In those experiments slow speed (1 mph) of travel down the row was shown to increase billet damage, and the fins could have been the source of some of the extra damage. Slow speed of travel down the row was not included in this year's experiment.

Mechanical planting increases the amount of physical damage to billets, but the extent of added damage is uncertain. This season a billet experiment was planted the day before the billet damage experiment was conducted. The frequency of billets with no detectable damage in the planting furrow was only 27%, whereas the billets cut the next morning from the same seedcane source with the same harvester settings had an undamaged billet frequency of 58%. No experimental information has been obtained comparing planters or planter settings and the damage caused to billets.

The availability of a Cameco chopper harvester during the entire 2000 season allowed experiments to be conducted, such as the date and rate of planting experiments, that were difficult to conduct on farms. These same experiments were re-planted during late summer and fall 2001, although weather conditions did not allow two-week planting intervals. In addition, small-scale experiments were established comparing billet and whole-stalk planting for HoCP 85-845 and HoCP 91-555.

There is intense interest in billet planting within the Louisiana sugarcane industry. The 2002 growing season will be an important one for assessing billet planting performance. A combination of a planting season with a variety of adverse weather conditions and a winter with widely spaced freezes, including a late freeze in March, created challenging conditions for billet plantings. Factors now known to be associated with poor billet performance that are under the control of the grower include short billet length, excessive physical billet damage, light planting rate, improper depth of cover, poor drainage, and herbicide injury. The addition of fertilizer at planting has improved yields in some, but not all, experiments. No chemical treatment to prevent stalk rot has been identified that consistently improves billet performance.

In most experiments, the yield of whole-stalk planting has been higher during the plant cane crop. However, the yields of whole-stalk and billet plantings have been comparable throughout the entire crop cycle. Most of the experiments have now been conducted with LCP 85-384. Early experiments with CP 70-321 showed it to be erratic in billet planting performance. As other varieties are released, their ability to tolerate billet planting will need to be evaluated. The research results suggest that the highest yields over time will be obtained with whole-stalk planting. However, when cane is badly lodged, it may be necessary to plant billets. Billets are more sensitive to any problem, so good planting practices are very important when planting billets.

Table 1. Plant cane yields of LCP 85-384 for two experiments comparing billet and whole stalk planting on commercial farms.

	Stalks per acre (x1000)		Tons of cane per acre		Sugar per acre (lbs.)	
Planting	Ascension	St. Mary	Ascension	St. Mary	Ascension	St. Mary
Billet	47.6 b	49.3 a	34.4 b	33.1 a	7850 b	7142 a
Whole	50.6 a	52.3 a	41.9 a	35.1 a	9179 a	7535 a

Values within a column followed by the same letter are not significantly different at $P = 0.05$.

Table 2. Plant cane and first stubble yields of LCP 85-384 from an experiment in Ascension Parish comparing plantings of billets and whole stalks with and without fertilizer (15-45-45) applied at planting.

	Tons of cane per acre[x]		Sugar per acre (lbs.)[x]	
Treatment	2000	2001	2000	2001
Billet	41.5 ab	21.8 ab	8013 ab	5034 ab
Billet + Fertilizer	38.0 b	23.3 ab	7391 b	5398 ab
Whole stalk	38.4 b	19.2 b	7160 b	4352 b
Whole stalk + Fertilizer	45.4 a	24.0 a	8543 a	5726 a

[x] Values within a column followed by the same letter are not significantly different at $P = 0.05$.

Table 3. Yields of LCP 85-384 from an experiment in Iberia Parish comparing whole stalks, long billets, and short billets treated with Tilt, Thimet, an antitranspirant (film-coating), and Tilt plus antitranspirant.[x]

Treatment	Tons of cane per acre[y]			Sugar per acre (lbs.)[y]		
	1999	2000	2001	1999	2000	2001
Whole stalk	42.5 ab	35.8 a	24.6 a	9712 ab	6991 a	5400 a
Long billet	44.3 a	30.0 b	22.3 ab	10095 a	6115 ab	4453 b
Short billet	44.0 a	33.2 ab	23.8 ab	10299 a	6570 ab	5372 a
Short billet + Tilt	40.6 ab	31.4 b	23.5 ab	9362 ab	6462 ab	5301 ab
Short billet + Thimet	38.0 b	30.8 b	22.8 ab	8778 b	6100 ab	4827 ab
Short billet + Antitranspirant	40.9 ab	29.6 b	22.5 ab	9480 ab	5787 b	4705 ab
Short billet + Tilt + Antitranspirant	37.3 b	32.9 ab	21.2 b	8475 b	6801 a	4903 ab

[x] Tilt (Syngenta, Inc.) is propiconazole fungicide; Thimet (American Cyanamid, Inc.) is phorate, a soil-applied insecticide; and the antitranspirant was Transfilm (PBI/Gordon, Inc.).
[Y] Values within a column followed by the same letter are not significantly different at $P = 0.05$.

Table 4. Effect of date of planting on plant cane yield of billet planted LCP 85-384.

Date of planting	Stalks/acre (x1000)	Tons of cane per acre	Sugar per acre (lbs.)
August 3	48.3 d	43.3 b	8972 b
August 15	53.1 ab	44.5 b	9296 b
August 31	54.8 a	49.8 a	10402 a
September 18	51.3 bc	49.7 a	9607 ab
September 28	49.2 cd	45.0 b	9200 b

Values within a column followed by the same letter are not significantly different at $P = 0.05$.

Table 5. Effect of rate of planting on plant cane yield of LCP 85-384 planted on two dates.

	Stalks per acre (x1000)		Tons of cane per acre		Sugar per acre (lbs.)	
Rate	Aug. 22	Sept. 18	Aug. 22	Sept. 18	Aug. 22	Sept. 18
1 billet	50.6 c	40.8 d	56.1 b	46.9 b	9274 b	8018 c
3 billets	68.3 b	50.3 c	66.9 a	57.9 a	11898 a	9484 b
6 billets	74.4 ab	56.7 b	65.4 a	63.6 a	12122 a	10771 a
9 billets	76.6 a	57.9 b	65.2 a	58.3 a	11876 a	10057 ab
12 billets	75.6 a	66.0 a	66.7 a	62.5 a	11876 a	10159 ab

Planting rate is the number of billets running in the furrow. Billets were planted on 22 August and 18 September. Values within a column followed by the same letter are not significantly different at $P = 0.05$.

