

Using Livestock to Promote Healthy Rangelands



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Introduction



A healthy mixture of different plants and animals is incredibly valuable to grassland ecosystems for many reasons related to resiliency, soil health, carbon capture, pollinators, livestock nutrition, and more. Additionally, this variety can create opportunities for greater economic sustainability of an operation. Cultivating healthy and balanced landscapes can be achieved through proper management and understanding of grazing behavior.

Benefits of Rangeland Heterogeneity

It is not uncommon to assume that rangelands are simply vast areas of grass. However, our rangeland ecosystems are home to thousands of different species of grasses, forbs, shrubs, insects, wildlife, and livestock. Another common assumption is that grazing livestock will consume mainly just grass for their diet. Although grazing behavior and diet selection can be complex, it is well established that cattle, sheep, and goats will all consume some portion of grasses, forbs, and shrubs.

Forbs and shrubs not only provide significant amounts of forage for livestock, but their roots tend to go deeper than grasses which allow them to uptake nutrients and minerals from deep below ground, improve water filtration, and improve soil structure. Additionally, legumes, a nitrogen fixing forb, are often quite high in protein content and can significantly enhance the quality of a grazing animal's diet.

Plant species are often divided into two groups based on their season of growth (Figure 1). Cool season species tend to grow well with cooler and wetter conditions common in the spring and early summer. Warm season species tend to grow later in the season with hotter and drier conditions. A good balance of warm and cool season plants will benefit the ecosystem due to differences in growth curves, maturity rates, and forage production. This ensures that grazing livestock would have access to actively growing, high quality forage, throughout the summer grazing season.

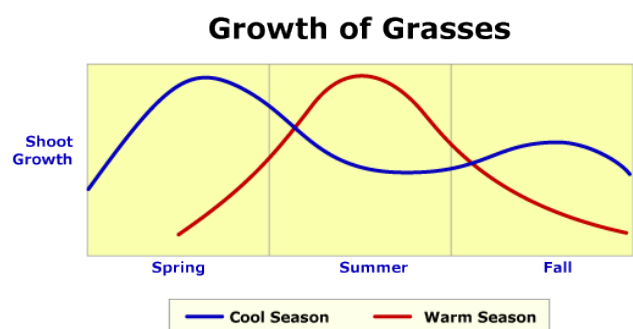


Figure 1. Growth patterns of cool and warm season plants. Courtesy: Using summer annuals to extend your grazing season (pasture.io)

A lack of plant variety can be indicative of poor pasture health and can pave the way for invasive and introduced species to take root. Invasive plants, such as leafy spurge or eastern red cedar trees can steal precious water and nutrient resources from our desirable plant species. Invasive cool season grasses, such as smooth brome and crested wheatgrass, will mature rapidly and tend to lack in production and nutrient quality when compared to native species. Among many other ecosystem benefits, species variety on rangelands is known to support increased forage production,

resilience to invasive species and unpredictable weather conditions, carbon sequestration, wildlife habitats, and diet selection of grazing livestock.

Animal Grazing Differences

Over time, grazing animals have adapted to reduce grazing competition of the same plants. Ruminants fall into three broad grazing categories based on selectivity: bulk grazers, intermediate selectors, and concentrate selectors (Figure 2).

