Texas A&M AgriLife Extension

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Matching the Cattle Production Cycle to Forage Availability on the High Plains

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To decrease the financial and biological risks associated with inadequate animal performance, it is critical that you match the livestock production cycle to the availability and quality of forages over a reasonable range in variability. Failing to do so in a year of extreme conditions can cause a financial crisis and force herd liquidation or loss of a business—even one that has had respectable average profits.

The following examines how to match the quantity and quality of forage to varying livestock demands during a normal year and discusses how to provide some flexibility in the face of unpredictable conditions. The focus here is on how to match brood cow nutrient requirements most closely with forage availability and quality while considering the natural range in variability in precipitation and growth within and among years in the Texas high plains. We also include suggestions for maintaining stocking flexibility when growing conditions are less than favorable.

Forage production varies through the year

Figure 1 illustrates the relationship between average monthly rainfall and forage production on native range in Amarillo. Forage production closely tracks monthly rainfall from April through June. However, after June, rainfall produces less feed because higher temperatures and evaporation rates, and advanced plant maturity lower plant production efficiency.

As new growth decreases and plants mature, die, and weather, the density and digestibility of forage nutrients decrease. Consequently, diet quality will likely track with the red bars in Figure 1. It is highest in mid to late spring and lowest in the dormant season.

Forage availability will likely be greatest in the late growing season and then gradually decrease through the dormant period. Cool season forages such as small grain fields can extend the availability of high quality forage during the year. However, this type of forage can be expensive to produce and is not typically used for brood cows. Alternatively, increasing perennial native cool-season forages, such as western wheatgrass, can be a cost-effective way to meet the cows' requirements for more of the year.

Requirements also change through the year

Nutrient requirements are based on body size and physiological status including growth, milk production, and fetal development. Large cows need more nutrients than small cows, and cows with greater milk production potential need more nutrients during lactation as well as for maintenance.

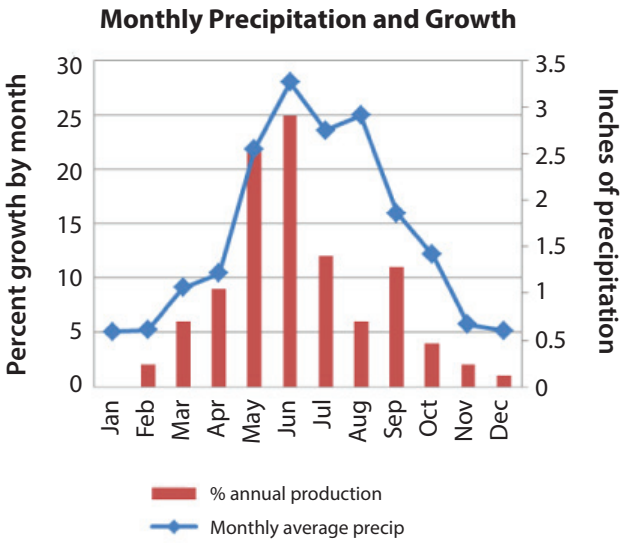

Figure 1. Monthly precipitation vs. monthly forage production for a representative site in the Texas Panhandle. Forage production efficiency is lower in late summer because of higher temperatures and plant maturity.

To maintain a 365-day calving interval, a cow must breed within 80 to 85 days after calving. The average postpartum interval (time that a cow is not cycling after calving) has been measured as 50 days or longer. However, this interval can be higher or lower depending on herd genetics, day length, nutrient intake, and body condition. A cow must be bred within 30 to 35 days after the average postpartum interval to maintain a 365-day calving interval.

Understanding how energy is partitioned in the beef cow is important to matching cow requirements to forage resources. A lactating cow that has not reached mature body weight uses dietary energy for maintenance, milk, and growth before it is used for reproduction. Using energy for growth is a major reason that cows calving the first time at 24 to 27 months old are the most likely to be open at the end of the next breeding season.

Nutrient requirements vary according to stage of production. The cow production cycle consists of peak lactation, pregnant and lactating, mid-gestation, and late gestation. The peak lactation phase begins at calving and lasts about 85 days, by which time the cow should be bred. Based on the National Research Council's *Nutrient Requirements of Beef Cattle 2000,* nutrient requirements are highest approximately 60 days post-calving.

After the cow is bred and lactation continues (pregnant and lactating phase), cow requirements decrease approximately 20 percent compared to their peak as the cow reduces milk production. Nutrient requirements for pregnancy are minimal during this period. However, from 90 days old through weaning, the calf will consume approximately 30 percent as much forage as a mature dry cow. Therefore, the lower cow requirement after peak lactation may be offset or exceeded by what the calf consumes. During drought, you can reduce grazing pressure by weaning calves early and ceasing lactation. After weaning until about 90 days before giving birth (mid gestation), cow nutrient requirements decrease an additional 10 percent from what they were during late lactation.

