

## Developing Management Criteria for Maximum Biomass Production of 'Alamo' and 'Cave in Rock' Switchgrass Cultivars in Western Arkansas

J.R. King, T.E. Pratt, L.D. Goff

Western Arkansas and Eastern Oklahoma are in the center of the U.S. switchgrass (*Panicum Virgatum L.*) production belt. Increasing interest in cellulosic ethanol production, especially switchgrass based production, has highlighted the need for information about maximizing production of this feedstock. Little if any information exists about switchgrass performance under animal waste fertility, or commercial fertility, and no information exists about supplemental irrigation. This study explores both fertility and irrigation of the two predominant switchgrass cultivars ('Alamo' and 'Cave in Rock') of western Arkansas and eastern Oklahoma. 'Alamo' and 'Cave in Rock' cultivars were randomly planted in 40'X40' subplots with three replications. Treatments included; 2 tons/ac animal waste (dry poultry litter); the nutrient equivalent of commercial fertilizer; supplemental irrigation (2"/week); and control. Half of each subplot was harvested in mid June, with yield and forage quality data recorded (See table 1). The remaining half of each subplot was annually harvested in early December.

The subplot half harvested in mid June was again harvested in early December. Biomass production was similar across fertility treatments for the first growing season. Animal waste fertilized plots yielded more biomass than commercial fertilized plots in subsequent years. Differences in yields by cultivar are not significant. Annual harvests and semiannual yields are not significantly different (See table 2). Animal waste fertility will yield significantly more biomass, in both cultivars, over 2 growing seasons than the equivalent rate of commercial fertilizer. Supplemental irrigation will significantly increase biomass yield during years with less than 45 inches of rainfall. 'Cave in Rock' will lodge under high rates of fertility and supplemental irrigation. Annual harvests are economically more feasible than multiple harvests.

Table 1.

Forage quality; % crude protein, % acid detergent fiber, and % neutral detergent fiber  
of Alamo and Cave-in Rock switchgrass. (6/8/2008 and 6/16/2009)

Treatment	CP	CP	ADF	ADF	NDF	NDF
	2008	2009	2008	2009	2008	2009
	-----%-----					
Alamo Fert.	6.75	<b>11.69</b>	34.83	<b>34.04</b>	65.99	<b>62.45</b>
Alamo Litter	7.81	<b>7.50</b>	36.76	<b>35.49</b>	65.94	<b>65.13</b>
Alamo Irrig. Fert.	6.44	<b>10.38</b>	33.09	<b>33.05</b>	64.99	<b>62.98</b>
Alamo Irrig. Litter	7.99	<b>7.25</b>	36.74	<b>34.92</b>	66.21	<b>64.36</b>
Cave-in Rock Fert.	7.99	<b>12.85</b>	35.24	<b>33.42</b>	63.92	<b>62.04</b>
Cave-in Rock Litter	9.23	<b>8.19</b>	38.65	<b>38.24</b>	66.34	<b>64.51</b>
Cave-in Rock Irrig. Fert.	7.61	<b>13.68</b>	33.14	<b>37.46</b>	63.91	<b>61.96</b>
Cave-in Rock Irrig. Litter	9.13	<b>8.00</b>	36.44	<b>35.71</b>	66.35	<b>65.73</b>

Fert. = Commercial Fertilizer

Litter = Poultry litter

Irrig = Irrigation water applied

Table 2.

Cultivar/Treatment	2008	2008	2008	2008	2009	2009	2009	2009
	Dry	Dry	2008	2008	Dry	Dry	2009	2009
	Matter	Matter	Two	Single	Matter	Matter	Two	Single
	Mean	Mean	Harvest	Harvest	Mean	Mean	Harvest	Harvest
	Harvest	Harvest	Mean	Mean	Harvest	Harvest	Total	Mean
	1	2	Total	(Nov. 17)	1	2	Mean	(Dec. 14)
	(June 19)	(Nov. 17)			(June 16)	(Dec. 14)		
	----- Lbs./Acre -----							
Alamo Comm. Fert.	10820	4873	<b>15693</b>	<b>10400</b>	6009	4865	<b>10874</b>	<b>7597</b>
Alamo Litter	12487	6507	<b>18993</b>	<b>11853</b>	7740	5163	<b>12903</b>	<b>11375</b>
Alamo Irrig. Comm. Fert.	7460	3880	<b>11340</b>	<b>10633</b>	6201	5116	<b>11317</b>	<b>13411</b>
Alamo Irrig. Litter	12220	5807	<b>18027</b>	<b>14600</b>	7997	6967	<b>14964</b>	<b>12467</b>
Cave-In-Rock Comm. Fert.	8360	2393	<b>10753</b>	<b>7280</b>	7836	2958	<b>10794</b>	<b>7313</b>
Cave-in-Rock Litter	9633	3900	<b>13533</b>	<b>8227</b>	7633	3887	<b>11520</b>	<b>9643</b>
Cave-In-Rock Irrig. Comm. Fert.	9440	2907	<b>12347</b>	<b>8440</b>	6360	4580	<b>10940</b>	<b>9438</b>
Cave-In-Rock Irrig. Litter	12093	4713	<b>16807</b>	<b>8287</b>	7952	4579	<b>12531</b>	<b>8619</b>

Litter = Dry broiler litter

Comm. Fert. = Commercial Fertilizer