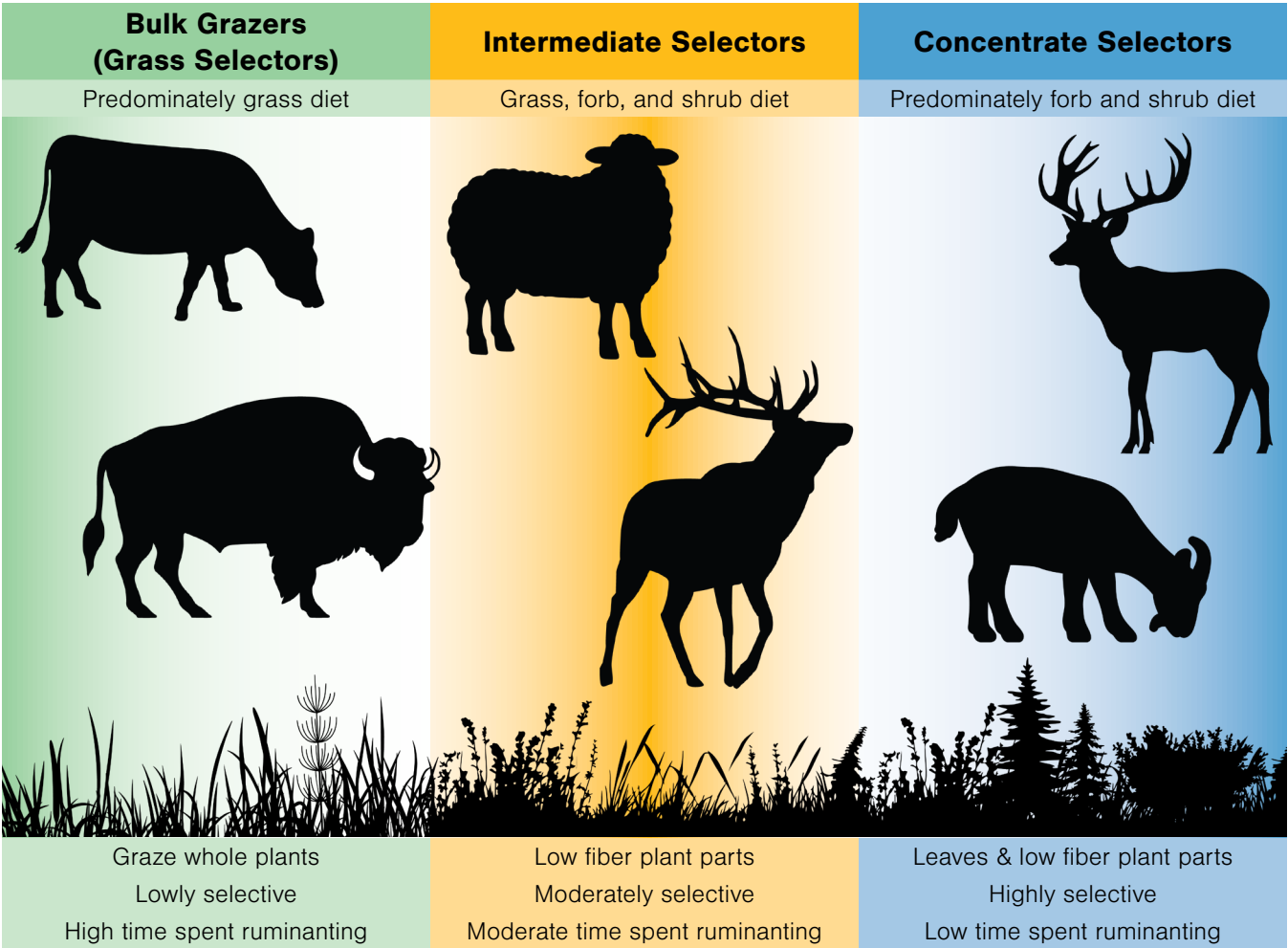


Figure 2. Classification of grazing types. Each classification includes the respective animal species, animal species, and grazing behavior.

Cattle and bison are among the most common bulk grazers and their diet consists primarily of grass. These large ruminants use their wide nose and tongue to grasp forage with relatively low plant selectivity compared to other grazers. Intermediate and concentrate selectors have narrower muzzles and prehensile lips that can easily select individual plants or plant parts. Concentrate selectors (i.e., goats, deer, and pronghorn) consume minimal grass and predominantly forb and shrub species. As their name suggests, intermediate grazers fall into the middle in terms of grazing preference. They include species like sheep and elk and have the largest adaptive grazing range utilizing grasses, forbs, and shrubs.

Beyond mouth structure, grazing animals have developed other unique adaptations to best suit their grazing preferences. Bulk grazers have the largest relative rumen size which gives them the ability to graze large amounts of forage then spend the greatest time ruminating on their high fiber diet. Concentrate selectors graze more frequently but because they are consuming less fibrous parts of the plant (leaves, seeds, etc.) their diet passes through the rumen relatively quickly. Because of their more nutrient dense diets, concentrate selectors have developed larger salivary glands to produce more enzymes to help break down additional fat and starch.

These herbivores also vary in the environment in which they are willing to graze. In general, intermediate and concentrate selectors will graze more rugged terrain and hillsides more readily than bulk grazers. Animals like sheep and goats also tend to graze further from water than cattle. Whether livestock or wildlife, having multiple species of ruminants present on the landscape will result in greater utilization of the resources and plant species that exist there. Although their diets are slightly different, ruminants do have some dietary overlap (Figure 3). For example, sheep and cattle have a 40-60% dietary overlap, so making sure that plant variety is present prior to introducing multiple species is crucial for grazing management.

