

IMPACT OF SUGARCANE MULCH MANAGEMENT STRATEGIES ON CROP YIELD

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INTRODUCTION

Since 1995, the sugarcane industry in Louisiana gradually developed a new harvesting system which involves the use of a combine harvester. Extractor fans in the combine harvester separate leaf-material from the billets and plant residue is deposited on the soil surface. Historically, the sugarcane residue has been removed by burning. Environmental concerns about burning have led to the need to find economical alternatives for residue management. The primary purpose of this project was to evaluate the effect of post-harvest residue (mulch cover) on the field with respect to crop yield. This project evaluated three management strategies. The treatments include (1) burning the mulch after harvest and cultivating in the spring; (2) sweeping the mulch off the top of the row and cultivating in the spring; and (3) leaving the mulch on the field and cultivating in the spring. Treatment 1 is the common method by which sugarcane mulch is managed in Louisiana. Treatments 2 and 3 are proposed sugarcane residue management practices for use by Louisiana sugarcane farmers. Sugarcane plant population and yields were measured for each treatment.

MATERIALS AND METHODS

Two experimental sites were located at the Louisiana Agriculture Experiment Station's Sugar Research Station, 12 m south of Baton Rouge. The first site was on a Commerce silt loam soil (fine silty, mixed, nonacid, thermic Aeric Fluvaquents). The site and consisted of six leveed plots 0.6 acre in size (nine rows spaced 5.9 ft apart and 459 ft long). The second study site was on a Sharkey clay (very fine, montmorillonitic nonacid, thermic, vertic Haplaquept) and consisted of six leveed plots 0.3 acre in size (six rows spaced 5.9 ft apart and 350 ft long). On the Commerce soil, two sugarcane growing cycles were monitored. A sugarcane variety HoCP91-555 was planted on September 19, 2001 and sugarcane yields and biomass were monitored during 2002-2005. This was followed by sugarcane variety L97-128 which was planted August 15, 2006 and yields and biomass monitored during 2007-2010. On the Sharkey clay site, a sugarcane variety HoCP91-555 was planted on October 21, 2003 and yields were monitored during 2004-2007. The treatments were applied after each harvest and yields and biomass were measured.

RESULTS AND DISCUSSION

The sugarcane variety HoCP91-555 was planted on a Commerce soil on September 19, 2001, and was harvested December 9, 2002, October 30, 2003, October 19, 2004, and October 25, 2005. Table 1 shows the sugarcane biomass yields for each treatment from 2003 to 2005. The biomass yields for burned, mulch, and swept treatments were 28.5, 24.5, and 25.4 t/a, respectively. The burned treatment increased biomass yield 9.3% and 5.6% over the mulch and swept treatments, respectively. Table 2 shows the sugar yields for each treatment from 2003 to 2005. The sugar yields for burned, mulch, and swept treatments were 5769, 5042, and 5251 lbs/a, respectively. The burned treatment increased sugar yields 12.6% and 9.0 % over the mulch and swept treatments, respectively.

Table 1. Annual sugarcane biomass (tons/acre) for variety HoCP91-555 on Commerce silt loam soil. The sugarcane was planted on September 19, 2001.

Treatment	Sugarcane Biomass First Stubble 2003	Sugarcane Biomass Second Stubble 2004	Sugarcane Biomass Third Stubble 2005	Average Sugarcane Biomass	Sugarcane Biomass difference
	(tons/acre)	(tons/acre)	(tons/acre)	(tons/acre)	(%)
Burned	30.8	21.4	28.6	26.9	0.0
Mulch	29.2	17.7	26.5	24.4	-9.3
Swept	28.0	19.6	28.7	25.4	-5.6
LSD .05	NS	NS	NS	1.9	--

Table 2. Annual sugar yields (lbs/a) for variety HoCP91-555 on Commerce silt loam soil. The sugarcane was planted on September 19, 2001.

Treatment	Sugar yield First Stubble 2003	Sugar yield Second Stubble 2004	Sugar yield Third Stubble 2005	Average Sugar yield	Sugar yield difference
	(lbs/acre)	(lbs/acre)	(lbs/acre)	(lbs/acre)	(%)
Burned	6360	4597	6351	5772	0.0
Mulch	5584	3862	5681	5042	-12.6
Swept	5687	3983	6084	5251	-9.0
LSD .05	NS	NS	NS	513	--

Table 3. Annual sugarcane biomass (tons/acre) for variety HoCP91-555 on Sharkey clay soil. The sugarcane was planted on October 21, 2003.

