Pasture Fed/Finished Programs

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Forages and concentrates are the primary sources of lipid in the beef cattle diet, and over the last decade fat supplementation has become a common practice to increase dietary energy density for high producing cattle. Now there is interest in trying to create a healthier beef product in response to consumer concerns. Finishing beef cattle on forages can produce a leaner product that is appealing to consumers. However, forage-finished beef does not compete favorably at retail with grain-finished beef, and interest in it tends to subside when greater supplies of grain for livestock feeding become available. The major challenge for forage-finished beef is providing a year round high quality forage supply in an economical manner.

Discrimination against forage-finished beef is associated with color (of muscle and/or fat), palatability (flavor and/or tenderness) and characteristics, which limits acceptability at wholesale and retail levels. Marketing problems related to year-round production of dependable supplies of forage-fed beef because (1) variations in weather (2) seasonality of forage production.

Forages of the Southeast

The Southeastern area of the US provides a great opportunity for forage-finished beef. The base of forage production in the Southeast are perennial grasses such as bermudagrass, bahiagrass, dallisgrass, and tall fescue. The perennial grasses provide permanent pastures for most beef cattle producers especially since they typically only need to be established once. Annual grasses, such as pearl millet, sorghum-sudangrass, crabgrass, ryegrass, oats, wheat, and rye are utilized in order to supplement the lower-quality perennial pastures. Winter annual forage plants all produce high-quality forage during a time of the year when forage is often scarce. Winter oats, rye and ryegrass are crops, which have found a place as part of the feeding system for beef cattle. Oats and rye require high levels of inputs and there are high risks associated with poor establishment and unfavorable weather conditions. Annual seeding of this forage can be expensive and may suffer from frequent fall droughts, which detract from their dependability. Reseeding annual clovers (white, subterranean, crimson, and others) can reduce or eliminate the annual seeding expense. Judicious use of these winter annuals is imperative in order to maximize their inherent high quality. Winter annuals such as rye, wheat, oats, and ryegrass are the most efficient forages to use, however that forces producers to finish cattle during cool seasons. Legumes are the highest quality forages available for beef cattle production. A few perennial legumes (alfalfa, perennial peanut, and secricea lespedeza) are used throughout the Southeast for hay production and grazing. Annual forages can be grazed to supplement perennial pastures and provide higher energy forage during the finishing phase. However, the implementation of annual forages can be costly since they have to be established each year. Annual forages also require high management input for grazing or a mechanical harvest component of management. Raising and finishing cattle on forages requires a strong focus on grazing and production management, forage quality, animal genetics, and animal health to achieve a consistent weight gain.

