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Forages, Pastures, and Management Options for Pasture-Finished Beef

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Pasture-finished beef is the original benchmark for beef consumption world-wide. Beef preferences and taste choices started with one animal fed in the "back lot" and transitioned to commercial feedlot and beef processing – marketing of today. "Grass-fat" cattle terminology and consumer acceptance has been increasingly discussed during the past 35 to 40 years (Bidner et al. 1981). Forage and animal scientist have been investigating pasture systems, animal performance, carcass characteristics, and sensory evaluations since the late 1960's (Bowling et al. 1977; Bagley, 1984). The status of State Experiment Stations and USDA forage-animal research was highlighted in 1975 at the "Forage Fed Beef: Production and Marketing Alternatives in the South" at the Southern Regional Forage-Fed Beef Research Workshop in New Orleans, LA and published in 1977 *(*So. Coop Series, Bull 220).

Today, pasture-finished beef includes a variety of terminology such as 100% Grass-Fed, Pasture-Finished, Natural Beef, Organic Beef, and other descriptions of an end-product that is not Feedlot-Finished. (Poore et al. 2020). Thus, the desire to market beef has become intertwined with defining cattle on pasture vs confined feedlot. And sustainability of the beef operation is directly related to sensory assessment, "eating quality", and consistency of product.

Throughout the time-period devoted to research and education of pasture-finished beef, the primary constraints and/or obstacles have remained relatively consistent. The management options, opportunities, and obstacles that must be addressed for pasture-finished beef includes the following:

- Forages Available in Vegetation Zones; Season of Production of DM and Nutritive Value.
- Beef Cattle Available; Calving Season(s); Performance Attributes.
- Pasture-Finishing Options and Descriptions
- Harvesting, Processing, Packaging, and Marketing of Beef

Forages Available in Vegetation Zones

Warm-season perennial grasses (WSPG) are the basic forages for pastures in the Southeastern US and rangeland in Texas and the Southwest. These grasses are tolerant of drought conditions and persistent under frequent defoliation created by stocking rates; however, they are in the lowest nutritive value class of forages. These WSPG have seasonal growth traits and are partially or completely dormant during the winter months depending on location (zip code) of the property. Figure 1 shows the average first and last freeze dates according to the USDA hardiness zones for the Southeastern US (Rouquette, 2018). Figure 2 shows various forage combinations that may be incorporated in management strategies for USDA Hardiness Zone 8 which includes the mid-portions of Texas to Georgia-South Carolina in the Southeastern US (Rouquette, 2018).

