Harvest & Efficiencies of Livestock Grazing

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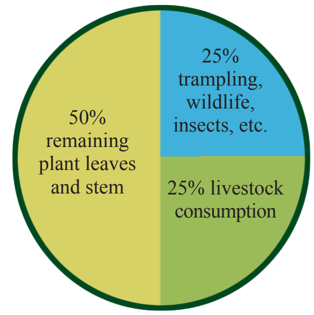
Harvesting forage by livestock grazing is inherently inefficient compared to mechanical methods because livestock are living on the same area that their food is being grown. Therefore, the interactions between daily animal activities and pasture plants' ability to survive are necessary considerations regarding the potential outcomes, such as animal production and carrying capacity. This article explores the reasons behind efficiencies of grazing and how management can impact it.

Figure 1. *Results of moderate grazing.*

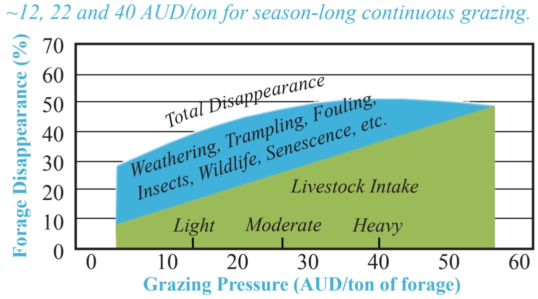


Stocking rate (number of animals per land area per time period) is the most critical decision a producer can make that will influence average daily gain, milk production and the health of pasture plants. Stocking rate decisions usually involve estimates of forage production that ultimately determine the carrying capacity for a particular pasture. From nearly 100 years of research and practical experience, stocking rate recommendations that remove 50% of the forage is the most sustainable. This rate is called "moderate" stocking or "take-half-leave-half" (Figure 1). Figure 1 shows the total forage that disappears is 50%. Harvest efficiency (intake by livestock) is 25% and grazing efficiency is 50% (livestock harvest divided by total disappearance).

Numerous stocking rate studies have shown that as the stocking rate increases, grazing and harvest efficiency increases because grazing pressure increases. Grazing pressure is an expression of the number of animals per weight of forage per area of land per day. For example, moderate stocking rates for pastures in western South Dakota are about 2-3 times lower than in eastern South Dakota because the forage production is also 2-3 times lower, but both pastures would have the same grazing pressure. In the July 2010 issue of Rangeland Ecology and Management, the authors showed this process by evaluating six stocking rate studies throughout the Great Plains. They found that as grazing pressure increased forage intake by livestock increased linearly but the total forage disappearance leveled off (Figure 2). Livestock grazing becomes more efficient at higher grazing pressures since more forage is consumed by the livestock than goes unused through other processes.

This research was conducted under season-long continuous grazing. Moderate-heavy grazing harvested 25-40% of the forage. Managers can also manipulate grazing pressure by changing the stocking density (number of animals per land area) by making the pasture size smaller. This is essentially what happens under rotational grazing. By subdividing a pasture into smaller units, grazing pressure can be increased. Experience suggests that rotational grazing increases harvest efficiency because of increased grazing pressure and it allocates less to remaining plant leaves and stem. Expected benefits of the following recovery period will increase plant vigor to justify the higher utilization levels (Figure 3).

Figure 2. *Forage disappearance as a function of grazing pressure. Light, moderate and heavy stocking rates averaged ~12, 22 and 40 AUD/ton for season-long continuous grazing.*



Rotational grazing limits the time animals are "living" on the same area as their food is being grown. Strategies have evolved from a simple 2-pasture switchback design to multiple- pasture managed, intensive grazing designs. The latest evolution of grazing systems is called "mob grazing". In this scenario, livestock densities are ultra high (>100,000 lbs of live weight/ac) and moved as frequently as everyday to several times per day. In this process, livestock are coming as close as possible to mimicking a "mower". Grazing pressures could be as high as 50-70 animal unit days/ton of forage under mob grazing. Thus, 100% forage disappearance would be expected, 20-70% through livestock intake and the remaining as trampled or fouled depending on the height and maturity of the grass. Normally, it would be expected that such heavy utilization would be detrimental to the pasture species, but with the area having been only grazed once for one day or less, the recovery time should outweigh the high utilization, much like mechanical harvesting of hay. The potential misuse of such a grazing practice could occur when plants are in growth stages where heavy defoliation is known to be detrimental, namely when plants are in the rapid stem elongation phase. Waiting for grasses to be in the reproductive stage is the most sustainable way to practice mob grazing. Otherwise, productivity will be reduced the following year.

In conclusion, since grazing animals live where their food is grown, harvest and grazing efficiencies are limited based on remaining leaf and stem material necessary for plant survival. Harvest efficiency increases under heavier stocking since grazing pressure increases. Rotational grazing practices, minimizing time livestock spend on a particular area, can increase harvest efficiency without negatively impacting plant vigor if the recovery period is long. Grazing systems using ultra high stocking densities come close to mimicking "mowing". These practices need special attention to plant growth stages because such high utilization can be harmful to future plant productivity no matter how long the remaining rest period is. Harvest efficiency of season-long continuous grazing is about 25% and usually 30-35% for rotational grazing when both are moderately stocked.