

# Forage-Livestock Research Progress Report

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## **Management Strategies for Cool-Season Annual Pastures and Stocker Cattle**

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The preparation and implementation of strategies for management are uniquely similar for those in agricultural operations, corporate business ventures, or head coaching positions. Success may be measured in terms of economic scale or win-loss columns. Sound management strategies are structured around base-line information or data on which cause-effect or input-output relationships can be accurately predicted. In order to have positive economic returns or “wins”, managers must utilize and implement all the “fixed” or known parameters, and deal with the “variables” on a case-by-case situation. And, for success, the “variables” should be identified beforehand, and strategies made on data-based decisions on an “if this...then that”, or a “read-react” methodology. Managers of grazing-stocking operations should mimic those in athletic events in that conditioning and discipline are necessary components for success. This is especially required when assessing conditions (read the situation) and then reacting or implementing temporary defenses/offenses that allows the operation (team) to stay-in-the-game and move toward the goal of scoring-winning-profit. Management can be disrupted or destroyed when encountering unexpected, non-anticipated, or unknown variables. These unexpected variables may resemble stock or inventory in businesses, offensive or defensive alignments in athletics, or forage-animal responses to climatic conditions in agricultural. Thus, to avert risk and “losses”, management must be equipped with sufficient data, knowledge and/or experiences to “read-and-react” to circumstances that can disrupt, destroy, or create “losses” to the operation.

Management and utilization of cool-season annual forages such as small grains, ryegrass, and clovers for optimum economic returns involve an integration of basic forage-animal production knowledge with the decision-ability to implement various events in a timely manner. The art and science of a managing economically, successful grazing ventures with winter annual pastures is not an especially easy task. Managers are required to

make projections on forage DM growth and production as well as forage removal by grazing in order to establish an initial stocking rate. Then, managers are forced to revise these original estimates and project stocking rates once again during another part of the season. This does not necessarily imply that managers must buy-and-sell cattle to adjust stocking rates; however, the dynamic nature of growth rate of cool-season annual forages requires some management flexibility in stocking density used to optimize gains per animal and per acre. Thus, the primary management decisions involved with successful winter pasture grazing ventures are those of setting and manipulating stocking rates to match current forage conditions and to stimulate forage growth for future stocking.

### **Forage Production and Timing of Events for Small Grains**

The timing of events is generically important for the success of any endeavor. With cool-season annual forages, timing of planting, fertilization, grazing initiation, grazing duration, defoliation severity, selection of weight-class of livestock, animal health, and purchase-sell decisions control economic returns. In the southeastern US, small grains have a bimodal function of dry matter (DM) production during the fall-winter-spring period (Fig 1). And, when annual ryegrass is included in the forage mixture for pasture, then the late-winter-spring DM production skews the forage response heavily toward February through May. For example, small grains with or without annual ryegrass may provide initial grazing in November-December, but the magnitude of DM is based on timing of establishment and fertilization schedules. Forage DM is almost always available earlier from plantings made on prepared seedbed compared to sod-seeded on bermudagrass. Forage DM from these pastures accelerates in the fall until climatic conditions (temperature and/or rainfall) cause a dramatic reduction in growth rate usually in late December to early February. Thus, in the case of

small grain-ryegrass pastures, there may actually be three distinct “seasons” (Fig 1) in which a different stocking rate would be deemed as “optimum”. The opportunity for management strategies, therefore, to capitalize on this normal but unpredictable timing of bimodal DM growth curve is to be prepared for the occurrence of erratic DM production. This does not imply that managers become meteorologists; however, within specific vegetation-climate zones, long-term weather data are available that will assist with predicting periods of climatic-risk for forage production.

