SDSU Extension

# BEEF

Chapter 49

# Cattle Grazing Behavior and Diet Selection: Implications for Management

Elaine E. Grings

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## Introduction

Efficient livestock production from grazing lands benefits from an understanding of grazing behavior and how livestock select a diet from available forages. Grazing environments can be complex systems in which livestock must make a series of decisions to meet a variety of needs. In addition to meeting nutritional needs, livestock are also driven by needs relative to thirst, rest, temperature, social interactions and avoidance of pests or predators. Understanding how livestock respond to meet these needs can help managers control cattle grazing behavior to obtain desired outcomes for both land management and animal performance.

### *Diet Selection*

Cattle are considered grazers, or grass-eaters. They have a broad, flat muzzle that allows them to take relatively large bites, but prevents them from being as selective in their diet as sheep, goats or many wild ruminants with smaller mouths. Cattle often use their tongue to pull a wide swath of forage into their mouth, which affects their bite size and choice of grazing areas. Cattle graze selectively and when grazing an area where there are different plant species or plants of different maturity they will select a diet that differs from the total available forage. What they eat tends to be of higher quality than what is generally available. They may select leaf over stem, green over brown, and choose certain plant species, all of which affects their diet quality. Cattle will also select grazing locations that provide a good opportunity for selecting a high quality diet. During the growing season, cattle diets are often higher in protein, digestibility and phosphorus than a sample of clipped forage. The actual difference between diet and clipped forage will be affected by what is available. In winter, all available forage may be of low quality leaving less opportunity for selection, and the diet will be more similar to the average of what is available.

Diet selection occurs at a variety of scales in both time and space. When taking a bite, the grazing animal decides whether to eat

### Key Points

- Cattle use a hierarchal decision making process to make diet selection decisions.
- Cattle use foraging strategies to determine where and when they will graze each day.
- Understanding the diet selection and foraging strategy process can help managers utilize grazing management options to meet animal and vegetation management goals.

leaf, stem or seed head (plant part), chooses which particular species (plant) to consume within the area that they can reach without taking a step (feeding station), and then from within a close similar selection of plants (patch), and chooses which area of the pasture to graze (feeding site) within an individual paddock or pasture (landscape) in which they have been placed [See Figure 1]. These choices also vary in time scales, ranging from weeks to months at the landscape level, hours at the plant community level, minutes at the patch level, to even seconds at the plant or bite level. Because sward or forage conditions change during these same scales, diet selection is very dynamic and varies in response to constantly changing conditions. While all senses are used in diet selection processes, they vary in importance at each hierarchal scale. Sight is likely the most important sense at larger scales, with cattle using visual cues to recognize grazing locations. At the scale of feeding station and plant, taste is likely the most important sense in the decision process, with smell also being important.

The important unit resulting from diet selection and grazing behavior is intake rate. This is the unit that changes with the decisions made at each scale of the grazing process. Cattle may make decisions to move from an area (whether feeding stations or patch or plant community) based on the rate that they can consume or take in forage. Intake rate is affected by a variety of characteristics, such as the height and density of the forage and the effort required to take a bite (prehension), chew, and swallow food, but because of the changing nature of both forage and animal, it is difficult to assign or predict behaviors associated with forage characteristics.

Grazing systems are designed to manipulate diet selection patterns in livestock, including cattle. Many grazing management strategies work at larger spatial/temporal scales, such as the patch, feeding site or landscape scales. Fencing, water development, and herding are examples of managing at higher levels of the grazing hierarchy. Some of the newer management strategies, such as mob grazing and targeted grazing, work at finer scales, such as by altering specific plant selection.

Cattle have a preference for young, green forage and prefer leaves over stems. These choices reflect the most nutritious forage. Cattle may make large grazing cycles over lengths of days or weeks, where they move out of an area and return when fresh growth is available. Cattle will often return to previously grazed areas to eat regrowth rather than move into ungrazed areas with a large amount of more mature forage. Studies have shown that the presence of dry stems will cause cattle to avoid plants, even when green growth may be present at the base. Although cattle are generally grazers, they will consume shrubs during certain periods of the year. When shrubs are higher in nutritional value than grasses, this can be an important addition to improve diet quality.

One principal of grazing management is to control the ability of livestock to return to previously grazed areas. Because livestock prefer young, green regrowth from areas already grazed, returning to repeatedly graze can potentially overuse the area and weaken the grass stand. In areas where a highly desirable species is found in only limited amounts, heavy grazing on that particular species can occur even when grazing time or number of animals is limited. Selective grazing can result in patchy landscapes, with areas of both heavily grazed and ungrazed vegetation. This may be a desirable vegetation management option when the goals include a diverse landscape or leaving excess plant biomass as might be done when managing habitat for certain birds. If patchiness is not a desired outcome, burning or mowing the vegetation can improve the palatability of ungrazed forage and encourage cattle to eat a sward more evenly.

