

The economic benefit of increased yield and digestibility in a perennial C₄ grass

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Introduction Big bluestem (*Andropogon gerardii* Vitman) is a perennial C₄ grass native to the North American tallgrass prairie (Weaver, 1954). It provides productive, high quality forage during late spring and summer in the Great Plains, USA (Mitchell *et al.*, 1994). Increasing forage yield and digestibility can increase livestock performance and grassland profitability (Casler & Vogel, 1999). This study aimed to compare the economic value of 2 big bluestem strains developed by 3 generations of breeding for increased forage yield and digestibility with the base populations from which they were derived.

Materials and methods Bonanza and Goldmine are big bluestem cultivars developed for high yield and digestibility by 3 cycles of selection from the Pawnee and Kaw base populations, respectively. Pawnee and Kaw cultivars are based on germplasm from USDA Plant Hardiness Zones (HZ) 5 and 6, respectively. Plots (n=12, each 0.4 ha) near Mead, Nebraska were seeded in 1998 with 3 replicates/cultivar x 4 cultivars. Ammonium nitrate was applied at 112 kg N/ha each spring. Crossbred yearling steers (350-400 kg; 3 steers/plot; stocking rate 7.5 steers/ha) grazed the plots in 2000, 2001, and 2002. All plots were grazed for the same number of days/year. The value of steers at the start and end of grazing was calculated at 1.87 and 1.74 US\$/kg live weight, respectively. Steer values were average Nebraskan market prices for the representative weight classes across years.

Results The big bluestem pastures gave 38-62 days of continuous grazing during each of the 3 years. Beef production and average daily gain (ADG) of steers grazing the Bonanza strain were 14-16% more than in steers grazing the Pawnee base population (Table 1). Economic returns to the producer improved by 32%, or 109 US\$/ha. Cattle performance on the Goldmine strain was 5-7% more than for the Kaw base population. Economic returns were 10% more for Goldmine compared to Kaw. Cattle performance and economic returns did not differ significantly between the 2 selected strains of Bonanza and Goldmine.

Table 1 Beef production, ADG, gross return, and the economic value of improvement for 4 big bluestem cultivars grazed with 7.5 steers/ha in 2000, 2001, and 2002. The standard error is in parentheses

| Cultivar | Beef production (kg/ha) | ADG (kg/hd/d) | Gross return (US\$/ha) | Value of improvement (US\$/ha) |
|----------|-------------------------|---------------|------------------------|--------------------------------|
| Pawnee | 398 (24) | 1.12 (0.04) | 340 | |
| Bonanza | 455 (19) | 1.30 (0.03) | 449 | 109 |
| Kaw | 424 (29) | 1.19 (0.05) | 392 | |
| Goldmine | 444 (18) | 1.27 (0.04) | 431 | 39 |

Conclusions Cultivars bred for increased yield and digestibility can increase significantly beef production and the profitability of grazing operations for producers in the tallgrass prairie region of the Great Plains, USA. These improved cultivars can be used to convert marginal cropland or degraded grazinglands to highly productive perennial grasslands. These grasslands can give co-benefits of ecosystem services to the public in the forms of perennial vegetative cover, carbon sequestration and storage, and reduced soil erosion. Bonanza and Goldmine were released officially in 2004. They are recommended in USA for use in HZ 5 and HZ 6, respectively.

References

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