Forage production is accelerated by proper timing of establishment and fertilization. For most of the southeastern US, the timing of these events has generally been as follows for over-seeding small grain and ryegrass into bermudagrass pastures:

1. Plant in late September to mid-October; this is rainfall-dependent.
2. Discourage fall bermudagrass growth via delayed fertilization during late summer and/or forage removal via grazing or haying. Also, one may lightly disk (2-3” depth) the sod without intent to permanently destroy the bermudagrass. In this case, the disks should not be set to “turn” sod and soil, but rather to create a slight scarification of the sod. If a grain drill is used, then the drill openers will “fit” into the disk grooves. If a grain drill is not used, then seed can be broadcast-applied with a low to no N fertilizer source. The use of N fertilizer at this time will encourage bermudagrass growth.
3. After small grain-ryegrass has initiated growth to 3” to 5” and stand survival is relatively certain (barring inclimate drought or armyworm infestation), then fertilize by applying all of the P<sub>2</sub>O<sub>5</sub> and K<sub>2</sub>O requirements, and about 40 to 50 lbs/ac of N (according to soil test recommendations; usually this may range from mid October to early November).
4. In late November to early December (after first killing frost) refertilize with N. This may be about 50 to 65 lbs/ac N, but is soil test dependent.
5. Re-apply N fertilizer (50-65 lbs/ac N) in early February and once again in late

March to early April. (At the Texas AgriLife Research Center at Overton, total N rates have ranged from 150 to 250 lbs/ac) The N rate should be based on soil tests and stocking rate objectives and/or requirements for DM production. Another N fertilization (50-65 lbs/ac N) may be applied in mid-May to complete the ryegrass growth period and to initiate a “flush” of bermudagrass growth. The mid-May fertilization could be the last fertilizer applied on bermudagrass pastures during the summer months; however, stocking rate and forage DM requirements dictate this decision. Fertilization of winter annual forages and moderate stocking rates enhances nutrient cycling and creates a 12-month management program wherein the bermudagrass root system continues to use and re-use fertilizer nutrients deposited as excreta.

For other, specific soil-climate regions, fertilizer timing and rates will vary. And, for prepared seedbed plantings, timing of events does not have to contend with bermudagrass; thus, earlier planting-fertilization schedules and initiation of stocking are in order. Using the above-mentioned outline timing of events, small grain-ryegrass sod-seeded into bermudagrass pastures are usually available for full-time grazing by late November to early December.

### **Method of Use and Stocking Rate of Small Grains**

The utilization of small grain-ryegrass pastures varies with management objectives and risks associated with the grazing venture. Perhaps one of the most optimum grazing management scenarios is that of having stocking rates which allow the opportunity for accumulation of excess forage DM through the winter, and then expose the pasture(s) to increased stocking rate and severity of defoliation in the spring to maintain the forage in a vegetative stage of growth while allowing animals to make near maximum daily gains (2.5 to 3.5 lbs/day). Small grain-ryegrass pastures are not inexpensive, but this should not necessarily imply that they are too costly to justify for use in an overall grazing plan. With pasture

costs of \$150 to \$250/ac depending on N rate, utilization of forage DM via stocking rate and animal performance parameters control the profit potential from these pastures. Although the following stocking strategies were not intended to be an all-inclusive listing, some decisions for method of use and stocking rates for small grain-ryegrass pastures areas may include the following options to optimize forage utilization from a bimodal forage DM production model:

**Option 1:** Stock pastures initially so that the reduced DM growth rate in mid-winter does not necessitate animal removal. In this scenario, additional cattle must be incorporated into the grazing scheme in mid-February to early March, and/or excess spring growth must be harvested as silage or hay (hay is usually not a good alternative in March and April due to inclement weather conditions for curing). The “additional” cattle may be part of the resident cows and calves and/or may involve winter-spring purchased stockers.

**Option 2:** Stock pastures during the fall with a moderate to heavy stocking rate, vacate pastures during the winter, and if necessary, supplement with hay and/or protein, and resume grazing in the spring. This necessitates an adjacent sacrifice area for cattle to reside during this potential 30 to 45-day winter period. This approach assumes cold, inclement weather during December-January, and thus is climatic zone specific.

