Building a Year Round Grazing System

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There are three basic ways to increase net returns in ruminant livestock operations. The first is to increase the price we get for our product. Unfortunately in a commodity based system we have little or no control over the price that we receive. The second is to increase total production. By producing more units that have a slim profit margin we can increase net returns. However, at some point we become resource limited; we run out of land or time. The third is to control production costs. Of these three ways to increase net returns, this one has the greatest potential to increase the profitability on most ruminant livestock operations in Kentucky.

Cow-Calf Costs

The single largest expense in cow-calf systems in Kentucky and surrounding states is winter feed. In most cases it makes up around 60% of the total production costs (Fig. 1). In comparison, other budget components are relatively small. Controlling winter feed costs represents the single largest opportunity to reduce total production costs and increase net returns.

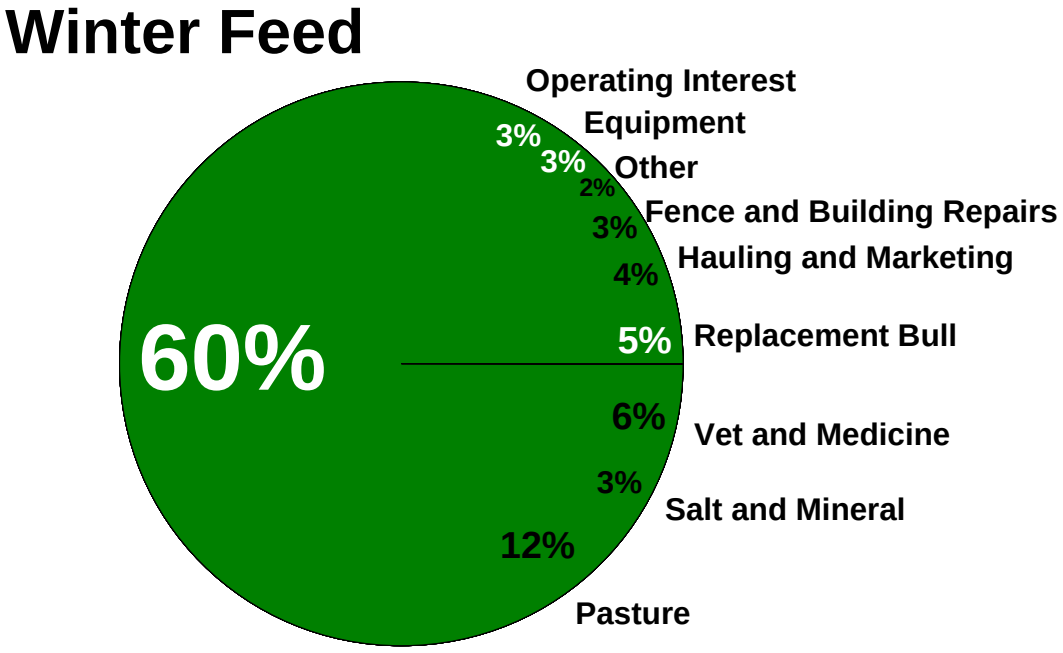


Figure 1. Winter feed costs as a proportion of total cow-calf budget for a fall calving herd consuming a hay ration. *Information in this figure was adapted from the 2008 Livestock Enterprise Budgets, Publication 446-047, Virginia Cooperative Extension.*

The winter feeding system that you choose can have a profound impact on total production costs and net returns. Table 1 shows the winter feed and total production costs and net returns for winter feeding systems based on hay and stockpiled grass for both spring and fall calving herds. Other than the winter feed, all other variables are held constant. For a fall calving herd consuming a hay based ration, the net return per cow-calf unit is around $15 versus $117 for a fall calving cow consuming a ration based on stockpiled grass. In this example hay is valued at $100/ton. Many producers contend that the actual cost of making is considerably less, however, if you include fertilization and equipment, the actual cost of making hay is $100/ton or more.

Table 1. Winter feed costs and net return per cow for various cow-calf systems used in Kentucky and other transition zone states.

Cow-Calf System	Winter Feed Cost	Total Production Cost	Net Return
	$ per cow		
Spring calving-hay	261.53	450.35	64.65
Spring calving-stockpile	179.46	365.41	149.59
Fall calving-hay	299.44	500.03	14.97
Fall calving-stockpile	200.53	397.66	117.34

Information in this table was adapted from the 2008 Livestock Enterprise Budgets, Publication 446-047, Virginia Cooperative Extension.

Choosing the Right Forage Species

Kentucky is located in a region of the United States commonly referred to as the "transition zone." This region is located between the temperate north and the subtropical south and is marked by hot summers and mild winters. Cool-season grasses grow well in the spring and fall but have limited growth during the summer and winter months. In contrast warm-season grasses grow well during the three to four month summer period, but are unproductive for the remainder of the year. Although many producers view the seasonal distribution of forage production as a major challenge facing ruminant livestock production, it is also an opportunity to utilize multiple species in a grazing system to build a "forage chain" that is capable of supplying high quality forage year around.