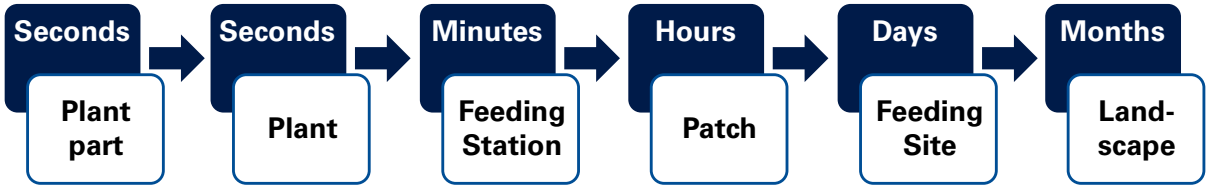


Figure 1: Hierarchal levels of decision making in the grazing process and associated time scale.

Age of animal affects the plant species that cattle eat (see Table 1). Young calves select high quality diets, which may be reflective of their smaller mouth size and the fact that they have more time to be selective when part of their diet comes from highly nutritious milk. Yearling cattle seem to select a more varied diet, likely because they have less experience and may be testing new foods. Mature cattle with very low nutrient demands may select lower quality diets. For example, mature steers grazing Northern Great Plains rangeland selected diets of lower crude protein concentration than other cattle classes. The data in Table 1 also shows that diet quality did not differ during October of this particular year, likely because preferred good quality forage was lacking. At that time, diet quality for all cattle types was very similar to available standing herbage. Although diet selection varied at certain times of the year for cattle in this study, physiological state within a given age class was not addressed. Research in Oregon has indicated that dry and lactating cows select diets of similar quality, and researchers concluded that physiological state did not alter diet selection patterns enough to alter nutrient content of the diet.

Table 1: Example of effects of cattle age on crude protein concentration of selected diet compared to available herbage during 5 months of grazing on Northern Great Plains rangeland. *Adapted from Grings et al., 2001.*

| Age | June | July | Aug. | Sept. | Oct. |
|---|---|---|---|---|---|
| Available Herbage | 9.2 | 11.5 | 10 | 9 | 8.6 |
| Calf | 14.2[a] | 12.6[a] | 10.9[a] | 10.8[a] | 8.9 |
| Yearling Heifer | 13.5[a] | 11.7[a] | 10.8[a] | 9.1[b] | 8.9 |
| Mature Cow | 11.8[b] | 11.2[b] | 9.9[a] | 8.8[b] | 8.7 |
| Mature Steer | 9.8[c] | 9.8[c] | 8.3[b] | 7.8[c] | 8.5 |
| [abc] Means within month differ by animal class if letters differ | | | | | |

Cattle tend to prefer foods that they know and avoid new or novel and unfamiliar foods. Cattle sample new foods only in small quantities and if they become sick within about 4 to 6 hours, they will avoid that food in the future. Pairing new foods with a preferred food or taste can be used to teach cattle to eat unfamiliar foods. This strategy is being used to train cattle to eat weeds and undesirable plant species that they might otherwise avoid. Several resources are available that provide detailed information on this and other methods for use of livestock to manipulate vegetation to reach desired management goals, known as prescribed or targeted grazing (see references: Davison et al., 2006; Launchbaugh et al, 2006; Livestock for Landscapes.)

Cattle are more likely to eat toxic foods if they are not familiar with them. This is important if placing cattle into new pastures containing toxic plants. It will take time for cattle to recognize the toxic plants, sometimes after it is too late. Cattle in thin body condition may eat toxic plants more readily than cattle in better body condition. Coupled with decreased liver mass and decreased ability of the liver to handle toxins, low body condition may make cattle more susceptible to poisoning by toxic plants.

Grazing can add 10-25% to maintenance energy needs of cattle, and this should be considered when planning grazing or supplementation strategies. This cost needs to be added to tabular values when looking at nutrient requirements. Because cattle prefer familiar foods, if they are placed into a new environment, they spend more time walking and exploring, and less time grazing, resulting in lowered feed intake. This behavior impacts energy expenditures and ultimately weight gain and other measures of animal performance.

Diet selection of cattle can be used to manage grazing patterns. For example, researchers in Oregon reported that cattle made more uniform use of pastures with a mix of upland and riparian vegetation in spring when nutritional quality of upland vegetation was relatively high. Later in the year, quality of upland vegetation declined and cattle then preferred use of the riparian areas that had higher quality forage (riparian areas also supplied more shade). Therefore, grazing pastures with riparian areas in the spring could result in more uniform grazing distribution than summer use.

## *Foraging strategies*

The amount of food a ruminant eats in a day is a function of the amount of time spent grazing and the amount of food ingested per unit of time. Cattle tend to spend about 7 to 12 hours grazing per day. Some of that time is spent searching for food and moving between grazing patches. Cattle use foraging strategies in their daily selection of grazing areas,

relying on spatial memory to help them decide where and how to graze each day. Foraging strategies within a landscape or pasture often start from water. An animal will need to return to water at some frequency, often daily, with decisions made as to where to graze from the water source. Cattle graze outward from a water source, and recommendations are often made that cattle grazing rangelands be required to travel no more than 2 miles to water in flat terrain and 1 mile in rough terrain. However, the distance traveled from water can be affected by both age and breed. Travel distances have been shown to increase with size of pasture, intensity of grazing and the forage biomass available. Cattle grazing seeded forages with high biomass will travel less than cattle grazing semi-arid rangelands where vegetation is more sparse. Because cattle only travel a certain distance from water, the shape of a pasture in relation to the water source may affect the utilization of forages within the pasture. This effect is more prominent in large compared to small pastures.

