# Designing a rotational grazing system

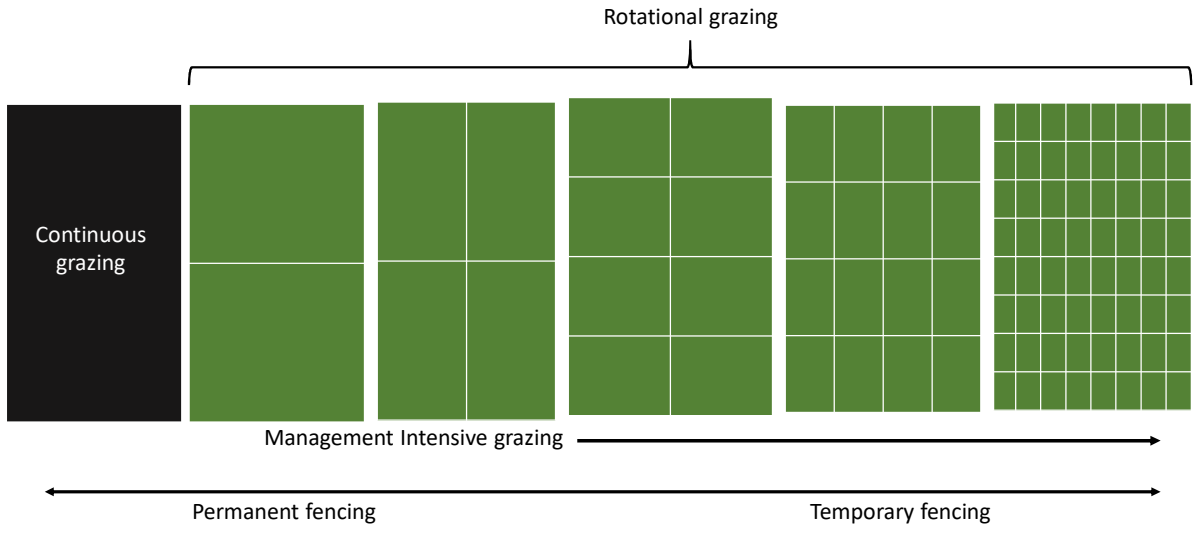
## What is rotational grazing?

- When one portion of the pasture is grazed at a time while the remainder of the pasture "rests."
- Pastures are sub-divided into smaller areas (called paddocks) and livestock are moved from one paddock to another.
- Animals are introduced to new feed in a new paddock on a "frequent" basis.

Rotational grazing is a very generic term.
There are many terms that are used.
Some mean the same thing.
Some mean something different.

- Management intensive grazing
- Intensive grazing
- Controlled grazing
- Short-duration grazing
- Cell grazing
- Time controlled grazing
- Strip grazing
- Managed grazing
- Voisin grazing
- Mob grazing

**MANAGED GRAZING**



# Management intensive grazing (MIG)

- Higher level of management
- More paddocks
- Shorter grazing periods
- Longer rest periods
- Increased carrying capacity

# Advantages of rotational grazing, especially more intensive

- Recycle nutrients and organic matter
- Better distribution of nutrients
- Reduce soil erosion
- More even grazing; reduce selective grazing
- Better weed control
- Increase stocking rates/carrying capacity (profits)
- Prevent re-infection with parasites
- Allow time for parasite eggs/larvae to die off

# Challenges to rotational grazing, esp. more intensive

- Fencing
- Water in every paddock (ideally)
- Shade in every paddock (ideally)
- Labor
- Worms, especially with small ruminants.

# Fencing considerations

- Many fencing materials for perimeters and sub-divisions.
- Permanent, semi-permanent, and temporary
- Charger choices: plug in, battery, and/or solar.
- What controls cattle may not control sheep.
- What controls sheep may not control goats.

Electric netting is popular for sheep and goats.

# Water considerations

- Location of water
  Ideally in paddock
- How are you going to supply water
- How much water
- Height of water trough
- Cost share with NRCS

# Shade considerations

- Do livestock need shade?
  1. Performance benefit
  2. For animal welfare
     (Five Freedoms of Animal Welfare)
- Problems with shade
  - Animals congregate around shade

## Internal parasite considerations

- Sheep and especially goats are more susceptible to worms than other livestock.
- 3-4 days is the quickest an egg can develop into infective worm larvae to be consumed by the animal
  - 3-4 day rotation will prevent reinfection with parasites
- It may take up to 60 days for a contaminated pasture to return to a low level of infectivity.
  - Long rest periods will allow most of the worm eggs and larvae to die off.

