

Stockpiling Perennial Warm-season Grasses: Bermudagrass Example

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Abstract. Winter feeding is the largest expense of maintaining a beef herd in terms of money and time. Stockpiled bermudagrass is an effective practice for reducing winter feeding expenses and extending the grazing season. Stockpiling forage is the practice of accumulating forage growth intended for grazing in a later season. In Arkansas, bermudagrass is stockpiled from early August to late October and is grazed from late October through mid-December. Rainfall during late summer can be erratic with high risk of drought stress, but an early start date maximizes the opportunity for acceptable stockpiled forage yield. Therefore, stockpiling bermudagrass should begin by early August in north Arkansas and by mid-August in south Arkansas to allow enough time for dry matter accumulation before cooler autumn night temperatures slow grass growth. Delaying the initiation of stockpiling from early August until early September reduced forage yield in October by up to 84%. Nitrogen fertilizer should be applied in early August at the N rate of 56-67 kg/ha. Ammonium nitrate or urea are common N sources and studies show that both give similar yield response. Poultry litter or animal manure can also be used as a fertilizer source with good results. Dry matter of stockpiled bermudagrass has been measured up to 6,720 kg/ha in on-farm grazing demonstrations. Forage quality of stockpiled bermudagrass remained above crude protein (CP) and energy (TDN) requirements for nonlactating cows from October through February. Stockpiling bermudagrass is a very reliable practice for extending the grazing season. In ninety on-farm stockpiled forage demonstrations across 32 Arkansas counties, the average savings for stockpiled bermudagrass compared to feeding hay was over \$20 per 454-kg animal unit (AU) over the winter hay feeding season.

Introduction

The cost of hay and purchased feed for winter feeding is the largest expense of maintaining a livestock herd. All too often, producers finish harvesting hay in the fall and then begin feeding it soon afterward. Adopting pasture management practices that extend the grazing season avoids investing more cost into stored forage that could be grazed instead of harvested for hay. Bermudagrass (*Cynodon dactylon* L.) is a popular perennial warm-season grass in the southeastern US. It is persistent, productive, and is adapted to a wide range of conditions. It produces most of its annual yield during late spring through summer with little growth occurring during early spring and fall. However, bermudagrass can produce significant forage yield in late summer that can be stockpiled for grazing during fall to reduce hay feeding. Bahiagrass (*Paspalum notatum* Flugge.) and dallisgrass (*Paspalum dilatatum* Poir.) have similar growing seasons as bermudagrass and can also be stockpiled for fall grazing by following the same recommendations. In Arkansas, the use of stockpiled bermudagrass has been an effective practice for reducing winter feeding expenses and extending the grazing season.

Methods – How stockpiling bermudagrass works

Stockpiling forage is the practice of accumulating forage growth intended for grazing in a later season. During the spring and summer, stockpiling is seldom advantageous except during severe drought because forages become mature and poor quality due to stem and seedhead production. However, stockpiling bermudagrass beginning in late summer, works well for providing fall and winter grazing. Cooling night temperatures and shorter days of late summer and early fall tend to reduce accumulation of forage fiber, thus promoting leafy, high-quality forage. Economic savings (\$/AU) were estimated by comparing cost of producing stockpiled forage to the cost of hay and supplement required to match animal performance during the winter feeding period. An animal-unit (AU) is defined as the feed requirement to meet the needs of a 454-kg beef cow during the winter hay feeding period.

The optimum temperature range for bermudagrass growth is 29° to 35°C. Bermudagrass growth sharply declines when night temperatures drop below 10°C. Rainfall during late summer can be erratic with high risk of drought stress, but an early start date maximizes the opportunity for acceptable stockpiled forage yield. Therefore, stockpiling bermudagrass should begin by early August in north Arkansas and by mid-August in south Arkansas to allow enough time for dry matter accumulation before cooler autumn night temperatures slow grass growth. Arkansas research at two locations, Fayetteville and Batesville, demonstrated the

importance of an early stockpiling initiation date for attaining a high forage yield (Scarborough et al., 2004). Delaying the initiation of stockpiling from early August until early September reduced forage yield in October by 61% to 84% (Table 1).

Table 1. Fall dry matter yield of stockpiled bermudagrass for two locations when stockpiling was initiated in early August or early September and percent decrease resulting from delayed initiation.