The final phase is late gestation. During this 90-day period, the fetus doubles in size. Here cow nutrient requirements increase but are still only 80 percent of what they were at peak lactation. Inadequate nutrition during this phase can reduce a cow's body fat reserves. Adequate fat reserves make calving easier and improve calf vigor.

Matching changing cow requirements to changing forage resources

The grids on page 3 can help you determine the optimum time for calving by matching the curves for nutrient needs and nutrient availability. The example provided assumes native rangeland forages in the Texas panhandle in an average year. If your forage resources differ (crop aftermath, small grain pasture, etc.) you can make your own estimates. The following instructions will help you estimate forage quality and quantity and compare them to cow requirements.

First, estimate an index of availability/quality as follows.

1. Rate your forage quantity for a month on a scale of 1 to 3, with 3 being the best
2. Rate your forage quality for the same month on a scale of 1 to 3, with 3 being the best

3. Multiply the forage quantity rating for a month by the forage quality rating for the same month (you will have a number ranging from 1 to 9)
4. Plot this number for the respective month on the Forage Quantity/Quality graph
5. Repeat steps 1-4 for each month of a 24-month period
6. Connect the dots with a line.

Second, estimate the cow's nutritional requirements over a production cycle, by month, relative to peak requirements under your weaning program. When you choose to wean can change nutrient requirements compared to the example. After completing the estimate of cow nutrient requirements for a 12-month period in the second grid, connect the dots with a line. Then, cut out the cow grid following the line and slide the grid horizontally along the forage quality/quantity grid. The point where the grids match up most closely indicates the optimum calving time from a biological standpoint. Marketing, available labor, etc., can change the desirability of this biologically optimum calving time but it will likely increase costs and risk or decrease reproductive performance.

Many cattlemen feel that calving should occur 45 to 60 days ahead of peak forage availability and quality to allow the calf to make use of the high-quality forage. This is a good approach when cow condition at calving is adequate for rebreeding (body condition score of 5 or more). It is more efficient to keep condition on cattle than to put it on. However, having adequate forage to support this body condition depends on rainfall quantity and timing, which can't be controlled. Calving more than 60 days before peak forage quantity/quality increases the quantity of supplemental nutrients needed to maintain overall herd productivity. If supplementation is not sufficient, inadequate conception rates will be more likely.

If forage growth falls short of expectations because of late or inadequate rains or cold temperatures and causes inadequate nutrient intake, additional supplement from calving to breeding will be needed to maintain adequate reproductive function. Decreasing the risk of reproductive failure during untimely or inadequate forage growth may be as important as increasing efficiency when adequate forage is available. Avoiding losses during drought may be more important to staying in business than making a few extra dollars when forage growth is good.

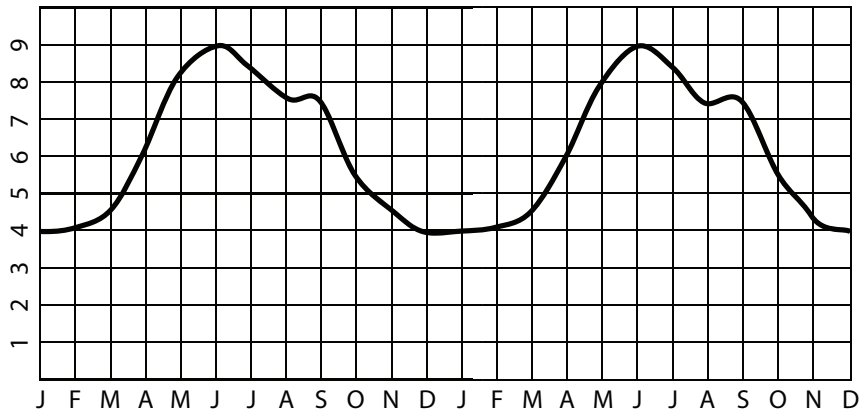

Figure 2. Forage quantity/quality grid for native rangeland forages in the Texas panhandle in an average year. You may use the grid to plot forage production for your particular situation.