Bottle jaw caused by *Haemonchus contortus* (barber pole worm)

## Getting started

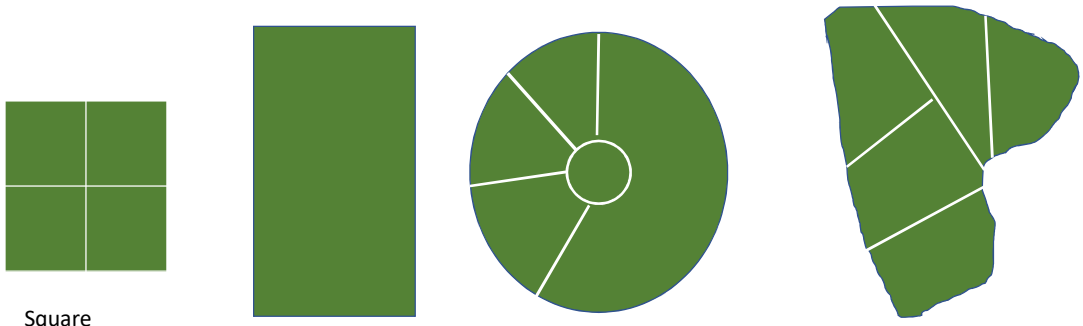
- What is the goal of your farm: short, medium, and long term
- What resources do you have access to: land, equipment, labor, and capital.
- Just do it!
- Trial and error, science and art
- Find what works for you.
- Observe and write things down

# Factors affecting number and size of paddocks

- Existing fences
- Cross fencing
- Topography
- Forage type
- Soil type
- Water access
- Land base

- There is no single best number of paddocks.
- Any number of paddocks is better than one big pasture continuously grazed.
- Start with 2-8.

# Paddock shapes



Square

Rectangular

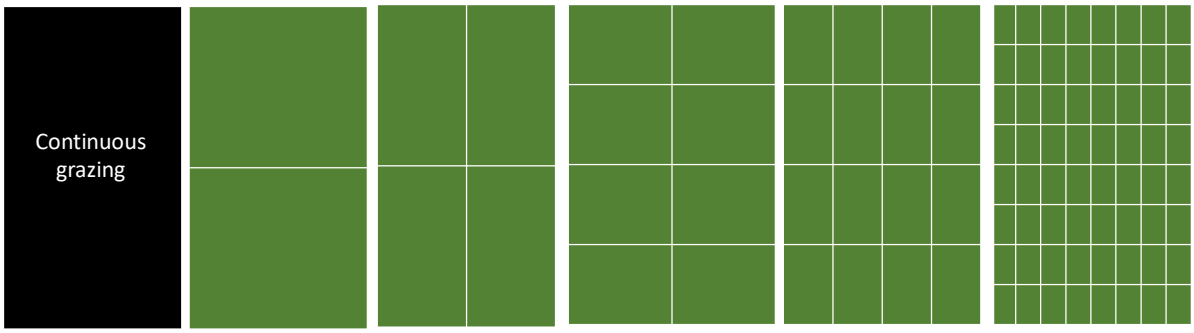
Wedge

Odd shape

# When to move animals

- Regrowth of forage plants under normal growing conditions usually occurs after 7 days.
- Remove no more than 40-50 percent of forage growth.
- “Take half – leave half”
- Leave at least 2-3 inches of stubble.

# How often to move animals



# How long to rest pastures

| Average Rest Period in Days for Forage Species | | |
|---|---|---|
| | Cool weather | Hot weather |
| Cool season grasses | 14 | 35-50 |
| Legumes | 21-28 | 21-28 |
| Source: West Central Forage Association. Pasture Planner. 2009 | | |

| Long rest<br>Slow regrowth<br>~6-7 weeks | Moderate rest<br>Moderate growth | Short rest<br>rapid regrowth<br>~ 3 weeks |
|---|---|---|
| Timothy<br>Smooth bromegrass | Alfalfa<br>Alsike clover<br>Sainfoin | Orchardgrass<br>Kentucky bluegrass<br>Meadow bromegrass<br>White clover<br>Tall fescue<br>Italian ryegrass<br>Creeping red fescue |

# How many paddocks do you need?

- 1-day rotation
- 30-day rest period
- 31 paddocks

- 4-day rotation
- 60-day rest
- 16 paddocks

- 7-day rotation
- 42-day rest period
- 8 paddocks

# Sacrifice area/lot/paddock

- Somewhere to put animals when it is too wet or too dry and/or forage needs time to regrow.