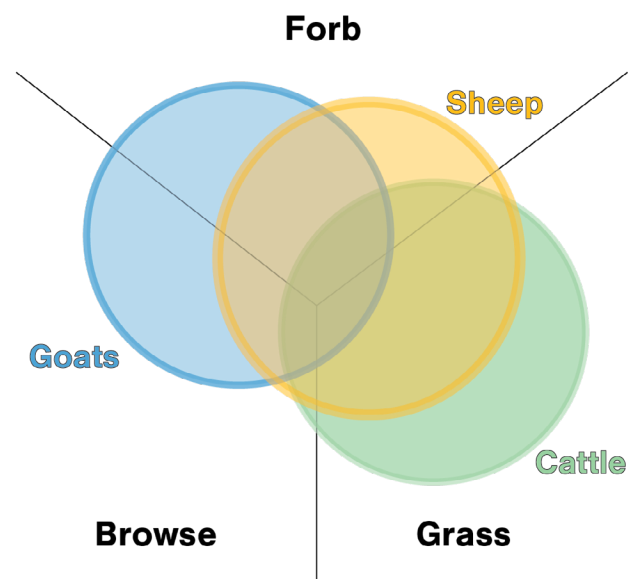
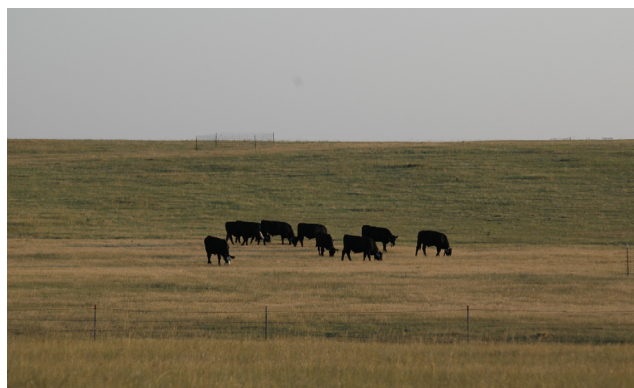


Figure 3. Diagram representing the dietary overlap of ruminant livestock (adapted from the ASI Sheep Production Handbook. 2015).

Implementing Pasture Rest and Rotation



Livestock grazing has a direct impact on plant variety in a pasture based on what is grazed, when it is grazed, and how long it is grazed. Alternating the timing of grazing every year is a core principle when it comes to promoting a good mixture of plant types and healthy grasslands. Essentially, this strategy allows different plants a chance to complete their life cycle and increase their root structures. This is because plants will delay root development to regrow their defoliated leaves.

When pastures are grazed at the same intensity and time frame every year, the same plant species will be defoliated at the same time in their growth curve year after year. As a result, certain species could be 'grazed out' and a shift in plant communities could occur. Simply changing the grazing order of pastures each year does not require infrastructure costs or fencing development.

For a producer with multiple pastures, changing the order in which you graze those pastures every year is one of the easiest and most cost-effective rotational grazing strategies. For example, in year 1 you might graze A, then B, then C. In year 2 you would graze B, then C, then A. In year 3 you would graze C, then A, then B. This simple rotational grazing strategy allows the plants on different growth curves to complete their life cycle every few years (Figure 4).

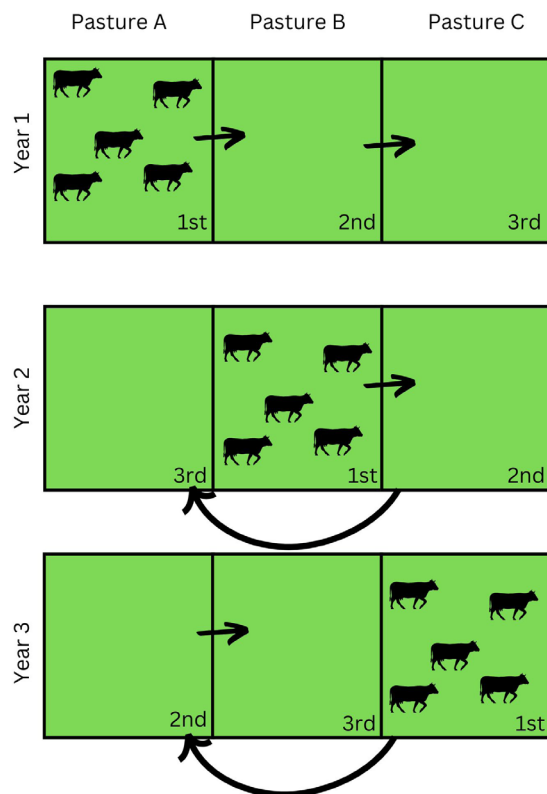


Figure 4. Diagram of a three-pasture rotational grazing strategy over three years.

