Reducing Winter Feeding Costs

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During periods of reduced forage growth (typically winter), livestock must have an alternative source of feed. However, producers spend an extraordinary amount of money on providing these alternative feeds. Analysis of data from the Standardized Performance Analysis (SPA, Fig. 1) survey indicates that there is wide variation in input costs associated with livestock production systems. Regardless of whether a producer falls into the low-, mid-, or high-cost category, feed costs account for approximately 26 percent of the cost of production. Feed costs, as demonstrated by the SPA data, reflect the second highest annual cost associated with cattle ownership, and second only to the original purchase price of the cattle. The use of supplemental feed (hay or concentrate) may be beneficial to livestock, especially for growing animals, animals in the latter stages of gestation, lactating animals, or during periods of reduced forage growth (i.e., drought, winter). Most producers could substantially reduce their winter feed costs by carefully considering their forage production management practices. Reducing input costs associated with hay production and feeding (regardless of whether the hay is produced on-farm or purchased off-farm) or concentrate-type feeds, can help to improve the profitability of livestock production systems. This publication discusses management practices that can reduce the costs associated with livestock winter feeding programs.

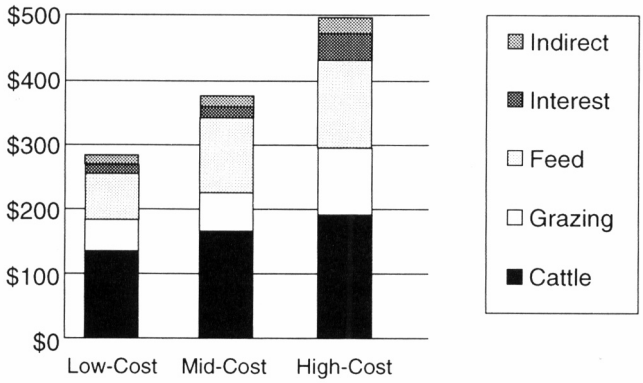

Figure 1. Standardized Performance Analysis (SPA) financial summary ($/cow). McGrann and Walter, 1995.

Improving Hay Utilization

Forage Production

One of the easiest methods to reduce the need for supplemental feed is to produce hay of higher nutritive value. Most hay is produced from introduced-forage pastures and the comments here will be specific to forage production of bermudagrass, Old World bluestems, tall fescue, and other commonly used introduced species. Hay produced from rangelands is not normally fertilized; however, nutritive value of traditional native grass hay can be improved by harvesting at the appropriate stage of maturity.

Forage nutritive value relates to those constituents in forages that can be determined by laboratory analysis, such as the crude protein content and digestibility. There are two aspects of forage production under direct control of the manager that govern production of hay that is high in nutritive value: proper soil fertility and the stage of maturity of the forage when harvested.

Nitrogen is second only to moisture in relative importance regarding dry matter production. There is a high positive correlation between fertilizer nitrogen and crude protein; as nitrogen rate increases, so does forage crude protein content. Table 1 illustrates the typical response of bermudagrass to increasing rates of nitrogen fertilizer. Note that other forage grasses will also respond in a similar fashion, but at somewhat reduced yields. It is also important to note that if growing or lactating animals are fed during the winter, high-crude protein hay can reduce the requirement for protein supplements.

Table 1 demonstrates the importance of nitrogen fertilizer regarding both crude protein and dry matter production. Depending on the level of crude protein required (mature animals or growing animals) and the dry matter needed for winter feeding, a producer can decide in advance what level of nitrogen fertilizer will be necessary for the enterprise. Remember, without nitrogen fertilizer, forage nutritive value and dry matter production will be reduced. Nitrogen is generally a good investment in the livestock production system because of a good return on every dollar of nitrogen invested.

For nitrogen fertilizer to be most effective, other soil nutrients, such as phosphorus and potassium, must be adequate and the soil pH must be appropriate for the forage species produced. For additional information on estimating livestock demand, fertilizer requirements, and forage production, see

Extension publication PSS-2584, "Forage Budgeting Guidelines." For additional information on forage production practices, see Extension publications PSS-2587, " Bermudagrass for Grazing and Hay", PSS-2559, "Tall Fescue in Oklahoma", and PSS-2585," Forage Legumes for Oklahoma."

