EFFICIENT GRAZING SYSTEMS: PUTTING PIECES TOGETHER

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Introduction

Pros and cons of grazing systems are well-known to this audience. Efficient grazing systems, however, are a different story. What is an efficient grazing system? I think we could argue that topic until the cows come home and I do not believe we could come to any agreement. I am going to approach the subject of efficiency from several angles but you will probably see them differently. Economic efficiencies will not be covered.

Grazing systems are unique for each enterprise, the land, the pasture, the livestock population, managers and farmhands. No universal plan is available even on late night TV. Grazing systems must be flexible enough to account for unanticipated situations or they will fail. They must be in concert with the environment in order to be sustainable.

Range or pasture-based grazing systems existed long before Kentucky was settled by Europeans. Migrating bison were part of a continental grassland system. Later, Native Americans imposed limited management on bison. The Barrens of western Kentucky are a reminder of their use of fire to manage the range for bison herds.

Present day grazing systems

Grazing systems, pastures, fences, water sources, and management practices were probably in place on your farm when you took over your farm. These simple, proven grazing systems may not have been thought of as functional, sustainable grazing systems but they were. In our present context, adopting a “grazing system” is assumed to be a different form of grassland livestock agriculture. When the subject comes up it is usually about modification of a grazing system by grassland managers for a number of reasons.

Upgrading and fine–tuning Kentucky grazing systems

Structural changes in traditional tobacco-beef cattle farming have encouraged many farmers to investigate means of increasing income from the cattle enterprise to offset declining income from tobacco sales. In many instances this means upgrading low-input grazing systems.

Some viable options for Kentucky grassland managers:

1. Raise productivity of existing grazing system: Get >90% calving.
2. Increase size of grazing system: Get more breeding cows.
3. Added value opportunities: Raise more homegrown calves as stockers.
4. Contract grazing (agistement) systems-dairy heifers, stockers, etc.
5. Diversify: Add livestock species; meat goats, sheep, equine. Sell hay.

Grazing systems: Will they fix the problem?

Grazing system modifications should never be considered a “cure all” for all livestock and pasture problems. Fine-tuning grazing systems, for example, should not be expected to be a solution for a beef cow herd with a serious genetic defect or a solution for one herd with a calf mortality rate of 50% or one producing 50 live calves per 100 cows mated. Returns to investment, management and labor in advanced grazing systems requires adoption of other livestock and pasture technologies, fiscal and management practices.

Taking advantage of grazing system investment

Upgrading grazing systems involves investment in capital, operating costs, management and labor. In order to recover investment costs and to get a good return on those investments one needs to increase system output while containing costs of input. Most changes to grazing systems involve pasture improvement, fencing and water services, and stock-handling facilities. Typically, rotational grazing is adopted or enhanced and more forage is produced. In enhanced grazing systems, stocking rate must be increased or surplus hay must be sold to convert the forage surplus into profit. Managers of Kentucky beef cow-calf grazing systems must boost cow or grow more stockers to use the extra forage. This “must” arises because enhancing already sound beef cattle grazing systems usually does not significantly increase per animal productivity. Productivity and profitability of enhanced beef grazing systems, therefore, should not rely on increased numbers of calves per cows mated or on higher sale weights of feeders.

Matching animal nutritional needs with nutrient supply of pastures

Most profitable grazing systems are typically ones that have succeeded in closely coordinating pasture growth and animal nutrition. Livestock grazing systems are energy-limited and this means that pasture should providing as much as possible of the amount and quality of energy needed by livestock. Efficient grazing systems have minimal inputs of stored feeds from on farm and off-farm sources. Stored feeds are much more costly than grass-clover pasture, which has the lowest cost per unit of energy and per unit of production in our region.

Stocker grazing systems: The best match of pasture and livestock

Kentucky grasslands grow from early March to the end of November but growth is minimal during December to February. Stocker grazing systems may be tailored to match that production curve. Destocking of grazing systems over the worst of winter not only eliminates winter feeding but it protects grassland and soils from overgrazing, treading damage and minimizes runoff problems. It also allows farmers to winter in Florida.