Selecting the right forage species is one of the first steps in successful pasture management. When choosing a forage species it is important to consider the following questions:

Is the plant adapted to this region? In order for a pasture or hay seeding to be successful the plant must be well adapted to the region. If the plant is not well adapted to the area, even the best pasture management practices will not result in a vigorous long-lived sod. In Kentucky, plants that are well adapted to areas of the mountainous east may not be well adapted to the western portions of the state.

Is the plant adapted to the soils present in the pasture? Soils can vary greatly from pasture to pasture. Some plant species require deep fertile soils while others can persist well on shallower soils that are lower in fertility. Soil drainage is another important consideration. Some plant species require well-drained soils while other can persist on less than well-drained soils.

What is the yield and nutritive value? Choose a species and varieties that yield well and possess a high nutritive value. In some cases, species or varieties that have lower dry matter yield may actually yield more animal per acre because their digestibility is greater.

What is the desired end use? Some species are better adapted to haying type management, while others are more persistent under grazing. For example bermudagrass is well adapted to close and frequent defoliation, while orchardgrass will not persist under this type of management.

Is the plant tolerant of environmental stresses? Plants well adapted to Kentucky will possess good drought tolerance. If your pastures border creeks or rivers that flood regularly, then a plant with good flooding tolerance should be chosen.

Is the plant tolerant of grazing? Forage species differ greatly in their tolerance of close and frequent grazing. In continuously grazed pastures, forages with excellent grazing tolerance should be used.

What level of management does the plant require? Plants that are less tolerant of grazing and less well adapted to the region will require more management in order to persist. Therefore, it is important to match the management level of the producer and the requirements of the plant.

When does the plant grow? Cool-season grasses produce most of their growth in the spring and fall, with limited growth during the summer months. In contrast, warm-season grasses grow well during the summer months, but produce very little in the spring and fall.

Does the plant possess any antiquality factors that may restrict use? Some forage plants possess antiquality factors that limit their use by livestock. For example forages related to sorghum can cause prussic acid poisoning. Other plants like pearl millet or small grains are generally safe, but can in some cases cause nitrate poisoning.

Is this species persistent under my conditions? Profitable grazing systems are based on dependable sods that will persist for a reasonable time period. Sods that require frequent maintenance and do not hold up under your conditions will increase your production costs.

Cool-Season versus Warm-Season Grasses

The primary forage base in Kentucky and other transition zone states are cool-season grasses. Cool-season grasses have optimum growth at approximately 70 degrees Fahrenheit. High temperatures and intermittent rainfall during the summer months limit cool-season grass growth. This results in the production curve shown in Figure 1. If a set stocking density is used, pastures will be under-utilized in the spring and fall and overgrazed during the summer months. Surplus forage could be harvested and fed during the summer months, but the high cost associated with hay and silage making makes this an unprofitable management decision in many cases.