**Option 3:** Stock pastures initially at an “optimum” spring stocking rate (1650-2000 lb BW/ac in the vegetation zone of the Texas AgriLife Research Center at Overton), and exercise a limit-graze scenario during the fall-winter period until the rapid spring forage growth rate occurs (usually late February to early March). This management strategy involves supplemental hay or deferred forage and protein in addition to an adjacent “sacrificed” area for animals to reside. Normally, these limit-graze systems would entail a 2- to 3-hr grazing per day with a 20- to 22-hour deferment, or some alternate-day grazing plan. The primary objective is to have some optimum number of cattle on hand without additional purchasing and available for grazing during the spring flush-growth period which is usually March through mid-May. This option is based on compensatory

ADG in the spring. However, costs of hay and supplement can be major expenses.

**Option 4:** Delay stocking winter pastures until mid-to-late winter (mid-January to early February) or until “just prior to” the onset of rapid spring forage growth. A component of this grazing scenario is that cattle may be purchased at a time when prices are generally higher than during the previous fall season. However, there are limited hay and supplemental requirements for this approach. Or, if cattle are purchased during the fall, backgrounding on hay or deferred forage, and supplemental protein are required.

Stocking rate, as alluded to earlier, becomes the single most important factor controlling forage regrowth, animal performance, and potential economic returns. Although stocking rate appears to be a “moving target”, management can use some established “rules-of-thumb” for site specific areas. For small grain-ryegrass pastures, any set stocking rate is likely not to be the “proper” stocking rate because of fluctuations in DM production. However, long-term grazing experiments with stocker cattle at Texas AgriLife Research at Overton have shown that initial December stocking rates of 650 to 800 lbs body weight (BW) usually do not necessitate a reduced or de-stocking decision due to winter climatic conditions. However, at this initial stocking density, an abundance of forage usually accumulates from mid-March to late May which requires additional cattle (increase stocking rate) or mechanical harvesting.

Initial stocking rates of 1000 to 1250 lbs/ac BW in the fall may be subject to increased risk or likelihood for the need to provide supplemental hay during mid-winter. And, with these higher initial stocking rates, some system of graze-rest would be preferred over continuous stocking. One reason for choosing these higher initial stocking rates is to create some “optimum” stocking rate for the 60- to 75-day period during the spring which approached 1650 to 2000 lbs/ac BW at the Texas AgriLife Research Center at Overton.

An integral part of the stocking rate decision for small grain-ryegrass pastures is the method of stocking used. For example, a multi-pasture (n = 8

to 12 ±) rotational stocking system that employs a 2 to 3-day resident grazing of each pasture usually enhances forage DM production compared to similarly stocked, continuously grazed pasture. Further, this magnitude of forage DM production is most dramatic during mid-winter when climatic conditions cause slow forage growth rates. If one chooses a rotationally stocked system, then cattle would likely have shorter resident time (n = 1 to 2 days) on any particular pasture in the fall and spring compared to a longer resident time (n = 2 to 4 days) during the mid-winter period. In general, as forage growth rate slows, then the movement of cattle among paddock slows (i.e., longer resident time on each paddock). And, with fast forage growth rate, the movement of cattle is increased (faster) from paddock to paddock (i.e., shorter resident time on each paddock). Thus, a combination of both continuous and rotational stocking during the growth period may be a best management practice.

Management must choose the desired level of performance for stocker cattle. The age-old question for management of what do you want..... “more gain per animal or more gain per acre?”, the answer is usually, “Yes”. If the overall average daily gain (ADG) is to exceed 2.5 lbs/hd/day, then stockers require an abundance of forage DM from which to selectively graze. However, if ADG of 1.8 to 2.0 lbs/day is acceptable, then stocking rate can be increased to the point that less forage refusal areas (spot grazing) should be apparent, and utilization of the small grain-ryegrass pasture may range from 3” to 5” in height.