Beef cow-calf systems:

Coordination of pasture growth and livestock nutrition
Grazing systems attempt to match the 12 month feed requirements of Kentucky's beef cow calf herds with reliable pasture growth for 8 months or so. Our pasture production curve is well-known but poorly documented. Nutrient requirement profiles of livestock throughout growth, mating, gestation, lactation and maintenance should be matched as closely as possible to pasture production curves. The match in beef cow calf grazing systems is easier if the breeding season is restricted to 60 days and even better if estrus is synchronized. If the pasture growth and animal requirements are poorly synchronized then you may expect:

1. Sub-par animal production.
2. To feed more supplements.
3. Lose control of pasture mass and quality.
4. Loss of pasture legumes
5. To need make more hay.
6. Clip more pastures more often.
7. Lower income.

Grazing systems: Ancillary Support
Enhanced grazing systems exert more managerial control of where and when livestock graze, and their movement to and from fields and services. Keeping livestock out of pastures, crops, highways, riparian zones and dangerous areas (e.g. highwalls) is equally important. On rangelands this can be done with a Basque shepherd and some dogs, otherwise with fences. Updated grazing systems inevitably need capital investment in fences, access ways, water services, stock-handling facilities, and hay barns. Design and location of these facilities are prerequisites for day to day operations with minimum labor and stress. Fence that is equally effective in pasture and livestock control ranges from under $1,000 per mile to over $25,000 per mile. Over-capitalization in these services should be avoided.

Pasture utilization is better and fewer miles of fence are needed when fields are square. The ratio of short to long side of fields should never be less than 1:8.

Generally grazing systems are more flexible with secure perimeter fences, less expensive within-farm pasture fences and temporary internal fences.

Movement of livestock and managers between pastures is made easier with traffic lanes, and cattle stops. Wear, tear and erosion of lanes may be anticipated and should be considered in planning. Pasture fields should have more than one entry gate to minimize traffic wear on pasture and lanes.

Water reticulation and water tanks may impact fence layout and pasture grazing management within grazing systems. Supply of liquid, clean water to livestock is essential all year around for cow-calf enterprises. Portable water services may be useful in rotation grazing operations.

Shelter and shade within pastures may be considered an integral part of grazing systems; particularly in ones where stock have a history of tall fescue toxicosis.

Grazing systems requirements: Grass species component
Invariably, successful sustainable grazing systems are based on reliable permanent pastures with one primary grass species. Tall fescue-based grazing systems meet this requirement in Kentucky. Tall fescue is favored because of a host of properties, such as early spring greenup, high dry matter yields, yield and storability as round bales of hay, fall stockpiling superiority (yield, quality, and low rate of deterioration), and excellent survival under grazing, and resistance to drought, heat, flooding, and soil erosion. Tall fescue toxicosis is negative component but we are learning to minimize its impact by overall grazing and pasture management.

Grazing systems requirements: Legume component
Another primary grazing system requirement is the use of pasture legumes to support the grass base. Grazing systems based on fertilizer nitrogen fail unless they are heavily subsidized or products are sold in protected markets. Red clover, white clover, and alfalfa work but red clover grows best with tall fescue providing pasture and grazing management ensures reseeding every at the start of every third season.

Grazing systems requirements: Management of soil fertility
Management of soil fertility in grass-clover grazing systems has simple requirements based on the needs of the pasture legume. Grass legume-pastures require periodic liming to keep soil pH above 6.2 and to ensure clovers have adequate Ca, Mg, and Mo. Legumes need more P than grasses and grasses out-compete legumes for K so K may be needed for legume survival and growth. Soil fertility management in grazing systems should be different from that of corn, wheat and beans. Grazing systems on permanent grasslands are best served by "maintenance" applications of fertilizer: Soil tests should be used to determine forms and rates of fertilizer needed to optimize soil nutrient status, thereafter; fertilizers should be applied every year to maintain that state. Plant

nutrients returned in dung, urine and manure, although unevenly distributed, should gradually reduce the annual costs of soil fertility maintenance.