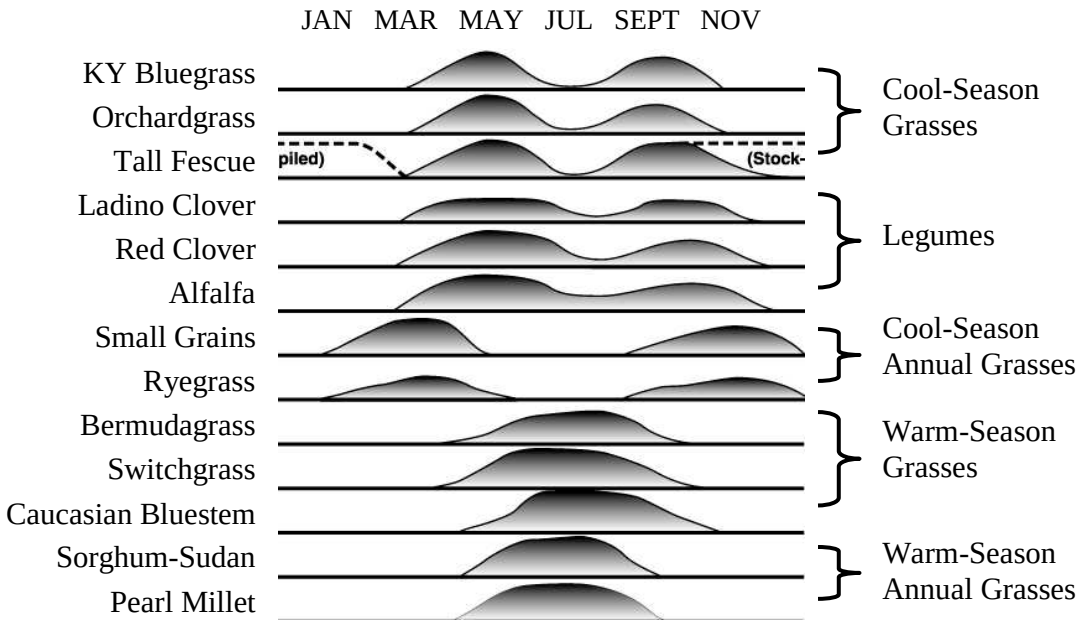


Figure 1. Typical growth curves of cool- and warm-season grasses growing in the transition zone of the United States. (*Adapted from Controlled Grazing of Virginia's Pastures, Publication 418-012*).

Warm-season grasses evolved from cool-season grasses and have optimum growth at approximately 90 to 100 degrees Fahrenheit. In the transition zone, warm-season grasses grow well during the summer months when cool-season grass growth is restricted. Warm-season species will produce approximately twice as much dry matter per unit of water used. Because warm-season grasses have optimum growth at higher temperatures and are more efficient at using water, they are a better choice to irrigate during the summer months than cool-season grasses. Although cool-season grass growth can be increased through irrigation, high temperatures during the summer months still restrict growth.

Cool-Season Perennial Grasses

Tall Fescue (*Schedonorus arundinaceus*) is the best-adapted cool-season grass for Kentucky. It is a bunchgrass that forms a tight sod that is able to withstand trampling and close grazing better than most cool-season grasses (Table 1). It also tolerates poorly drained soils and drought. It does best on medium fertility soils with a pH of 5.8-6.2, but will persist on land that is acidic and low in fertility. Most tall fescue is infected with an endophyte that imparts grazing and drought tolerance to the grass, but produces toxins that negatively impact livestock performance. Although tall fescue toxicosis is generally less severe in small ruminants, these toxins can cause decreased gains, fescue foot, reduced milk production, and reproductive problems.

The newest part to the tall fescue story is the discovery of a novel or friendly endophyte that appears to give tall fescue the persistent characteristics of the toxic endophyte, but does not produce the toxins associated with the animal disorders. Initial testing and on-farm trials in transition zone states show that animals grazing tall fescue infected with the novel endophyte

performed similar to animals grazing endophyte free tall fescue. The persistence of tall fescue infected with the novel endophyte has been similar to tall fescue infected with the toxic endophyte. Since animals that are grazing novel endophyte tall do not experience any negative feedback (they do not feel sick) they will tend to eat more. Therefore, controlled or rotational stocking should be used with novel endophyte tall fescues.

One of tall fescues most underutilized attributes is its ability to be stockpiled for late fall and winter grazing. Stockpiled tall fescue is almost always higher in forage quality than the average hay produced in Virginia. In a study conducted in Virginia's Southern Piedmont region, stockpiled tall fescue was on average 36 and 23% higher in crude protein and energy than the average hay produced in Virginia. One acre of stockpiled tall fescue can provide around 45 to 60 days of late fall or winter grazing for a brood cow.

More recently there has been an interested in stockpiling tall fescue for summer grazing. In the past, this practice has not been actively explored due to the toxic endophyte in tall fescue. However, with the development of novel endophyte cultivars, stockpiling for summer grazing may be a viable option. Research conducted at Virginia Tech's Southern Piedmont AREC found that calves grazing novel endophyte tall fescue clipped in the mid-May and then fertilized with 60 lb N/A gained 1.4 lb/day from early July to mid-August. Calves grazing a second set of pastures that were fertilized but NOT clipped gained 1.1 kb/day. One of the keys to making this system work is to manage grazing during the summer months to leave adequate residue. In the above study, approximately 50% of the standing forage was removed.

Orchardgrass (*Dactylus glomerta*) is a productive cool-season grass that possesses high nutritive value and good palatability. It grows in clumps and forms an open sod. This species can be used for hay and pasture, but requires better management than tall fescue. Orchardgrass will not persist under continuous grazing. It is fairly drought tolerant, but requires higher fertility to maintain productivity and persistence (Table 1). This grass is not as well adapted to the warmer portions of Kentucky as tall fescue and should be considered semi-permanent species in these areas.

Kentucky Bluegrass (*Poa pratensis*) is a cool-season grass that forms a tough sod that is capable of tolerating close and frequent grazing (Table 1). This species possess rhizomes, modified stems that grow just below the soil surface that allows it spread and fill in damaged areas in the sod. Kentucky bluegrass is well adapted to the mountains and central region of Kentucky. However, bluegrass is lower yielding than tall fescue and orchardgrass and goes dormant during the summer months. Although this species can be found in pastures in the western and southern regions of Kentucky, its growing season is relatively short and stands can be difficult to maintain.