As evidenced by the above discussions, the best stocking rate plan by management exists when flexible alternatives exist and when management controls cattle numbers to fit the current situation. Some of the “best fit” stocking scenarios may exist when multiple (n = 2 or more) sets of cattle may be used to graze excess forage growth. Although many situations exist, most notable are: (a) use of additional stocker cattle in the spring which were either purchased late or backgrounded during the winter; and/or (b) use of resident fall or winter calving cows and their calves to graze excess forage on a full-time or limit-graze scenario.

## **Supplementation of Stockers on Small Grain Pasture**

Use of a supplemental energy, protein, and/or fiber (roughage) can have dramatic effects on animal performance and economics of the system. Management strategies concerned with incorporating a supplement for stocker cattle should be targeted at one or more concerns for increasing gain per animal, buffering forage-animal responses due to stocking rate, and/or animal health-digestion benefits. Before implementing a supplementation program, management should be aware of the impact of a supplement resulting in additive effects (forage + supplement intake) compared to a substitutive effect wherein the supplement replaces some of the daily forage intake. Thus, supplementation decisions should be based primarily on the following factors: 1) quantity of supplement to be fed; this is best evaluated when expressed as a % of body weight (BW); 2) additional ADG attributed to the supplement; this is expressed as the efficiency of supplement:extra gain ratio; 3) cost of the supplement; 4) method of delivery of the supplement; and 5) frequency of providing supplement (daily, 3 times per week, etc). Numerous comparative, supplementation of stockers on winter pasture experiments in the southeastern US led by research at Oklahoma State University (Dr. G.W. Horn) and at Texas AgriLife Research Center at Overton (Dr. F.M. Rouquette, Jr.) have provided guidelines for management. These data sets have provided some the of the following supplementation strategies:

1. A fiber (roughage, hay) source can be as effective as an energy source in reducing animal health disorders associated with frothy bloat, diarrhea, and other attributes related to conditioning the rumen for adaptation from low quality roughage for backgrounding to high quality, high moisture cool-season annual forage.
2. The biological optimum rate of supplement to reduce substitutive effects and enhance additive effects has been shown to approximate daily levels at 0.2% BW to 0.4% BW per hd, depending on supplement source.
3. The recommended daily levels of 0.2% BW to 0.4% BW have resulted in

supplement:extra gain ratios of 3:1 to 5:1. Thus, with cost of supplement at \$300/ton (\$0.15/lb), the extra cost of stocker gain attributed to supplement would range from \$0.45 to \$0.75/lb.

4. The desire to provide supplement at higher daily levels (ie 1% BW) usually results in inefficient supplement:extra gain that may range from 8:1 to more than 12:1; thus, the cost/lb gain for these supplement levels may be cost-prohibitive. However, under conditions of severely restricted forage availability due to stocking rate, then these levels of supplementation may be an acceptable compromise for management.
5. Impact of animal gain to supplement may be similar when fed daily or at an alternate day approach. Delivery system, animal behavior and handling implications, and labor becomes the determinates of economic success.

### **Forage Production and Timing of Events for Ryegrass and Clover**

Annual ryegrass has become one of the most widely used cool-season annual forages in the southeastern U.S. Ryegrass may be planted alone or in combination with small grains and/or clovers. Although annual ryegrass may provide fall grazing when planted on prepared seedbed, most of the forage DM is produced during late winter to late spring (February through May). During a 25-year period at the Texas AgriLife Research Center at Overton, the average date for initial stocking of ryegrass pastures has been February 24. However, this date was at a time when adequate forage had accumulated sufficiently to provide continuous stocking rates of about 2750 to 3000 lbs/ac BW on high stocked pastures. Thus, when lighter stocking rates are desired, then grazing may be initiated in late January to early February. Initiation of grazing and stocking rate are site specific management strategies based on climate conditions as well as soil fertility and nutrient status for plant growth. In general, forage production of annual ryegrass increases with time from January to late April. Plant maturation processes are usually visible via seedhead formation by early May; however, this is also a function of climate and nitrogen availability.

