

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

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Introduction In the United States, governmental regulations mandate the improvement of farming practices to improve environmental quality. There is a requirement to reduce the siltation of waterways, soil carbon losses, and nutrient runoff along the Mississippi River Delta. 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 environmental and economic solutions for both grain farmers and cattle producers. Producers are slow to adopt conservation tillage practices because of a perceived risk of reduced production. The objective of this project was to compare conventional tillage to reduced tillage and no-till systems for production of small-grain forage for grazing livestock.

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 ploughing, heavy discing, and light discing, 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 Sept. annually at a rate of 68 kg/ha of each. In the first year, grazing was managed using put-and-take stocking, while set stocking rates were used in the second year. In the first year, 90 calves (213 kg) were stocked in Nov. when forage height reached 20 cm in each pasture and removed when forage became limiting in late Jan. A second group of 167 calves (270 kg) was stocked beginning on 31 Jan. and removed by 13 May. In the second year, 90 calves (208 kg) were stocked on 28 Oct. and removed on 23 Jan. On 2 March, the pastures were restocked with 135 calves (233 kg), and removed on 27 April. In the second year, forage availability of each pasture was measured using a calibrated disk meter. Data pooled across the 2-year study were analysed using the mixed procedure of SAS (SAS Inst., Inc.; Cary, NC); least-square means were separated using contrast statements.

Results Autumn 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 days/ha, or gain/ha. Forage production was higher ($p<0.05$) in no-till pastures than conventional-tillage pastures at the initiation of autumn grazing (1,879 vs. 1,525 kg), the end of autumn 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 average daily gains, grazing-day/ha, and gain/ha of calves grazing wheat-rye pasture

| | Conventional | Reduced | No-Till | s. e. m |
|-----------------|-------------------|--------------------|-------------------|---------|
| Autumn ADG, kg | 0.65 ^a | 0.75 ^{ab} | 0.79 ^b | 0.21 |
| Spring ADG, kg | 1.04 | 1.11 | 1.06 | 0.004 |
| Grazing days/ha | 664 | 578 | 627 | 53.1 |
| Gain/ha, kg | 576 | 550 | 593 | 68.7 |

^{a, b} LS means in rows with differing superscripts differ ($p<0.05$).

Conclusion Establishment of small-grain pastures using no-till methods appears to be superior to conventional tillage in autumn and winter forage production. This increase in forage production may be the mechanism for improved performance during the late autumn and early winter observed in the 2-year study. These results indicate no-till production systems are a viable alternative for establishment of small-grain pastures for livestock grazing, with no change in animal gain/ha and increased forage production in autumn compared to conventional farming methods.