- Barn
- Barn lot
- Sacrifice pasture
- Zero grazing is best for sheep/goats due to parasite risk

# Mixed or multi-species grazing

- Cattle, sheep, goats, and horses all have different foraging behavior.
- Co-graze if there is a diverse plant population.
- Leader-follower to reduce parasite loads.

# Leader-follower system

- Animals with different forage needs pass through a pasture in succession.
- Animals with highest nutrition needs should graze paddock first
  e.g., lactating females and young stock, followed by animals with lower nutrition requirements, e.g., dry females
- Graze cattle first on paddocks with high parasite loads.

## Forward Creep Grazing

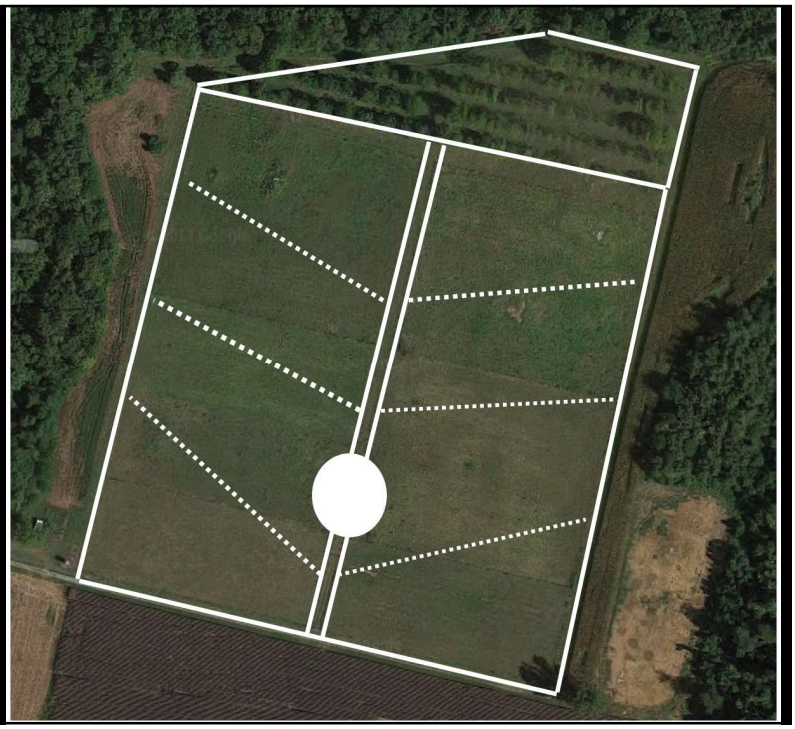
- Through an opening in the fence, give lambs, kids, or calves access to paddock first
- More nutritious feed
- Cleaner pasture (worm wise).