Table 6. Effect of billet planting rate on the first stubble yield of LCP 85-384 at the Sugar Research Station during 2001.

Planting rate	Cane yield	Stalk No.	Stalk Wt.	Normal juice Brix	Normal juice Sucrose	Sugar yield
	T/A	1000/A	lbs.	%	%	lbs/A
3 Billets	53.9	53.7	2.00	16.2	13.4	10202
5 Billets	52.9	57.3	2.16	16.0	13.3	9969
7 Billets	55.3	57.2	1.64	15.9	13.2	10259
9 Billets	56.7	58.8	2.02	16.3	13.7	11006
LSD .05 Treatment	NS	NS	0.48	NS	NS	NS

The billets were cut with a combine harvester and hand planted in 1999.

Table 7. First stubble yield comparison of billet and whole-stalk planting, rate of billet planting and starter fertilizer with LCP 85-384 at the Sugar Research Station during 2001.

			First Stubble - 2001				
Planting type and rate	Starter fertilizer	Cane yield	Stalk No.	Stalk Wt.	Normal juice Brix	Normal juice Sucrose	Sugar Yield
		T/A	1000/A	lbs.	%	%	lbs/A
Whole	0-0-0	54.5	57.9	1.58	15.2	12.2	9237
1X Billet	0-0-0	50.9	57.5	1.63	15.4	12.6	8978
2X Billet	0-0-0	49.7	62.7	1.66	16.0	13.3	9365
Whole	45-45-45	51.4	62.7	1.75	15.7	13.0	9376
1X Billet	45-45-45	49.7	57.5	1.83	16.3	13.7	9592
2X Billet	45-45-45	49.5	54.6	1.60	16.0	13.2	9264
LSD .05 Treatments		NS	3.0	NS	0.9	1.1	NS
			Mean Effect				
Whole		52.9	60.3	1.67	15.4	12.6	9307
1X Billet		50.1	57.5	1.73	15.9	13.2	9285
2X Billet		49.6	58.7	1.63	16.0	13.3	9314
	0-0-0	51.7	59.4	1.62	15.6	12.7	9193
	45-45-45	50.0	58.3	1.73	16.0	13.3	9411
LSD .05 Rate Means		NS	2.1	NS	NS	NS	NS
LSD .05 Fall Fert. Mean		NS	NS	NS	NS	NS	NS

Whole-stalk planting consisted of a four running stalk planting rate; 1X Billet consisted of 6-9 running billets; and 2X Billet consisted of 12-18 running billets. Starter fertilizer was applied in the planting furrow in 1999, and normal fertilizer practice was followed in the spring of each crop year.

Table 8. Millable stalk population of LCP 85-384 as affected by fungicides, antitranspirants, and other chemical treatments applied singly and in combination in a dip-inoculation experiment.

Treatment[x]	Stalks per acre (x1000)
Leaf Shield antitranspirant 1:10	53.5
Leaf Shield 1:10 + Tilt fungicide 2.2 ml fp/10 gal	57.4
Wilt Pruf antitranspirant 1:10	46.5
Wilt Pruf 1:10 + Tilt 2.2 ml fp/10 gal	44.4
Transfilm antitranspirant 1:10	47.9
Transfilm 1:10 + Tilt 2.2 ml fp/10 gal	44.7
Tilt 2.2 ml/10 gal	54.4
Hydrostik antitranspirant 1:20	52.4
Dithane fungicide 114 g fp/10 gal	49.1
Leaf shield 1:10 + Dithane 114 g fp/10 gal	52.9
Transfilm 1:10 + Dithane 114 g fp/10 gal	51.2
Agri 50 1:10 dip + 1 L 1:10 drench	46.5
Agri 50 1:50 dip + 1 L 1:50 drench	50.0
Vitazyme 1% dip	55.6
Vitazyme 1% 1 L drench	49.4
Non-treated billets	52.4

[x]Billets were submerged for 10 min and planted as one running billet in single-row, 25-foot plots with four replications. Tilt is propiconazole, Dithane is mancozeb, and Agri 50 contains sodium lauryl sulfate. There were no significant differences among treatments.

Table 9. Effect of chopper harvester settings on billet damage during 2001.

Treatment[1]	Damaged buds/billet	Wounds/ billet	Billets with no damage
Seed choppers, leg wraps, primary fan, 45 degree	0.10 c	0.4 c	72 %
Seed choppers, leg wraps, secondary fan+, 45 degree	0.22 abc	0.6 bc	62 %
Seed choppers, leg wraps, primary fan, 90 degree	0.16 bc	0.5 bc	66 %
Seed choppers, primary fan, 45 degree	0.18 bc	1.2 ab	44 %
Seed choppers, secondary fan+, 45 degree	0.22 abc	1.7 a	52 %
Seed choppers, no fins, secondary fan+	0.14 bc	1.6 a	48 %
Seed choppers, no fins, primary fan	0.18 bc	1.2 ab	56 %
Regular choppers, primary fan	0.38 a	1.7 a	32 %
Regular choppers, secondary fan+	0.30 ab	1.7 a	44 %
Regular choppers, leg wraps, primary fan	0.18 bc	0.6 bc	58 %

[1]Treatments consisted of special seed cutting drums with only one knife per drum designed to cut long billets, regular billet chopping drums with two blades removed to cut long billets, pipe fittings (leg wraps) that couple around the bottom of the base cutter shafts, primary extractor fan only, primary and secondary extractor fans, and aligning the elevator at 45 and 90 degrees. Values within a column followed by the same letter are not significantly different at $P = 0.05$.

CULTURAL AND LAND MANAGEMENT PRACTICES RESEARCH IN SUGARCANE IN 2001

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SUMMARY

Seven field experiments were conducted in 2001 to test the effects of various cultural and land management practices on yield components of sugarcane. Results from tests on planting practices showed that subsequent cane yields after the plant cane season were higher when planted in August than in October.

Results from date-of-harvest experiments showed sugar yields across varieties in first stubble increased through the harvest season up to 45% above yields in early October. Additionally, yields in the first stubble crop increased when the plant cane crop was harvested later. First stubble sugar yields increased 11% as a result of harvesting plant cane in early December vs October. Cane yields increased 6%.

Planting rates of seed cane as billets or whole stalks produced more response in plant cane than in subsequent stubble crops based on data from 2001. Date of harvest or date of planting had more effect on subsequent yield than seed source or planting rate. However, cane from four running billets showed a 7% decrease in sugar yield compared to use of whole stalks or five running billets.

