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In February, I gave a presentation at the Wisconsin Grazing Conference that was part of a session on grass management. In my part of the session, I talked about how dairy farmers in southwestern Missouri have started managing their grasses based on leaf stage, which is something a group of us picked up during a trip to New Zealand a couple of years ago. I got the idea that not everyone in the audience agreed with what I was saying. Part of that might have to do with feelings that what farmers do in New Zealand has almost no application to what we do in the U.S. Another part of that may have to do with many people feeling that “every farm is different,” so we can’t develop thumb rules for grazing management based on quantifiable measurements, planning or anything else that we can put down on paper or on a computer program. To a degree, these people are right. U.S. conditions are different from those in New Zealand. However, people must realize New Zealand is not the virtual utopia they have perceived in their minds. The northern most part of the north island is semi-tropical with heat and humidity while the southern tip of the south island will freeze calves to death during their spring calving season. Rainfall can be from 20 to over 100 inches annually. And with no government support it is not all roses for their producers either. Also, soil types, moisture availability, winter weather — all of these factors vary greatly from place to place within the U.S. I’m not saying every U.S. grass farmer needs to do everything the same as they do in New Zealand. But we all do have certain things in common with farmers in New Zealand, and with grass farmers throughout the U.S. We want to have profitable, efficient operations that offer an enjoyable way of making a living.

I happen to think that to achieve these goals, grass farmers need to follow the “Three Ms”: measure, monitor, manage. Maybe some well-established graziers with years of experience in grazing can afford to fly by the seat of their pants, and some have been successful using the “gut feel” approach. Yet it is my view that this approach is hurting many other graziers by reducing their productivity, increasing their costs, and making their lives less enjoyable. The lack of thumb rules also doesn’t provide much help to newer graziers who are looking for help in managing their pastures. All of the other highly developed grazing nations in the world are measuring, monitoring and managing, and there is no reason why we in the U.S. shouldn’t be doing the same. Let’s look at the “three-leaf” stage recommendation that seems to have caused a bit of a stir. Research in both the U.S. and other countries has demonstrated that various species of grasses will maintain a set number of live, viable leaves. Fescue and perennial ryegrass (which are in the same grass family) are predominately three-leaf plants, meaning that as the fourth leaf emerges, the first leaf begins to die. Orchardgrass is considered a four- to five-leaf plant — it won’t go beyond that number.

The aim of good pasture management is to grow a large amount of high quality pasture, the majority of which will be either eaten or harvested, and which will persist for the maximum possible time. I believe a bit of plant physiology may help in understanding the leaf stage concept and/or canopy closure. The lifespan of a leaf from fescue or ryegrass is equal to the time taken for 3 leaves to grow per tiller. As each new leaf grows after this 3 leaf stage the oldest or first leaf grown dies. This is a simple principle for good grazing management for fescues and ryegrasses...leaves have a limited lifespan and if not eaten or harvested will die and be wasted. Grazing after the 3-leaf stage will result in wastage of feed due to increased dead leaves in the lower canopy, increased shading of daughter tillers and clover plants reducing their viability, decreased feed value due to increased fiber and declining energy, protein and digestibility levels as well as the potential for increased seed head production in the spring from stem elongation.

The simplicity of the 3 leaf stage for ryegrass and fescue can be a great rule of thumb if producers take time to monitor and manage. The key terminology is “leaf stage” as most species of grasses will have their own physiological “leaf stage” that can be used for optimum grazing that maximizes productivity, quality, utilization and persistence which all play into profitability for the overall operation. Amazingly utilization of the “leaf stage” rule is a management practice that can maximize all four of these factors.

I always question why we should sacrifice quality throughout the season and then have to use more supplements to make up for what we already had. Supplementation then becomes a band-aid rather than a complimentary additive.