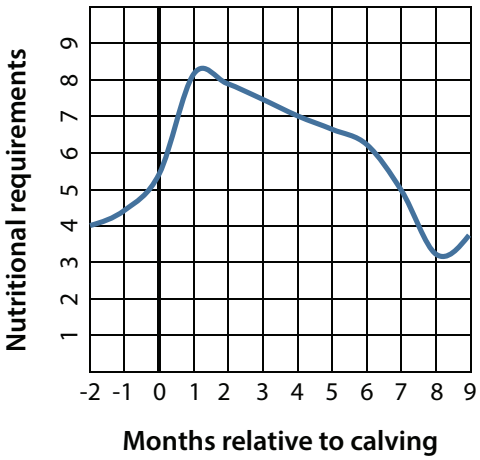

Figure 3. Cow nutritional requirements. 0 on the horizontal axis indicates the time of calving. You can match nutrition supply and demand by superimposing the grids until the curves match most closely. The month on the forage quantity/quality grid on which the heavy calving date line falls is a good estimate of when the ideal calving time would be from a forage availability standpoint.

Another approach is to calve near or at normal peak forage quality/quantity. This allows the cow access to a more nutrient dense diet—it is an easier and more cost-effective way for her to reach optimum body condition before calving. This approach can save you money by decreasing the need for expensive feed supplements for cows whose condition scores are less than 5 before calving. Feed that you raise or purchase is the largest annual variable cost (49 percent) of the average cow-calf enterprise. It is generally more cost effective to have a cow gain condition on native range than by using purchased or raised feed.

If calving at 45 to 60 days before peak forage, it should start around the first of April, given our assumptions of nutrient requirements and forage availability/quality. In years with late or poor rainfall, cows may lose significant fat reserves before calving without high levels of supplementation. In this case, you will need more harvested feeds or risk poor pregnancy rates or late calves the following year.

If calving at peak forage availability, it should start in late May or early June. This allows cows to increase body condition on cheaper grazed forages before calving. Increased body reserves will allow cows to lose condition through the lactation period and still be in adequate condition for winter. When subsequent rain falls short, calves may need to be weaned early so cows can maintain adequate body condition.

If calving season coincides with optimum forage, but cow condition or pregnancy rates are below projections, it may indicate that nutrient demand still exceeds supply. This can be caused by unnecessarily high individual animal requirements (e.g. high milk production), excessive stocking rates (cows too large or too many cows), mineral or vitamin deficiency, inadequate forage quality, or because forage failed to grow at the expected time or rate.

Maintaining appropriate stocking rates

Early summer is one of the critical times you need to assess forage demand and supply and adjust livestock numbers. If you choose late spring calving to better fit cow demands to the availability and quality of forage, calves may be too young for early weaning during early summer. Marketing light pairs can be a problem because buyers for pairs are probably also short of grass and packers will not want a lactating cow. Livestock such as stocker cattle, which can be sold more reliably without a loss, would be desirable. The likelihood of drought will dictate the proportion of these more saleable classes of livestock you should manage for—when drought risk is high, mature cows should comprise a smaller proportion of the total livestock inventory.

Keeping more heifer calves and even steer calves as stockers gives you more flexible classes of cattle when drought risk is high. This strategy can also allow you to develop heifers economically—you can carry them through the winter for less money than if you push them all for high levels of gain. You can then expose the heifers to a bull for a short time during the breeding season of good years. This allows you to produce both open and bred heifers at lower cost. When forage availability is low, they can still be marketed as feeders without undue economic risk. During a string of good years, large numbers of replacements will allow you to expand the herd more rapidly. More replacements also allow you to maintain a younger herd age profile and the ability to cull more deeply before they depreciate with age.

Stocking flexibility can also include leased grazing. Depending on the agreement, leasing can be an alternative way to expand the herd following drought. It can also increase cash flow and profit with lower risk than actually owning the cattle. Other species such as sheep or goats, which you may be more willing to market during droughts, can use other parts of the landscape or forage resources. Other species have been used widely across Texas, but less so in the high plains because they require different fencing and predator protection.

Conclusions

Rainfall patterns in a region largely determine the timing, quantity, and quality of forage you will have through the year. Matching peak nutrient requirements to peak availability of

high-quality forage can decrease production costs and nutritional risk of the cowherd by decreasing your need to purchase supplemental feed. However, even when nutrient availability and demand are closely matched, the weather can cause shortfalls in forage quantity or quality. Having cattle that can be marketed easily throughout the year with some likely profit will decrease the financial risk associated with drought.

The AgriLife Extension publication, *Using Historical Rainfall Patterns to Plan for Drought in the High Plains* (ERM-012), discusses the need to maintain flexibility of livestock numbers, some critical points in the year when forage supplies should be assessed to better match supplies with demand, and some general options for reducing the forage demand of the cows and their offspring.

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