Covering stubble with soil improved yields of second stubble cane, especially when starter fertilizer was applied to plant cane. Likewise, tilling of harvest residue resulted in soil-covered stubble and higher first stubble sugar yields than when the residue was burned or left undisturbed.

OBJECTIVES

This research is designed to provide information on cultural practices in an effort to help cane growers produce maximum economic yields and thereby a more profitable production system. This annual progress report is presented to provide the latest available data on certain practices and not as a final recommendation for growers to use all of these practices. Recommendations are based on several years of research data.

RESULTS AND DISCUSSION:

Type and Rate of Planting

The type and rate of seed cane had little effect on subsequent stubble crops (Tables 1, 2, and 3). However, cane from four running billets showed a 7% decrease in sugar yield compared to use of whole stalks or five running billets (Table 4).

Date of Planting

Second stubble cane yield of HoCp 85-845 increased almost 7% and sugar yield 11% with a late (Nov. 1) planting date (Table 1). Alternatively, first stubble sugar yields of this variety and variety LCP 85-384 were about 5% lower when cane was planted in mid-October vs mid-August (Table 4). This apparent opposite response may be caused by weather conditions surrounding the development period of the planted cane in each experiment.

Harvest Date on Subsequent Yields

It is well established that later harvest of sugarcane often results in higher sugar yield. This occurred in 2001 with sugar yields 45% higher on December 3 than on Oct. 9 (Table 5). Date of harvest for earlier crops also can affect subsequent stubble yields. Plant cane harvested in December resulted in subsequent stubble crops that produced 6% more cane (because of a 7% increase in stalk population) and 11% more sugar than stubble crops developing from plant cane harvested in October (Table 5). These results underscore the importance of the crop to perennate and the production inputs that affect it.

Residue Management/Stubble Protection

Soil temperature 3 inches deep in the cane bed of first stubble HoCP 85-845 was only moderately affected by residue management. When harvest residue was burned, average daily soil temperature was usually a few degrees higher than other treatments (Fig. 1) with the greatest difference occurring between burning and leaving the residue mat. Incorporating the residue and sweeping to the row middle resulted in intermediate temperatures. Minimum soil temperature was lowest for the burn treatment, but never exceeded 45° F. Leaving the residue mat resulted in the highest minimum temperatures, but were usually only 3-4° F higher than those in the burn treatment (Fig. 2). Similar to average daily temperatures, minimum temperatures for sweeping or tilling the residue were intermediate. Using a cultivator to slightly incorporate harvest residue and provide some soil cover over the stubble of HoCP 85-845 resulted in a 12% increase in first stubble sugar yield over the residue-burned check (Table 6). The increase in sugar yield was caused mainly by increased CRS and secondarily by slightly higher average cane yield. Possibly related to these results was the development rate of the stalk population. Although initially higher, stalk populations in the burn plots were lower than those that were tilled (Fig.3). Tillage/soil covering may also have reduced the number of bull shoots of this variety, thus improving the CRS. The number of bull shoots were not determined, however. In a related test, covering stubble with soil generally resulted in about an 11% increase in sugar yield for the second stubble crop of three varities (Table 7). However, HoCP 85-845 was benefitted more consistently by soil cover than either LCP 82-89 or LCP 85-384. The use of 45-45-45 starter fertilizer interacted with cover to produce higher yields than starter with the check. There were few differences between cover and check treatments when no starter fertilizer was applied with the seed cane.

Table 1. Effect of date of planting, seed size and starter fertilizer on the second stubble cane yield of HoCP 85-845 on the St. Gabriel Research Station, 2001.

Date Of Planting	Seed Stalk Size	Starter Fertilizer N-P-K	Second Stubble Cane - 2001 Cane Yield	Stalk No.	Stalk Wt.	Normal Sucrose	Sugar Yield
1998		lbs/A	T/A	1000/A	lbs.	%	lbs/A
Sept. 1	Whole	0-0-0	41.7	31.8	2.71	12.8	7411
	Whole	45-45-45	36.3	32.1	2.41	14.0	7219
	Billet	0-0-0	39.8	35.0	2.36	13.9	7851
	Billet	45-45-45	39.5	36.6	2.26	13.3	7396
Nov. 1	Whole	0-0-0	42.4	35.4	2.63	14.1	8511
	Whole	45-45-45	45.5	37.7	2.57	13.3	8550
	Billet	0-0-0	40.2	35.0	2.38	14.8	8563
	Billet	45-45-45	40.2	33.8	2.35	13.2	7473
LSD .05 Treatments			5.4	3.0	0.37	1.2	1307
			Mean Effect				
Sept. 1			39.3	36.3	2.44	13.5	7469
Nov. 1			42.1	33.9	2.48	13.8	8274
	Whole		41.5	34.3	2.58	13.5	7923
	Billets		40.0	35.9	2.34	13.8	7821
		0-0-0	41.0	34.3	2.52	13.9	8084
		45-45-45	40.4	35.8	2.40	13.4	7660
LSD .05 Date Means			2.7	1.5	NS	NS	654
LSD .05 Seed Size Means			NS	NS	0.18	NS	NS
LSD .05 Starter Fertilizer Means			NS	NS	NS	NS	NS

Planted with each seed size on each date in 1998 and harvested as second stubble cane in 2001. For the billet rate, the whole stalks were cut by hand 18 inches long in the planting furrow. Starter fertilizer was applied in the planting furrow in 1998, and normal fertilizer practice was followed in the spring of each crop year.

Table 2. Effect of seed size, rate of planting and starter fertilizer on the first stubble cane yield of LCP 85-384 on the St. Gabriel Research Station, 2001.