It is not uncommon for annual ryegrass to remain at the vegetative-seed head stage in moderately to low stocked pastures until late May to early June.

In general, annual clovers, except for white clover, usually produce adequate forage for grazing later than that for ryegrass at any specific site. If moisture is available, white clover from a re-seeding scenario may offer forage for grazing earlier than ryegrass. In general, newly planted clovers are usually available for continuous stocking by late February to early March. Natural reseeded clover pastures, however, may be available for grazing as early as December, but usually provide adequate DM by late January to early February. Time of grazing initiation is species dependent as well as site-climate specific. Usually, the earlier that clovers provide grazing, the earlier that they mature and vacate the pastures. For example, crimson clover varieties usually initiate flowering by mid-April and do not provide much forage for grazing by mid-May. Arrowleaf clover, on the other hand, may provide grazing until mid-June to mid-July but this is rainfall-temperature dependent. The timing of necessary events for clovers pertains primarily to soil pH regulation and soil nutrient availability at emergence.

### **Method of Use and Stocking Rate**

Stocking rates for ryegrass or ryegrass mixtures are similar to those mentioned for small grains during the late winter-spring months. Initial stocking rates which allow for an abundance of forage DM will provide stocker ADG of 2.5 to 3.0 lbs/day. In East Texas, this initial stocking rate would be about 1250 to 1500 lbs in early to mid-February. Pastures that are stocked sufficiently heavy to prevent forage heights from being above about 4 inches are likely to limit stocker ADG to less than 2 lbs/day.

A two-year stocking rate experiment at Texas AgriLife Research Center at Overton compared 'Tibbee' crimson clover vs 'TAM-90' annual ryegrass overseeded on bermudagrass pastures. Stocker cattle were F-1 (Angus x Brahman) replacement heifers that were being developed for a subsequent fall-calving program. At stocking rates of 1.5, 2.6, and 4 hd/ac (535-lb heifers), respective ADG was 2.9, 2.4, and 1.4 lbs/da for

crimson and 2.8, 2.6, and 1.6 for ryegrass pastures. During the mid-February to mid-June stocking period, heifer gain per acre was similar but favored ryegrass at the high and medium stocking rates. Heifer gain per acre at the low stocking rates favored the clover pastures as a reflection of ADG. Thus, ryegrass or clover can provide gains of 500 to 800 lbs per acre for stocker heifers during the spring-early summer period.

Most ryegrass and/or clover pastures are used primarily by cow-calf operators rather than for stockers. A seven-year average of forage and cow-calf responses to multiple stocking rates at the Texas AgriLife Research Center at Overton showed suckling, fall-born calf ADG of 1.9, 2.2, and 3.2 lbs/day, respectively, at stocking rates of 2.1, 1.3, and 0.8 cow-calf units per acre (1 cow-calf unit = 1500 lbs). On these continuously stocked pastures in East Texas, a conservative stocking rate of 0.75 to 1.25 cow-calf units has been consistently risk-free with respect to the need to de-stock or reduce stocking rate from February to weaning of fall-born calves in June-July. And, at the 0.75 to 1.0 cow-calf unit/ac level, there is usually an abundance of ryegrass-bermudagrass forage that can be harvested as hay by late-May to late-June.

Animal performance from clovers (primarily crimson or arrowleaf), during this same time period resulted in suckling calf ADG of 1.7, 2.4, and 3.0 lbs/day, respectively, at stocking rates of 1.9, 1.2, and 0.75 cow-calf units/ac. Although suckling calf gain and pasture stocking rates were relatively similar at low stocking rates, ryegrass was more resistant to severe defoliation regimens than were the clovers. Additionally, with most clovers, except arrowleaf, grazing management decisions usually dictate that cattle be removed for hay purposes or reseeding about 30 days earlier than for ryegrass pastures. Arrowleaf clover usually matures and flowers later than annual ryegrass.