Treatment	Sugarcane Biomass First Stubble 2005	Sugarcane Biomass Second Stubble 2006	Sugarcane Biomass Third Stubble 2007	Average Sugarcane Biomass	Sugarcane Biomass difference
	(tons/acre)	(tons/acre)	(tons/acre)	(tons/acre)	(%)
Burned	25.9	26.6	26.4	26.3	0.0
Mulch	27.8	23.2	26.1	25.7	-2.3
Swept	26.5	26.2	23.7	25.5	-3.0
LSD .05	NS	NS	NS	NS	--

Table 4. Annual sugar yield (lbs/acre) for variety HoCP91-555 on Sharkey clay soil. The sugarcane was planted on October 21, 2003.

Treatment	Sugar yield First Stubble 2005	Sugar yield Second Stubble 2006	Sugar yield Third Stubble 2007	Average Sugar yield	Sugar yield difference
	(lbs/acre)	(lbs/acre)	(lbs/acre)	(lbs/acre)	(%)
Burned	5570	5852	4627	5350	0.0
Mulch	5520	5187	4345	5017	-6.2
Swept	5076	5845	3534	4818	-9.9
LSD .05	NS	NS	NS	NS	--

The sugarcane variety HoCP91-555 was planted on a Sharkey clay soil on October 21, 2003, and was harvested on October 26, 2004, October 20, 2005, November 2, 2006, and October 16, 2007. Table 3 shows the sugarcane biomass yields for each treatment from 2005 to 2007. The biomass yields for burned, mulch, and swept treatments were 26.3, 25.7, and 25.5, respectively. The burned treatment increased biomass yield 2.3% and 3.0% over the mulch and swept treatments, respectively. Table 4 shows the sugar yields for each treatment from 2005 to 2007. The sugar yields for burned, mulch, and swept treatments were 5350, 5017, and 4818 lbs/a, respectively. The burned treatment increased the sugar yield 9.9% and 6.2% over the swept and mulch treatments, respectively.

The sugarcane variety L97-128 was planted on a Commerce silt loam soil on August 15,

2006, and was harvested on November 9, 2007, November 3, 2008, November 19, 2009, and October 20, 2010. Table 5 shows the sugarcane biomass yields for each treatment from 2008 to 2010. The biomass yields for burned, mulch, and swept treatments were 26.7, 24.7, and 26.7 t/a, respectively. The burn and swept treatment increased biomass yield 7.9% over the mulch treatment. Table 6 shows the sugar yields for each treatment from 2008 to 2010. The sugar yields for burned, swept, and mulch treatments were 6199, 6126, and 5358 lbs/a, respectively. The burned treatment increased sugar yield 13.6% and 1.2% over the mulch and swept treatments respectively.

Table 5. Annual sugarcane biomass (tons/acre) for variety L97-128 on Commerce silt loam soil. The sugarcane was planted on August 15, 2006.

Treatment	Sugarcane Biomass First Stubble 2008	Sugarcane Biomass Second Stubble 2009	Sugarcane Biomass Third Stubble 2010	Average Sugarcane Biomass	Sugarcane Biomass difference
	(tons/acre)	(tons/acre)	(tons/acre)	(tons/acre)	(%)
Burned	28.5	28.7	22.8	26.7	0.0
Mulch	26.2	28.2	19.6	24.6	-7.9
Swept	28.4	28.9	22.8	26.7	0.0
LSD .05	NS	NS	NS	NS	--

Table 6. Annual sugar yield (lbs/acre) for variety L97-128 on Commerce silt loam soil. The sugarcane was planted on August 15, 2006.

Treatment	Sugar yield First Stubble 2008	Sugar yield Second Stubble 2009	Sugar yield Third Stubble 2000	Average Sugar yield	Sugar yield difference
	(lbs/acre)	(lbs/acre)	(lbs/acre)	(lbs/acre)	(%)
Burned	6235	6141	6221	6199	0.0
Mulch	5693	5848	4534	5358	-13.6
Swept	5938	6220	6219	6126	-1.2
LSD .05	NS	NS	NS	NS	--

Table 7 shows the sugarcane biomass yield and sugar yield for each treatment averaged over nine crop years. The sugarcane biomass yield for burned, mulch, and swept treatments were 26.6, 24.9, and 25.5 t/a, respectively. The burned treatment increased biomass yield 6.4% over the mulch treatment. The sugar yield for burned, mulch, and swept treatments were 5764, 5139, and 5404 lbs/a, respectively. The burned treatment increased sugar yield 10.8% over the mulch treatment.

Table 7. Average biomass and sugar yield for nine crop years during 2001 through 2010.

Treatment	Biomass yield (tons/acre)	Sugar yield (lbs/acre)	% Difference Biomass	% Difference Sugar
Burned	26.6	5764	0.0	0.0
Mulch	24.9	5139	-6.4	-10.8
Swept	25.8	5404	-3.0	-6.3
LSD .05	1.5	375	--	--

CONCLUSIONS

The burned treatment increased biomass yields by 6.4% and sugar yields by 10.8% over the mulch treatment. The burned treatment was significantly greater in biomass and sugar yield than the mulch treatment. The swept treatment was not significantly different from the burn or mulch treatment.