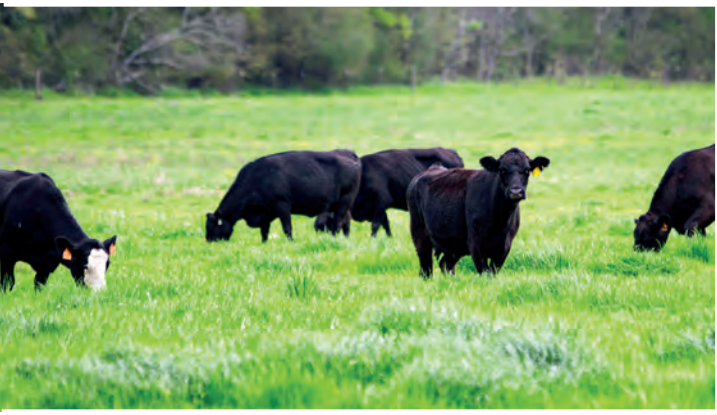
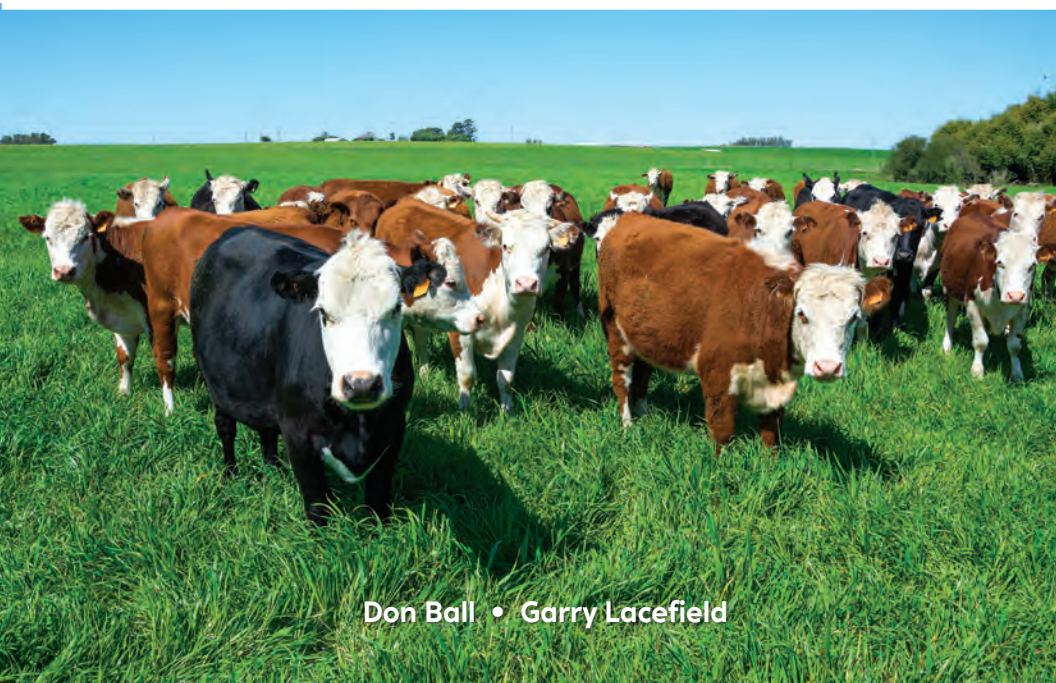
QUALITY FORAGE SEED GROWN IN OREGON

Keys to a Profitable Forage Program





Don Ball • Garry Lacefield

Oregon-grown forage seed is produced in the grass seed capital of the world where ideal growing conditions and passionate growers contribute to the inherent high quality of seed. Directed by local seed growers, Oregon's seed commissions advance research, ensure quality production and monitor purity testing to provide forage/livestock producers the very best products to help them to be successful. This publication is provided by the Oregon Forage Seed Commissions to bolster the progress of the forage and livestock industry. In addition to the information provided in this publication, producers who plant quality Oregon-grown seed are already a step ahead to a profitable forage program.

Bryan Ostlund,
Administrator, Oregon Forage Seed Commissions

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Oregon TALL FESCUE

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PREFACE

Forage crops have long been recognized as being important in livestock production. Typically, over half the cost of producing livestock is the expense of providing forage (pasture, hay, haylage or silage). In addition, the level of performance of grazing animals depends largely on the nutritional value of what they eat, which for most animals is mainly forage. The basic commodity is forage and animals are the harvesters or consumers. Efficient forage production and utilization are essential to a profitable operation.