Reed Canarygrass (*Phalaris arundinacea*) is cool-season grass that is very tolerant of flooding, making it good choice for poorly drained soils. It does not stockpile as well as tall fescue and bluegrass. Under good management, this coarse, sod-forming perennial grass spreads by short, scaly rhizomes, forming a thick sod. Reed canarygrass contains alkaloids that decrease palatability. Sheep appear to more sensitive to these alkaloids, refusing reed canarygrass at

lower alkaloid concentrations than cattle. Low alkaloid cultivars should be used in small ruminant forage programs. These include 'Venture', 'Palaton', and 'Rival'.

Table 2. Characteristics of commonly used grass and legume species.[a]

Grass Species		----------Tolerance----------					
	Life cycle	Heat & drought	Wet soils	Grazing	Soil acidity	Seedling vigor	Sod forming ability
Tall Fescue E+	CSP[b]	E[c]	G	E	G	G	G
Tall Fescue E-	CSP	F	G	F	G	F	G
Orchardgrass	CSP	G	P	F	F	G	F
Kentucky Bluegrass	CSP	P	F	E	F	P	E
Timothy	CSP	F	P	P	F	G	P
Prairie Bromegrass	CSP	F	F	P	F	G	F
Smooth Brome	CSP	F	F	P	F	G	G
Reed Canarygrass	CSP	G	E	G	G	F	E
Perennial Ryegrass	CSP	P	P	E	F	E	P
Annual Ryegrass	WA	F	E	E	G	E	G
Oats	WA	F	F	G	F	G	P
Rye	WA	F	F	G	G	E	P
Wheat	WA	F	P	G	P	G	P
Bermudagrass	WSP	E	P	E	E	F	E
Caucasian Bluestem	WSP	E	F	G	G	P	F-G
Switchgrass	WSP	E	F	P	F	P	G
Crabgrass	SA	F	P	E	E	G	G
Pearl Millet	SA	E	P	F	E	E	P
Sorghum	SA	E	P	F	P	G	P
Sorghum-Sudan	SA	E	P	F	P	E	P
Alfalfa	CSP	E	P	P-G	P	G	P
Birdsfoot Trefoil	CSP	G	G	F	G	P	P
Red Clover	CSP	G	F	G	F	E	P
Sericea Lespedeza	WSP	E	F	F-G	E	P	P
White Clover	CSP	P	G	E	F	F	G
Annual Lespedeza	WSA	G	F	G	E	F	P

[a] Adapted in part from Southern Forages Fourth Edition.
[b] CSP=cool-season perennial, WA=winter annual, WSP=warm-season perennial, SA=summer annual
[c] E=excellent, G=good, F=fair, P=poor

Perennial ryegrass (*Lolium perenne*)**, smooth bromegrass** (*Bromos inermis*)**, prairie bromegrass** (*Bromos Willdenowii*) are other cool-season grasses that can be used in grazing systems in Kentucky. While these grasses possess positive attributes, they are generally less well adapted and will require a higher level of management to persist on farms in transition area of the United States.

Perennial Warm-season Grasses

Bermudagrass (*Cynodon dactylon*) is highly productive warm-season grass that is well adapted to the southern and western parts of Kentucky. This grass responds well to nitrogen fertilization and requires significant amounts of nitrogen for optimum growth (250-350 lb nitrogen/A). Bermudagrass possesses a stoloniferous growth habit that forms a dense sod that is very tolerant to close and frequent grazing (Table 1). It grows best at temperatures between 90 and 100 F, when the growth of cool-season grasses is severely limited. Although bermudagrass has ample growth during the summer, it is unproductive from early fall until late spring. This grass is best used in a grazing system with a perennial cool-season grass such as tall fescue. The use of bermudagrass in Kentucky has been limited by vegetative establishment. The recent development of cold-tolerant seed varieties could facilitate wide scale adoption in transition zone states.

Caucasian bluestem (*Bothriochloa caucasia)* is an old world bluestem that is adapted to Kentucky. This warm-season grass starts growth later than switchgrass, competing less with cool-season grasses for late spring utilization. Research in Virginia has shown that it can produce approximately 240 grazing days per acre. Animal performance is good, but somewhat lower than native warm-season grasses. Establishment can be difficult due poor seed quality and low seedling vigor. It does possess a lower growth habit than the native grasses, making it better adapted to close and frequent grazing. Performance in Virginia has been somewhat sporadic with some stands persisting well, while others have been overtaken by common bermudagrass. This may be related to grazing pressure during the summer months and possibly insect damage.