Grazing systems requirements: Environmental impact

Grazing systems must be in accordance with state and federal environmental laws. These laws aim at minimizing the impact of livestock on surface water quality. They aim at reducing contamination of surface water by dung, urine, and soil particles. Contaminants include solid particles, solutes, and organisms such as pathogenic strains of *Escherichia coli*. Good grazing systems should restrict livestock access to streams and riparian zones. Stock water management is an integral part of this component.

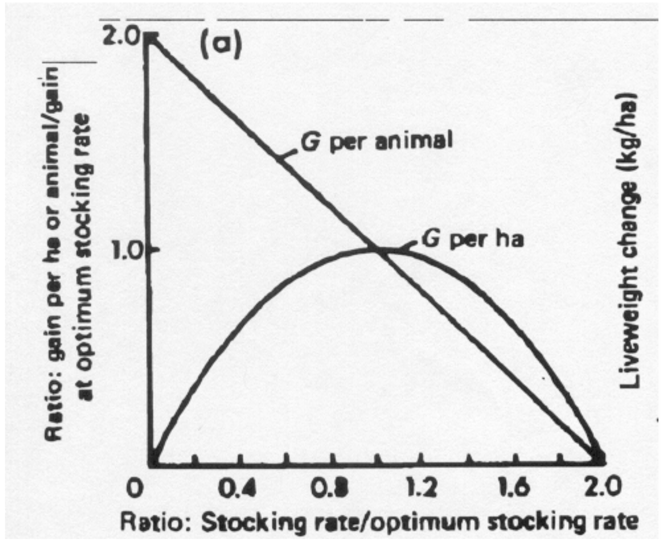
Grazing systems: Sustainability

Well-managed grazing systems operating in concert with the environment are stabilizing, as they were in Kentucky during the 1940s and 1950's. Over time, soils of sustainable grazing systems have lower density, higher rates of infiltration, lower rates of run off, more capacity to store plant-available water, higher soil oxygen tension, higher concentrations of soil organic matter, more active nutrient cycling, and more diverse and numerous soil microfauna (e.g. earthworms) and microflora. Well-managed grazing systems, therefore, improve structure, fertility, resiliency, and potential productivity of soils. Simply, good grazing systems are good for the environment, profit and productivity of grassland agriculture.

Grazing systems: Risk management

Risk management, that is minimizing or managing enterprise risks, is one of the best reasons for enhancing a grazing system. There are many types of risks associated with grazing systems. Some catastrophic risks, hurricanes, tornados, earthquake, lightning, drought, flood may be managed with insurance or federal assistance (FEMA). Risks of some contagious diseases may be treated with vaccines. Nutritional deficiencies, such as legume bloat, hypomagnesic tetany, and poison plants (e.g. fescue toxicants) may be reduced with appropriate livestock, pasture and grazing management.

Adopting new grazing systems may lower enterprise risks by extending grazing season (as in fall stockpiles), or by better matching intake to animal needs. Conversely, some practices may increase enterprise risks. Eventually increasing stocking rates destabilize grazing systems by increasing risks of starvation or disease. This is seen in G.E Maraschin's diagram (a) indicating the impact of stocking rate on per animal and per hectare production. The impact of stocking rate on risks and profits on a British grazing dairy are shown in diagram "d".

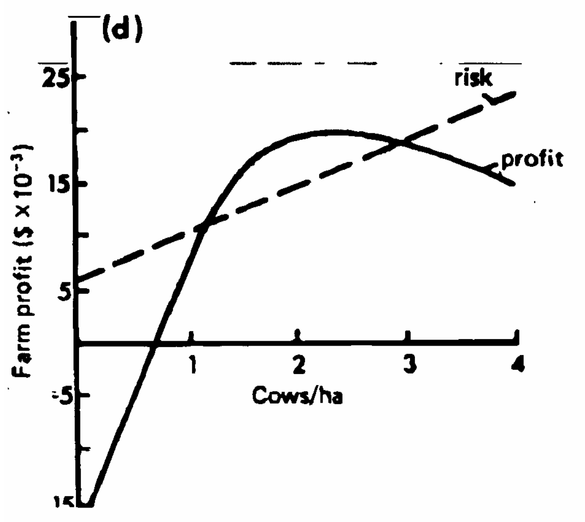


Maraschin, G. E. (2001). Production potential of South American grasslands. p.1-33. Proceedings of the XIX International Grasslands Conference Brasil.