High production input costs combined with inadequate sale prices of animals and animal products put many forage/livestock producers in a difficult financial position. Many livestock producers who are concerned about profitability may be compelled to consider making substantial changes in their operations. Fortunately, in many operations there are usually several areas related to forage production and management in which changes can be made that will dramatically improve the cost effectiveness of production. This publication provides a discussion of some critically important topics.

KNOW FORAGE OPTIONS AND ANIMAL NUTRITIONAL NEEDS

Making good decisions as to what forage species to plant in a given field is a requirement for success of a forage planting. A surprising number of plantings fail or perform poorly because the forage crop(s) selected was/were not well adapted. A producer must learn what forage species are suited to be grown on a particular soil type and site. It is also important to consider how each adapted forage crop can contribute to the overall forage program. This will likely require reading and thought as well as perhaps seeking advice of neighbors, university extension personnel or others whose opinions are valued. It can also be helpful to simply observe what species are already volunteering in the field to be planted or are being grown in a nearby area.

Variety selection is also critically important. The number of varieties available varies greatly among forage species, but in most cases, several options will exist. As with differences among forage species, varieties *within* a species can differ with regard to forage yield, forage quality, timing of forage growth, winter hardiness, susceptibility to diseases and numerous other traits. In most cases, forage variety trial information from universities and industry can be accessed online. Data generated in close proximity to where the crop(s) will be planted is particularly valuable, but even data from nearby states can provide much insight.

Seed of improved varieties, especially the best varieties, usually costs more than "common" seed or seed of less productive varieties. Consideration of the differing cost of varieties often has an inordinate and unfortunate influence on seed purchase decisions. After all, most of us are in such a habit of "looking for a good deal" that the tendency is to pay attention to the lowest price and not think much about potential long-term consequences.

Seed is only a fraction of the overall cost of establishing most forage crops; usually no more than 5 to 15 percent of the total. This is not of major consequence even with annual crops, but with perennial crops where seed cost is prorated over a stand life of several years, the difference in seed cost between the best variety and the worst variety is usually miniscule on an annual basis, while the potential for higher returns for better varieties is immense.

Seed should be purchased from reputable dealers who provide assurance that seed quality is high. This favors getting a good stand and increases the likelihood of profitable results from the planting. Seed purchase should be considered more of an investment than an expense.

The nutritional needs of grazing animals vary among livestock species and also within a given species. Even for a given individual animal, nutritional requirements vary. Factors that influence their needs include age, reproductive status, lactation and even weather. A forage-livestock producer needs to know what the requirements of animals will be, and take this into consideration when deciding what forages to plant.

ESTABLISHMENT IS CRITICAL

Good forage production requires an adequate stand of plants. The requirements for various forage crops vary widely, so a review of educational information related to establishment of a species to be planted is essential. Mistakes during establishment often have long-term consequences.

Once a decision has been made as to what will be planted in a particular field, a soil test should be taken to determine what soil amendments may need to be applied. Ideally, this should be done well in advance of planting because if lime is needed, it should be applied and (if possible) tilled into the soil to allow a few months for it to react and raise soil pH.

Application of the type(s) and amounts of fertilizer recommended by soil test should normally be applied just prior to final seedbed preparation. In particular, mixing fertilizer that contains phosphorus and/or potassium into the seedbed facilitates access of seedling plants to these nutrients, which are needed for their growth.

Weeds are often a problem during establishment. For some forage crops, use of a labeled herbicide (pre-emergence or post-emergence) can minimize this problem. Tillage done well ahead of planting can allow germination of many weed seeds in the soil, and additional tillage or use of a herbicide just prior to planting can eliminate the weed seedlings. In establishment of perennial forages that have poor seedling vigor, application of a large amount of nitrogen at planting is not advisable as it can increase weed competition.

Some factors that affect establishment success need to be tailored to a given forage crop. These include date of planting, seeding rate and depth of seeding. Recommendations are readily available from universities, Extension and other agency personnel and commercial companies. Attention to detail with regard to these points is advisable. Use of high quality seed of proven varieties is always prudent and seed should be placed in good seed/soil contact at the proper depth, seeding rate and date. The last three considerations vary for different forage crops, but recommendations are readily available from university and industry sources.