Switchgrass (*Panicum virgatum*), **eastern gamagrass** (*Tripsacum dactyloides*), **big bluestem** (*Andropogon gerardii*), and **indiangrass** (*Sorghastrum nutans*) are native warm-season grasses that can grow in Kentucky and other transition zone states. Although these grasses tend to be very drought tolerant, they do not tolerate close and frequent grazing making them less well adapted to unmanaged grazing systems. The native grasses are well adapted to wildlife and could be incorporate in riparian zones and field borders to stimulate wildlife production.

Cool and Warm-Season Legumes

Incorporating legumes into a cool-season grass stands increases both yield and animal performance and improves forage availability during the summer months. They also dilute the toxins produced by the endophyte in tall fescue leading to improved growth and higher conception rates. In addition, legumes form a symbiotic relationship with *Rhizobium* bacteria in which nitrogen from the air is fixed into a plant available form. There is no need for nitrogen fertilizer when tall growing legumes make up more than 30% of the pasture. The value of nitrogen fixation from common pasture legumes is shown in Table 2. Legume seed should always be inoculated with the proper strain of nitrogen fixing bacteria before seeding.

Table 3. Value of legumes in terms of fixed nitrogen.

Legume Species	N Fixed	Value of Fixed Nitrogen ($/A/year)		
	lb/A/year	N cost=$0.50/lb	N cost=$0.75/lb	N cost=$1.00/lb
Alfalfa	150-250	75-125	113 to 188	150 to 200
Red Clover	75-200	38-100	56 to 150	75 to 200
Ladino Clover	75-150	38-75	56 to 113	75 to 150
Annual Lespedeza	50-150	25-75	38 to 113	50 to 150

Adapted in part from Southern Forages, Fourth Edition.

Red clover (*Trifolium pratense*) is perhaps the most important pasture legume in Kentucky. It is a short-lived perennial legume that must be reintroduced into pastures every two to three years. A strong attribute of this species is that it can be frost seeded into established pastures (Table 1). Red clover has a tap root that helps to increase summer growth of cool-season pastures. Research in Kentucky and Virginia has shown that improved varieties will persist two to three years, while common red clovers persist one to two years.

White Clover (*Trifolium repens*) is one of the most important pasture legumes in Kentucky. It has a stoloniferous growth habit that is well adapted to grazing (Table 1). White clover can be grouped into small, medium, and large types. The large or ladino types are taller and produce three to five times as much dry matter. Therefore, ladino clover is recommended for pasture use. Although white clover is not drought tolerant, it persists in pastures through reseeding. White clover and other legumes should in most cases be grown in combination with grasses.

Alfalfa (*Medicago sativa*) is commonly referred to as the 'queen of forages'. Alfalfa is a highly productive legume that that possesses a deep tap root. This species is best adapted to well-drained, fertile soils and will not persist in poorly drained areas. Alfalfa has excellent drought tolerance and may be a good option for summer grazing in regions of Kentucky where warm-season grasses are less well adapted. Although alfalfa is commonly used for hay and silage, it can be grazed rotationally. In recent years, grazing type alfalfas have been developed and would be an excellent choice for small ruminant grazing systems. Like other legumes, pure stands of alfalfa can cause bloat in ruminant livestock. Maintaining approximately 50-50 mixture of grass and legumes will greatly reduce the chances of bloat.

Birdsfoot trefoil (*Lotus corniculatus*) in a non-bloating legume that is better adapted to poorly-drained, low fertility soils than other commonly used legumes. Grown on well-drained fertile soils, birdsfoot trefoil is not as productive as alfalfa. Therefore, it is important that trefoil be grown where other legumes are not well adapted. Forage quality tends to be high due to smaller stems and tannin induced bypass protein. Trefoil is a short-lived perennial, with original plants persisting two to three seasons under good management. However, this species will produce volunteer stands when allowed to reseed. Stand establishment can be difficult due to poor seedling vigor. In Kentucky, this species is best adapted to the cooler regions of the state.

Sericea lespedeza (*Lespedeza cuneata*) is a non-bloating, warm-season perennial legume that is well adapted to Kentucky. It possesses an extremely deep tap root that imparts excellent drought tolerance. It is resistant to many diseases and has few insect problems. Sericea persists on acid soils that are low in fertility making it well adapted to pastureland in the southeastern U.S. High tannin levels in older varieties greatly decrease palatability. Newer cultivars have lower tannin levels, finer stems, and increased grazing tolerance. Poor seedling vigor makes establishment difficult. In most cases, sericea must be planted in pure stands, with an adapted cool-season grass being drilled in once the lespedeza is well established. Like alfalfa, this species must be rotationally grazed to be persistent.

Annual lespedezas (*Kummerowia stipulacea* and *Kummerowia striata*) are summer-annual legumes that are well adapted to Kentucky. In the past, annual lespedeza was widely used, but with the increased availability of lime and fertilizer it has been replaced with more productive cool-season legumes. This species can be frost seeded or drilled into closely grazed perennial cool-season grass pastures to increase summer forage availability and may be an excellent choice for rented pastureland where lime and fertilize inputs cannot be justified.