Seed Stalk Size and Rate	Starter Fertilizer	Cane Yield	First Stubble - 2001				
			Stalk		Normal Juice		Sugar Yield
			No.	Wt.	Brix	Sucrose	
		T/A	1000/A	lbs.	%	%	lbs/A
Whole	0-0-0	54.5	57.9	1.58	15.2	12.2	9237
1X Billet	0-0-0	50.9	57.5	1.63	15.4	12.6	8978
2X Billet	0-0-0	49.7	62.7	1.66	16.0	13.3	9365
Whole	45-45-45	51.4	62.7	1.75	15.7	13.0	9376
1X Billet	45-45-45	49.7	57.5	1.83	16.3	13.7	9592
2X Billet	45-45-45	49.5	54.6	1.60	16.0	13.2	9264
LSD .05 Treatments		NS	3.0	NS	0.9	1.1	NS
			Mean Effect				
Whole		52.9	60.3	1.67	15.4	12.6	9307
1X Billet		50.1	57.5	1.73	15.9	13.2	9285
2X Billet		49.6	58.7	1.63	16.0	13.3	9314
	0-0-0	51.7	59.4	1.62	15.6	12.7	9193
	45-45-45	50.0	58.3	1.73	16.0	13.3	9411
LSD .05 Rate Means		NS	2.1	NS	NS	NS	NS
LSD .05 Fall Fert. Mean		NS	NS	NS	NS	NS	NS

Planted with each seed size in 1999 and harvested as plant cane in 2000 and first stubble in 2001. The billets were cut with a combine and planted with a mechanical planter. Starter fertilizer was applied in the planting furrow in 1999, and normal fertilizer practice was followed in the spring of each crop year.
Whole = 4 running stalks.
1X Billet = 6-9 running billets.
2X Billet = 12-18 running billets.

Table 3. Effect of rate of planting billets on the yield of LCP 85-384 variety on the St. Gabriel Research Station, 2001.

	First Stubble - 2001					
	Cane	Stalk		Normal Juice		Sugar
Planting Rate	Yield	No.	Wt.	Brix	Sucrose	Yield
	T/A	1000/A	lbs.	%	%	lbs/A
	LCP 85-384					
3 Billets	53.9	53.7	2.00	16.2	13.4	10202
5 Billets	52.9	57.3	2.16	16.0	13.3	9969
7 Billets	55.3	57.2	1.64	15.9	13.2	10259
9 Billets	56.7	58.8	2.02	16.3	13.7	11006
LSD .05 Treatment	NS	NS	0.48	NS	NS	NS

The billets were cut with a combine harvester and hand planted in 1999.

Table 4. Effect of date of planting, seed size and rate of planting on the yield of first stubble in two varieties on the St. Gabriel Research Station, 2001.

			First Stubble - 2001				
Cane	Planting	Planting	Cane	Stalk		Normal	Sugar
Variety	Date	Rate	Yield	No.	Wt.	Sucrose	Yield
	1999		T/A	1000/A	lbs.	%	lbs/A
LCP 85-384	Aug. 16	3 Whole	48.2	45.0	2.24	14.6	10102
		4 Whole	47.6	44.4	2.37	15.2	10477
		4 Billet	44.8	43.5	2.22	15.3	9821
		5 Billet	47.3	43.1	2.46	15.6	10674
	Oct .13	3 Whole	45.0	41.3	2.34	15.3	9994
		4 Whole	45.2	40.8	2.38	15.2	9906
		4 Billet	43.1	39.6	2.41	14.9	9293
		5 Billet	44.9	39.2	2.52	15.4	10059
HoCP 85-845	Aug. 16	3 Whole	38.2	32.5	2.53	15.3	8475
		4 Whole	36.6	31.3	2.60	15.6	8304
		4 Billet	35.1	29.5	2.65	15.3	7761
		5 Billet	37.2	33.3	2.44	15.3	8208

Table 4. Continued.

Cane Variety	Planting Date	Planting Rate	First Stubble - 2001 Cane Yield	 Stalk No.	 Stalk Wt.	 Normal Sucrose	 Sugar Yield
	1999		T/A	1000/A	lbs.	%	lbs/A
	Oct. 13	3 Whole	36.4	28.0	2.85	15.0	7872
		4 Whole	36.7	31.8	2.35	15.0	7945
		4 Billet	34.3	33.1	2.30	15.1	7490
		5 Billet	36.7	33.5	2.31	15.1	7988
LSD .05 Treatments			5.6	2.6	0.48	0.8	1052
			Mean Effect				
	Aug. 16		41.9	37.8	2.44	15.3	9228
	Oct. 13		40.3	35.9	2.43	15.1	8818
		3 Whole	41.9	36.4	2.49	15.1	9111
		4 Whole	41.5	37.1	2.43	15.3	9158
		4 Billet	39.3	36.4	2.39	15.1	8591
		5 Billet	41.5	37.3	2.43	15.3	9232
LSD .05 Date			NS	0.9	NS	NS	372
LSD .05 Rate			NS	NS	NS	0.4	526

Plant cane was planted on two dates in 1999. For the billet rates, the whole stalks were cut by hand 18 inches long in the planting furrow.

Table 5. Effect of date of harvest in plant cane and first stubble on the first stubble yield of two varieties on the St. Gabriel Research Station, 2001.

Harvest Date		First Stubble Cane - 2001				
Plant Cane	1ST Stubble	Cane Yield	Stalk No.	Stalk Wt.	Normal Sucrose	Sugar Yield
2000	2001	T/A	1000/A	lbs.	%	lbs/A
				HoCP 85-845		
Oct. 1	Oct. 9	29.9	36.8	1.64	11.7	4796
	Nov. 1	31.2	35.9	1.72	12.8	5565
	Dec. 3	32.3	35.1	1.78	13.6	6215
Dec. 1	Oct. 9	34.2	39.8	1.58	12.2	5765
	Nov. 1	35.2	39.5	2.03	12.7	6231
	Dec. 3	38.4	39.5	1.94	14.7	8108
				HoCP 91-555		
Oct. 1	Oct. 9	32.8	45.5	1.64	11.5	5145
	Nov. 1	41.2	47.2	1.65	12.4	7163
	Dec. 3	43.3	45.5	1.79	13.9	8582
Dec. 1	Oct. 9	36.9	49.4	1.63	11.7	5949
	Nov. 1	37.6	48.5	1.63	12.9	6803
	Dec. 3	41.2	47.1	1.63	14.9	8859
LSD .05 Treat.		3.5	1.7	0.25	1.1	1133
				Mean Effect		
Oct. 1		35.1	41.0	1.70	12.7	6244
Dec. 1		37.3	44.0	1.74	13.2	6952
	Oct. 9	33.5	42.9	1.62	11.8	5413
	Nov. 1	36.3	42.8	1.76	12.7	6400
	Dec. 3	38.8	41.8	1.79	14.3	7941
LSD .05 Plant cane		1.5	0.7	NS	0.4	463
LSD .05 1st Stubble		1.8	0.9	0.13	0.5	567

Plant cane was harvested in October and December in 2000. First stubble cane was harvested in October, November and December in 2001.