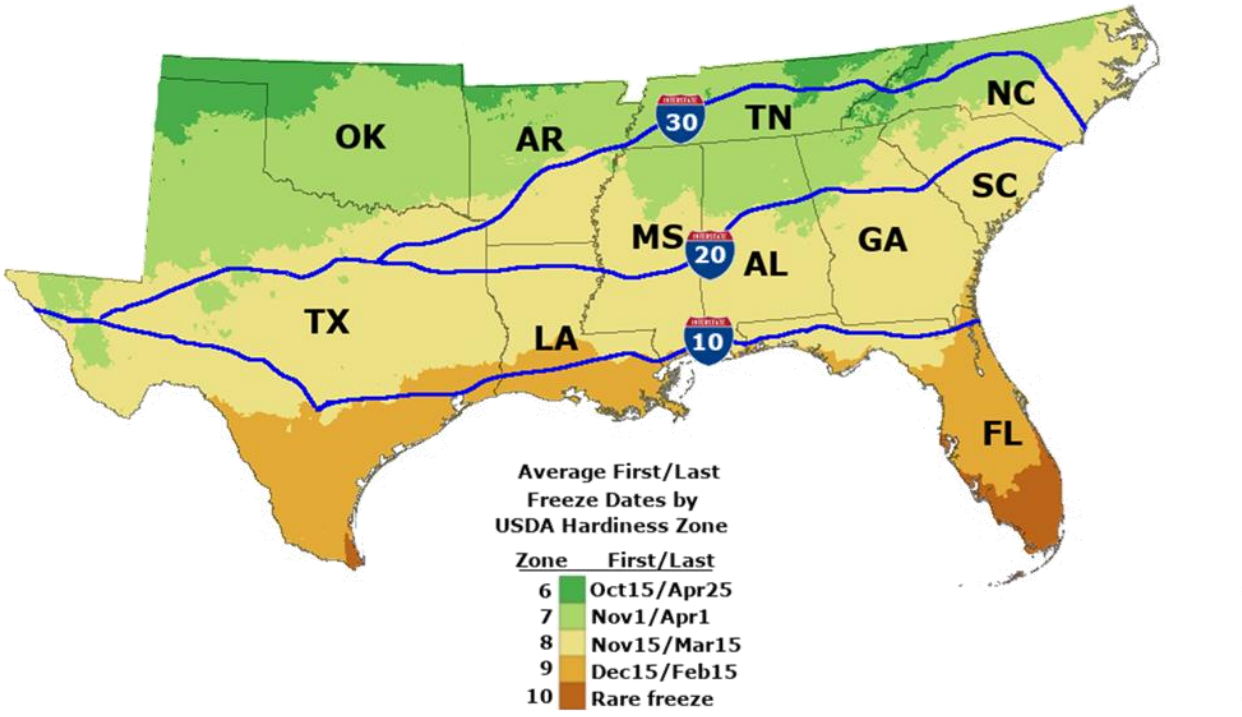

Figure 1. Average first and last freeze dates according to USDA Hardiness Zones.

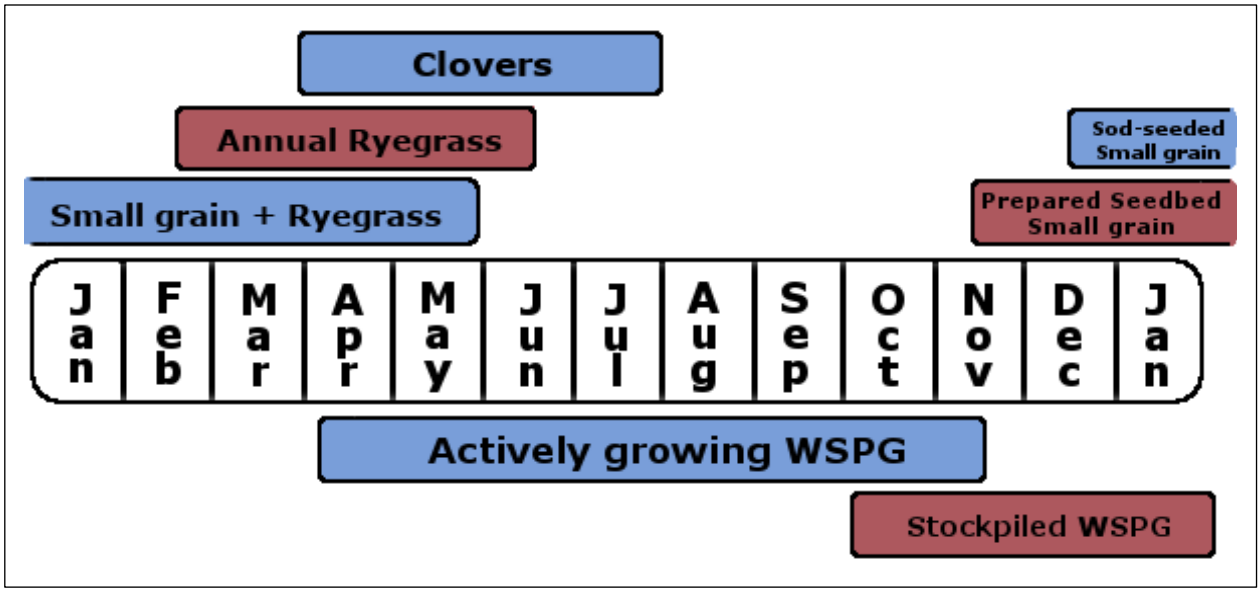

Figure 2. Forage combinations with warm-season perennial grasses (WSPG) for 365-day grazing in Hardiness Zone 8.

For pasture-finished beef to meet acceptable average daily gain (ADG) and body condition score (BCS) at time of harvest, cool-season annual forages can be overseeded on WSPG to extend the active grazing period. The cool-season annual grasses and clovers provide the highest forage nutritive value for cattle ADG. Thus, to obtain stocker ADG of 2 lbs/da or more for an extended period, cool-season annual forages become the major forage options for the pasture system for pasture-finished beef.