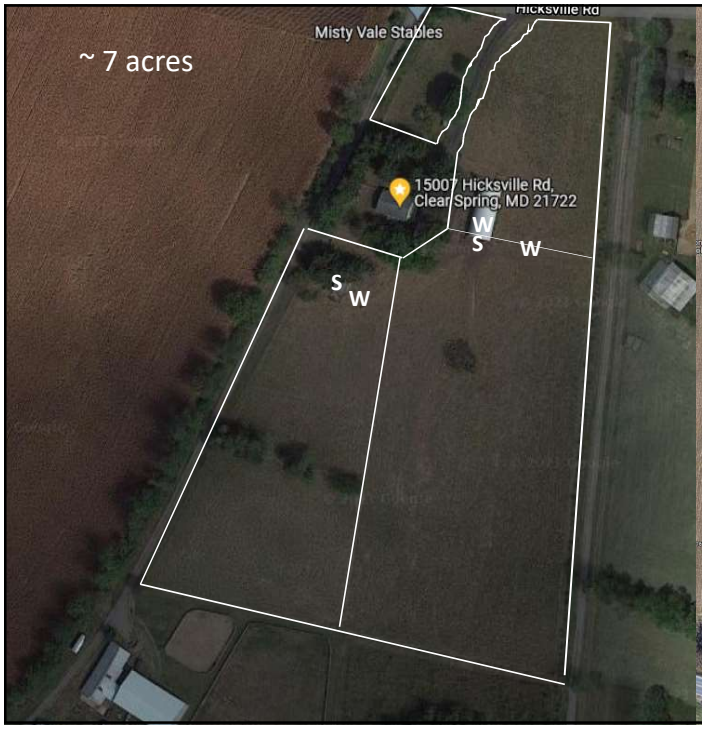
## Strip grazing

- Use temporary fencing to allot animals enough forage for a short time period; then, move the fence forward providing a new allocation.
- Common practice with stockpiled forages and annuals

# Small Ruminant Research @ WMREC

10 acres – 100 lambs
2 groups of lambs
7-day rotation
21-day rest period



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# What is Management-intensive Grazing (MiG) and what can it do for my farm?

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Management-intensive grazing (MiG; sometimes called "rotational grazing") is a topic frequently discussed among forage producers. Many testimonials have been made regarding the benefits of MiG. Some claim that simply implementing a MiG system will allow doubling or even tripling stocking rates and total elimination of fertilizer inputs. These claims rarely are truly realized; however, MiG does offer substantial benefits to forage-based livestock producers. Benefits include improved animal productivity, increased plant persistence, conservation of environmental resources, and improved animal temperament. This article will serve as a general overview of MiG and examples are taken in part from Southern Forages 4th Edition and a large three year grazing study conducted by Drs. Carl Hoveland, Mark McCann, and Nick Hill at the University of Georgia.

## What is MiG?

MiG is any grazing method that utilizes repeating periods of grazing and rest among two or more paddocks or pastures. "Rotational grazing" is commonly used as a general term and there are many other terms used by producers and scientists for MiG. A few of these include **rotational grazing, managed grazing, intensive grazing, rational grazing, controlled grazing,** and **rotational stocking**. However, MiG is a preferred description because it places emphasis on the "management" aspects of improved grazing systems.

Several methods of MiG grazing are used, including **rotational stocking, buffer grazing, strip grazing, creep grazing, deferred grazing, limit grazing, first-last grazing, mixed species grazing, sequence grazing,** and **frontal grazing**. Each of these methods will have specific situations where they are best applied. For example, limit grazing is an excellent practice for improving utilization of winter annual forages by mature beef cows, rotational stocking is beneficial when stocker cattle graze winter annuals or paddocks containing clovers, and creep grazing can be used to improve calf weaning weights on bermudagrass pastures. Some grazing methods can be combined for further flexibility. **Deferred grazing** allows the stockpiling of forage (e.g., stockpiled tall fescue or bermudagrass), and this stockpiled forage can be efficiently grazed later in the season using either **frontal** or **strip grazing** systems. More information on these terms can be found in a related factsheet entitled "Common Grazing Methods and Some Specific Farm Applications" (http://www.caes.uga.edu/commodities/fieldcrops/forages/questions/023FAQ-grazmethods.pdf).

For simplicity, further discussion in this article will use the more general term "MiG" since it encompasses all of these improved grazing methods. The principles discussed herein can be applied to each of these grazing methods and the impact they generally have on animal requirements, plant needs, and environmental conditions (drought, muddy soils, stream protection etc.).

## Why Should I Implement MiG?

Forages are often inefficiently utilized when pastures are continuously stocked. Many times grazing animals will only utilize 30-40% of the forage in a pasture with the rest refused or wasted. There are many reasons for this waste. The grazing herd, like people, is typically lazy and will heavily graze areas close to shade

or water and ignore more distant areas. Animals also prefer young, tender, and leafy portions of forages and refuse stemmy mature material when allowed a choice. When there is an excessive amount of forage present, the grazing animal frequently returns to grazed areas to utilized fresh regrowth and refuse large amounts of previously ungrazed forage because it is too "tough".

## Effects on Animal Performance

Many times the benefits of implementing MiG are exaggerated. Claims of doubling or even tripling stocking rate are sometimes made. Don't believe these claims! It is certainly possible to increase stocking rate and decrease hay and fertilizer inputs using MiG. Stocking rate increases of 35-60% have been reported in the scientific literature (Table 1). However, as a general rule, stocking rates should only be increased by 10-25% during the first few years, so as to allow your pastures and forage management skills to improve. In the meantime, any excess forage production can be harvested as hay or mowed and returned to the soil.