Fig. 1. The effect of residue management on average daily cane bed temperature at a 3-inch soil depth. Line at 65 degrees indicates minimum temperature for growth.

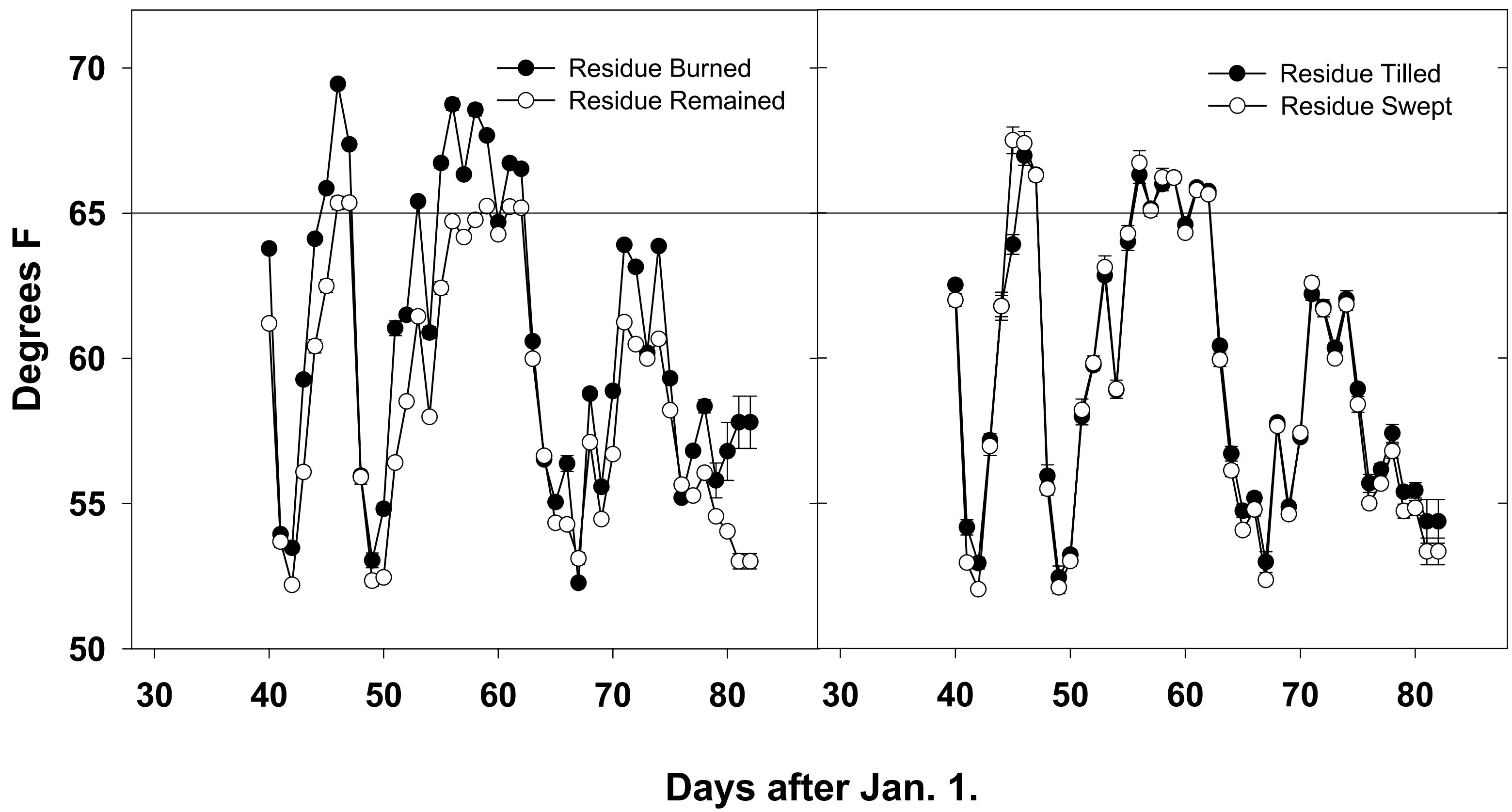

Fig. 2. The effect of residue management on minimum daily cane bed temperature at a 3-inch soil depth.

