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MANAGING FORAGE RISK IN THE MID-SOUTH

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Forage risk is one of many risks livestock producers face each year. Livestock operations with cattle, sheep, goats, and equine rely heavily on pasture and mechanically harvested forage to provide a large portion of the feed needs of their livestock. The primary risk associated with forage is production, but financial and market risk are also present. Thus, managing forage risk is an important aspect of operations that utilize forages.

Livestock producers frequently ask the question of how to feed livestock for 365 days a year and how to achieve that goal at the least cost without sacrificing livestock production goals. Pasture and hay production can account for a large percentage of annual costs when raising livestock (Griffith and Bowling, 2024). Thus, it is important to manage the cost of pasture and mechanically harvested forages while ensuring there is adequate production to meet animal nutrient and intake requirements. The objective of this paper is to outline some of the major forage risks producers face and to provide an approach to mitigate these risks.

Types of Forage Risk

Forage risk includes production, financial, and market risk. Production risk includes forage yield, forage quality, forage production timing, and accumulation of nitrates or prussic acid. Forage yield and forage quality are influenced by quantity and timing of precipitation, temperature, disease, soil nutrients, forage species, and timing of harvest. Forage production timing is influenced by all the aforementioned factors with the forage species being the primary determinant. Additionally, some forages tend to accumulate nitrates during drought stress while others may produce prussic acid following a frost. These are conditions that can lead to disposing of forage or delaying use of forage.

Financial risk and market risk are closely related. Financial risks associated with forage production are largely associated with time periods when forage production has been reduced for some reason. When forage and hay production declines, it generally results in increased feed costs to maintain livestock, which directly influences profitability. Similarly, when additional feed resources are needed, there is a cost of finding an alternative feed source, which may include the physical time of locating additional feed resources or the trucking of feed resources from long distances. Similarly, market risk in forage production can come from the need to sell livestock prematurely to ration forage resources or selling livestock that would have not otherwise been sold during that period. Another form of market risk would be associated with hay prices increasing due to reduced hay supply.

Approaches to Manage Forage Risk

There are several ways to manage forage risk. Some can be rather expensive while others may be less expensive. The more expensive ways to manage forage risk include producing or purchasing more hay than is typically needed and storing the forage, forced livestock sells, and to self-insure, which would mean taking on all the risk. Potentially more desirable methods to manage forage risk may include reducing the stocking rate, forage species diversification, and forage insurance.

Reduce the stocking rate: Many producers stock pastures based on optimal conditions and thus maximum forage production in a given year. This often results in too many animals for the annual quantity of forage and often leads to overgrazing pasture, which results in the need to renovate pasture more frequently. When setting a stocking rate, producers should consider the forage type and time of year, because forage production from a single species is not constant throughout the year. Forage availability is seasonally-dependent for a given species as can be seen in Figure 1 with cool-season perennial grasses such as tall fescue and orchardgrass. As producers consider the seasonal component of forage availability, it is also important to consider the animal size. It is common to think about the number of acres per animal, but it may be

more appropriate to think in terms of pounds of animal per acre given the forage base, time of year, and animal stage of production. In Tennessee, a good place to start with stocking rate is 500 to 600 pounds of animal per acre and then adjust to fit a specific production system. Reducing the stocking rate may result in times when all forage is not utilized, but this is often a better situation than consistently being overstocked.

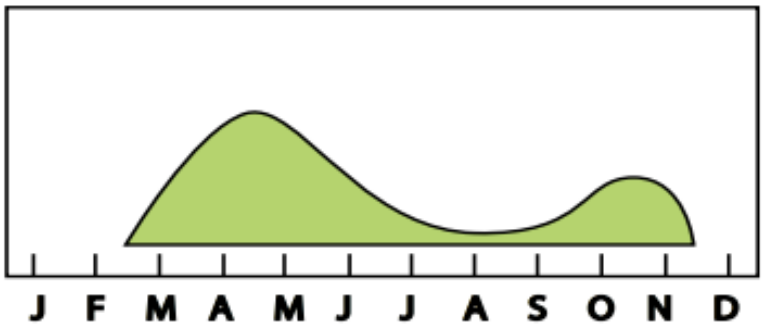

Figure 1. *Yield distribution of cool-season perennial grasses (Bates, 1999)*

Forage diversification: In the Mid-South region (i.e. Arkansas, Kentucky, Missouri, North Carolina, Tennessee, Virginia, and parts of other surrounding states), livestock producers commonly rely on cool-season perennial forages such as tall fescue as pasture from April through October with some reliance on volunteer warm-season grasses through the summer, which can result in overgrazing cool-season perennial pastures when sufficient precipitation is not received. Those producers then rely on hay the remainder of the year. One alternative to alleviate some grazing pressure on cool-season perennial pasture and potentially reduce the length of hay feeding is to include a warm-season perennial grass such as bermudagrass, gamagrass, switchgrass, big bluestem, little bluestem, or indiangrass. Another alternative may be an improved variety of crabgrass that will reseed itself annually or to use summer annuals that are seeded annually.