The plant’s main focus post grazing (residual 2-3 inches) is to re-establish its photosynthetic energy factory, the leaf. Root growth and daughter tiller development is generally stopped after grazing while carbohydrates are being mobilized from the stubble to provide energy to the first new leaf’s growth. It is not until after the first new leaf is fully emerged that carbohydrates are beginning to be stored again. This can be signal to the root system to begin growth again. It is not until the 2 leaf stage that carbohydrates are being sent to daughter tillers and potential tillering begins. It is not until the 3 leaf stage that root growth and tillering are fully active, carbohydrate stores in the tiller base has been replenished and growth is maximized. This would be the optimum time to graze or harvest. When the 4th leaf emerges the original or first leaf begins to die and the photosynthetic ability of this leaf is greatly diminished and eventually has no benefit to the plant at all. Forage quality is reduced, chances of fungal or rust diseases increase and palatability and digestibility of the plant is reduced for the animal. Additionally, light reaching the daughter tillers and clover plants is reduced affecting their productivity. Leaf growth will continue (4, 5, 6 leaves etc.) while the build-up of dead or dieing matter accumulates in the under canopy as the fescue or ryegrass plant will generally only have the 3 live leaves. Grazing to the 2-3 inch residual becomes difficult as cows will normally refuse the lower part of the canopy thus the critical need to graze at the plants proper physiological state. Residuals may be somewhat shorter in the early spring and gradually rise with a maximum 3-3.5 inches in the summer to reduce light penetration from increasing soil temperature and/or drying the soil to quickly. Grazing too quickly (before 2 leaf stage) for prolonged periods of time will lead to the carbohydrate depletion and eventual dry matter yield reduction and possible plant and daughter tiller death.

Now, each producer has their favorite grass. It will be imperative for them to investigate these physiological properties we have discussed for ryegrass and fescue. The concept will work for most all forages; you just have to know the parameters for your favorite grass (leaf stages and post grazing residual). We have let the plant do its thing. Grow new leaves, replenish its root reserve and now harvest at the THAT plant’s physiological leaf stage. I have to emphasize for the producer to do their own research and discover if their favorite grass can meet these criteria, leaves (whatever number) and height (whatever height) that are species specific and will allow the plant to thrive and persist. Even if the plant cannot follow leaf stage or canopy closure protocols there will be other “rules of thumb” a producer will discover. Many of our producers in Missouri have been through the “take half-leave half” to lax or tight grazing to actually measuring dry matter in the paddocks and now additionally monitoring leaf stage throughout. Their systems have evolved as they have become better grass based dairy producers.

It cannot be over-emphasized, harvesting the grass beyond the 3 leaf stage in fescue and ryegrass will reduce quality and potentially intake for dairy cows, thus sacrificing milk production. There are certainly conditions that can contribute to modifying a strict leaf-count management system,

but the system in general makes perfect sense in terms of the plant's growth cycle, and it has been proven to work in many climates and countries.

Measuring and monitoring post-grazing forage residual is also important to managing pastures. Let's look again at ryegrass and fescue. To maintain quality in these grasses, cows must harvest the forage to a residual down to 2 to 2.5 inches. Research has shown that more than 80% of the carbohydrate stores are in the bottom 2 inches of the plant, so having the cows harvest that plant to this height has little negative effect on plant longevity — as long as the plant is allowed to re-grow back to the three-leaf stage when all carbohydrates are fully replenished. Unpublished research at University of Missouri over a two-year period showed an annual advantage of more than 2,000 pounds of dry matter per acre when fescue and perennial ryegrass plots were clipped to a height of two to three inches rather than five to six inches. This shouldn't be surprising, as evidence of this can be found in many Missouri yards. Australian researchers promote grass harvest at canopy closure, or where the ground directly below canopy cannot be seen. Drs. Danny Donaghy and John Roche, senior scientists with the Tasmanian Institute of Agricultural Research, have data from the tough climates of Australia suggesting that canopy closure generally matches the 2-plus leaf stage for ryegrass. This strategy is easy for producers to grasp and manage. Yes, brome grass and reed canarygrass will require taller post-grazing residuals for optimal re-growth. But it's important to recognize that there are appropriate strategies — thumb rules — for all of these forages, we need to recognize them, and we can fine-tune these strategies by measuring, monitoring and managing.