Forage & Pastures for Producing ≥ 2 lbs/day of Stocker Gain

- **Cool-Season Annuals**
  - **Small Grains; Dec – Apr**
  - **Annual Ryegrass; Jan – May**
  - **Clovers; Feb – June**
- **Warm-Season Annual Grass**
  - **May – July**
  - **July – Oct with Supplementation**
- **Warm-Season Perennial Grass**
  - **Apr – June**
  - **July – Oct with Supplementation**

Forage nutritive value, TDN and percent protein, becomes the primary concern and target for management to graze cattle with or without supplementation to achieve ADG 2 of lbs/da or more for an extended period. Thus, seasonality of forage DM production and gradual decline in nutritive value with chronological and physiological maturity creates opportunities/options for pasture systems to provide grazing from December to July. Combining cool-season annual forages with warm-season perennial grasses may require sod-seeding and consideration of fertilization (soil test). Moderate to low stocking rates of pastures offers optimum to maximum ADG. Rotational stocking may be an option for management; however, the "target stocking strategy" should not be that of grazing to a short grass stubble height to achieve a "high utilization efficiency". Cattle are leaf-selectors when grazing, and low to moderate stocking rates allows them to consume the highest nutritive value forage at any time.

Cattle Available for Pasture-Finishing

One of the first obstacles of pasture finishing operations noted by researchers in the late 1960's to early 1970's was that "faster maturing cattle" would be a good "match" of forage x cattle without supplemental grain (Spooner & Ray, 1977). Since these early experiments, the US cattle herds have been significantly influenced by crossbreeding with Continental sires and other genetics that has resulted in larger framed, later maturing cattle. Many cattle breeds emphasize EPD's for carcass attributes as well as other growth traits. Regardless of breed or breedtype preferences, the primary cattle concerns/options should be focused on:

- Animal Breedtype that it is best adapted to the environmental and climatic conditions of the specific vegetational zone of the property. In many parts of Texas and the Southeastern US, stockers for pasture-finishing may be about 25% Brahman influenced to reach ADG performance expectations on WSPG or warm-season annual grasses during the summer months.
- Calving Season is the primary catalyst for matching cool-season annual forages with seasonality of WSPG. Winter-born calves weaned in the fall have opportunities to be stocked on sod-seeded or prepared seeded small grain + ryegrass pastures from December to mid-April to mid-June. This pasture system provides an abundance of high quality forage to allow for stocker ADG of 2.25 to 3.5 lbs/da. During 120 to 150-d stocking period, stockers can gain 300 to 400 pounds (Rouquette et al. 2007). Thus, stockers can reach 1000 to 1100 lbs by late-May to early June and with BCS $\geq$ 6 at 15 to 18 months of age.

  Fall-calving and early summer weaning offers an opportunity to incorporate cool-season annual forages into cow-calf pasture systems and wean 8- to 9-month-old calves at 750 to 900 lbs. This allows for options of harvesting at weaning, (Rouquette & Carpenter,1981; Rouquette et al. 1983; Rouquette, 1984), or to extend grazing throughout the summer on a summer annual forage such as a brown mid-rib sorghum x sudan grass or Tifton 85 bermudagrass. These forage combinations will allow for harvesting pasture-finished cattle at 900 to 1000 lbs by the time the stocker is 12 to 14 months of age.
- Age at Harvest for pasture-finished beef generally ranges from about 12 to 20 months. This is a management option based on liveweight and BCS along with expected carcass quality. Harvesting costs are usually on a per head basis regardless of liveweight. Thus, to reduce expense and costs per pound of dressed, packaged beef, and to ensure increased marbling, liveweight and age at harvest becomes major factors in planning forage-pasture systems.

Pasture-Finishing Options and Description

Although confined feedlot-produced beef accounts for 95 to 97% of all beef consumed in the US, many consumers want some form of pasture-finished beef for reasons related to perceived health benefits, taste, social concerns for animal welfare, locally-produced, and other preferences. (Poore et al. 2020) The types of pasture-finished beef include various definitions of the product. Some of the general descriptions used for marketing beef includes: Pasture-Finished, Pasture-Raised; Grass-Fed; 100% Grass-Fed; Grass-Fat; Certified Organic; Natural; Free-Ranging; etc. (Rouquette et al. 2014). The array of product names is indicative of the entrepreneurial activities used to merchandize the beef product. With definitive and often extreme seasonality of forages, some level of supplemental energy-protein may be used by more than 50% of producers. (Poore et al. 2020). Supplemental feeding can vary from offering a limited percent bodyweight per head per day such as 0.5% to 1%, or it could include ad libitum supplement to cattle on pasture. (Kelley et al. 1992) Thus, full-feeding on pasture may fit the description of some who market pasture-finished beef. Supplementation on pasture can effect ADG, final liveweight and carcass traits.