This strategy can be taken one step further to allow deferment in a pasture for an entire growing season (Figure 5). This allows the plants in the deferred pasture to grow and expand their root systems to the full extent. For example, in year 1 you might graze A, then B, and rest C until the dormant season. In year 2 you would graze B, then C, and rest A. In year 3 you would graze C, then A, and rest B. An additional option for this strategy would be to graze the rested pasture during the dormant season when the plants are done growing. Although plants are less impacted by dormant grazing, spring regrowth could be compromised if the forage is grazed to short or if sufficient soil cover is not maintained.

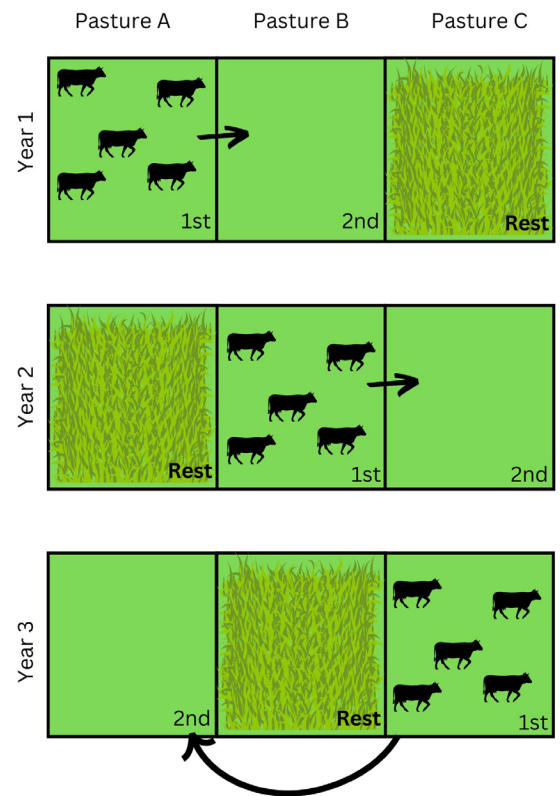


Figure 5. Diagram of a three-pasture rest rotation grazing strategy over three years.

Livestock producers have many options to take this alternate timing strategy further to meet their management and production goals. Cross fencing, even temporarily, to practice rotational grazing can result in greater forage production, higher pasture utilization, and improved plant variety. The overarching goal of this strategy is to create more areas where plants are growing and recovering without grazing pressure. Good grazing management balances the forage demand of grazing livestock with the forage supply and recovery needs of the landscape.

Managing Undesirable Plant Species

Rangelands can also be home to undesirable species. Although some species may be noxious and require control, many of these plants can also provide significant benefits. For example, new season growth of many native shrubs such as leadplant, wild rose, and western snowberry (buckbrush) are readily consumed by grazing livestock. Trees and shrubs can provide shelter, habitat, and feed for livestock and wildlife. Oftentimes native forbs can be misidentified as “weeds” in a pasture. These forbs are necessary for pollinators and make up a crucial portion of a grazing animal’s diet. Some forbs can be indicative of soil health. For

example, poisonvetch can be an indicator of high selenium in the soil.

For some noxious, invasive plant species, control methods are necessary to reduce their spread. Over time, these undesirable plants can decrease rangeland health by choking out the beneficial, native species. Targeted grazing can help manage plant populations and can be as intensive or extensive as you prefer. However, with greater intensity comes greater results! If animals have not been exposed to certain plants, there may be a brief “training period” of intensive grazing that essentially forces the animal to consume a target species. The goal of targeted grazing is to significantly defoliate the undesirable species. Over time, this will reduce those species and pave the way for more desirable species.

Leafy Spurge

Leafy spurge is a noxious weed that can quickly take over a landscape. Targeted grazing can be a good way to reduce leafy spurge without the negative impact of broadleaf herbicide on beneficial forbs. Although it is commonly thought of as unpalatable, sheep and goats can develop an affinity for the plant and graze it throughout the year. Unlike cattle, small ruminants do not experience the negative impact from the toxic compounds in leafy spurge. In fact, due to its relatively high crude protein and digestibility sheep and goats may have greater average daily gains when grazing leafy spurge. A good strategy is to graze leafy spurge early when it is only 3 to 4 inches tall. This will limit the plant's ability to flower and produce seed. If the plant has already flowered, sheep will still consume the flowers which limits reseeding. Seed viability is not completely eliminated once seeds have gone through the digestive system but can be reduced by about 50%. Figure 6 demonstrates the reduction in leafy spurge after being target grazed by sheep using two strands of poly-wire electric fence.



