

Forage Production Efficiency Factors*

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Introduction

The areas of adaptation of individual forage crop species differ greatly, the soils and sites available for forage production vary greatly (often even on a given farm), various species and classes of livestock are produced on different farms, and producers have widely differing resources and objectives. As a result, no two forage/livestock operations are exactly alike, and there is no one specific “correct” forage program. However, there are several key factors or concepts that have general application with regard to cost efficiency, and these will be the focus of this paper. These factors have always been important, but they loom as being even more important than ever in these days of high production inputs.

Take Care With Forage Establishment

Good forage production requires an adequate stand of forage plants. Mistakes made during establishment often have long-term consequences, because seedling plants are much more vulnerable to stress than older, more mature plants that have already developed good root systems.

Proper establishment requires attention to detail, including selection of productive varieties of adapted forage species, and following recommendations with regard to seeding rates, seeding depths, and date of planting. Control of weeds and insects are additional steps that may make the difference between success and failure. Taking care to not graze a new pasture stand too soon (thus avoiding trampling or grazing damage to the young plants), preventing weeds from shading out young pasture plants, and using proper timing and appropriate amounts of fertilizer can also be of extreme importance.

Soil Test, Then Lime And Fertilize As Needed

Application of fertilizer nutrients without having taken a soil test is guesswork. This is an elementary point, but applying nutrients or lime based on soil test recommendations remains one of the easiest and best ways the typical producer can increase the carrying capacity of pastures or the yields obtained from hayfields. Interestingly, although it is widely known that fertilization and liming are extremely important, many people don't apply soil amendments in the proper amounts and/or at the proper times, resulting in this being a major limitation to forage/livestock production. The higher the cost of fertilizer, the more important and cost efficient soil testing becomes.

Decisions related to applying fertilizers, particularly those involving the application of nitrogen fertilizer, should also take into consideration whether or not additional forage is needed in the short run. Not every acre of pasture necessarily needs to be fertilized every year. Soil test recommendations for pastures are based on the assumption that the forage produced is going to be

used. In the real world that isn't always the case. To use an absurd example, if a cattleman has 1,000 acres of pasture and only 1 cow, it isn't going to pay to fertilize.

Fertilization is important to getting good yields, but matching stocking rates and grazing method to forage production is important in getting good forage utilization. This is where fertilization of forage crops differs from fertilization of row crops. Fertilizing corn, soybeans, or cotton according to soil test recommendations almost always impacts favorably on yields and profit, but fertilizing forage crops will pay only when producers can utilize the forage that is produced. Making a forage fertilization program work economically requires having stocking rates adjusted to match the level of forage production.

Another important concept is that while livestock consume a lot of forage and therefore ingest large amounts of nutrients, they don't retain many fertilizer nutrients in their bodies. Most of the nutrients livestock consume are recycled. This is why soil fertility quickly becomes so much more critical in hay fields, where large quantities of nutrients are being removed from the field, as compared to pastures. Nutrients also flow from one field to another as animals consume forage or feed in one area and then deposit dung and urine in another. The long-term effects of nutrient flow can have important impacts on soil fertility, water quality, and the profitability of a livestock operation.

Use Legumes Whenever Feasible

Legumes, whether grown alone or with grasses, offer important advantages including improved forage quality and biological nitrogen fixation. Other potential benefits include increased total forage production and more even distribution of forage growth in pastures. Disadvantages of legumes are that as compared to grasses, they are generally more difficult to establish, less dependable, more sensitive to herbicides, and on average require higher levels of management. In addition, the feasibility of using a particular legume can vary greatly depending on a number of factors including soil pH and fertility, soil type, grazing or cutting management, and species of grasses present,

However, because they potentially can simultaneously increase animal performance and lower nitrogen fertilizer costs, the impact of legumes on profitability can be immense. Thus, it makes sense for a producer to periodically consider on a field-by-field basis whether the introduction or increased use of legumes would be beneficial and feasible. Once legumes have been established, proper management helps optimize benefits.