Table 1. Increase in gain per acre in rotational compared to continuous grazing.

| State | % Increase |
|---|---|
| Arkansas | 44 |
| Georgia | 37 |
| Oklahoma | 35 |
| Virginia | 61 |

There are situations where MiG is not particularly helpful from an animal performance perspective. Forcing the grazing animal to consume forage to a predetermined height eliminates their ability to select high quality leaves and often reduces individual animal performance (daily gain per head). This is particularly important when animals with high nutrient requirements like stocker cattle or replacement heifers are rotationally grazed on relatively low-quality forages, such as bermudagrass or bahiagrass. Remember that although individual animal performance is reduced, it is possible to increase stocking rate resulting in higher gain per acre. For producers grazing animals with lower nutrient requirements, like mature cows, this can be a great advantage. In a three year study conducted in central Georgia, rotational stocking improved cow-calf stocking rate by about 38% and improved calf production per acre by 37%. Individual cow or calf performance was not affected in this study (Table 2).

Table 2. Effects of rotational stocking on performance of beef cattle grazing bermudagrass and endophyte-free tall fescue in central Georgia.

| Item | Continuous | Rotational | Difference* |
|---|---|---|---|
| Cow weight at calving, lbs | 1037 | 1017 | NS |
| Cow weight at weaning, lbs | 1090 | 1071 | NS |
| Stocking rate, cows/acre | 0.5 | 0.69 | +38% |
| Pregnancy rate, % | 93 | 95 | NS |
| Weaning weight, lb | 490 | 486 | NS |
| Calf production, lb/ac | 243 | 334 | +37% |

* NS = not statistically significant

## Effects on Plant Persistence

While increased animal production per acre is often what sells producers on a MiG system, plant performance is also improved. Many plants respond well to short grazing and long rest periods. Rest periods allow plants to produce new leaves which collect energy, transform it into sugars, and store these sugars so that more leaves can be produced following the next grazing cycle. Not only is regrowth potential improved, but root depth and stand life are improved as well.

Practicing controlled grazing also decreases the amount of trampling and pugging (hoof damage) of plants and soils (particularly on wet prepared fields). This can improve productivity and persistence of forages.

Under MiG in the central Georgia study conducted by Hoveland and others, endophyte-free tall fescue productivity and persistence was greatly improved. This resulted in less hay feeding in the rotational stocked system (Table 3). In fact, over the three year grazing study, cattle in the rotationally stocked system required

31% less hay per head. If this hay were priced at $110 per dry ton, an annual average savings of $41.30 per cow would be realized for each of the three years. Reductions in supplement costs and labor for feeding hay would also add to the advantage of MiG.

Table 3. Pounds of winter hay fed per cow as affected by grazing method during three year study. Cows grazed bermudagrass/endophyte-free tall fescue mixture. (From Hoveland. McCann and Hill. 1997).

| | 1988-1989 | 1989-1990 | 1990-1991 | 3-year Average |
|---|---|---|---|---|
| Rotational | 1310 | 1480 | 2240 | 1680 |
| Continuous | 1750 | 1900 | 3650 | 2430 |
| Decrease, % | -25% | -22% | -39% | -31% |

MiG systems can also improve legume establishment and persistence. Clover can be broadcast seeded and trampled in by animals grazing small paddocks in late winter. MiG also allows flash grazing of paddocks to prevent small legume seedlings from grass shading. After clovers are established, the improved grazing control allows producers to favor clover regrowth.

## Intangible effects

There are many benefits of practicing MiG that are difficult to quantify. Notice that the scope of this article's subtitle "What can it do for my farm?" is much larger than merely animal performance. Two of the most important benefits MiG offers your farm are 1) improved control and 2) improved flexibility.

***Control***: Cross fencing and water developments in large pastures effectively transfer the grazing decisions from the grazing animal to the farm manager. Before a pasture is cross-fenced, the grazing animals determine 1) where they want to eat, 2) what they want to eat or (more importantly) what they will refuse to eat, 3) how long they will eat, and 4) how often they will return to eat. Once cross-fences are erected the farm manager controls how many animals graze a set amount of acres for a set amount of time. Once available forage has been efficiently utilized, animals are allowed to move to another paddock and cannot return until forage is ready for another grazing.

