Multi-Species Grazing and Marketing

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Several factors influence the use of the nation's grasslands. Biological efficiency, often the primary consideration in research, is important but may be overshadowed by public policy, economic factors, and producer attitudes. The grasslands of the eastern and southeastern U.S. and from Texas through the southern great plains and the eastern portion of the northern great plains are largely privately owned. The 11 western states, however, vary from 40 percent to over 70 percent public lands, which means that the producer has little control over actual land use. The major constraints to efficient land use in the western range states are: livestock water, low or unpredictable rainfall, limited ground water resources; poor range conditions resulting from brush or undesirable forb and grass invasion and/or mismanagement; changing demands for public land use; regulations restricting management control of factors affecting rangeland use (i.e.—predator control, fencing, etc.); and local economic conditions.

Multi-species grazing provides a viable method for improving biological and economic efficiency of rangelands utilization. Multi-species grazing has been widely used by producers in some limited areas of the U.S. for over 75 years, but was never practiced or has declined significantly in other areas. Ranchers in the Edwards Plateau region of Texas recognized long ago that there were benefits to adding sheep to their cattle operations, and if they had brush or browse, adding goats further enhanced range improvements and potential economic benefits. Where these mixed species grazing practices have been maintained, range conditions are generally superior to those where they have been abandoned. In the Southeast, the lack of available market outlets for sheep and goats has been a major constraint to the practice. Increasing pressure from predators and transient economic factors have contributed to the decline of the practice in the Southwest. Economic conditions coupled with land use policies have been the primary constraints to multi-species grazing in the public lands states of the West. There is renewed interest in multi-species grazing among ranchers, public land managers, and researchers. This interest is due to a growing recognition that multi-species grazing may enchance plant use and animal productivity and may improve economic efficiency.

Biological Efficiency

The primary factor affecting the appropriateness of multi-species grazing is its biological efficiency. The important components of biological efficiency are: the ability of the grazing system to exploit the selective grazing habits of the different animal species in the system; the diversity of the plant species on the land to be grazed; and the extent to which animal performance may be affected by the grazing system. The effects of some specific grazing management practices on biological efficiency of multi-species grazing are not clearly understood. Some of the less understood effects of the grazing practices are: short duration rotation grazing vs. continuous grazing, substitution rates among livestock and/or wildlife species, grazing the species separately or together, and the desired effects of the grazing system on the plant community.

Kothmann (1983) stated that the gap between research on grazing systems and management practices is resulting in grazing management systems being developed as an "art" by trial and error. He emphasized the importance of controlled studies that compare different management practices with respect to plant, animal, and economic responses. A review of the literature also emphasizes the need for such studies on the subject of multi-species grazing. The most comprehensive reviews of the literature on this subject have been conducted by Nolan and Connolly (1977), Rector (1983), and the participants in the conference on multi-species grazing hosted by Winrock International Livestock Center (Baker and Jones 1985).

Diet Selectivity and Dietary Overlap

Many studies have documented relative differences in the selective grazing habits of livestock and wildlife species. Cattle diets generally contain fewer plant species and a higher percentage of grasses than sheep and goat diets (Fraps and Cory 1940). Sheep tend to eat a higher proportion of leaf material than cattle (Kothmann 1968, 1977), more forbs than cattle and goats (McMahan 1964; Cook et al. 1967), and species that are very low in available quantities (Bishop et al. 1975; Taylor 1985). Goats select a wider variety of plant species (Fraps and Cory 1940), select more browse than cattle or sheep (McMahan 1964), and are more opportunistic grazers because they readily shift plant species grazed when advantageous (Fraps and Cory 1940; Taylor 1985).

Multi-species grazing research started in the U.S. over 50 years ago in the Edwards Plateau region of Texas. Taylor (1985) summarized most the Texas studies involving cattle, sheep, goats, and white-tailed deer, alone or in various combinations. The results indicated that grass is a major component of all animal diets except for deer; that cattle are primarily grass consumers, although they will aggressively graze non-grass materials at certain times of the year; that sheep eat more forbs than do cattle and less browse than goats; that goats consume more browse and less grass than cattle and sheep; and that Spanish goats are more aggressive browsers than Angora goats due to their larger size and ability to graze

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in dense brush. Rector (1983) concluded that cattle diets were not affected by presence of sheep or goats, but in the case of sheep and goats the presence of one species affected the diet of the other. Grazing cattle in combination with sheep and/or goats tended to consistently increase biological efficiency through improved animal performance, more uniform forage use, and in some situations increased land carrying capacity.

Cook (1985) summarized several studies conducted on northern Utah foothill rangelands. Sheep generally consumed approximately 17% of the grass, 51% of the forbs and 57% of the browse produced when grazed alone, while cattle consumed 52% of the grass, 20% of the forbs and 18% of the browse when grazed alone. When grazed in common, all three forage classes received approximately 50% use. When grazing cows and calves and ewes and lambs in common, biological efficiency was increased by 67% over cows and calves alone and by 31% over ewes and lambs alone. When grazing ewes and lambs in common with steers, the biological efficiency was increased by 91% when compared to sheep alone and by 19% when compared to steers grazed alone.