Figure 6. Fenceline view of ungrazed (left) and grazed (right) leafy spurge using sheep as a method of target grazing.

Eastern Red Cedar

Throughout history, wildfires frequented the Great Plains ecosystem which helped to maintain a treeless landscape. Today, encroachment of woody species, including the Eastern Red Cedar (ERC) tree, has emerged as a significant threat to rangelands and pastures across the globe. The presence of trees on rangeland ecosystems has been shown to dramatically reduce forage production and beneficial plant variety. With targeted grazing management, goats can provide an opportunity to suppress some of the spread of ERC across the Great Plains.

Goats have displayed a greater preference for younger trees and regrowth. Debarking and defoliating young trees limits their ability to grow to reproductive maturity. Goats will also debark older ERC which can lead to foliage browning and tree death (Figure 7). Targeted grazing of ERC with goats can be highly effective on younger trees. Older, seed producing trees may require mechanical removal and prescribed fire for effective control. Additionally, when using goats for targeted browsing, it is important to assess existing browse species in the target area. This is because goats will have a greater preference for deciduous trees and shrubs before selecting the ERC.

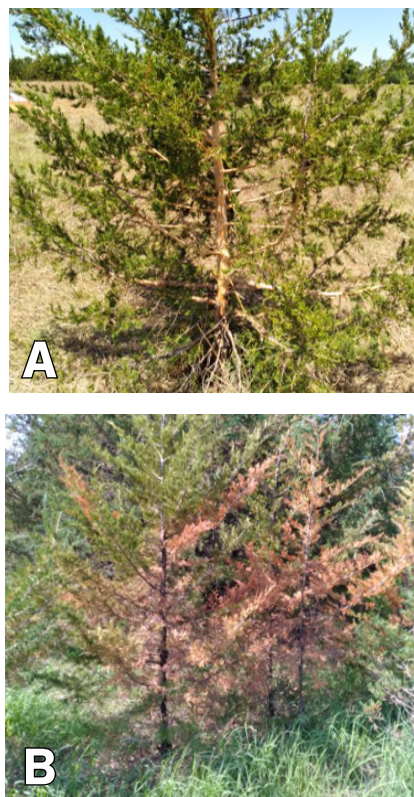


Figure 7. A) Debarking of Eastern Red Cedar by goats B) Foliage browning as a result of debarking and defoliation by goats. Photos courtesy of Dr. Sandy Smart.

Invasive Cool Season Grasses

Common invasive cool season grasses are smooth brome grass, Kentucky bluegrass, crested wheatgrass (Figure 8), and cheatgrass. These grasses mature very quickly and have lower tonnage and nutrient quality than most native species. In general, livestock will require less protein supplementation when grazing native grass. This is because healthy rangelands with a good amount of native plant variety tend to hold onto much greater nutritional value when compared to pastures with introduced species, even in the dormant season.



Figure 8. Crested wheatgrass that was spring grazed by yearling cattle.

When invasive species become prevalent, targeted species grazing in the spring could be a good strategy. Allow high intensity grazing only while the invasive species is actively growing in the spring and avoid grazing during peak warm season growth (Figure 1). For areas with a high concentration of invasive species, consider temporary fencing to force even higher spring grazing pressure in those areas.

Total eradication of the undesirable grass is unlikely. However, removing some of the competition from the desirable species can allow them to flourish. An added benefit of grazing these grasses early, while they are in active growth, is that cattle will reap the benefits of their nutrients before the plants seed out, mature, and lose nutritive value. Prescribed burning can also be used as a method to control undesirable grass species.

Economic Benefit of Multispecies Grazing

Incorporating multispecies grazing into an operation can be a great opportunity to promote heterogeneity on the rangelands as well as the business. First, it increases stocking rates of pastures without causing harm to rangelands, thus increasing returns per acre. This means being able to sell one calf plus potentially two lambs/kids per female off the same acreage. A general rule of thumb with multispecies grazing is to equate one sheep/goat per one cow on rangeland. However, a healthy plant population is necessary to support different types of grazing selection (Figure 2).