***Flexibility:*** Producers soon realize that there is no "set" schedule for rotating pastures and that the length of rest and grazing periods will change with weather and forage growth rate. This added flexibility is an often overlooked advantage to practicing MiG. Paddocks can be removed from the rotation for overseeding or complete stand renovation. Individual paddocks can also be skipped during times of rapid growth and stockpiled for later grazing or hay harvest. Low-lying paddocks with drainage problems can be left ungrazed during wet periods to minimize trampling injury and improve stand productivity and longevity.

## Summary

Practicing MiG offers many advantages for most producers. Less forage is wasted by animals, which normally allows stocking density to increase. MiG systems also improve the persistence of some forage species and can greatly decrease hay requirements when managed appropriately. Recent fencing and watering equipment developments have made grazing systems easier and cheaper to implement. These advances have "opened the door" for many producers to adopt improved grazing management practices. Other reasons for implementing grazing systems include improved nutrient distribution and environmental stewardship. Animal handling is also usually improved with MiG systems. Frequent movement and exposure to people usually improves animal temperament. This frequent exposure also allows the farm manager to detect diseases or other problems quicker so that they can be treated in a timely manner.




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J. Scott Angle, Dean and Director.

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# Common Grazing Methods and Some Specific Farm Applications

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Many people confuse the terms "grazing system" and "grazing method". In actuality these are very different terms. **Grazing system** is a broad "umbrella" term and is defined as "any integrated combination of animal plant and other environmental components and the *grazing method* by which the system is managed to meet specific results or goals". A **grazing method** is "a defined procedure or technique of grazing management designed to achieve a specific objective". If you examine these definitions closely, you can see that a grazing system can be defined broadly- like an automobile. Grazing method is a subtype of a system- like a truck, station wagon or motorcycle- all of which are automobiles, but are most useful in different situations. Grazing methods are extremely variable in their design and due to this **there is no "one size fits all"** method for all farms. In this paper several controlled grazing methods will be outlined along with specific examples of situations where they are useful.

***Continuous stocking*** This is the simplest grazing method and is almost certainly the most commonly practiced in Georgia. Animals are stocked on a single pasture unit for the length of the grazing season. Utilization of forage in this system is typically low, unless the pasture is overstocked (when animal performance will suffer). Spot grazing can occur in this system, particularly when pastures are understocked or during periods of rapid forage growth. Normally animals are *set stocked* through the entire grazing season, with no animals added or removed from the system. Unfortunately, this makes it practically impossible to achieve optimal forage utilization during the majority of the season. If stocking rate can be altered occasionally during the season, forage utilization can be improved. Continuous stocking can be useful when stocking rate is set properly and maximum individual animal performance is desired (for example, replacement heifers on bermudagrass pastures). In this situation, animals have the ability to select high quality diets, but forage utilization and gain per acre can suffer under these circumstances.

***Rotational stocking*** This method is commonly referred to as "rotational grazing" although animals are actually stocked on the pasture on a rotational basis. Under this system the grazing area is divided into several small "paddocks". Animals are concentrated on these paddocks for relatively short periods of time with the ultimate goal being uniform and efficient utilization of forage species. The number of paddocks can vary from 2 to over 40. Large numbers of paddocks improve control of grazing and animals, but increases input costs and labor. In general, 8 to 12 paddocks provides sufficient utilization efficiency and rest periods for most forage and animal systems. Some operations may benefit from more paddocks- particularly when multiple forage species or herds are grazed.

Grazing period varies according to number of paddocks and range from 14 days to less than 1 day. Following the grazing period animals are moved to another paddock for grazing and the previously grazed paddock is allowed to rest and regrow. This system minimizes the amount of individual animal diet selection and can reduce individual animal performance. However, the improved forage utilization normally allows increased stocking rates and increased animal gain per acre. In addition, the rest periods enable less grazing tolerant species like endophyte-free tall fescue, orchardgrass and native species to persist for longer periods of time. This method also allows a large amount of producer flexibility. During periods of rapid forage growth

some paddocks can be deferred from grazing and used for hay production. This can be an excellent system for beef cow-calf producers, particularly when cool season perennials are grazed.