Wildlife are an important component of multi-species grazing systems on U.S. rangelands. Dietary overlap of wildlife species with domestic livestock is of concern to both public lands managers and private landowners where fee hunting is an important income source. Hansen and Reid (1975) and Olsen and Hansen (1977), in studies conducted on the Red Desert of Wyoming, reported that dietary overlap of cattle vs. elk was 55%, cattle vs. sheep was 35%, elk vs. sheep was 30%, sheep vs. antelope was 21%, and 8% for cattle vs. antelope. McCracken and Hansen (1981), in a study conducted in south central Colorado on xeric sites with shrub steppe and pinyon-juniper vegetation and mesic sites with a typical forested grasslands vegetation, reported dietary overlaps of 53% for sheep vs. cattle, 46% for sheep vs. elk, 39% for cattle vs. elk, 15% for sheep vs. mule deer, 10% for cattle vs. mule deer, and 30% for mule deer vs. elk. The Texas studies summarized by Taylor (1985), generally indicate no competitive problems with white-tail deer vs. cattle or sheep. However, goats and particularly Spanish goats, are competitive with white-tail deer under heavy grazing pressure.

Optimum Land Use and Multi-species Grazing

Certain rangelands may be better suited for grazing by a single species of livestock. For example, tall grass prairies are better suited for cattle grazing than for sheep or goats. Stemmy bunchgrasses are also better suited for cattle. Some lands heavily infested with palatable brush species may be better suited to goats than sheep. As topography and vegetation become more diverse, common use tends to improve utilization (Cook 1954; Stoddard and Smith 1943; Smith 1965; Merrill et al. 1966). As the number of plant species available and the forage classes (grasses, forbs, browse) become more uniformly represented, the likelihood of successful multi-species grazing increases. Sheep tend to prefer upland grazing sites and will avoid wetlands, while cattle tend to prefer lowland sites and are not averse to grazing wetlands. This principle has resulted in one of the more productive summer mountain grazing ranges in the Targhee National Forest in Idaho, where sheep from the U.S. Sheep Experiment Station have been rotated for over 20 years in alternate years with cattle. Cattle tend to prefer the Riparian zones and other lowland areas, but little damage is evident since these areas tend to be avoided by sheep in the alternate years. Sheep tend to better utilize the upland sites, steeper slopes and higher elevation short grass ranges than cattle in alternate years.

It is important to consider animal behavior in planning grazing systems. Squires (1978) suggests that livestock distribution is influenced by social factors, water distribution, shade, wind direction and velocity, and interactions of these factors. Anderson et al. (1985), in studies at the Jornada Experimental Range in New Mexico on common use of range by cattle and sheep, observed little overlap in spatial use of areas within paddocks, which indicated greater total use of forages produced. The only exception to this was some overlap during periods of ephemeral plant growth.

Another project at the Jornada Range (Hulet and Anderson, 1987) is the bonding of cattle and sheep, enabling sheep to graze very close to cattle and be protected by the cattle from predators. The extent to which this bonding influences intakes and selectivity of the sheep and cattle is not fully understood at this time, and is being investigated.

Grazing management can influence animal diet selectivity, and provide an opportunity to optimize benefits from common use. As grazing pressure increases and/or available forage declines, dietary overlap increases (Merrill and Young 1954; Cook et al. 1967). Seasonal variations in forage availability, palatability of various plant species, and the amount of green vs. dead material can greatly influence dietary overlap (Van Dyne and Heady 1965; Thedford et al. 1971). It is likely that the high intensity—low frequency or short duration grazing systems currently being advocated will not enhance multi-species grazing strategies. The primary benefit of these systems is often promoted as reduced diet selectivity and more uniform paddock use, which may be the primary benefit of common use grazing. The long-term biological and economic benefits of these grazing strategies remain to be proven on more arid rangeland with shorter growing seasons.

Manipulating the plant community through multi-species grazing has been used as a range management tool. Taylor (1985) emphasizes the need to understand management objectives in terms of (1) control of brush or (2) use of brush in a grazing program, and outlines several general principles to follow in developing a management plan. Several studies in Utah have demonstrated the value of the grazing animal in manipulating forage composition. Cattle were used by Frischknecht and Harris (1973) in spring grazing of grasses to maintain or increase shrubs for deer winter forage, and summer grazing by sheep was used to control sagebrush where grass was a desired species. Goats were used by Provenza (1981) to manipulate blackbrush, stimulate stem growth, and make it more palatable and nutritious for cattle. Bowns (1985) discusses the use of goats in northern Utah to control oak mottes, thereby reducing competition of this plant with more desirable shrubs used by wintering mule deer.

