The impact of tillage system for small-grain pasture establishment on the performance of growing beef calves in Arkansas

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Introduction Government mandates reductions in environmental problems including the siltation of waterways, soil carbon loss, and nutrient runoff along the Mississippi River Delta. Previous research by the University of Arkansas has shown that the use of small-grain forages by grazing cattle offers real opportunities to produce high-quality forage for cattle production during the winter and spring months. No-till and reduced tillage practices developed primarily for grain production may offer solutions for both grain farmers and cattle producers. The objective of this project is to compare clean till to no-till and reduced tillage systems for production of small grain forage for grazing.

Materials and methods Four hundred eighty-two weaned calves were used in a 2-year study evaluating the effects of tillage method on small-grain forage production and animal performance. Three tillage methods were evaluated: 1) conventional tillage, consisting of chisel plowing, heavy disking, and light disking, 2) reduced tillage with a target of 50% soil surface residue, and 3) no-till seeding. Wheat and rye were planted in the first week of September each year at a rate of 68 kg of each/ha. In year one, grazing was managed using put-and-take stocking, while set stocking rates were used in year two. In year one, 90 calves (213 kg) were stocked in November when forage height reached 20 cm in each pasture and removed when forage became limiting in late January. A second group of 167 calves (270 kg) was stocked beginning on 31 January and removed by 13 May. In year two, 90 calves (208 kg) were stocked on 28 October and removed on 23 January. On 2 March, the pastures were restocked with 135 calves (233 kg), and removed on 27 April. In year 2, forage availability of each pasture was determined using a calibrated disk meter. Data pooled across the 2-year study were analyzed using the mixed procedure of SAS (SAS Inst., Inc.; Cary, NC) least-square means were separated using contrast statements.

Results Performance of steers grazing small grain pastures are shown in Table 1. Fall average daily gains (ADG) by the steers in no-till pastures were 0.14 kg/d higher ($p<0.05$) than steers in conventional tillage pastures. When data were pooled across years, there were no differences ($p>0.05$) in ADG during the spring-grazing period, grazing-d/ha, or gain/ha. Forage production was higher ($p<0.05$) in no-till pastures than conventional-tillage pastures at the initiation of fall grazing (1,879 vs. 1,525 kg), the end of fall grazing (1,254 vs. 1,015 kg), and the initiation of spring grazing (1,170 vs. 856 kg). No-till pastures contained more ($p<0.05$) forage at the initiation of spring grazing than reduced-tillage pastures (1,170 vs. 913 kg).

Table 1 Effect of tillage system on ADG, grazing-day/ha, and gain/ha of calves grazing wheat-rye pasture

	Conventional	Reduced	No-Till	s. e. m
Fall ADG, kg	0.65[a]	0.75[ab]	0.79[a]	0.21
Spring ADG, kg	1.04	1.11	1.06	0.004
Grazing-d/ha	664	578	627	53.1
Gain/ha, kg	576	550	593	68.7

[ab] LSmeans in rows with differing superscripts differ ($P<0.05$).

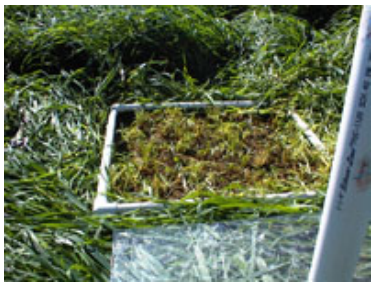
Conclusion Establishment of small-grain pastures using No-Till methods appears to be superior in fall and winter forage production to conventional tillage. This increase in forage production may be the mechanism for improved performance during the late fall and early winter observed in the 2-year study. These results indicate no-till production systems are available for establishment of small grain pastures for livestock grazing, with no reduction in animal gains or forage production compared to conventional farming methods.

Clean till pasture being prepped with finishing disk prior to planting cop

Drilling grain into clean till seed bed

Clean till wheat rye mix September 15, 2004. 7 days after planting

Conventional till wheat rye mix Oct. 7, 2004. 28 days after planting



Clipping and measuring the amount of forage on a clean till treatment pasture

2.5 inch rain event on Clean till small grains, October 9, 2004

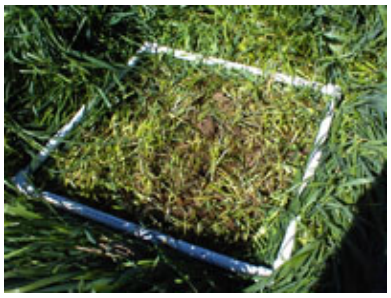
Conventional till wheat rye mix Nov. 11, 2004. 65 days after planting

Finishing disk used to prepare soil on light disk treatment pasture. Disk is set to cut the soil 2 to 3 inches in depth

Fertilizer buggy is calibrated and used to broadcast seed onto light disk treatment

Light disk and broadcast planting of wheat rye mix September 15, 2004. 7 days after planting

Light disk and broadcast wheat rye mix Oct.7, 2004. 28 days after planting



Clipping and measuring forage on a light disk treatment pasture

Light disk and broadcast wheat rye mix Nov. 11, 2004. 65 days after planting

Light disk treatment on the left; clean till on the right 8 days after planting

2.5 inch rain event on light disk and broadcast pasture. October 9, 2004

Spraying summer weeds getting ready for no till planting of winter annuals

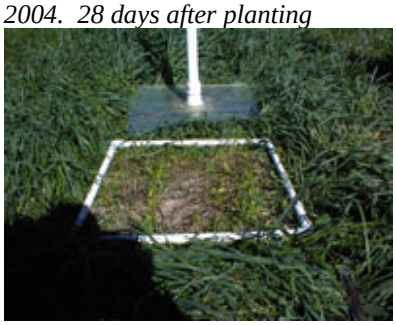
No till drill rows in stubble 7 days after being sprayed to kill any summer vegetation

No till wheat rye mix 7 days after planting, September 15, 2004. 7 days after planting

No till wheat rye mix October 7, 2004. 28 days after planting

2.5 inch rain event on no till pasture October 9, 2004

No till wheat rye mix November 11, 2004. 65 days after planting



Clipping and measuring the amount of forage on a no till treatment pasture

Calves sorted and ready to go to small grains pastures., Fall, 2004

Calves on no till pasture Dec. 2, 2004. Calves out 28 days