It is not wise to "cut corners" during establishment. If a producer is going to make a mistake that will have a severe long-term effect on forage production, it will probably be made between the time the decision to plant a forage crop (or crops) is made and when the planter is pulled out of the field.

APPLY LIME AND FERTILIZER AS NEEDED

This practice, more than any other, affects the level and economic efficiency of forage production. Fertilizing and liming as needed help ensure good yields, improve forage quality, lengthen stand life and reduce weed problems.

Budgets prepared by university agricultural economists indicate that the expense of applying fertilizer according to soil test recommendations frequently accounts for 50 percent or more of the cost of growing forage. In addition, supplying adequate amounts of plant nutrients has a major effect on forage crop plant health and productivity.

Soil testing is more valuable than ever. First, it allows a producer to determine soil pH, which is a critically important factor in forage production. In addition, anyone who doesn't do soil testing is guessing with regard to applying fertilizer. Applying too much fertilizer is a waste of money; applying too little will result in less-than-optimal forage growth. Soil testing isn't a glamorous activity, but it can provide a huge payback in terms of forage crop productivity and animal production. The higher fertilizer costs, the more important soil testing becomes.

Most livestock producers realize that forage is normally the least expensive source of nutrition for their animals, but when fertilizer costs are high, the idea of applying fertilizer in accordance with soil test recommendations may constitute a dilemma. On the one hand, fertilizer seems unreasonably expensive. On the other hand, failure to apply fertilizer will result in poor forage growth, with the result being that it may be necessary to purchase alternative sources of nutrition that will be even more expensive than applying fertilizer.

Higher fertilizer prices often cause producers to decide to apply less fertilizer. In such a situation, it makes sense to carefully assess stocking rate, expenses and the risk of running out of pasture forage too soon (which would increase stored feed needs unless animals are sold). Some producers reach the conclusion that to some extent they can substitute pasture acres for fertilizer, at least in the short run.

Careful attention to timing of fertilizer applications is worthwhile because pasture forage is more valuable at certain times or in some situations than others. As one example, tall fescue growth typically is greatest in spring, minimal in summer and relatively good in autumn. Because there is more likely to be an adequate amount of fescue pasture forage available in spring, fertilizer applied in late summer or early autumn may stimulate tall fescue growth that proves to be particularly valuable. The higher fertilizer prices are and the more expensive hay or alternative sources of feed become, the more important the timing of fertilizer application becomes.

Not all fields are equally productive. For example, one pasture may be located in a bottom where there is good soil and where moisture is seldom a serious limiting factor, while another pasture is dominated by steep hills where the soil is poor and plants are vulnerable to drought. Obviously, the return in terms of forage production per dollar spent on fertilizer will be quite different in the two fields.

Organic waste materials can be a good option for providing nutrients to forage crops. Livestock manures, poultry litter, treated municipal wastes and by-products from food processing may offer an opportunity for lowering costs. The keys to successful use of such materials are: (1) to make certain the cost per unit of nutrients applied is economical; (2) to verify that the product is safe to humans and animals; and (3) to know that the product will not harm the soil or the environment.

USE LEGUMES WHENEVER FEASIBLE

Legumes offer important advantages, whether grown alone or with grasses. Every producer should regularly consider on a field-by-field basis whether the introduction of legumes would be beneficial and feasible. Once legumes have been established, proper management optimizes benefits**.**

If you look at the big picture, there are really only two ways to improve the economic status of any enterprise, agricultural or otherwise. One is to increase income. The other is to reduce expenses. The fact that forage legumes such as clovers, vetches, alfalfa and lespedezas offer the possibility of simultaneously doing both provides insight as to why they are of such great value in forage/livestock production.

A unique way that forage legumes can reduce expenses is via their ability to interact symbiotically with a specific type of bacteria *(Rhizobium)* that takes nitrogen (N) from the air and fixes it in nodules attached to their roots. Studies have shown that where a good legume stand is present, the amount of N fixed per acre per year will typically be in the range of 50 to 150 pounds for most annual legumes, and 100 to 200 pounds or more for a perennial legume. Therefore, if N is selling for $0.60 per pound, fixation of 100 pounds per acre per year is worth $60 per acre.

Another way forage legumes can help reduce costs is that when they are grown in combination with forage grass(es), the grazing season will often be extended as compared to grass alone, thus helping reduce the need for stored feed. While this does not occur with every grass/legume combination, it regularly occurs with some. One example is that in many areas red clover seeded into tall fescue or orchardgrass will increase the amount of summer pasture forage growth. Another is that when

crimson clover, a winter annual, is seeded into a warm season perennial grass such as bermudagrass or bahiagrass, it will provide additional winter and early spring growth.