The other critical element of good hay production is to harvest the forage at the appropriate stage of maturity. With increasing maturity, there is a corresponding increase in cell wall components that are less digestible than cell contents. There is also an increase in lignin, which is an indigestible forage component. Increased cell wall and lignin are important in helping forages maintain their leaves and stems in an upright manner. Cell wall and lignin have a negative effect on forage nutritive value. Figure 2 demonstrates in a conceptual manner the typical forage response to increasing maturity. Although nutritive value of legumes also declines with increasing maturity, the effect is not as dramatic as with grasses.

Because of the declining nature of forage nutritive value with time, it is important that forage be harvested while nutritive value is high. There must, however, be enough dry matter in the field to justify the cost of mowing and baling the forage. Data contained in Table 2 suggests various stages of growth for different forage species that will result in a good balance of dry matter production and forage nutritive value.

Table 1. Bermudagrass dry matter (DM) yield and crude protein (CP) content as influenced by cultivar and nitrogen application rate. Taliaferro et al.,1995.

Variety	N rate (lbs/ac)	DM (tons/ac)	CP (%)
		Haskell, OK	
Midland	40	5.71	12.24
	80	6.56	11.10
	160	8.21	13.07
	320	8.99	14.60
Hardie	40	7.28	11.87
	80	7.73	11.36
	160	8.85	12.62
	320	9.94	13.90
Tifton 44	40	6.38	11.92
	80	6.75	11.50
	160	8.73	12.59
	320	9.91	13.70
		Stillwater, OK	
Midland	40	3.72	8.67
	80	4.69	9.40
	160	5.89	10.54
	320	7.31	12.86
Hardie	40	4.15	8.83
	80	5.13	9.21
	160	5.67	10.62
	320	7.45	12.05
Tifton 44	40	3.72	10.23
	80	4.59	10.02
	160	5.25	11.42
	320	6.90	13.27

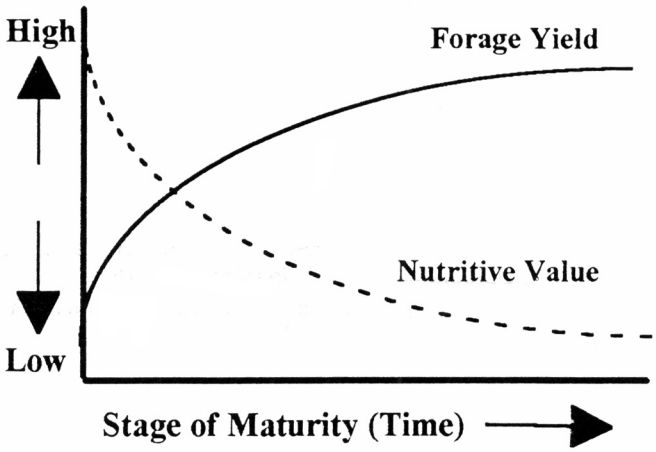

Figure 2. Effect of stage of maturity on forage yield and forage nutritive value.

The producer has great control over both the quantity and nutritive value of forages used for conservation as hay. The amount of purchased feed for winter feeding programs can be reduced if care is taken to produce hay that has been fertilized adequately and harvested at the appropriate stage of maturity. These concepts apply equally to forage that is cut and ensiled.

Harvesting and Storage

Good management practices do not end with application of the correct level of nitrogen fertilizer and harvest at the appropriate stage of maturity. The most critical time in hay production is the period immediately following harvest and prior to baling. Most producers realize that forages used for hay should not be harvested when there is a good chance of rain. Much of the harvested dry matter and nutrients can be lost if rain falls on the harvested forage while field curing. Raindrop impact shatters leaves and rain leaches valuable nutrients from the forage tissue.

Field-cured hay should have a moisture content of approximately 15 to 20percent at baling. It is important to rapidly reduce the moisture content of hay to this moisture level since plant respiration will continue until the moisture content is approximately 40percent. Continued respiration uses highly digestible plant nutrients that are important for good animal performance. Properly cured hay is also essential to reduce the potential for spontaneous combustion of stored hay. High-moisture hay produces tremendous amounts of heat energy that can lead to a costly hay fire. High-moisture hay is also conducive to the formation of molds and fungi that can reduce the nutritive value of the hay or cause the formation of toxins as in the case of high-moisture sweetclover hay.