Second, adding another livestock species enterprise to your business can help mitigate risk and improve cashflow throughout the year. The natural seasonal breeding patterns of sheep and goats causes greater seasonal price swings in the lamb and kid markets. The cattle market, however, remains relatively consistent throughout the year (Figure 9). Feeder calf markets tend to increase in the summer months while feeder lamb and kid prices drop. Then, as the calf market dips in the fall, the lamb and kid markets climb until the Easter holiday.

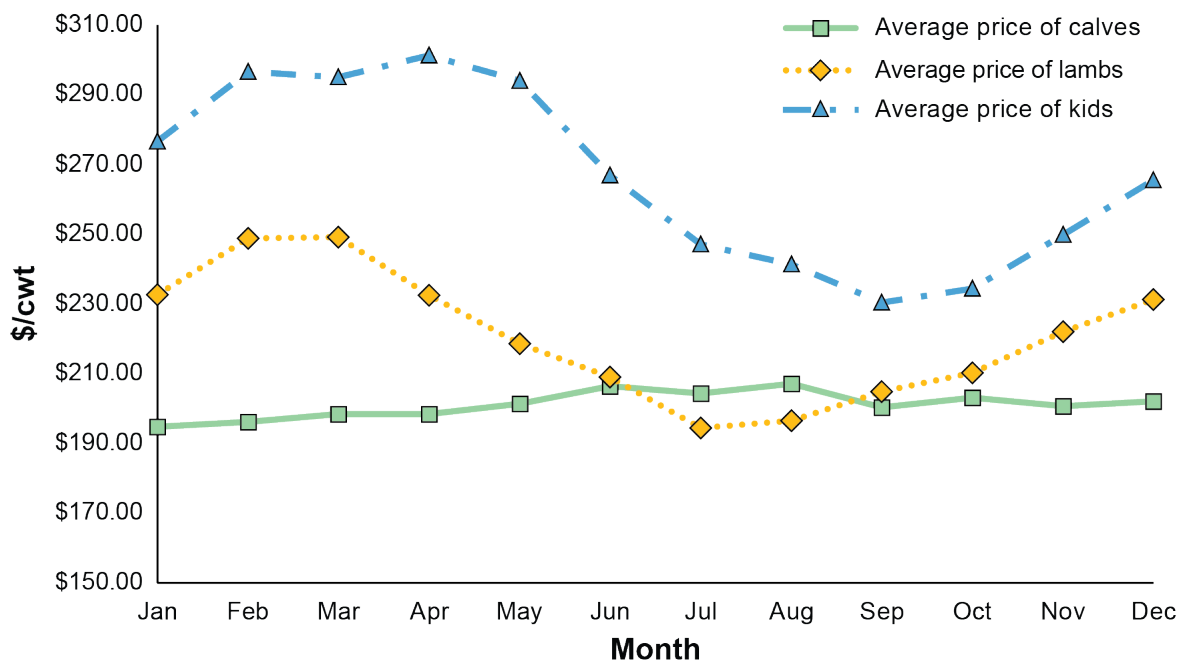


Figure 9. Monthly average price for 500 to 600 lb. calves, 50 to 60 lb. lambs, and 50 to 60 lb. kid goats from reported South Dakota auction markets (2013-2023; LMIC, 2024).

Third, wool can also be an additional annual source of income. According to the most recent cost of production study from the American Sheep Industry (2018), the north central region of the U.S. has the highest rate of return per ewe due in part because of reduced feed costs by grazing.

The overhead cost (buying ewes/does and potentially fencing) and the additional labor requirements of small ruminants often deters producers from integrating sheep. Although variable costs may change and differ greatly between operations, adding another livestock species decreases your fixed cost per animal unit. Additionally, with twin born lambs and wool, ewes should be able to cover the cost of purchase within the first year. Like sheep, goats also raise multiple offspring.

Conclusion

Rangeland ecosystems are home to an assortment of plant and animal life. It is important to promote this mixture to ensure healthy and productive land. Plant variety includes differences in plant species, types, and growth seasons. A good balance of these differences is beneficial for health of the ecosystem, but also ensures grazing livestock have access to high quality, actively growing forage throughout the growing season. At a minimum, the timing of grazing should change every year to allow plants on different growth curves to complete their life cycles. Ruminant animals have varying grazing strategies and dietary preferences which allows multispecies grazing to occur with minimal competition. These dietary differences can increase pasture utilization and be used to manage undesirable plant populations. Additionally, incorporating multispecies grazing can provide additional economic opportunities.



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