As compared to growing grass alone, forage yield resulting from growing a legume with a grass is often increased. The more costly N fertilizer becomes, the more likely it is that a livestock producer will be tempted to cut back on, or even eliminate, applications of N fertilizer. Yield is especially likely to be higher with a grass/legume mixture as compared to grass that receives little or no nitrogen fertilizer.

Last but certainly not least, forage legumes offer a wonderful opportunity for increasing income as a result of higher levels of animal performance. Thousands of experiments, as well as wide producer experience, have shown that legumes usually produce higher quality forage than grasses. Weight gains, conception rates and the overall health of grazing animals tend to be higher when the level of nutrition is improved.

That legumes often increase profitability of a forage-livestock operation was dramatically proven by a review of stocker steer grazing experiments in Alabama. In this exercise, studies involving 37 different forage systems were identified, only 15 of which involved legumes. Each of these experiments were three or more years in duration, and only 15 involved legumes. Performance per animal and per acre and the number of grazing days varied greatly among the systems. However, when Auburn University budget information was used to calculate pasture costs per pound of gain, the influence of legumes was striking. Of the ten lowest costs per pound of gain, the seven lowest, and 8 of the 10 lowest, involved legumes. In various systems this was because of some combination of lower nitrogen fertilizer costs, longer grazing periods and (especially) higher animal performance.

Forage legumes require more planting precision, they are less tolerant of herbicides and they are generally less tolerant of soil acidity than grasses. Also, with a few legumes the possibility of legume bloat can occur, although with proper management this problem rarely occurs. A succinct summary as to the matter of growing forage legumes is this: Nothing is perfect, and the benefits legumes offer

greatly outweigh the disadvantages. Use of forage legumes has always been a forage/livestock profit factor, but the higher the cost of production inputs and/or the lower the price paid for animals and animal products, the more economically important the use of legumes becomes.

EMPHASIZE FORAGE QUALITY

High animal gains, excellent milk production, reproductive efficiency and adequate profit require adequate nutrition. Producing high quality forage requires knowing the factors that affect forage quality and managing accordingly. Matching forage quality to animal nutritional needs greatly increases efficiency.

Advances in plant and animal breeding, introduction of various products that favor animal well-being and development of new management approaches have made it possible to increase animal performance. However, for animal production potential to be fully realized, there must be additional focus on forage quality.

Inherent forage quality varies greatly among and within forage crops, and nutritional needs vary among and within animal species and classes. Producing suitable quality forage for a given situation requires knowing the factors that affect forage quality, then exercising management accordingly.

Analyzing stored forages for nutrient content can determine whether forage quality is adequate, and can guide ration supplementation. If hay or haylage does not meet the nutritional requirements of the animals to which it is being fed, one of two things will happen: (1) weight gains and possibly reproductive efficiency will be less than optimum; or (2) supplemental feeds will need to be provided. Either of these scenarios is likely to have economic consequences that are far more negative than providing hay or haylage of adequate quality.

PREVENT OR MINIMIZE PESTS AND PLANT-RELATED DISORDERS

Diseases, insects, nematodes and weeds are thieves that steal water, nutrients, light and space from forage plants, resulting in lower yields, as well as reduced forage quality and shorter stand persistence. 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 harm to livestock.

Tall Fescue Endophyte

Space in this publication does not allow discussion of the numerous plant pests and disorders that can occur. However, a particularly good example of the economic importance of understanding an animal disorder occurs with tall fescue, which is the most widely grown forage grass in the United States. Most acreage is the variety 'Kentucky 31,' and in most fields over 80 percent of the fescue plants are infected with an internal fungus (endophyte) that produces toxins that lower animal gains and reproductive levels. The animal disorder caused by consumption of endophyte toxins is referred to as fescue toxicosis or fescue toxicity.

Toxic endophyte tall fescue reduces income on livestock farms in the USA by as much as a billion dollars each year. Thus, it is important for livestock producers to understand their options regarding minimizing endophyte toxin-related losses. In broad terms they are as follows.

Avoidance - This is simply the idea of preventing consumption of toxic fescue by grazing animals, at least at certain times. Consider the following: (1) grazing animals react more to endophyte toxins during hot weather; (2) toxin levels are highest in late spring; and (3) weight gains and conception rates of animals grazing toxic fescue in late spring are likely to be low. Thus, keeping certain animals from grazing toxic fescue at certain times can reduce losses.