Annuals versus Perennials

In Kentucky, cool-season grasses produce ample forage in the spring and fall, but high and low temperatures limit summer and winter growth. Summer and winter annuals can fill this gap with relatively high quality forage when properly managed. Advantages to using annual grasses include fast germination and emergence, rapid growth, high productivity, and flexibility of utilization. Annuals can be grazed as needed and excess growth can be harvested as hay or silage. Major disadvantages include the high cost of annual establishment and the increased risk of stand failure due to variable rainfall during spring and fall establishment periods. In most cases, profitable ruminant livestock production will be based on well adapted perennial sods that require minimum maintenance and supplemented with annuals as needed.

Winter Annuals

Wheat (*Triticum aestivum*) is one of the most versatile small grains for a farming operation. Due to its excellent winter hardiness, wheat can be sown later in the fall than barley has good potential for pasture, silage or hay production. Wheat will withstand wetter soils than barley or oats, but tends to be less tolerant of poorly drained soils than rye and triticale. Newer winter wheat varieties with Hessian fly resistance can be seeded as early as late August and produce an abundance of excellent fall grazing. Managed properly, wheat can be grazed in the fall, again in early spring, and finally harvested for grain, hay or silage.

Barley (*Hordeum vulgare*) is generally more susceptible to winterkill than wheat, especially when it has been overgrazed. It should not be grazed as short or as late into the fall as wheat. Barley does best on fertile, well-drained soils. It is sensitive to acidic soil conditions and pH should be maintained above 5. Barley produces high quality silage or hay with a higher digestibility than other small grains, but lower yields. Good quality grazing can be obtained from early seeded barley.

Triticale (X *Triticosecale) i*s a high yielding forage crop that is gaining popularity throughout the country and particularly in the Midwest. Triticale generally has a higher forage yield, but lower quality than wheat. It is a cross between rye and wheat. As such, it is adapted to a wide range of soils. Tolerance to low pH is better than wheat, but not as good as rye.

Rye (*Secale cereale*) is the most cold tolerant and least exacting in its soil and moisture requirements of all small grains. Like wheat, rye can be sown in late August to provide fall grazing, excellent winter ground cover, and spring grazing. The rapid growth of rye, both in the fall and spring, makes it the most productive of the small grains for pasture. Rye is the earliest maturing of the small grains. The release of several grazing type ryes has provided better varieties for grazing and silage. Rye tends to be a more consistent producer of spring pasture than wheat, although it quickly becomes stemmy and unpalatable in late spring.

Winter Oats (*Avena sativa*) produce very palatable forage and are best adapted to well-drained clay or sandy loam soils. They do not perform as well under extremely dry or wet conditions as wheat or rye. Although oats produce high quality forage, yields tend to be lower than the other small grains. As a rule, the hardiest winter oat variety (Kenoat) is considerably less winter hardy than common wheat and barley varieties. However, in the southern US, oats will usually survive most winters. Similar to barley, winter oats must be seeded in mid-September to be well established before cold weather arrives.

Annual ryegrass (*Lolium multiflorum*) is a cool-season annual that can provide late fall, winter, and early spring grazing. Attributes of annual ryegrass include ease of establishment, high yields, high nutritive value, and later maturing than the small grains. In contrast to small grains, annual ryegrass continues to regrow in the spring until high temperatures limit growth in early summer. Annual ryegrass is commonly used to overseed summer pastures, thereby extending the useful season of this land area. It is adapted to all soil types and grows best at a pH of 5.7 or higher. The highest yields are obtained on fertile and well-drained soils with nitrogen fertilization.

Summer Annuals

Sorghum species (*Sorghum bicolor*) include sudangrass, sorghum, and sorghum-sudangrass hybrids. These species are tall growing coarse annuals that are best adapted to well-drained, fertile soils, but will grow on imperfectly drained soils when surface water is removed. These grasses do not tolerate low pH and require liming when grown on acid soils. The sorghum species contain prussic acid and can cause poisoning in ruminant livestock when young, drought stressed, or frosted forage is grazed. Research conducted in Virginia has shown that on average, varieties containing the brown midrib trait (BMR) are approximately 5% more digestible. Therefore, inclusion of cultivars containing the BMR trait into forage production systems is highly encouraged.

Pearl millet (*Pennisetum americanum*) has smaller stems and tends to be leafier than forage sorghum, sudangrass, and sorghum-sudangrass hybrids. It is better adapted to more acid soils and soils with a lower water holding capacity than the sorghum species. Pearl millet grows rapidly and will provide grazing in as little as 45 to 60 days. Unlike *Sorghum* species, there is no concern

with prussic acid poisoning, so grazing can begin earlier. Dwarf varieties are available and tend to be better suited for grazing.