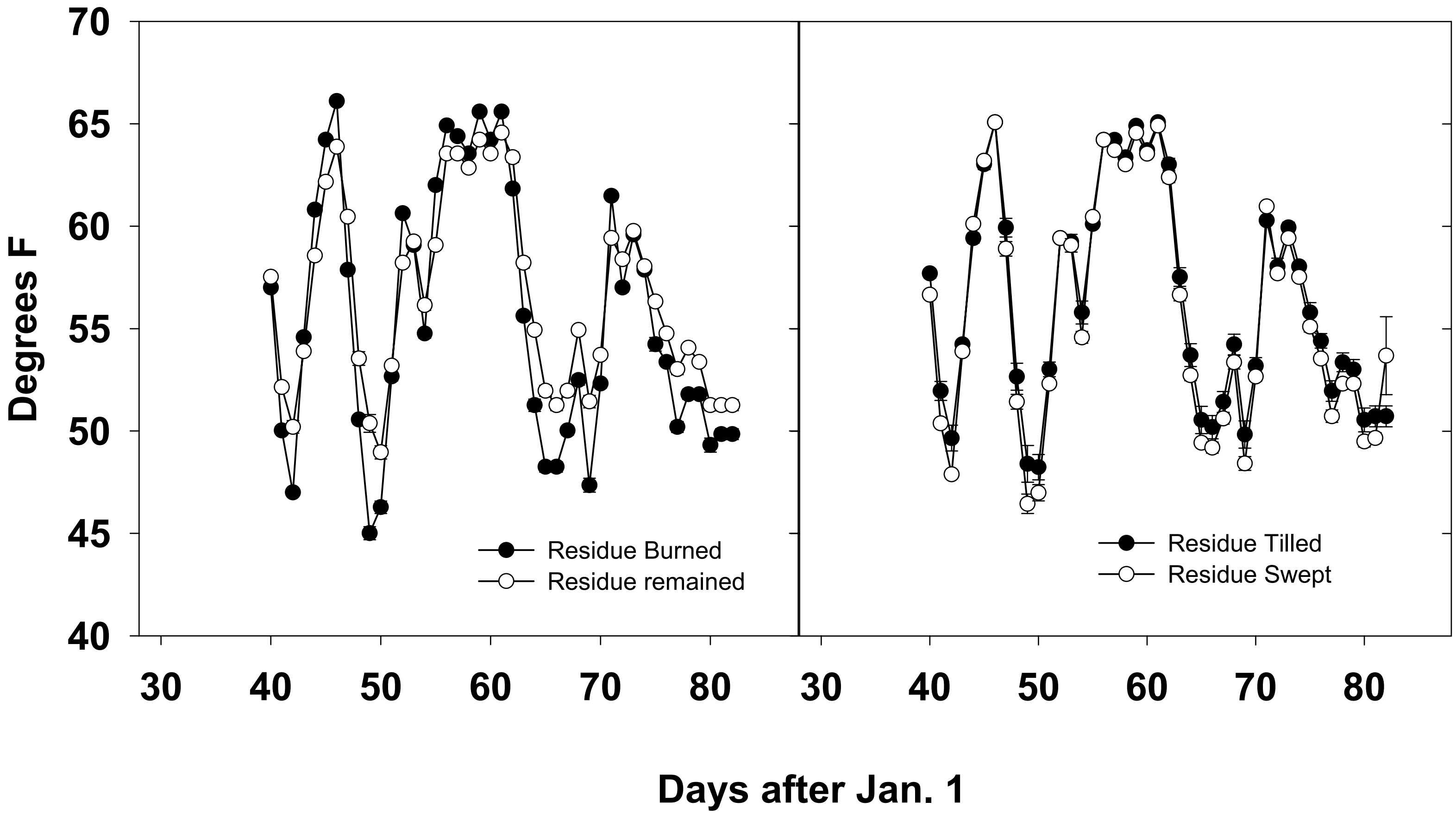

Table 6. Effect of residue management on the first stubble yield of HoCP 85-845 variety on the St. Gabriel Research Station, 2001.

Residue Management Treatment	First Stubble Cane - 2001					
	Cane Yield	Stalk No.	Stalk Wt.	Normal Juice Brix	Normal Juice Sucrose	Sugar Yield
2000	T/A	1000/A	lbs.	%	%	lbs/A
	HoCP 85-845					
Residue	35.5	27.9	2.56	15.3	12.8	6448
Burn	35.3	25.7	2.80	15.8	13.3	6528
Surfactant	34.6	27.7	2.52	15.9	13.4	6541
Sweep	35.2	27.1	2.61	16.3	13.8	6923
Till	37.0	30.5	2.44	16.5	13.9	7312
LSD .05	NS		0.36	0.7	0.8	690

The burn plots were harvested and the trash was removed by burning. The soil cover was applied over the cane stubbles immediately after harvesting plant cane in 2000. Surfactant treatment was 1 qt/ac of non-ionic surfactant, Triton X-100 applied in December, 2000.

Fig. 3. Effect of Residue Management on Stalk Population Development

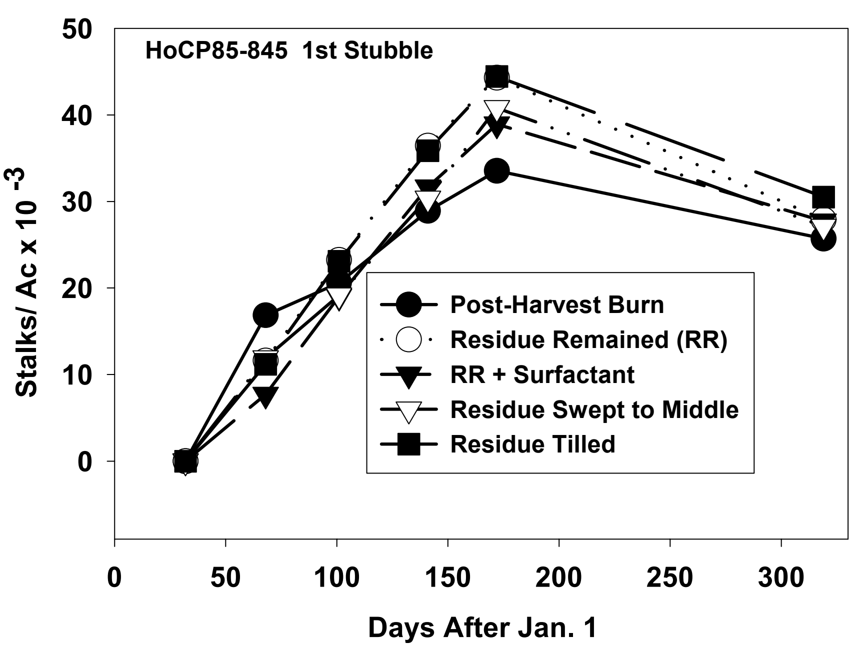

Table 7. Effect of fall applied starter fertilizer and soil cover on second stubble yield of three cane varieties on the St. Gabriel Research Station, 2001.

Starter Fertilizer $N-P_2O_5-K_2O$	Soil Cover	Second Stubble Cane - 2001 Cane Yield	Stalk No.	Stalk Wt.	Normal Juice Brix	Normal Juice Sucrose	Sugar Yield
lbs/A		T/A	1000/A	lbs.	%	%	lbs/A
		LCP 82-89					
0-0-0	Check	43.9	43.0	1.98	15.0	11.3	6627
0-0-0	Cover	43.6	44.1	1.98	14.5	10.8	6319
45-45-45	Check	36.3	43.4	1.68	14.9	11.2	5503
45-45-45	Cover	41.6	38.1	1.84	15.1	11.6	6620
		LCP 85-384					
0-0-0	Check	49.9	55.5	1.81	14.7	11.5	7967
0-0-0	Cover	39.3	52.4	1.91	15.8	12.8	7017
45-45-45	Check	38.7	49.8	1.70	15.3	12.2	6557
45-45-45	Cover	44.9	45.9	1.75	15.9	12.8	8011
		HoCP 85-845					
0-0-0	Check	36.3	37.2	1.80	14.2	11.3	5586
0-0-0	Cover	39.1	37.6	2.00	14.7	12.0	6506
45-45-45	Check	33.1	35.7	1.64	15.2	12.6	5837
45-45-45	Cover	41.4	33.8	1.85	15.5	13.0	7580
LSD .05 Treat.		4.6	4.4	0.27	1.3	1.6	1354
		Mean Effect					
0-0-0		42.0	44.9	1.92	14.8	11.6	6654
45-45-45		39.3	41.1	1.74	15.3	12.2	6688
	Check	39.7	44.1	1.77	14.9	11.7	6329
	Cover	41.7	42.0	1.89	15.3	12.2	7012
LSD .05 Fall Fert.		1.9	1.8	0.11	NS	NS	NS
LSD .05 Cover		1.9	1.8	0.11	NS	NS	553

The fall fertilizer was applied in the planting furrow as a starter fertilizer in 1998. The cover was applied after plant cane harvest in 1999 and the first stubble harvest in 2000.