Emphasize Forage Quality

Animal performance is the ultimate measure of forage quality, but laboratory determinations of nutritional measures such as the levels of crude protein or digestible protein, energy (often expressed as total digestible nutrients), and fiber (usually expressed as crude fiber, acid detergent fiber, and/or neutral detergent fiber) are useful. Making certain that there is adequate protein and energy to meet animal nutritional requirements, and that fiber levels are low enough so that intake and digestibility will be high, is necessary to ensure good animal performance. On most farms, energy is the primary limiting nutritional factor, and thus deserves the most attention.

There is general consensus among forage crop agronomists and animal scientists that hay quality on many farms needs to be improved. Many factors can affect hay quality, but the two most

important are fertilization and stage of maturity at harvest, both of which are under the control of the producer.

The main way that fertilization affects forage quality is that applying nitrogen fertilizer increases the protein content of grasses, at least up to a point. While the levels of various nutrient elements in forage can be increased with fertilization, energy and fiber levels are relatively unaffected. The primary impact of fertilization is on forage quantity, rather than quality.

The most important determinant of hay quality is stage of maturity at harvest, but a high percentage of hay is harvested too late (though there are exceptions, a “rule of thumb” is that forage grasses should be harvested about the time seed heads first begin to emerge and forage legumes should be harvested when they first begin to bloom). Hay yields increase as forages become more fibrous, and it is gratifying to produce a high yield, but increased maturity lowers quality. Thus, because it is the quantity of nutrients consumed, rather than the quantity of hay consumed, that determines animal performance, sacrificing hay quality in order to obtain higher yields is counterproductive.

The quality-versus-quantity concept is one that many producers seem to have difficulty grasping and/or putting into practice. As hay becomes more mature and fibrous, animal performance is penalized in two ways. The quantity of nutrients per pound or ton of hay is less, while intake and the rate of passage through the bodies of the animals are lower, with the result being that fewer nutrients are absorbed into the animals’ bodies.

Forage quality is also important in pastures. Since some forage crops are inherently higher in quality than others, selection of what to plant (or what is allowed to be present) is of much consequence. Legumes almost invariably improve forage quality and animal performance, so growing them as companion species to grasses can be a wonderful technique. In addition, keeping stocking rates low enough to maintain enough leaf area to allow good rates of photosynthesis, but high enough to prevent forage from becoming too fibrous, has a major impact on animal performance.

In addition, since various forages or feeds are not equal with regard to forage quality, whenever possible the best quality material should be provided to the animals that have the highest nutritional requirements. This concept goes hand-in-hand with exercising good pasture management and minimizing stored feed requirements.

Prevent Or Minimize Pests And Plant-Related Disorders

Diseases, insects, nematodes, and weeds are thieves that lower yields, reduce forage quality and stand persistence, and steal water, nutrients, light, and space from forage plants. Variety selection, cultural practices, scouting, use of pesticides, and other management techniques can minimize pest problems. Knowledge of potential animal disorders caused by plants can reduce or avoid losses.

Strive To Improve Pasture Utilization

Forage is a unique commodity. It doesn’t do a livestock producer much good to merely produce forage. For it to benefit him economically, it has to be consumed by his animals. Furthermore, it needs to be consumed at a time when it has good nutritive value. This requires good grazing management.

Both the quantity and quality of forage available in a pasture vary over time. Many factors, including rainfall, timing and amount of fertilization, temperature, stocking rate, and the amount of sunshine, influence forage production. Consequently, adjustments in stocking rate, amount of pasture to which the animals have access, and/or the type(s) of animals that have access to particular areas are likely to be needed periodically to ensure good pasture utilization.

Various grazing methods can be used to improve pasture utilization in different situations. They include rotational stocking (moving animals from one pasture to another), creep grazing (allowing young animals to access a higher quality pasture), limit grazing (providing animals access to a pasture for only a few hours at a time), and forward grazing (allowing animals having higher nutritional requirements to have first access to a pasture so they can selectively graze the most nutritious forage).