### **Management Strategy Expectations**

**Pastures.** As always the case, grazing management strategies for forage production and animal response is site specific and is affected by the timing of cultural-management events and

climate. For the most part, the expectations of various classes of livestock ADG under moderate stocking conditions would approximate 2.0 to 2.5 lbs/day for stockers and 2.5 to 3.0 lb/day for suckling calves. For the cool-season annual forages, and particularly small grain-ryegrass pastures, one of the most efficient methods of grazing management is to initiate a stocking rate that allows for adequate leaf area for rapid growth during late winter. Once the forage has initiated a “spring burst” of growth, then stocking rate adjustments (increases) may be made in an attempt to “catch” the pasture. However, management strategies should not allow for such an abundance of growth that the small grain (especially rye) initiates premature flowering, flag leaf set, and seedhead formation.

The perception that rotational stocking is always better than continuous stocking is not a valid assumption. Previous research has shown that the “year effect” often determines differences in these stocking methods. However, rotational stocking may allow for more forage growth, and judicious use of stocking rates may result in extra gain per acre as compared to continuously stocked pastures. Research at the Texas AgriLife Research Center at Overton suggests that at low (650 to 800 lbs/ac BW at initiation) to moderate stocking rate (1200 lbs/ac BW at initiation) there may be no difference between method of stocking with respect to stocker ADG; however, even at these stocking rates, the rotationally stocked pastures had more forage “mass” for potential haying, etc. compared to the continuously stocked pastures. Rotationally stocked pastures at high stocking rates (1800 lbs/ac BW at initiation) have been shown to have greater stocker ADG and gain per acre than stocker calves at similar stocking rates under continuous stocking.

**Stockers.** Management strategies for an economically-successful stocker cattle venture are associated with an array of factors that will contribute to animal performance and merchandizing of cattle. Prior to investment in cattle, a sales-plan should be developed to allow for maximum sell price with minimum discounts-deductions. For optimum merchandizing of stocker cattle, management should consider and implement some or all of the following factors to

encourage multiple buyers to bid on the cattle: a) sell truckload lots of about 48,000 to 50,000 pounds; freight costs and buyers want to minimize trucking costs per head; b) same sex of calf, or at least truckload lots of the same sex; c) color and breed type uniformity; d) final weight, average stocker weight, and uniformity; e) final weighing conditions with respect to percent shrink, location, etc. Before stockers are purchased, an animal health program should be planned for receiving-vaccinations, growth implants, dewormer for 1 or 2 times, etc. The interfacing of pasture systems and animal performance requires attention to the details of production per animal and production per acre.

### **Economic Considerations for Stocker Operations**

Achieving the economic optimum grazing management and utilization of annual winter pastures is not an especially easy task. A knowledge base of forage growth expectations for a specific site and the art of managing judicious defoliation regimens allow for the greatest opportunity for positive economic returns and an acceptable transition from cool-season to warm-season pastures. Positive economic returns are the

primary objectives for commercial stocker cattle ventures. At this stage of management, this is NOT the venue for “experimentation with the unknown”!! Every State Experiment Station, Extension Service, and/or USDA/ARS facility has comparative databases for forage varieties, establishment practices, fertilization recommendation, seasonal DM production expectations, forage growth variations caused by climatic conditions, pasture systems for stocking methods, animal performance attributes due to stocking rate, supplementation, animal health issues and preventive measures, etc. to reduce-eliminate the “guesswork” for managers. Even with the incorporation of agronomic principles and “next plan scenarios” for climatic conditions, the primary deterrents to positive cash flow and economic success may be attributed to two factors:

1. Purchase Price – Sell Price Margin
2. Death Loss

Of these two factors, the margin associated with purchase-sell prices can range from “positive, memorable ventures” to “experience-only” to “economic disasters”. Advance planning, discipline in management, and attention to the details of advance preparation allows for strategies that minimize the “losses” and optimize the “wins”.



Fig 1. A generalized schematic of bimodal forage growth for small grain-ryegrass in the southeastern US.