LONG-TERM EVALUATION OF THE EFFECTS OF COMBINE TRASH BLANKET ON SOIL NITROGEN AND CARBON
(Cycle One Results)

H. P. Viator
Iberia Research Station

SUMMARY

A study designed to evaluate the long-term consequences and benefits of the trash blanket generated by combine harvesting was initiated using LCP 85-384 plant cane in 1997. For each cane cycle, beginning with the plant cane harvest, three treatments will be established for all ratoon crops in the cycle: ratoon cane grown on rows with the trash blanket (GCTB), ratoon cane grown on rows from which the trash blanket will be repositioned in the furrow in the fall (TBR), and ratoon cane grown on rows with residue from the combining of cane burned standing (BSTB). The third ratoon crop of cycle number one was harvested in 2000. Although the measurements are preliminary and slightly variable, the trend appears to be toward higher levels of soil nitrogen and carbon on plots where residue was retained. Several full cycles of production will be required before conclusive observations can be drawn.

INTRODUCTION

Research under Louisiana conditions has consistently shown a two to four tons of cane per acre decrease in yield when combine residue is not removed from the field before springtime. Waiting to remove trash in February or March by either burning, raking or shaving has not produced consistent positive results relative to fall removal. The trash blanket negatively influences ratoon yields by trapping soil moisture, lowering soil temperature, and possibly liberating allelopathic chemicals. The positive effects of the green cane trash blanket include moisture conservation, reduction in soil erosion, cold protection, and the suppression of weeds. A longer-term effect may be the enhancement of soil organic matter. South African research under tropical conditions has shown that long-term trash retention (green-cane harvesting) allowed for lower N and K fertilizer rates after a number of years. The primary objective of this research effort is to evaluate the impact of residue management on cane yield and soil organic properties on a <u>long-term basis</u>.

PROCEDURES

In November 1997, a field of LCP 85-384 plant cane was divided in two and the cane on a third of the rows in each half was burned standing prior to combining. The rows of cane in the remaining two-thirds of each half were green chopped, and the leafy trash residue was broadcast evenly over the field by the combine. Shortly after harvest the trash blanket was physically removed from the tops of half of the rows receiving the combine residue in each half of the field. The resultant three treatments are: 1) ratoon cane grown on rows with residue from the combining of cane burned standing, 2) ratoon cane grown on rows with residue from the combining of green cane,

Research is partially supported by a financial grant from the American Sugar Cane League

and 3) ratoon cane grown on rows from which combine residue was repositioned to the furrow. These same treatments will be initiated with plant cane and imposed for each ratoon crop of at least two cropping cycles (three ratoon crops per cycle). Standard herbicide and cultural practices will be employed for all treatments.

Treatment plots are three rows wide and 365 feet in length, arranged in a randomized block design and replicated twice. Long-term effects of residue management will be ascertained by measuring the direct effects on cane and sugar yield over time. Additionally, changes in organic matter content of the soil will be monitored. An appropriate analysis of variance will be used to determine significant differences among the treatment means.

RESULTS

Soil organic matter has a significant influence on chemical and physical traits of the soil, contributing major amounts of plant nutrients and providing for water-holding capacity. Soil organic matter tends to decrease with cultivation and with the removal of plant residues. Numerous long-term studies involving cover crops and the retention of plant residue have provided evidence of substantial improvements in soil fertility. Significant increases in soil organic matter have been measured in the soil surface. Several of these long-term studies, however, have clearly shown that meaningful soil organic matter increases require the retention of plant residue for years, if not decades. Though the differences in soil nitrogen and carbon shown in the table below suggest a buildup of fertility where the residue was retained, a considerable amount of additional data will be required before interpretations can be made with certainty.

Preliminary observations on the influence of residue management on soil C and N		
Residue treatment	% carbon in the upper 12"	% nitrogen in the upper 12"
Cane burned standing prior to harvest	1.186	0.112
Combine residue retained	1.274	0.125

SUGARCANE YIELDS LOWERED BY WATER-LOGGED SOILS

H. P. Viator
Iberia Research Station

SUMMARY

Sugarcane grown on plots with water in the row furrows from November 2000 to March 2001 yielded significantly less cane (33.7 vs. 28.8 tons/acre, $P = .02$) and sugar (7,612 vs. 6,309 pounds/acre, $P = .03$) than sugarcane grown on plots without water in the furrows. Even though cane in the dry plots contained more than 12,000 more stalks/acre and was 20 inches taller on the average, this heavier cane completely lodged, resulting in a narrowing of the yield gap between the water-logged and non-water-logged sugarcane plots.

INTRODUCTION

High water table levels, especially during the winter-spring period characterized by low evapotranspiration, saturate the root zone and undermine the development of sugarcane. Significant yield increases in sugarcane have been realized by the lowering of the water table through the use of subsurface tile drains in Louisiana. Numerous ratoon fields, which were deeply rutted during the fall harvest, had water remaining in the rutted furrows from the fall of 2000 to the spring of 2001. It was impossible to remove the water in most of these fields until dry conditions returned in March 2001. This presented an opportunity to evaluate the effects of water logging on ratoon cane and sugar yields.

PROCEDURES

Fifty-foot sections of row, both with and without water in the furrows, were measured within the same production field on January 24, 2001. Each of the two treatments, water logged and dry, was replicated eight times, resulting in a total of 16 plots. Field drains were avoided. Stalk population counts and height measurements were accomplished intermittently during the growing season. Combine-harvested plot weights were determined with a weigh wagon equipped with hydraulic load cells. Data were collected for cane and sugar yields and CRS.