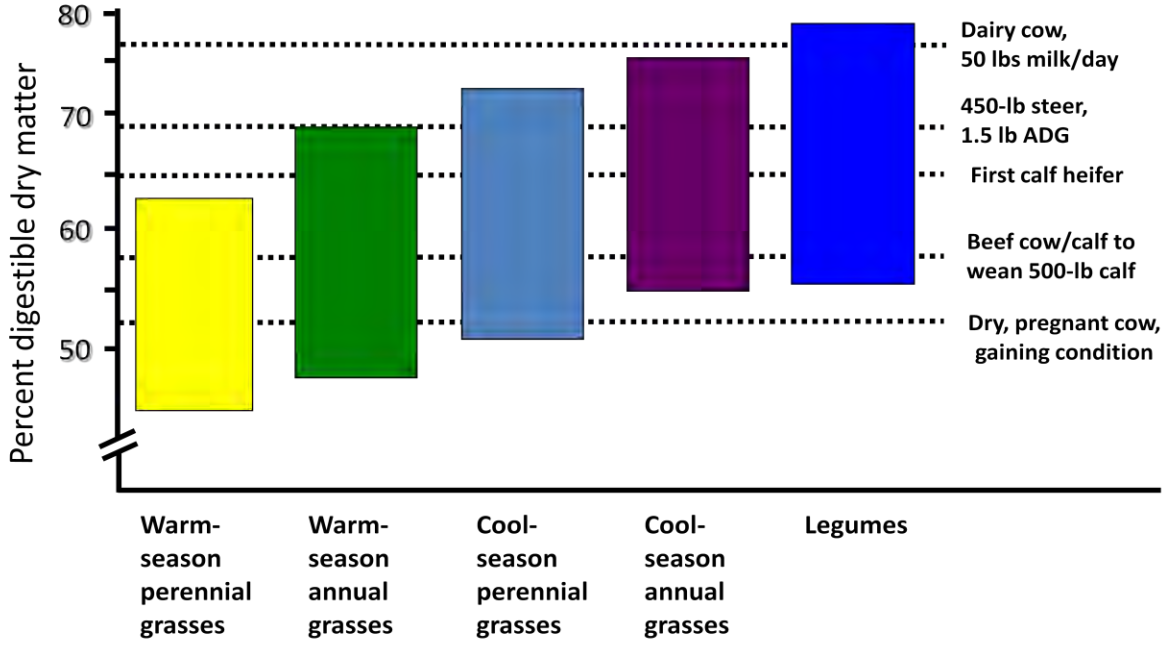
The Seasonality of Forages

The seasonality of forages coupled with the availability of feeder cattle must be evaluated to enable a consistent and constant supply of beef. While packer resistance can create marketing difficulties for beef finished on forages because of the implied variability in tenderness, color, and flavor. For a year-round, forage-fed slaughter beef program to be effective, a variety of forages would need to be utilized to allow adequate growth with

economical gains. Any forage program to be successful in the lower South will demand more than one forage.

Environmental factors impose certain seasonal restraints upon the quality and quantity of forage produced during the year and upon animal performance. The quality of our forages utilized throughout the Southeast varies from season to season. As illustrated in Figure 1, warm season perennial grasses, the base of beef cattle production in the Southeast, has the lowest quality compared with cool season grasses and legumes. Winter annual grasses and grass-legume mixes meet the nutrient requirements of growing animals. Perennial grasses have acceptable quality in the spring, but few meet nutrient requirements even of heavy stockers. Cool season perennial grasses are not widely used in the lower South. Fall or winter calving is typical in t he lower South with calves weaning at 596-706 lb BW. Late winter calving in the lower South leaves a gap between weaning and availability of high-quality winter pastures. We can do an incredible job putting weight on spring- born calves with annual ryegrass the following spring, but many have not reached optimum weights. Summer forages require a different calving seasons or possibly different cattle will be necessary for a year round supply.

Figure 1. Forage digestibility ranges and their suitability for different classes of livestock.



Adapted from: H. Lippke and M.E. Riewe. 1976. Texas Agric. Exp. Stn. Res. Monograph RMGC:169-206.

Supplementing along with grass-fed

Forage-grain feeding regimens allow growth and development on forages while completion of the finishing phase with grain increases product acceptability and consistency. A finishing strategy that emphasizes the combination of forage and grain feeding can reduce the undesirable traits of an all-forage feeding strategy. However, supplementing with grain affects the definition of "grass-fed." The grass-fed claim applies to beef cattle whose diet is solely derived from forage. Several researchers have evaluated the impact of grain-on-grass on animal performance.

Most studies where the crude protein content of summer perennials, cool-season annuals and summer annuals have been monitored, show that protein intake greatly exceeds the requirements of the animals. Therefore, in order to maximize animal production and profit, some type of supplemental energy should be fed to the grazing animals. When beef steers were finished on ryegrass pasture with corn oil supplementation over two years, steers finished on grass only had lower average daily gains (ADG), hot carcass weights (HCW), yield grades (YG) and quality grades (QG) compared with steers supplemented with corn or corn + corn oil (Table 1; Corriher et al., 2009). Stocking rate had to be managed when grazing ryegrass without supplementation to maximize gains on forage only. Drought conditions can also force producers to alter stocking rates for maximum forage utilization and gains.

Table 1. Performance of steers finished on ryegrass pastures with supplemental corn oil (Corriher et al., 2009).

Item	No Corn	Corn	Corn + Corn Oil
Steers #	9	14	14
Initial BW, lb	913.3	854.7	855.1
112-d ADG, lb	2.36	3.64	3.57
HCW, lb	635.3	708.7	718.8
QG	9.78	10.57	10.29
YG	1.89	2.29	2.43

HCW = hot carcass weight; QG = quality grade (11 = US Select +, 12 = US Choice -, 13 = US Choice); YG = yield grade

In Texas, Bonsmara crossbred steers grazing Tifton 85 bermudagrass were supplemented with pelleted corn gluten feed at 0.8% of their body weight or allowed to graze pasture only. Even though supplementation resulted in an additional 0.75 lbs/day in 2006 and 0.52 lbs/day in 2007, the supplement to extra gain ratios were about 8:1 in 2006 and 13:1 in 2007. This substitution effect was anticipated, however, the costs of an extra pound of steer gain were $1 to 1.60/lb (2006 and 2007 respectively). Supplement did not affect carcass traits of steers harvested direct from pastures. All carcass traits were enhanced for steers that had 90-days on feed. Production of natural beef was readily accomplished on Tifton 85 bermudagrass pastures; however, merchandizing of the finished product will be linked to niche marketing for non-fed cattle.