Measuring pasture is critical in understanding the amount of forage you have right now, and for establishing a plan for grazing pressure for the next seven to 10 days. You don't have to use an expensive electronic meter or a sophisticated computer program. A good grazing stick can work if you take enough measurements, do it often enough, and record and calculate the information. This is how you learn where to go next with your herd, and how much post-grazing residual to leave. This measuring may be a bit daunting to the beginning grazer, what with the time involved in the collecting and calculating the data. But the rewards in terms of potential reductions in fertilizer use and hay/grain feeding can make it all worthwhile. The monitoring is much easier and less time consuming, as counting leaves simply requires grabbing and counting a handful of grass in the tallest paddocks. That's all it takes to know whether the pasture has reached its maximum growth. With experience, you'll be able to visualize that a paddock ready to graze in the spring with three leaves may have a dry matter reading of 2,800-3000 pounds per acre, while in the hot summer months the same field may reach three leaves at 2,400 pounds. Management is obviously involved in all of this. Measuring and monitoring allows us to manage feed demand deficits or surpluses by making adjustments to supplemental feed, remove paddocks from the grazing system for mechanical harvesting, or change fertilizing plans. The key to a successful grazing operation is the development of a "systems" approach to the operation, and developing within each system a set of operating procedures that can be evaluated and adapted to make the operations work more efficiently.

Let's look at a concrete example, something that happened here in southern Missouri a few weeks ago. Pasture growth was approaching 100 pounds/day/acre for annuals, and nearly 70 pounds/day/acre for perennial forages. Many producers were calculating how many acres to pull from the system for silage based on these growth rates and their daily feed demand need (around 40-60 pounds per day/acre). But three days of severe freezes wiped out entire orchards, and sent grass growth rates to zero. Many grass farmers who had made silage were forced to immediately feed back that harvested feed. Which farmers reacted correctly — the ones who harvested, or the ones who didn't? The answer is the ones who had a plan or a system they followed for managing their forages and cows. A history of growth rates may have given these producers confidence to

not harvest silage, or to harvest smaller amounts, but we are still in developing stages of this kind of historical data on growth rates. In the majority of years the producers who planned to harvest based on key performance indicators they have established for their farm (average farm cover, daily feed demand, average daily growth rate) would have been ahead of the ones who did not harvest. Their goal in harvesting was to maintain forage quality and the grazing wedge throughout the upcoming season as well as to have quality forage to feedback during periods of reduced growth. The key is they had a plan and stuck with it...we just all got bit and bit hard this spring from 80 degrees to teens in 12 hours.

Not all protocols, standards or “rules of thumb” will work from farm to farm. The critical factor is having the intelligence to recognize something of value, and adapting it to your own operation. Perhaps a producer’s operation does not utilize ryegrass, fescue or orchardgrass — maybe the predominant species is bromegrass. If that’s the case, let’s say that by investigating bromegrass physiology, the producer discovers it grows five to six live leaves before the original leaf begins to die, and that post-grazing residuals may need to be four to six inches for continued productivity and persistence. At that point, this producer can develop a guideline for management using leaf stage on a few bromegrass acres to see how this protocol will on his farm. To simply “fly by the seat of the pants” is silly, and requires years of experience to finally get your management correct. Developing procedures for your farm from other experienced producers, and reliable research entities with the producer’s interest at the heart of their program, will be the most efficient way for grass farmers to establish profitable operations. Traveling from state to state, as well as internationally, will offer insights you may not otherwise experience. It is certainly critical to understand what may work, and how to adapt that policy to fit your operation. But measurement, monitoring, management — and thumb rules — need to play an important role in all of this.