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Case Study: Demonstration of the feasibility of extending the grazing period of beef cow-calf herds beyond 300 days in Arkansas

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ABSTRACT

A 5-yr 300-d-grazing extension demonstration implemented research-based management practices to reduce hay feeding to 60 d or less, while achieving 90% calf crop and weaning weight of 249 kg. Pastures consisted of 36.5 ha of tall fescue (Festuca arundinacea) and 16.2 ha of common bermudagrass (Cynodon dactylon) with an initial stocking rate of 1.2 ha per animal unit. In yr 1, the cow herd was 38 fall-calving Balancer multiparous cows bred to Balancer bulls. Horned Hereford bulls were used in yr 2 to 5. The grazing protocol was fescue and clover in spring, bermudagrass for summer and early fall, fescue and clover for late fall, and stockpiled fescue in winter. The management practices were rotational grazing, strip grazing stockpiled forages during winter, and a 60-d breeding season. The lengths of the grazing season for yr 1, 2, 3, 4, and 5 were 337, 311, 330, 323, and 279 d, respectively, and averaged 316 ± 20.4 d (mean ± SD). The mean mature cow net calf crop for 2 to 5 yr was 90 ± 7.0%; 24 percentage points improvement compared with yr 1. Calves were weaned the second week of May. The weaning weights for yr 1, 2, 3, 4, and 5 were 213 ± 21.4, 255 ± 39.2, 273 ± 40.4, 241 ± 35.7, and 259 ± 31.0 kg, respectively. The calving season averaged 59 ± 9.4 d for 5 yr. By incorporating research-based management practices, 300-d grazing with acceptable beef-cattle performance was achieved.

Key words: 300-d grazing, forage, cow-calf, strip grazing

INTRODUCTION

Since 2005 cattle producers have experienced substantial increases in production costs. From 2000 to 2005 corn prices were below $2.50 per 25.4 kg (bushel), but between 2006 and 2011 corn prices increased from $3.04 to $6.22 per 25.4 kg (USDA, 2012a). The cost of fertilizer (N, P_2O_5, and K_2O composition; USDA, 2012b), 17–17–17 fertilizer (USDA, 2012b), ammonium nitrate (USDA, 2012c), and urea (USDA, 2012c) increased 182, 204, 161, and 177%, respectively, from 2000 to 2012. Retail diesel prices ($/L) averaged $5.72 from 2000 to 2004 but increased 60% from 2005 ($9.08) to 2011 ($14.53; EIA, 2012).

Throughout a 10-state area (AR, KY, MO, IL, IN, OH, WV, VA, TN, and NC) the average number of hay or silage feeding days was 133 with a range of 86 to 165 d (G. Lacefield, 2011, University of Kentucky, Research Educational Center, Princeton, KY, personal communication). The purpose of the 300-d-grazing program was to implement science-based management practices to increase the number of grazing days, thus reducing the number of days of feeding hay, reducing the need for nitrogen fertilizer, and improving hay storage and feeding efficiency.

The 300-d-grazing demonstration was a statewide educational effort demonstrating how to plan and manage forage production in seasonal blocks of summer, fall, winter, and spring to match the nutrient demands for livestock operations. The goals of

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the discovery farm were to 1) demonstrate rotational and strip-grazing management to improve the use of complimentary cool- and warm-season forages, 2) demonstrate targeted fertilizer use and reduction of fertilizer through legume establishment, 3) reduce hay feeding to 60 d or less, 4) manage for a 90% net calf crop, 5) manage for an average weaning weight of 249 kg, and 6) implement management practices that are common and available to all cattle producers. The objective of this case study was to describe the adopted management practices and report production outcomes measured at the 300-d-grazing discovery farm from 2008 through 2013.

MATERIALS AND METHODS

Experimental Procedure

This was an extension demonstration that established goals and objectives, implemented research-based management practices, and collected production data to determine whether goals and objectives were achieved. The demonstration was conducted within a systems approach over a period of 5 yr to determine whether the system was sustainable. No treatments were compared, experimental units were not defined, and new management practices were not evaluated. All management practices implemented were research based and available to producers.