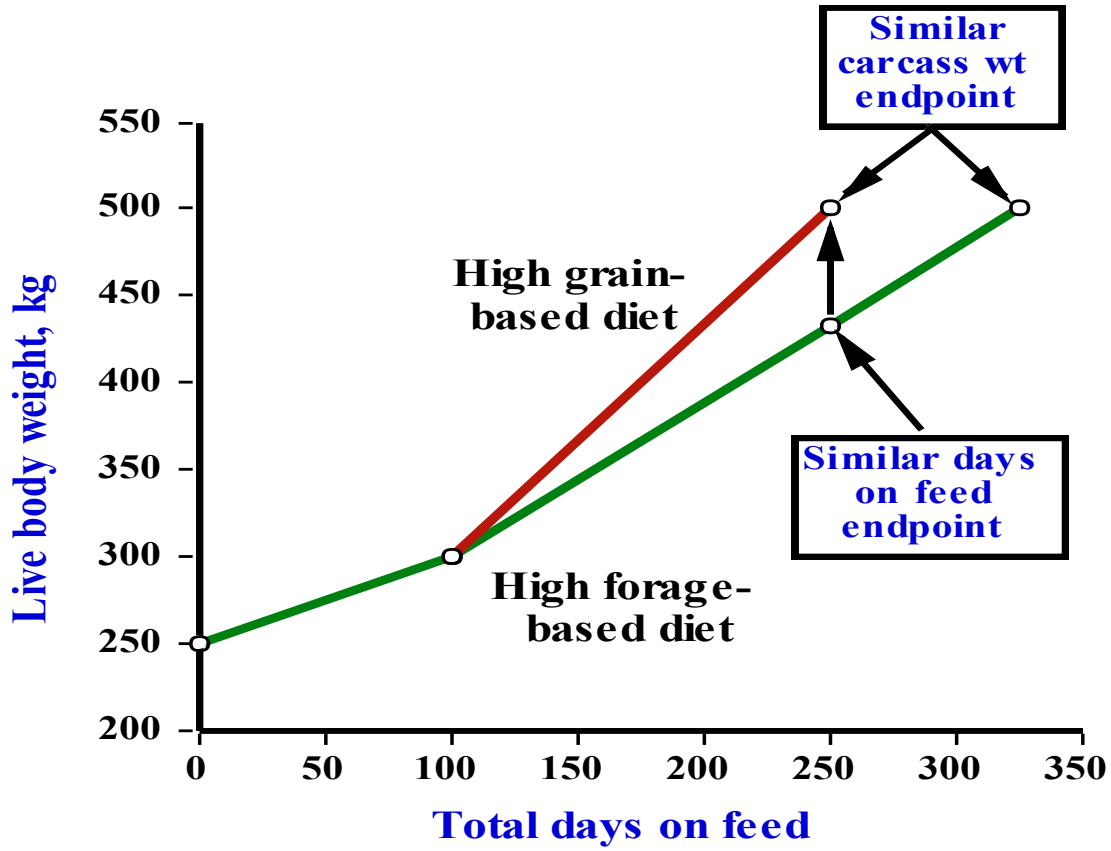
Table 2. Two-year performance of Bonsmara crossbred steers stocked on Tifton 85 (Rouquette et al., 2007).

Item*	**2006**	**2007**
Initial Weight	676	770
60-d ADG (lb/d)		
PAS Only	1.56	1.79
0.8% BW-SUP	2.26	2.03
Total ADG (lb/d)		
PAS Only	0.99	1.07
0.8% BW-SUP	1.74	1.59
Final Weight (lbs)		
PAS Only	784	889
0.8% BW-SUP	848	944

PAS = pasture only; SUP = pelleted corn gluten

Supplements may have to be fed to alleviate the nutritional stress imposed by poor-quality and in sufficient quantity of pasture during certain seasons of the year. North Carolina researchers demonstrated that one way to increase the returns from a cattle-finishing program was to graze high-quality pasture and feed supplemental concentrates (Wise et al., 1965). Researchers in Alabama (Hoveland et al., 1972), Florida (Chapman et al., 1964), Louisiana (Carpenter et al., 1966) and Georgia (Saunders et al., 1966) all confirm the desirability of using grass-grain combinations for finishing cattle for slaughter. There is a wide variation in possible combinations, which can be used to finish cattle on high-quality forages with or without supplemental feed. Selecting a combination depends on ecoregion (soil type, rainfall distribution, and temperatures), management, breeding season, and production goals.