Dilution - If at least some of the toxic fescue in an animal's diet is replaced with something else, the total amount of toxins consumed will be lower. One of the most effective approaches for reducing the effects of a toxic endophyte pasture is to grow a legume such as white clover with the grass.

Pasture Height - Animal gains are not reduced as much on young, tender growth of toxic endophyte fescue as is the case when they graze older, more mature forage. Also, fescue seedheads contain more toxins than leaves and stems. Grazing management that keeps animals eating young grass and that minimizes the opportunity for them to selectively graze seedheads is desirable.

Hay And Haylage Management - Hay, and especially haylage, contain lower levels of endophyte toxins than green grass, but there are still adverse effects. However, toxic hay fed during cool weather has less negative effect on animals than the same hay fed during warm weather.

Kill Tall Fescue And Establish Some Other Forage Crop - Another option is to kill a stand of toxic endophyte fescue and replace it with some other perennial forage crop such as bermudagrass or orchardgrass. This is especially feasible when forage crops and row crops are grown in rotation. However, tall fescue has many excellent forage qualities, so the best option may be to replace toxic fescue with non-toxic fescue.

Kill Toxic Endophyte Fescue And Plant Endophyte-Free Or Novel Endophyte Tall Fescue - Since the endophyte was discovered and its importance was recognized, several tall fescue varieties have been released that do not contain an endophyte. These endophyte-free varieties do not cause fescue toxicosis because there is no internal fungus present to produce toxins. The result is markedly better animal performance. However, in some environments the stress tolerance of some endophyte-free varieties is less than endophyte-infected tall fescue. This can result in decreased stand persistence, especially in the southern portions of the area in which tall fescue is grown.

A major forage research development was identification of endophyte strains that do not produce the toxins referred to above, but that do produce the compounds that enable fescue persistence. "Novel endophyte" is the term scientists use for a fungus that was selected and subsequently inserted into a plant for the purpose of getting particular results.

Novel endophyte fescue (NEF) has been a great success. Since 2000, hundreds of thousands of acres have been planted in the USA, plus a substantial number have been planted in other countries, especially New Zealand (novel endophyte perennial ryegrass is even more widely planted than NEF in that country).

Here are three important facts. First, gains of animals grazing NEF have been similar to those obtained with endophyte-free

fescue (sometimes almost twice the gain as on toxic endophyte Kentucky 31). Second, the reproductive rates of animals grazing endophyte-free or NEF varieties are often considerably better as well. Third (in view of the stand loss problems that can occur with some endophyte-free fescue varieties in harsh climates and/or otherwise stressful conditions), a point of special interest is that NEF has proven to be tough and persistent. Several NEFs are now commercially available in the United States, and more are expected.

Non-toxic tall fescue (endophyte-free or NEF) represents one of our most promising opportunities for cost- efficient livestock production. For example, gains of yearling beef animals grazing non-toxic tall fescue can approach 2 lb/day, and calf weaning weights can be 50 or more pounds higher than with toxic endophyte fescue. When clover is grown with non-toxic tall fescue, gains are even better, while nitrogen expenses are reduced or eliminated. Clearly, non-toxic tall fescue can greatly improve the economics of livestock production on many farms where tall fescue is adapted.

Note: A publication that provides much insight into the history, management and potential of tall fescue is titled, "The Wonder Grass: The Story of Tall Fescue in the United States." This book, written by D.M. Ball, G.D. Lacefield and C.S. Hoveland, was published by the Oregon Tall Fescue Commission. Information pertaining to obtaining the book is available at: www.oregontallfescue.org/wondergrass.

EXERCISE GOOD GRAZING MANAGEMENT

The quantity and quality of pasture growth vary over time. Periodic adjustments in stocking rate or use of cross fencing to vary the type and amount of available forage greatly affect animal performance and pasture species composition. Knowing the advantages and disadvantages of different grazing methods allows use of various approaches as needed to reach objectives. Matching stocking rates with forage production is also extremely important.

Grazing management is a many-faceted topic that becomes increasingly important when economic conditions are difficult. Here are some (certainly not all) of the economically important benefits that can result from proper grazing management.