The use of a warm-season perennial grass or a summer annual will reduce grazing pressure on cool-season perennial pastures, which may provide perennial pasture enough rest to lengthen the fall and early winter grazing season. Figure 2 illustrates how warm-season grasses can fill the summer gap in cool-season grass systems and relieve cool-season grass from being overgrazed during the summer months. The lengthening of the grazing season could result in fewer days of feeding hay. Another alternative to reduce the number of days feeding hay is planting winter annuals for grazing. Depending on the time of planting and winter annual planted, the grazing season could be extended in the fall and early winter and increase grazing days in late winter and early spring. Thus, an increase in grazing days could also reduce the number of days hay is fed.

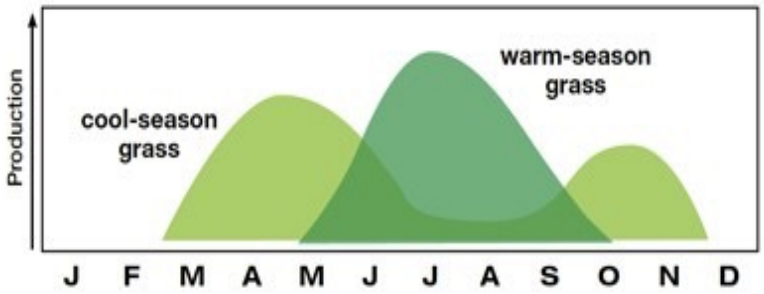

Figure 2. *Yield distribution of cool-season perennial grasses and warm season grasses (Keyser et al., 2012)*

Pasture, Rangeland and Forage Insurance: Pasture, Rangeland and Forage insurance (PRF) is an insurance product administered through the United States Department of Agriculture-Risk Management Agency. It can be purchased through an approved crop insurance provider. PRF is an insurance product that makes indemnity payments to policy holders when their area receives below average rainfall. For more specifics of how the program works and how it can be used in managing risk, please refer to Griffith (2017).

Putting the Numbers Behind It

Managing any type of risk takes time and effort. Thus, it is important to demonstrate how management of forage risk can influence profitability or net return to the operation, and therefore make it worth a person's time to manage such risk. In most instances, managing forage risk is associated with increasing the number of days livestock can graze while simultaneously reducing the number of days hay or other mechanically harvested feedstuffs are needed. This is most easily demonstrated using an example, and the example will be a cow-calf operation with the following assumptions:

- 30 spring calving cows weighing 1,200 pounds on average
- 90 percent calf crop (27 calves)
- 60 acres of cool-season perennial pasture (2 acres per cow-calf pair of grazed forage)
- 150 days of hay feeding (fed 30 pounds per head per day = 2.25 tons per cow = 67.5 tons for the herd = 22.5 acres of hay at a 3 ton per acre yield) (This underestimates hay needs as it does not adjust for moisture or feed waste.)
- $160 per acre per year cool-season perennial pasture expense
- $390 per acre per year hay ground expense ($130/ton)

Given the base assumptions, the total annual cost for pasture and hay when only utilizing a cool-season perennial is $18,375 or $612.50 per cow (Table 1).

	Unit	$/unit	Quantity	Total Cost	$/cow
Pasture	acre	$160.00	60	$9,600.00	$320.00
Hay	acre	$390.00	22.5	$8,775.00	$292.50
			Total cost	**$18,375.00**	**$612.50**

Table 1. *Total Annual Pasture and Hay Cost, 30 cows (Cool-Season Perennial Only, 150 Days of Hay Feeding)*

If a warm-season perennial was instituted into the system for grazing then it could feasibly reduce grazing pressure on the cool-season perennial, allow for stockpiling in late summer and early fall and thus extend the grazing season. Research has shown that many of the warm-season perennials can provide approximately 200 animal unit days of grazing per acre each year (Biermacher et al., 2012; Lowe et al., 2015). If 15 acres of the pasture were in a warm-season perennial, it could provide approximately 100 days of grazing for the 30-cow herd, which would provide sufficient time to stockpile the 45 acres of perennial cool-season pasture for fall and winter grazing. (Please refer back to Figure 2). Using a conservative 60 days of additional grazing means that hay would only have to be fed for 90 days. Table 2 details the cost of the cool-season and warm-season pasture with 90 days of hay feeding as well as the difference compared to the cool-season perennial only. The warm-season perennial pasture cost was assumed to be $220 per acre, which is more expensive per acre than the cool-season perennial cost per acre, but it also reduces the required number of hay acres by nine acres (22.5 acres with only cool season grasses compared to 13.5 acres with cool and warm season grasses). Replacing 15 acres of the cool-season perennial pasture with warm-season perennial pasture reduced the cost per cow by $87 per head to $525.50 per head and reduced the total cost of pasture and hay by $2,610 to $15,765.