The 300-d-grazing discovery farm demonstration (yr 1 = July 1, 2008, to June 30, 2009; yr 2 = July 1, 2009, to June 30, 2010; yr 3 = July 1, 2010, to June 30, 2011; yr 4 = July 1, 2011, to June 30, 2012; and yr 5 = July 1, 2012, to June 30, 2013) was conducted at the University of Arkansas Livestock and Forestry Research Station near Batesville, Arkansas. The demonstration consisted of 16.2 ha of common bermudagrass [*Cynodon dactylon* (L.) Pers. (Bm1, Bm2, Bm3, and Bm4)] and two 9.1-ha pastures of toxic endophyte-infected Kentucky-31 tall fescue [*Festuca arundinacea* L. (KY-31; **Fld 10** and **Fld 11**)], 9.1 ha of Ark-Plus tall fescue (**Fld 12**), and 9.1 ha of Ark-Plus fescue and annual grassy mix (**Fld 9**; Figure 1). The bermudagrass was divided into four 4.1-ha paddocks with a water source in each paddock. Each of the fescue pastures contained ponds. All pastures were fenced with electric fencing and could be subdivided.

The soil type in the bermudagrass pastures consisted of Noark very cherty silt loam, 12 to 30% slopes (USDA, 2013). Noark is a deep, well-drained, moderately steep to steep soil on side slopes. Typically the surface layer is very dark brown, very cherty silt loam about 10.2 cm thick. The subsurface layer is brown, very cherty silt loam that extends to a depth of about 35.5 cm. Natural fertility is low, and the content of OM is low. The surface and subsurface layers are slightly acid to strongly acid; the subsoil is strongly acid to extremely acid. Permeability is moderate. The available water capacity is low. Runoff is rapid, and erosion is a very severe hazard (Ferguson et al., 1982).

The primary soil types in the fescue pastures consisted of Captina silt loam, 3 to 8% slopes (48%), and Captina silt loam, 1 to 3% slopes (37%; USDA, 2013). Captina soil types are deep, moderately well drained, and gently sloping on uplands and stream terraces. Typically, the surface layer is dark-brown silt loam about 5 cm thick. The subsurface layer is brown silt loam about 10 cm thick. Natural fertility is low, and the content of OM is low. This soil is strongly acid or very strongly acid throughout. Permeability is moderate above the fragipan and slow in the fragipan, which begins at a depth of 46 to 76 cm. The fragipan restricts root penetration and slows the movement of water through the soil. The available water capacity is medium. Runoff is medium, and erosion is a severe hazard if cultivated crops are grown. Crops respond well to fertilizer, and tilth is easy to maintain (Ferguson et al., 1982).

Other soil types in the fescue pastures were Clarksville very cherty silt loam, 20 to 40% slopes (9.2%), and Noark very cherty silt loam, 8 to 12% slopes (5.4%; USDA, 2013). The Clarksville soil type is a deep, somewhat excessively drained, steep soil on side slopes on dissected hills. Typically, the surface layer is dark-grayish-brown, very cherty silt loam about 7.6 cm thick. The subsurface layer is pale-brown, very cherty silt loam about 28 cm thick. Natural fertility is low, and the content of OM is low. This soil is strongly acid or very strongly acid throughout. Permeability is moderately rapid. The available water capacity is low. Runoff is rapid, and erosion is a very severe hazard if the soil is not protected (Ferguson et al., 1982). The Noark soils characteristics were described discussing the soil type of the bermudagrass pastures.

A pasture inventory was conducted in yr 1 (January 2009). The inventory was completed by walking a zigzag pattern across all pastures and stopping at every fifth step to record what was located at the tip of the toe (grass, legume, weed, bare ground, and so on). More than 100 tally marks were recorded in each field (Coblentz et al., 2006). Soil samples were collected in yr 1 (August 2008), yr 2 (July 2009), and yr 4 (July 2011). Soil was collected with a soil probe approximately 1,502 cm deep from at least 12 samples using a zigzag sampling pattern in each pasture to obtain a representative sample. Soil samples were mixed thoroughly and allowed to air dry before shipment to the soil-testing laboratory (Espinoza and Daniels, 2009).

The emphasis in forage management for a 300-d grazing season was to plan forage practices for 100-d seasons of spring, summer, and fall and a 65-d winter period. Forage management plans were made at least one season ahead for each 100-d period so practices were in place to provide adequate forage. A 5-step approach was used to plan the forage program. Step 1: Inventory the forage base to find what forages were available for grazing during each season. This step identified forage species and weed pressure. Step 2: Improve forage management practices to extend the