Higher Percentage Of Pasture Forage Utilized - The percentage of pasture forage produced that ends up being consumed by grazing animals increases as grazing management increases. With management intensive grazing, utilization can be increased by as much as 20 to 30 percent in some cases.

More Pasture Forage Produced - Leaves are the food production factory of forage plants. One of the goals of grazing management should be to ensure that there is always enough young leaf tissue present to allow good interception of sunlight, but to minimize the number of old, marginally productive leaves. This favors more forage growth.

Better Nutrient Recycling - Good grazing management forces grazing animals to spend more nearly equal amounts of time in various parts of pastures. This results in more even distribution of urine and manure, which are major sources of nutrients.

Higher Quality Pasture Forage - The older and more mature forage becomes, the lower forage quality will be. Proper grazing management helps ensure that pastures are not undergrazed and that pasture forage quality will be high.

Fewer Weeds - As grazing management becomes more intensive, animals have less opportunity to selectively graze. Many weed species have low tolerance to defoliation and thus are put at a severe disadvantage if it occurs on a regular basis.

Less "Spot Overgrazing" Of Desirable Plants - Good grazing management allows a rest period for desirable forages. The result is a substantial increase in the competitiveness and persistence of desirable forages.

Facilitates Use Of Legumes - Legumes offer many benefits, but they require a higher level of management than grasses. Good grazing management can include use of strategies that favor establishment and persistence of legumes.

Larger Plant Root Systems - Removal of leaves is a major stress factor for plants. When plants are grazed too closely, root growth stops or is severely reduced. Appropriate grazing management favors development of larger root systems that make plants more resistant to drought and other stresses, thus tending to lengthen the number of calendar days of grazing and reduce stored feed needs.

Improved Soil Quality - Pastures that are never overgrazed and in which forage plants and their root systems are healthy and vigorous tend to have more soil organic matter, be less compacted and allow better water infiltration. Such pastures are also much less vulnerable to erosion. Therefore, grazing management results in a livestock operation being much more environmentally friendly.

MINIMIZE STORED FEED REQUIREMENTS

Feeding animals during times when pasture forage is not available is typically the greatest expense associated with livestock production. While most livestock producers know that hay is costly, it seems that many may not fully realize and appreciate just how expensive it really is. Anyone who would like additional enlightenment regarding the cost of hay production should carefully review up-to-date forage budgets that are applicable to their geographical area.

An inescapable conclusion that results from a thorough evaluation of the cost of hay production is that, to the extent possible, it is desirable for a cattle producer to minimize the feeding of hay. A recent publication titled, "Extending Grazing and Reducing Stored Feed Needs," which summarizes approaches that can be used to accomplish this objective, is online at several websites.

For most livestock producers, extending the grazing season for their animals, or otherwise filling gaps in pasture forage availability to reduce stored feed needs, should be a high priority objective. Extending the grazing season with use of both cool season and warm season forages, stockpiling forage and grazing crop residues are examples of ways stored feed needs can be reduced.

Most livestock producers need to have a supply of stored feed on hand to provide to their animals at times when pasture forage is inadequate to meet nutritional needs. Hay is the most logical type of stored feed to rely upon at most

times and in most situations. However, hay is environmentally problematic, labor intensive and expensive. Generally, the less hay or other stored feed required, the greater the cost effectiveness of a livestock operation.

REDUCE STORAGE AND FEEDING LOSSES

Wasting hay, silage or other stored feed is costly. On many farms the average storage loss for round bales of hay stored outside exceeds 30 percent, and feeding losses can easily be as high or higher. Minimizing waste with good management, forage testing and ration formulation enhances feeding efficiency, animal performance and profits.

Several factors affect the extent of hay storage losses, but storage technique is of utmost importance. Losses of dry hay stored inside a barn or otherwise protected from the elements are usually of little concern. However, even for barn stored hay, losses rise sharply as moisture levels increase above 20 percent, and losses from round bales stored outside under adverse conditions can be much larger. Hay can be subject to dry matter losses as well as to losses of forage quality during storage.

In the eastern United States, it is not unusual for four to eight or more inches of spoilage to occur on the exterior of large round bales stored outside with no protection from the elements. A weathered layer six inches in depth on a five-foot by six-foot bale contains about one-third of the package volume. The percentage of loss decreases as bale size increases because a smaller proportion of the bale volume is contained in the surface layer.