On a personal note, many producers in my home county of Burnet in Texas have been forced out of sheep and goat production due to predator problems. One can identify to the year when these enterprises were abandoned by the size of the cedar trees observed while driving down the road.

Observing this progressive range deterioration is a sad experience.

Economic Considerations

Economic benefits from multi-species grazing must be derived from improved production efficiency of the land and improved risk management of capital and cash flow. Research that develops economic models must be conducted along with the development of biological models when evaluating grazing systems and management practices. Since range management is a long-term proposition, the rancher must evaluate the relative long-term expected costs and returns from the various species that could be managed in his production situations, the constraints to production of the various animal species he could use, and the long-term land use management or improvement objectives.

Again, a good example is the multi-species grazing situation in the Edwards Plateau region of Texas. In Burnet County, Texas, the average stocking rate for much of the county is 20-25 acres per animal unit on the annual basis, with leasing rates of $6 to $7 per AUM. Deer hunting leases sell for $300-$500 per person, with an average acreage lease size of 100 acres per hunter. At 20 acres per cow unit and $6 per month per cow, the income from cattle leases on 100 acres would be approximately $360, which is about the same as from a deer lease having only average hunting quality. The rancher with average or better deer hunting in Burnet County must carefully evaluate any change in grazing management or land improvement programs in terms of their consequences to the deer population.

Another example and misconception is the general view that public lands of the West are leased to ranchers at substantially below market value. The average monthly cost of herders, camptender, vehicle operations, predator control and/or losses and other expenses at the U.S. Sheep Experiment Station are approaching $2 per ewe per month, which is comparable for commercial producers in the region. At 6 ewes per AUM, we are at a cost disadvantage to the Burnet, Texas producer that can lease fenced sheep pasture at $1 per ewe per month. The non-land costs of range management are therefore very important to the rancher in developing his grazing program, and may preclude conversion to a grazing program that is clearly the most efficient biologically and may even maximize gross income.

The extent to which multi-species grazing may improve land and/or animal productivity was extensively reviewed and discussed by Nolan and Connolly (1977) and in several papers presented at the Winrock conference (Baker and Jones 1985). The positive responses to multi-species grazing generally appear to be more in terms of improved animal performance and more uniform use of the plant species, rather than from potential increases in stocking rates.

The problem in the ranching industry is not understanding what we are marketing. Too many ranchers think they are in the cattle business, sheep business, or whatever their specific enterprises may be when their actual business is appropriate and proper land use. The first principle to understand is what the land resource base can produce on a sustainable basis, how this might be manipulated by management to enhance productivity, and how to most efficiently harvest what the land will produce. We must then determine how best to market what we can produce. The primary product from rangelands is forage, and the marketable products are beef, lamb, wool, mohair, leasing for hunting, etc.

One of the first economic principles of business management is risk management. The economically astute rancher of today understands risk management, and one of the basic principles of risk management is expanded market options. Therefore, the most obvious potential economic benefits of multi-species grazing would be more product to market through improved forage use and more products through which to market the forage such as lamb, wool, beef, mohair; or even feeder lambs, slaughter lambs, and breeding stock within the sheep enterprise as an example. The increased marketable product diversity significantly improves the risk management.

The other potential economic benefit most obvious is the potentially improved cash flow with multi-species grazing enterprises. The cow-calf producer, for example, may do some limited culling at calving, but has most of his annual sales at weaning time. Adding sheep adds lamb, wool, and cull ewes to the marketable products and probably increases to at least six months the times of the year in which income is generated. Adding goats or fee hunting further distributes income flow. A more continuous cash flow has the potential to reduce interest costs, and certainly makes a lender happier.

There are potential negative economic consequences of multi-species grazing. The individual must determine if it is biologically feasible to add a second or third animal species to his ranching system. He must determine whether or not there are technical constraints to producing the added species, such as poisonous plants, predators, climatic conditions, etc. He must also make certain that there are adequate market outlets for the products to be produced. Adding a second animal species to the system complicates management by requiring a broader knowlege base and by increasing facilities and equipment requirements. It also has the potential of diluting marketing strength in the primary enterprise, since adding a species generally requires reducing the number in the other species.

Summary

Additional information is needed to fully understand the appropriateness of multi-species grazing in the various range ecosystems. The biological understanding of factors such as diet selectivity, dietary overlap and grazing behavior of the various domestic and wildlife species continues to increase. The effects of specific grazing management practices on the biological efficiency of multi-species grazing are less understood. These include grazing practices such as short duration rotational grazing vs. continuous grazing, substitution rates among the livestock and/or wildlife species, grazing the species separately or together, and the desired effects of the grazing system on the plant community. Economic decision-making models are clearly needed to assist the educator and range manager in determining its appropriateness to specific situations.

It is obvious that, in many rangeland situations, multi-species grazing should be practiced more than it is today. Those ranchers that have maintained productive and diversi-

fied livestock enterprises are generally more economically sound than those that have followed the trend toward specialization. The associated benefits to range condition with multi-species grazing are equally as important to the range manager.

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