Risk management: Planning for a grazing system failure

Some time should be spent in anticipating and planning for management responses to minor problems and catastrophic events. Some thought should be given to responses to severe storms (snow, ice, and lightning), tornadoes, hurricanes and floods. Calving, lambing, and foaling are particularly critical times. Predators may have a major impact on management of sheep and goat grazing systems. Failure in water service and integrity may be expected. Fences, gates, and water gaps may fail and need regular checking. Continuity and charge on electric fences also subject to failure. What would you do if your grazing livestock were quarantined because of contagious animal disease?

Protecting pasture integrity is a tenet of grazing system management. Water-logged pastures are very susceptible to treading damage, which has long-term effects on pasture composition and growth. Accessible “high and dry” loafing areas should be provided in flood-prone areas to minimize pasture damage and for animal welfare and health.



From Doyle, C.J., & A. Lazenby (1984). The effect of stocking rate and fertilizer usage on income variability for dairy farms in England and Wales. Grass and Forage Science 39:117-127.

Grazing systems: Crisis management
Some thought should be given to grazing management responses to severe storms (lightning), tornadoes, hurricanes and floods. Calving, lambing, and foaling are critical times. Accessible "high and dry" loafing areas may be needed on flood-prone areas to minimize pasture damage and for animal welfare. Predators may have a major impact on management of sheep and goat grazing systems.

Grazing systems: Rigid or flexible?
If you experienced the 1999 and 2002 droughts as an operator of a grazing enterprise in central Kentucky then you will not need convincing that rigid grazing systems will fail. Flexibility in grazing system operation is essential to account for environmental, fiscal, marketing and other crises.

Risk management in times of pasture shortage

Strategic reserves are needed year around to sustain livestock productivity during short-term fluctuations in supply of pasture and other events. Failure to recognize early signs of a grazing system in stress may be expensive. Kentucky beef producers may not recognize early signs of mid-season droughts and delay supplementing grazing systems. Operators need to anticipate these deficits or accept losses in growth, production, or body condition. In times of stress, pasture may be rationed, or livestock shifted to stockpiled pasture, or put on crop residues, fed hay, silage or concentrate. In times of slow pasture growth, the rotation must be slowed, say from 30 to 60 days, and the grazing spells shortened from say 7 to 2 days. This is a place for temporary fences.

Strategic reserves

Kentucky pastures grow very little from November through February. Although "pickins"' are nearly always available, grazing systems are typically not able to carry beef cow herds without supplement until the end of March. All year around pasture systems need about 5 big (1000 lb) bales of pasture hay per cow per winter. This would provide about 40 lb of hay per day per cow for 125 days and allow for wastage.

Management in times of plenty

Grazing system operators should also be prepared for occasions when rate of pasture production is faster than the rate of consumption by grazing. Surplus pasture is a potential problem of finely-tuned grazing systems. In spring and early summer, the first option is to remove fields from rotation and plan for a hay or silage harvest. The second option is to remove a pasture from the rotation and set aside or stockpile pastures. The third option is to accelerate the rotation: this means grazing pastures for a shorter time, say from 7 days instead of 2 days and the pasture rotation accelerated, say to 14 days. This practice slows the rate of pasture deterioration (dead and dying herbage, clover death and decline etc), reduces the risk of losing control of the pasture while sustaining amount and quality of intake. A fourth option may be mechanical mowing.

Conclusions

Grazing systems are complex ecosystems. Fortunately the grasslands on which they are contained are robust, resilient, and reliable ecosystems that adjust to most man-made and environmental perturbations. Ruminant livestock and horses, which coevolved on the grasslands over millions of years, are equally robust and resilient and able to handle situations thrust upon them by man. Management of grazing systems is largely intuitive, perhaps also inborn because of man's coexistence with livestock over 100,000 years or so. Experience and education helps, but flexibility and short response time are key.