Crabgrass (*Digitaria* species) is commonly considered a weed, but possesses significant potential for supplying high quality summer forage. A primary advantage of crabgrass is that it is well adapted to Kentucky and occurs naturally in most summer pastures, especially those that have been overgrazed. Crabgrass is best adapted to well-drained soils such as sands, sandy loams, loamy fine sand, loams, and silt loams that do not crack extensively. It can produce grazable forage in as little as 35 days, but normally 40 to 60 days is required. Like pearl millet, it does not contain prussic acid. Although crabgrass is an annual it acts like a perennial through prolific reseeding. Therefore, it must go to seed at least once during the growing season. Shallow tillage in late winter or early spring incorporates the volunteer seed and helps to ensure a uniform stand.

Brassicas

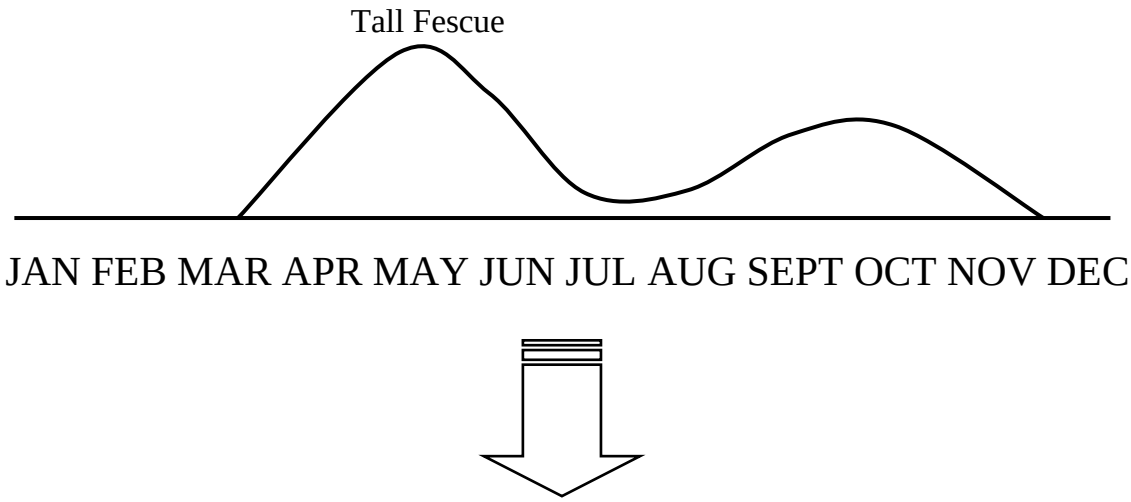
Brassicas include **kale** (*Brassica olleracea*), **rape** (*Brassica napus*), **swede** (*Brassica napus*), and **turnip** (*Brassica rapa*). Rape, turnip, or stemless kale can be planted in late spring to provide forage during the late summer period. Kale and swede can also be seeded in late spring, but will provide grazing in the late fall to early winter period. Rape and turnips can be planted in late summer to provide late fall and early winter grazing. All brassicas require well-drained, fertile soils and a near neutral pH for optimum production. Strip grazing is needed to maximize utilization of brassicas. If regrowth will be grazed, a back fence is required. Brassicas can be 90% digestible and can cause health disorders if not properly managed. Problems can be avoided by following several common sense recommendations: 1) introduce animals to brassica pastures slowly, 2) never turn hungry animals that are not adapted into brassica pastures, 3) brassicas should not make up more 75% of diet, and 4) allow access to grass pasture or dry hay at all times.