Harvesting, Processing, Packaging, and Marketing

The largest obstacles for those who want to produce and sell pasture-finished beef are those of harvesting and processing animals on a time-dependable, regular custom basis. Once the animal has been harvested, processing, packaging, and aging of primal cuts requires cold storage space. In addition, if the producer wants to sell a Certified USDA product, then the harvesting plant has to be USDA approved. Some of the certifications that are available for the final products includes American Grass Fed Association, Organic BEEF, Welfare Standards (GAP4), Go Texan, and others. Certification that denotes an inspection-approval provides some level of "security" to the consumer, and also plays a major role in marketing the various cuts of beef. Some standards of certification includes maximum age of animal, supplementation, etc. Many of the small packing plants may not be USDA inspected; thus, carcass quality traits may be "claimed" by the producer. Verification of quality traits relates to some form of inspection, repeat-customers, and word-of-mouth. Distribution and re-occurring demand for pasture-finished beef ranges in size and scope from sole owner to being part of a cooperative or aggregator-operation.

Pasture Systems and Management Options

Warm-season perennial grasses are the basic pasture unit in Texas and the Southeastern US because of persistence and sustainability. However, these grasses are in the lowest nutritive value class of forages. Enhanced nutritive value of the pasture system may be achieved with cool-season annual grasses and legumes and warm-season annual grasses.

Matching calving season with forages for pastures that provide optimum-maximum ADG for the weaned, stockers are illustrated in Table 1 for fall-born and Table 2 for winter-born calves (Rouquette, 2013). Challenges for management includes knowledge and awareness of soil and climatic conditions of the specific vegetational zone. To buffer the seasonality of forage production with periods of dry conditions, pro-active management strategies include access to stored forages such as high quality hay and/or silage in addition to energy-protein supplementation. The level of operational successes are related to defining the forage requirements for pasture production for desirable ADG, BCS, and final liveweight within the

desired-allowable age of the animal. Successes with pasture-finished cattle is closely linked to matching forage DM and nutritive value of forages with stocking rate of the preferred breedtype that combines ADG, maturing, growth, and carcass traits.

Table 1. Monthly calendar of events for fall-weaned calves and forages for optimum gain potential for pasture-finishing.

Month	**Activity**	**Forages/Pastures**
August – September	Suckling	Perennial grass pasture[1]
October	Wean; Background	Hay + Supplement Perennial grass + Supplement
November	Background; Initiate Stocking	Perennial grass + Supplement Oats, Wheat, Rye ± Ryegrass
December – March	Stocked on Pasture	Oats, Wheat, Rye ± Ryegrass
April	Stocked on Pasture; Harvest Option	Oats, Wheat, Rye ± Ryegrass
May	Harvest Option	Ryegrass; Perennial grass
June	Harvest Option	Warm-season annual grass[2] Tifton 85 bermudagrass
July	Reduced Harvest Option	Warm-season annual grass Tifton 85 bermudagrass

[1] Bermudagrass, etc; Native grasses
[2] Brown mid-rib sorghum x Sudan grass; pearl millet
[3] Rouquette 2013

Table 2. Monthly calendar of events for fall-born calves and forages for optimum gain for harvest at weaning.

Month	Activity	Forages/Pastures
August	Dry cow	Perennial grass pastures[1]
September	Calve	Perennial grass pastures
October	Calve; Suckling calf	Perennial grass pastures
November	Cow-calf; suckling	Perennial grass; Hay ± Supplement
December	Cow-calf; suckling	Hay ± Supplement; Small Grain[2]
January	Cow-calf; suckling	Small grain[2]
February - April	Cow-calf; suckling	Ryegrass ± clover
May	Wean; Harvest Option	Ryegrass; Bermudagrass
June	Wean; Harvest Option	Bermudagrass ± Supplement
July	Wean; Reduced Harvest Option	Bermudagrass ± Supplement

[1] Bermudagrass, etc; Native grasses
[2] Oats, Wheat, Rye
[3] Rouquette 2013

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