Grazing management is a complex topic that cannot be comprehensively addressed in this paper, but suffice it to say that forage utilization can be substantially increased through the use of various pasture management techniques. The level and type of grazing management needed on various farms differ because the resources, types of livestock to be grazed, the types of forage plants present on a farm, and the objectives of producers vary tremendously. Each producer must decide what is appropriate for his operation. However, the fact remains that on many farms a higher level of grazing management could sharply increase forage utilization and profit.

Minimize Stored Feed Requirements

A major portion of the expense of keeping livestock is feeding them at times when there is no pasture growth available. Therefore, a basic objective for almost any forage/livestock operation should be to try to keep the amount of hay or other stored feed provided to the animals as low as possible.

On many farms, careful selection of the forages to be grown can reduce the amount of stored feed required. In particular, using both warm season and cool season perennial forage crops will help maximize the length of the grazing season. Also, selection of varieties that exhibit a particularly desirable growth distribution can sometimes help a producer provide more calendar days of grazing for his animals. In many situations, annuals can be used to complement the distribution of growth of perennial forages.

On farms where there is a diversity of farming enterprises, it may be possible to delay hay feeding by allowing cattle to glean corn, sorghum, or other crop residue. While crop residues do not provide high quality forage and may need to be supplemented, they can be a highly economical source of nutrition for some types of livestock such as brood cows.

In some cases it may be possible to “stockpile” pasture forage and subsequently graze it to delay the feeding of hay or other stored feed. This works best with tall fescue because this species can make a substantial quantity of growth just before the winter hay feeding season begins, plus the accumulated growth of fescue holds its quality better than that of most forages. Stockpiling, especially in areas where fescue is well adapted, is one of the most effective techniques for minimizing stored feed requirements.

Reduce Storage And Feeding Losses

Perhaps the easiest and simplest way for the average livestock producer to improve the cost efficiency of his operation is to minimize hay waste in storage and feeding. The introduction of round balers was a great time- and labor-saving innovation, but because round bales are often stored outside and are allowed to weather excessively, the percentage of hay wasted has increased.

It is likely that many producers do not fully realize the extent of their hay storage and feeding losses. Losses differ in various parts of the nation and with different types of hay, but research suggests that weathering losses can sometimes exceed 30% or more of the hay that is stored outside. In addition, it has been shown that under a poor feeding system, feeding losses alone can exceed 40%.

To reduce hay storage losses storage, the first priority should usually be to reduce or eliminate the amount of hay/soil contact. Storing hay on railroad ties, old tires, crushed rock, or a concrete pad are particularly good ways to reduce losses. If ground contact cannot be avoided, it is critically important that a well-drained site be selected for round bale storage. Other approaches that can be helpful include storing bales in a sunny spot where hay dries more quickly, feeding loosely baled hay early in the feeding period to minimize waste, and going to special lengths to protect the highest quality hay. (This might include storing it inside a shed or covering it with plastic or a tarp.)

There are two primary ways hay feeding losses can be reduced. The first is to reduce the amount of hay to which livestock have access at one time. The second is to use some type of round bale protectors (those that prevent loose hay from falling to the ground are best). Each approach requires effort, but is effective in reducing hay waste.

When hay (or other stored feed) is wasted, it is a real loss, not a potential loss. When hay is lost, all the investment of time, money, and energy has already been made and is lost as well. Hay that is wasted represents a squandering of resources and impacts heavily on the economics of a livestock operation. Thus, all steps within reason that can be taken to minimize hay storage and feeding losses should be taken.

Be Willing To Make An Investment Of Resources

The last point doesn't have as much to do with production efficiency as with production philosophy, but it may be the most important of all. A person can have a great deal of knowledge, but if he isn't willing to make the effort to apply it, he isn't going to reap the benefits. Rarely, if ever, do we get something for nothing, and this applies to forage programs about as well as to anything else. Having beautiful, productive pastures and hayfields that are efficiently utilized requires an investment of thought, study, time, effort, and a certain amount of money.