	Unit	$/unit	Quantity	Total Cost	$/cow
Pasture					
Cool	acre	$160.00	45	$7,200.00	$240.00
Warm	acre	$220.00	15	$3,300.00	$110.00
Hay	acre	$390.00	13.5	$5,265.00	$175.50
			Total cost	**$15,765.00**	**$525.50**
			Difference from cool-season only	**$87.00**	**$2,610.00**

Table 2. *Total Annual Pasture and Hay Cost, 30 cows (45 acres Cool-Season Pasture, 15 acres Warm-Season Pasture, 90 days of Hay Feeding)*

Using a similar approach and interseeding a winter annual such as ryegrass in the 15 acres of bermudagrass may also reduce the number of days of hay feeding and diversify production risk associated with forage. Based on variety trials at the University of Tennessee, annual ryegrass can produce three to five tons of dry matter per acre. Figure 3 illustrates forage production yield of four winter annuals in Georgia (Hancock, 2017). Thus, 15 acres of annual ryegrass producing three tons of dry matter per acre could theoretically provide 100 days of grazing for the 30-cow herd. However, it would conservatively guarantee 60 days of grazing for the cow herd, which will be the assumption for the example calculation. Table 3 specifies the cost of 45 acres of a cool-season perennial and 15 acres of a warm-season perennial interseeded with a winter annual. The winter annual is assumed to cost $180 per acre. It is assumed hay feeding with the winter annual and the warm-season perennial is reduced to 30 days, decreasing the required number of hay acres to 4.5 acres (compared to 22.5 acres in table 1 and 13.5 acres in table 2). Thus, total cost per cow from pasture and hay is $498.50, which is $114 per head lower than the cool-season perennial pasture only system. This system can feasibly reduce total pasture and hay cost by $3,420.

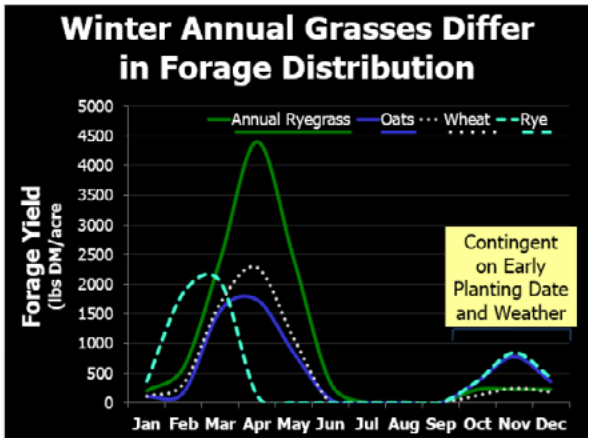

Figure 3. *Yield and yield distribution of four winter annuals in Georgia (Hancock, 2017.)*

	Unit	$/unit	Quantity	Total Cost	$/cow
Pasture					
Cool	acre	$160.00	45	$7,200.00	$240.00
Warm Annual	acre	$180.00	15	$2,700.00	$90.00
Warm	acre	$220.00	15	$3,300.00	$110.00
Hay	acre	$390.00	4.5	$1,755.00	$58.50
			Total cost	**$14,955.00**	**$498.50**
			Difference from cool-season only	**$114.00**	**$3,420.00**

Table 3. *Total Annual Pasture and Hay Cost, 30 cow (45 acres Cool-Season Pasture, 15 acres Warm-Season Pasture, 30 days of Hay Feeding)*

As it relates to stocking rate and PRF insurance to manage forage risk, it is not as easy to quantify the risk adjusted costs and net returns. However, overgrazing perennial pasture stresses the pasture and will shorten the stand life of those pastures, which supports a moderate stocking rate. Being severely understocked can also be expensive by having fewer animals to market each year. Thus, producers should stock pastures conservatively but not too conservatively. As was previously stated, starting with a stocking rate of 500 to 600 pounds per acre is appropriate. The stocking rate can then be adjusted based on production system, site, and weather.

PRF insurance is similar in that it is based on a rainfall index. Below average rainfall in a certain time period can trigger indemnity payments that can be used to purchase hay or other feedstuffs for livestock. However, the rainfall index does not track forage production precisely. There are several options as it relates to PRF insurance, which can result in the product being highly variable in cost and potential payout if an indemnity is warranted. Tennessee forage producers have covered more than 1.1 million acres from 2016 through 2024 with 93.6 percent of those acres being covered at the 90 percent coverage level. The average cost has ranged from $4 to $12 per acre depending on the coverage level. Tennessee forage producers have paid $13.4 million in premium and received $12.5 million in indemnity payments (USDA-RMA, 2024). For more information on PRF, refer to Griffith (2017). These three forage risk management strategies can be used separately or in conjunction with each other.

Conclusion

Managing forage risk is an integral component of managing the overall risk profile in livestock production. There are several practices that can be employed to manage forage risk including managing the stocking rate, diversification of forages, and PRF insurance. This publication provided some examples of how forage diversification can reduce hay needs and reduce total cost to an operation. However, there is no guarantee that hay needs are reduced every year. What forage diversification does is provides more days in which successful forage production can occur since they all have different growing seasons and grow under different growing conditions. None of these practices can guarantee successful forage risk management, but employing some of them will likely benefit many livestock operations.

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