Year	Dry Matter Yield (kg/ha)					
	Batesville			Fayetteville		
	August	September	% decrease	August	September	% decrease
2000	741	220	71	1,611	567	65
2001	1,333	520	61	4,734	736	84

Bermudagrass is stockpiled from early August to late October and is grazed from late October through mid-December. The following steps are recommended to increase the likelihood of producing successful stockpiled forage:

- Remove existing forage residue in early August to leave a stubble of 2-3 inches
- Fertilize with 56-67 kg/ha of nitrogen in early August (mid-August in south Arkansas)
- Defer grazing until late October to allow dry matter to accumulate
- Strip or rotationally graze to extend the grazing period of the stockpiled forage
- Grazing period in Arkansas is typically October to December

A major factor that prevents producers from trying stockpiled forages is the mistaken perception that nitrogen fertilizer applied during hot, dry weather in late summer will be lost. Ammonium nitrate has long been used as a N source for stockpiling forage and is still a preferred N source in northwest Arkansas. If ammonium nitrate is used as the N source, N losses will be negligible. The perception is that if urea fertilizer is applied during warm weather, most of the nitrogen can be lost from volatilization. However, Arkansas research showed that urea applied in August for stockpiled bermudagrass was nearly as effective as ammonium nitrate and produced forage yields averaging 90% of that from ammonium nitrate (Jennings et al., 2010). Phosphorus (P) and potassium (K) fertilizer should be applied according to soil test recommendations. If adequate P and K were applied in spring or summer and not removed in a hay crop, then only N should be needed for fall forage growth. Poultry litter or animal manure can be used as a fertilizer source with good results.

Results and Discussion – How stockpiling bermudagrass profitably extends the grazing season

Stockpiling bermudagrass is a very reliable practice for extending the grazing season. In ninety on-farm stockpiled forage demonstrations across 32 Arkansas counties, the savings for stockpiled bermudagrass compared to feeding hay averaged over \$20 per animal unit (AU) and ranged up to \$60 per AU.

Stockpiled forage can be valuable under any grazing method, but length of the grazing period can be increased substantially by using improved grazing practices. In these demonstrations, strip grazing the stockpiled forage, allowing a 2-3 day grazing allotment with a single electric fence wire, doubled the number of AU grazing days per hectare compared to continuous grazing and increased the average savings by an additional \$10 per AU.

An Arkansas research study found that dry matter digestibility of stockpiled bermudagrass was adequate quality for nonlactating beef cows in October, but declined to levels below those nutrient requirements in January (Scarborough et al., 2006). In other on-farm extension demonstrations conducted across Arkansas over four-years, forage quality remained above crude protein (CP) and energy (TDN) requirements for nonlactating cows from October through February (Table 2) Stockpiled bermudagrass yields averaged over 3,250 kg/ha and ranged up to 6,700 kg/ha during that 4-year period.

Table 2. Crude protein and TDN content of stockpiled bermudagrass from October to February in Arkansas on-farm demonstrations from 2002 to 2006.

Month	Crude Protein*	Total Digestible Nutrients*
	-----%-----	
October	14.5 (8-22.4)	59.6 (51.2-65.5)

November	13.6 (8.4-21.4)	59.6 (53.8-64.3)
December	13.8 (6.8-23.8)	58.5 (50.7-63.6)
January	12.8 (8.9-14.6)	56.0 (51.5-60.6)
February	10.6 (9.4-11.1)	52.4 (47.4-55.6)
*range of nutrient percent indicated by ().		

Stockpiled perennial warm-season grasses such as bermudagrass, bahiagrass and dallisgrass are not as tolerant to freezing temperature as tall fescue (*Festulolium braunii* K.A.). The warm-season grasses become dry and brittle after a killing frost and lose leaves and forage quality due to repeated rainfall and freeze events. Frozen precipitation can ruin stockpiled bermudagrass because cattle often refuse grazing it after the ice or snow melts. Because of the steady decline in quality after onset of freezing weather and increasing chances of freezing precipitation in late winter, plans should be made to finish grazing stockpiled bermudagrass by late December unless adequate supplementation is provided.

Producers often ask how many hectares of forage should be stockpiled. In a four-year southwest Arkansas study, stockpiling bermudagrass at a rate of 25% of the pasture area, along with fall planting of winter annuals in 25% of the acreage, and using rotational grazing, allowed a significant reduction in winter hay feeding (Beck et al. 2016). The grazing season was extended from 258 days with continuous grazing and no stockpiling or winter annual forages to 350 days with the use of the improved forage management practices.

Conclusions and/or Implications

1. Stockpiled bermudagrass is a cost-effective alternative to feeding hay during winter in Arkansas.
2. Stockpiled bermudagrass reduced winter feed costs by \$20/AU or more compared to feeding hay and supplement.
3. Forage quality of stockpiled bermudagrass was adequate for nonlactating cows through the fall and early winter.
4. Strip grazing increased the savings per AU and doubled the grazing days per hectare over continuous grazing.

References

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