RESULTS

Measurements of plant population and height taken during the grand growth stage revealed that the water-logged cane had 20% fewer stalks per acre and was 17% shorter than the cane on the dry plots, suggesting a projected difference at harvest of approximately 10 tons of cane per acre in favor of the cane on the dry plots. In early September, however, the heavier cane on the dry plots completely lodged. Tons of cane per acre, pounds of sugar per acre and pounds of sugar per ton were 33.7, 7,612 and 226 and 28.8, 6,309 and 219, respectively, for the dry and water-logged plots.

Research is partially supported by a financial grant from the American Sugar Cane League.

THE EVALUATION OF PRECISION FARMING TECHNOLOGIES IN SUGARCANE
(*Observations are preliminary and investigations are ongoing*)

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SUMMARY

An investigation of precision farming technologies was initiated in 2000. Both a conventional approach to evaluating soil fertility and soil electron conductivity are being used to evaluate soil variability in separate studies.

The conventional approach of using geo-referenced cells (1.5 acre cell size) to show variation in soil-test attributes was used to map the variability in soil fertility of a fallow sugarcane field. Simple Pearson correlation coefficients were used to relate the variability in soil fertility and other variables to cellular tonnage and plant cane sugar yields. The strongest association was between lodging and sugar yield ($r = .7$, $P = .004$), with lodged cells averaging approximately 1,900 pounds of sugar/acre less than cells with erect cane. More moderate associations with yield were calculated for depth of hardpan and soil phosphorus.

Two fallow sugarcane fields were mapped for soil electrical conductivity (EC). Changes in soil EC appeared to be strongly associated with sum of the bases (approximation of cation exchange capacity) and soil organic matter. A strong association is also expected for soil texture (analysis not complete). Consideration is being given to variably applying either or both lime and nitrogen fertilizer based on the management zones (see maps below) depicted by the changes in EC reading within the field, which presumably represent changes in soil texture and CEC.

INTRODUCTION

Precision farming is defined as using information technologies to tailor soil and crop management to fit the specific conditions found within a field. Precision farming involves technologies that depend on global positioning systems (GPS) to collect information for site-specific management plans. Geo-referenced maps of the field can be produced to identify areas within individual fields to be uniquely managed. With sugarcane growers spending from 35 to 45% of direct expenses ($115 to $140/acre) for fertilizer and herbicides, it is easy to see the potential for significant savings with variable rate technology. Use of precision farming technologies may also have important environmental and health benefits. Prescription fertilizer and herbicide programs have the potential for minimizing ground and surface water contamination, which qualifies these practices as Best Management Practices useful for meeting water quality standards. The profitable use of these precision farming technologies in sugarcane production have not been investigated for the conditions that prevail in Louisiana.

Research is partially supported by a financial grant from the American Sugar Cane League

PROCEDURES

Conventional mapping of soil and plant properties: Using a GPS receiver, coordinates for sampling of soil properties were determined. The 28.5-acre fallow field was partitioned using a 1.5-acre grid. Representative soil samples were taken from each cell and submitted to the LSU AgCenter Soil Testing Laboratory for analysis. Data were collected on soil Ca, depth of the hardpan, K, Mg, Na, OM%, P, pH, salts, sum of the bases, and the following plant attributes - lodging, plant height and population, pounds of sugar per acre and per ton, stalk weight, and tons of cane per acre. Simple Pearson correlation coefficients were calculated to determine associations among the measured variables (spatial patterns in soil fertility have not correlated well with yield in numerous studies).

Soil electrical conductivity: Two fields (30.4 and 31.3 acres) were mapped using a Veris 3100 Soil Electrical Conductivity mapping system equipped with DGPS mapping capability. The Veris was operated on approximately 36 foot transects at 5-6 mph and measured EC at two depths in the soil (0-1 foot and 0-3 foot) simultaneously. More than 4,500 data points were acquired for each field, yielding a density from 145 to 150 data points per acre. The Veris data were imported into SSToolbox, an ArcView-based agricultural Geographical Information System (GIS). The data for the shallow EC readings were classified into five classes using the quantile method, which grouped the data with equal numbers of data points. A referenced grid consisting of one-acre cells was used as a pattern for sampling soil. The randomly selected sampling points within the cells were moved to the nearest corresponding Veris point to assure that five sample points fell within each of five zones of similar electrical conductivity. Samples were collected at each point and submitted to the LSU AgCenter Soil Testing Laboratory for analysis. The EC value for each sample location was added as an attribute of the soil test data. Correlation coefficients were calculated between EC and soil test attributes using the total number of field sample points. Bivariate regression analysis was performed on the sample point data, using EC as the dependent variable. Additionally, surface maps created by kriging (a spatial prediction of the value of a variable at an unknown location through use of the spatial correlation among its neighboring points) the 4,500+ EC data points were compared to the sum of the bases surface maps created from the one-acre cellular soil sample points, showing the relationship between EC and the sum of the bases.

PRELIMINARY RESULTS

Conventional mapping of soil and plant properties: Yield measurements of plant cane revealed substantial fluctuation among the geo-referenced cells, with tonnage ranging from 20 to 39 tons/acre and sugar ranging from 3,876 to 7,013 lbs/acre among the 19, 1.5-acre cells. This was surprising because field variation for plant height and plant population appeared to be relatively low prior to harvest. The extreme variation in yield appeared to be mostly determined by lodging (see maps below), with lodged and erect plots differing an average of over eight tons/acre. Correlations suggested association between soil pH and yield, soil P and yield, and soil hard pan depth and yield. Consideration is being given to the use of deep subsoiling to mitigate the hardpan dilemma during the next fallow period.

Evaluation of soil electrical conductivity: Sample results are currently being evaluated to determine the prescription for site-specific inputs. It appears that field patterns reflect differences in soil texture, organic matter content, and inherent fertility - attributes which should be suitable candidates for variable input rates such as nitrogen fertilizer and/or herbicides.

Maps showing apparent spatial relationships

Geo-referenced maps showing lodging and yield relationship

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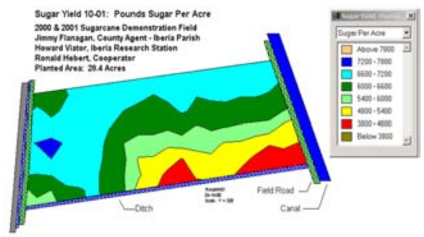

- ***Comparison of EC zones to zones of the sum of bases***
- ***R^2 = .71***