***Deferred grazing*** or ***"stockpiling"*** This is a largely underutilized grazing method where forage production is deferred from grazing until later in the season. Stockpiling is typically performed in the fall months to reduce hay needs in late autumn and early winter. This practice is particularly useful in tall fescue based systems where fall growth rates are good and forage maintains quality well into the winter. This practice can also be utilized in bermudagrass systems, but diet quality rapidly declines after frost and protein supplementation may be necessary.

***Creep grazing*** Creep grazing is essentially identical to traditional creep feeding young animals, except that forages are grazed in place of grain feeding. This method allows young animals with high nutrient requirements to access high quality forages like pearl millet, chicory, grazing tolerant alfalfa or winter annuals. Access to these high quality paddocks is provided either underneath electric fences or through a creep opening (See Southern Forages for gate design). Dams are maintained on traditional perennial base forages like tall fescue or bermudagrass and prevented from grazing high quality forages. Excellent calf gains have been reported in Georgia with summer creep grazed pearl millet on fescue based pastures. This is a system that offers excellent potential to improve weaning weights and should be utilized more often in Georgia beef cattle operations.

Table 1. Effect of allowing calves to creep graze pearl millet from June to September (104 d) in North Georgia tall fescue based pasture systems.

| | Control | Creep-grazed calves |
|---|---|---|
| Calf gain, lb/hd | 144 | 219 |
| Calf average daily gain, lbs | 1.38 | 2.10 |
| Cow weight change, lbs | -60 | 27 |

***Strip grazing*** This is a self-descriptive grazing term where animals are held in small areas by a movable electric fence graze and normally graze a one or two day forage supply. Once this 'strip' is utilized, the front fence is moved forward in the pasture. A back fence may or may not be used depending on circumstances. Due to lack of forage selectivity, performance of animals with high nutrient requirements will likely be depressed when strip grazing is used. Labor requirements can also be high for strip grazing. This method works particularly well when dry cows are grazing stockpiled forages as it typically forces high forage utilization rates.

***Limit grazing*** Another self-explanatory term where animals are allowed limited time in certain paddocks. This method is typically practiced when animals are grazing a base paddock containing low quality forages (like dormant bermudagrass or low quality hay) and are allowed periodic access to high quality and high cost pastures (like winter annuals). This is an extremely effective practice where animals limit graze a pasture for a few hours per day or on an alternate day basis. Advantages include decreasing intake of high quality forages to more effectively “balance" animal nutrient requirements (particularly with mature animals grazing winter annuals). Decreased pugging or trampling of winter annuals also improves forage utilization. This method can be used with summer annuals to improve cow condition in mid-summer.

***Leader-follower grazing, first-last grazing,*** or ***forward grazing*** In leader-follower systems the herd is sorted into multiple (normally two) nutrient requirement groups. The high nutrient requirement (leader) group is rotated through paddocks before the low nutrient requirement (follower) group. Paddocks are lightly grazed by the leader group which allows these animals to select a high quality diet to meet growth or production needs. The follower group then grazes the paddock to utilize lower quality forage and allow high quality regrowth. This method is used in stocker operations where growing calves graze in front of cow-calf pairs. Dairy operations also frequently use this method with either two or three groups. In a two group system lactating cows

are the leader group with all other cows in the follower group. In a three group system, lactating cows graze first, replacement heifers second and dry cows third.

## Summary

All of the above grazing methods can be useful in particular situations. Carefully think through individual farm operation goals and needs. Match grazing methods with animal, plant and producer needs to implementing a successful grazing system. All of the systems above, including continuous stocking, require management skills and inputs. At a minimum, pasture growth rate needs to be monitored frequently with forage and cattle managed in timely manner. Carefully consider farm goals before implementing grazing methods to match systems to desired animal and land productivity.

None of these methods is rigid in nature or "set in stone". Some producers allow the grazing system to determine farm goals while the opposite should be true. A farm need not practice rotational stocking during all periods of the year, with all classes of animals, and on all available forages. Many methods can (and probably should) be combined within a grazing system to meet seasonal needs. For example, a producer may continuously stock bermudagrass pastures during summer months with areas of pearl millet reserved to creep graze calves. This same producer could then rotationally stock additional paddocks of tall fescue in fall and spring months and defer grazing on a few tall fescue paddocks to stockpile forage and minimize or eliminate hay needs. Other producers may not have access to tall fescue and could limit graze winter annuals during winter months while grazing dormant bermudagrass or feeding low quality hay.



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