Putting the Pieces Together

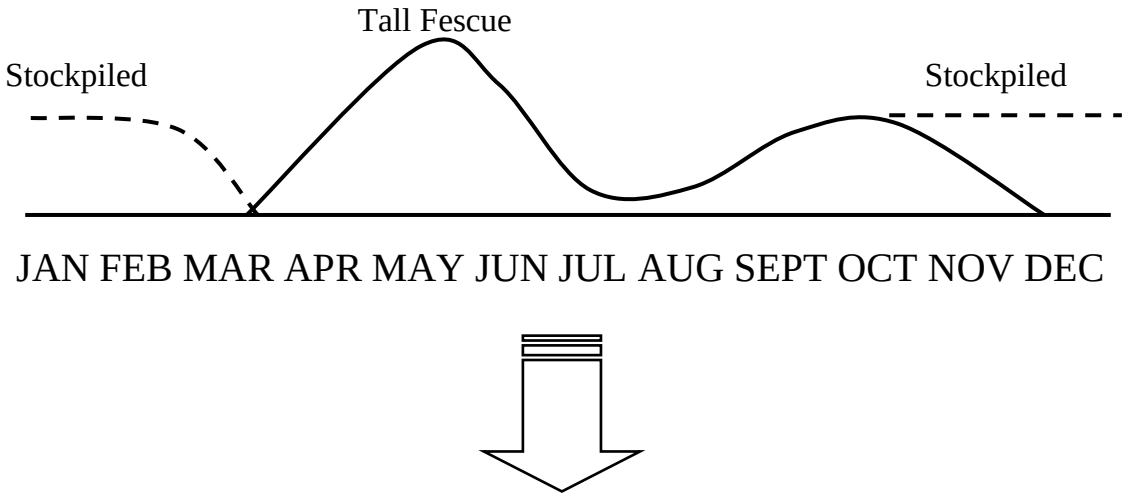
If you ever go onto two different farms and find two identical grazing systems, then one is wrong. Grazing systems are unique and dynamic entities that change and evolve as needs and experience level of grazers change. There is no one right or wrong grazing system. It is your job to build a system that meets your particular needs. Below you will find an example of a grazing system for the southern portions of western Kentucky. I would like to add a word of caution. It is always easier to make a grazing system work on paper than it is in real life. It is important to build flexibility into your grazing system that will allow you to adapt to the constantly changing weather conditions that we encounter in Kentucky and other transition zone states.

Example: A Grazing System for Western Kentucky

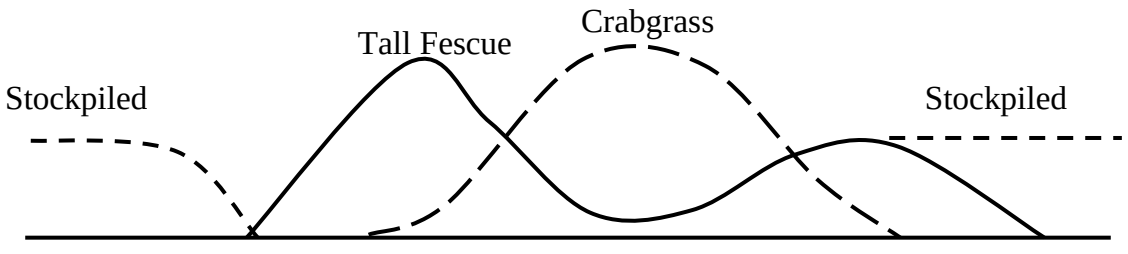
Start with a tall fescue-clover mixture. Note the summer slump in forage production and the need to feed hay during the winter months.



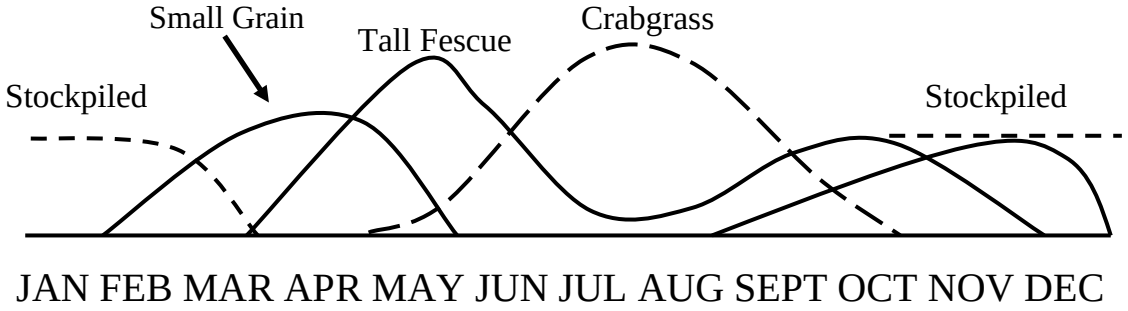
The first thing we can do to extend grazing is to actively stockpile tall fescue for winter grazing. This greatly increases the length of our grazing season. We still have a forage deficit in the summer months.



Next, we add crabgrass, a warm-season annual grass that is very palatable and highly digestible, into our forage chain. The addition of crabgrass levels off our seasonal distribution of forage by filling in the forage deficit during the summer months. We still have several short periods in the spring and fall that need to be filled in.



We then interseed a cool-season annual (small grain or annual ryegrass) into the crabgrass stands in late summer or early fall. The result is a grazing system that comes very close to meeting our desired goal of year-round grazing.



Conclusion

In Kentucky, high temperatures and intermittent rainfall in the summer and cool temperatures during the winter limit the growth of cool-season pastures. However, a wide variety of both cool- and warm-season species can be grown in this region. Assembled into a forage chain, these species can provide year around grazing in many years. However, forage chains do require higher levels of management. It is important to remember that the simpler that you can keep your forage chain, the easier it will be to manage.