In addition to water, other attractants can be used to help manipulate cattle foraging strategies and thereby control cattle distribution patterns. The placement of salt and supplements has effectively been used to manage livestock distribution. Lick tubs have been used to entice cattle onto hilltops not previously used and to draw cattle out of riparian areas.

Cattle follow a daily cycle in their grazing, which may vary slightly with day length and temperature. The morning grazing bout starts around sunrise and may last three to give hours, and then, after a ruminating/resting period, the cattle will generally spend another period of about 3 hours grazing in late afternoon. Short, less intense grazing bouts can occur throughout the middle of the day and at night. Intake is reported to be greatest during the afternoon grazing bout as cattle prepare for a period of only limited grazing through the night.

The amount of time cattle can graze in a day has upper limits as they do require time for resting and ruminating. In conditions of low forage availability, daily intake may be below optimal because cattle must spend more time searching for food. Also, as sward structure changes, decreases in bite rate and amount of forage per bite occur. In relatively tall, dense stands, changes in bite rate and amount per bite can balance one another to maintain a consistent intake. However, in short, less dense stands that limit amount per bite, intake may not be compensated by increased biting rate.

Cattle learn grazing behaviors from others, most notably their mothers. Cattle can also learn from their peers and from their own experiences. Older cattle in a herd may have knowledge of a grazing area, pasture or landscape that can be passed on to newer and younger animals in a herd. Alternatively, removal of older animals with established grazing patterns can help a herd develop new distribution patterns when desired. A certain amount of time will be invested in learning a new environment, which may affect animal performance and grazing distribution. Small pastures that require less time to explore may receive more even grazing distribution.

Age also affects the selection of the area in a pasture where cattle graze. Studies conducted in hilly terrain in eastern Oregon showed that young cows tended to spend more time in riparian areas than did older cows. In Montana, older cows used rough terrain more uniformly than younger cows.

It can be important to consider the daily grazing cycle when planning supplementation times in all grazing systems and pasture moves within intensive grazing systems. Several studies have reported reduced intake and animal performance when supplementation disrupts grazing bouts. Providing supplements at times when livestock are grazing less intensely, such as late morning or during a midday rest period, may prevent decreases in intake. Other studies have shown no effect of supplementation time, but varied results from different studies may be related to pasture size or to the feeding of high energy (i.e. grain) versus protein supplements. Studies in which cattle have been given access to fresh grazing areas in strip-grazed pastures in the afternoon have reported higher animal performance than for livestock moved to fresh grazing areas in the morning. This may be related to the increased grazing intensity in the afternoon coupled with an increase in soluble carbohydrates in forages later in the day.

Many factors have potential to limit forage intake by grazing animals. Low forage availability can restrict intake, but this effect is influenced by the plant community type being grazed.

Low forage quality can affect intake if cattle are required to chew bites for a long time before swallowing or if ruminal fill is too great and cattle feel full. Temperature extremes may limit grazing time, but cattle do adapt to temperatures over time. Grazing time can be affected by overall thermal conditions, such as amount of sunlight (solar radiation) and wind speed (convection). When cattle are within their thermo-neutral zone (the range of temperature in which they do not have to expend extra energy either heating or cooling their body temperature), the majority of grazing occurs during the day. On very hot days, cattle decrease the amount of time spent grazing in the afternoon and increase their nighttime grazing. On cold days, cattle do the opposite, grazing less at night and more in the afternoon.

### *Management of grazing behavior*

Grazing strategies can be developed for specific situations based on an understanding of diet selection and behavior.

- Determine the vegetation management goal and develop an appropriate grazing strategy relative to desired biodiversity, frequency of defoliation, and grazing distribution by manipulating cattle preference for forage characteristics.
- Use an understanding of how cattle approach novel foods to change behavior to get cattle to eat undesirable weedy plants.
- Realize that naïve cattle may expend more energy when learning a new area.
- Use attractants such as water, salt, and lick tubs to pull cattle into unused areas or away from areas such as riparian zones.
- Consider timing supplementation activities so that they do not disrupt major grazing bouts.
- When evaluating cattle needs relative to forage quality and supply, remember to increase energy requirements to account for the costs of grazing.
- Some have suggested that, under intensive grazing conditions, cattle movements can be timed to maximize intake and improve animal performance.

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## Helpful Resources

BEHAVE: Behavioral Education for Human, Animal, Vegetation and Ecosystem Management http://extension.usu.edu/behave/

Livestock for Landscapes. http://www.livestockforlandscapes.com/