Figure 2. Forage-vs grain-based beef production systems



Finishing beef cattle solely on forages is challenging. One of the main concerns about feeding high levels of roughage or all forage diets is the influence of diet on acceptability of final product. Cattle on grain typically gain quicker than cattle on forage alone. Forage-fed cattle typically has less marbling and the finishing period is longer for forage-finished cattle. In order to achieve the same carcass weight endpoint on forages compared to high-grain diet, forage-fed cattle require more total days on feed (Figure 2). If fed for similar number of days cattle on the high forage-based diet typically have lower body weights/carcass weights compared to cattle on high grain-based diets. (Figure 2).

Much of the Southeast can produce forages almost year-round due to a mild, humid climate. A group of researchers in Louisiana evaluated a stocker and finishing beef system involving forages over three years in the early 1990s. Cool season annual forage mixtures, including ryegrass, and cereal grain-ryegrass with and without clovers, were utilized 36% of the time during the stocker phase. Hay fed in drylot represented 15% of the stocker phase and was the alternative management system for the winter season from November to March. Forage systems utilized during the spring and summer months used more and different forages and combinations. Warm-season annuals were utilized 10% of the time, generally being double-cropped with cool-season annuals. Warm season perennials (17%), perennial grass-clover (10%), and grain on pasture (19%) accounted for the remainder of the time on pasture. When available, cattle groups requiring faster rates of gain were placed on warm-season annual pastures. Grain on pasture was used when bermudagrass was the only available forage resource and high rates of gain were required to reach target weights. Energy supplements are reportedly more efficiently utilized as diet quality declines, hence, grain was fed on bermudagrass and not ryegrass pastures. Stocker cattle terminated in November, January, and March were primarily fall-born, summer-weaned calves placed initially on stocker treatments in July. These fall-born calves generally had lower rates of gain, weighed less at the termination dates, and had higher costs of gain compared with stocker calves terminated in May, July and September, which were predominantly spring-born, fall-weaned calves (Table 3).

Table 3. Performance of stocker calves produced on forages year-round as influenced by termination date (Bagley et al., 1990).

Item	**Termination Date**					
	Nov	**Jan**	**March**	**May**	**July**	**Sept**
Initial age (mo)	9.2	9.4	9.2	9.2	8.5	8.5
Stocker phase length (mo)	5.8	5.8	6.8	7.5	8.7	7.8
Initial wt (kg)	540	523	520	492	483	496
Avg Gain (kg/d)	1.01	0.97	1.04	1.41	1.12	1.23
Avg Final wt (kg)	706	695	739	811	771	767
Avg Cost of gain ($/kg)	3.35	3.40	3.11	2.38	2.51	2.47

Table 4. Performance and production costs of forage- and silage-finished beef produced year-round.

Item	Finishing Treatment	Group					
		March	**May**	**July**	**Sept**	**Nov**	**Jan**
Daily gain (kg)	*Silage*	2.16	5.36	5.12	2.16	2.32	2.14
	Forage	1.79	2.05	1.76	1.22	1.64	1.76
Final Wt (kg)	*Silage*	963.6	990	1025	1052	1036	977
	Forage	926.1	948	944	961	968	953
Variable Cost ($/kg)	*Silage*	2.67	2.51	2.67	3.24	2.87	2.82
	Forage	3.20	1.90	2.18	3.10	3.15	3.64

Placing stocker calves on pastures in July through late summer and early fall generally result in poor animal performance. High ambient temperatures and increasing photoperiods have been shown to decrease forage quality and voluntary forage intake. In much of the humid South, it may be possible to finish beef to acceptable grades on forage alone at certain times of the year (Horn, 1980). For finishing systems to become viable, beef of a consistent quality must be available on a year-round basis.

In general, grain in the diet will have to increase as forage availability and/or quality decreases. Efficiency of energy utilization from supplementing corn on forages has shown to increase as forage quality declines (Golding et al., 1976). Cool-season annuals can make up the majority of the diet of animals slaughtered in May, and warm-season forages can make up the majority of the diet for September slaughtered animals. Quality of corn silage diets remain constant during a year while forage diets vary from relatively low quality bermudagrass to high quality cool-season annual pastures. Cattle finished on the standardized corn silage diet gained faster than companion forage-finished cattle overall and gains were higher despite termination date (Table 4; Coombs et al., 1990). Gains on forages varied more than animal gains on corn silage.

Conclusion

The selection of the best system will vary geographically as well as yearly. There is no one set strategy that will fulfill the needs of all. Matching the production system within a given environment, while maintaining a marketable product and fulfilling the needs of the consumer, is the ultimate goal. Many factors, including economic considerations have limited the utilization of forages for growing and finishing beef cattle. Maximum forage production and forage quality influence the efficiency with which ruminants convert forages into meat.

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