In areas of high and/or frequent rainfall, or with hay that does not shed water readily, the method of storage can make the difference between less than five percent

or more than 50 percent, dry matter loss due to weathering. Furthermore, losses of more than 14 percent of the total crude protein and more than 25 percent of the total digestible nutrients can occur in the most highly weathered parts of a bale. An important associated factor is that the palatability of weathered portions of bales is decreased, which lowers intake and increases refusal. Space does not allow discussion of all important hay storage points in this publication, but here are a few that are worthy of consideration.

- In general, as density (tightness) of round bales is increased, the lower the amount of spoilage due to outside storage will occur, assuming hay moisture at baling is 18 to 20 percent or lower.
- Net wrap is more effective than twine wrap in preventing losses.
- If hay must be stored outside, the location should be a well-drained area. Hay/soil contact should be prevented.
- The flat ends of bales should be firmly butted against one another. If possible, rows should run north and south. At least three feet should be left between bale rows to allow good air circulation.
- Barn storage or use of some type of cover to prevent penetration of rain water is desirable, especially on loosely baled or large-stemmed hay.

Hay storage and hay feeding are intertwined, and both operations greatly influence the amount of hay wasted (and therefore needed) in a livestock operation. In fact, hay storage conditions affect feeding losses, because animals are more reluctant to consume weathered hay, and will therefore waste more. Feeding losses occur mainly from trampling, refusal and leaf shatter. Some feeding loss is inevitable, but it can vary from as little as two or three percent to well over 50 percent. The more hay presented to animals at a time, the higher feeding losses will be.

Recognition of the potentially higher losses from feeding large hay packages has led to development of various strategies to minimize losses. Placing a barrier between animals and the hay, such as a hay ring, has been shown to be quite helpful. A cone, trailer or cradle feeder design is even more effective due to reduced amounts of hay falling on the ground. Some producers unroll hay on sod, which can also greatly lower feeding losses while reducing pasture damage as compared to simply placing a bale on sod.

If hay is fed on sod, the feeding areas should be rotated. This minimizes soil compaction and damage, and also helps result in more even distribution of dung and urine. It is desirable to select less fertile fields (or such areas within fields) for feeding hay on sod, as this will aid in building soil fertility in these locations.

Losses of hay during storage and feeding are *real*, and not just potential, losses. When hay losses occur, the time, thought, labor and monetary inputs involved in producing or procuring the hay are lost along with the hay. Clearly, any livestock producer who is seriously interested in maximizing cost effectiveness in his or her operation needs to focus on all aspects of hay. Losses that occur during storage and feeding are expensive but relatively easy to prevent or minimize.

Hay Production Versus Hay Purchase

There are several valid reasons why people may opt to produce rather than purchase hay. However, anyone who is truly serious about improving the cost effectiveness of their operation would do well to consider the economic feasibility of buying hay as opposed to producing hay. Because of the expense of owning and operating hay equipment, it is quite difficult for a producer who has only a relatively small number of animals to economically justify producing hay. Most Land Grant universities provide annually prepared budgets that provide much insight regarding the economics of producing versus purchasing hay.

RESULTS REQUIRE INVESTMENTS

In human endeavors, results are usually highly correlated with investments in terms of thought, time, effort and a certain amount of money. In particular, the best and most profitable forage programs have had the most thought put into them. Top producers strive to continue to improve their operations.

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REFERENCES

1. Ball, D.M., C.S. Hoveland, C.S., and G.D. Lacefield. 2015. Southern Forages (Fifth Edition). International Plant Nutrition Institute. Peachtree Corners, Georgia.
2. Ball, D.M., and G.D. Lacefield. 2008. Keys to Forage Profitability. Proc. of AFGC/SRM National Conference, Louisville, KY.
3. Chessmore, Roy A. 1979. Profitable Pasture Management. Interstate Printers and Publishers, Inc., Danville, Illinois.
4. Heath, Maurice E., Robert F Barnes, and Darrel S. Metcalfe. 1985. Forages. Iowa State University Press, Ames, Iowa.
5. Lacefield, G.D. and Ray Smith. 2009. Renovating Hay & Pasture Fields. University of Kentucky. Pub. No. AGGR-26.
6. Pearson, C.J., and R.L. Ison. 1987. Agronomy of Grassland Systems. Cambridge University Press, New York, New York.
7. Smith, Burt, Leung Pingsun, and George Love. 1986. Intesive Grazing Management. The Graziers Hui, Kamuela, Hawaii.
8. Vallentine, John F. 1990. Grazing Management. Academic Press, Inc., San Diego, California.

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