Hay should be properly stored to minimize dry matter loss and loss of stored nutrients. It is common knowledge that small square bales should be stored out of the weather. There seems to be the misconception that large round bales

Table 2. Recommended growth stages to harvest and harvest intervals for various hay crops. Ball et al., 1996.

Plant Species	Stage of harvest and/or interval
Alfalfa	15- to 1 8-inch height for first cutting, mow every 4 to 5 weeks or when 15 inches high.
Orchardgrass, timothy, tall fescue	Boot to early head stage for first cut, aftermath cuts at 4 to 6 week intervals.
Red, arrowleaf, or crimson clovers	Early bloom.
Sericea Lespedeza	15- to 1 8-inch height.
Oat, barley, wheat, rye	Boot to early head stage.
Soybean, cowpea	Mid- to full-bloom and before bottom leaves begin to fall.
Ladino or white clover	Cut at correct stage for companion grass.
Hybrid bermudagrass	15- to 18-inch height for first cutting, mow every 4 to 5 weeks or when 15 inches high.
Birdsfoot trefoil	Cut at correct stage for companion grass.
Sudangrass, sorghum-sudan hybrids, pearlmillet	30- to 40-inch height.

Table 3. Effect of storage system on dry matter loss of ryegrass hay stored for seven months.

Storage System	Dry matter (%)	Losses Animal Befusal (%)	Total (%)
Ground	28	22	50
Gravel	31	17	48
Tires	35	6	41
Rack	26	6	32
Rack with cover	12	2	14
Barn	2	1	3

can be stored outside under virtually any condition and still provide hay of good nutritive value. Nothing could be further from the truth!

An experiment in Louisiana examined the effect of storage conditions of large round bales of ryegrass stored for seven months. The results are contained in Table 3.

Data from Oklahoma State University also indicate that improperly stored round bales can lose as much as 50percent of their dry matter. This results in the hay costing twice as much. Round bales should be stored to minimize exposure to the elements. Many producers believe that a good hay storage barn is the only building on the farm or ranch that will actually pay for itself. Based on the data indicating hay dry matter loss in the field, they may be right. For more information on proper storage of round bale hay, see Extension publication BAE-1716, "Round Bale Hay Storage."

Hay Feeding

Hay should be fed using a manger or hay ring to decrease the amount of hay that is wasted. If a manger or hay ring is not used, livestock will render much of the hay useless by urinating, defecating, and bedding on the hay material. The result of the wasted material significantly increases the hay cost.

If possible, hay should be fed in the afternoon. Studies on hay feeding suggest that animal performance is better when animals are forced to spend the morning and early afternoon foraging on standing dormant forages and then receive hay. Animals that were fed hay in the morning generally spent most of their time loafing around the feeding area waiting on the next hay feeding time.

Alternatives to Feeding Hay

Feeding hay during periods of reduced forage growth dates from at least 750 B.C. in Great Britain and even earlier for middle eastern countries using alfalfa hay. The use of hay can be critical to livestock survival during times of reduced forage production or during periods of snow cover. Although hay will probably never be completely eliminated from livestock production systems, many Oklahoma producers feed too much hay for too long a period of time. In fact, it is not unusual to see many producers feed hay for 5 to 6 months. This type of feeding program is expensive, especially when producers could be pasturing their livestock.

Stockpiled Forage

One alternative to feeding hay is the use of stockpiled forages. Stockpiling is the process of allowing forage to accumulate in the pasture for grazing at a later time. There are two distinct advantages to using stockpiled forage.

The first is that the producer is not out the expense of baling the forage, hauling the hay to the barn or other storage location, and then hauling the hay back to the livestock at a later date. The savings that can be realized from using stockpiled forages relative to hay production and feeding can be substantial. Information derived from AGMACH$, a software program developed at OSU, indicates that production costs associated with harvesting and hauling hay can approach $35/acre (Table 4).

Thus, the use of stockpiled forage can significantly decrease costs of livestock winter-feeding programs. The other advantage is that the producer is not forced to feed hay during inclement weather.

The use of stockpiled forage is not new. Producers who use rangelands have utilized stockpiled forage for winter grazing for many years. In fact, hay is not generally fed on rangelands except during periods of heavy snow cover. What may be somewhat novel is that producers using introduced forages can also take advantage of stockpiled forage for winter grazing.

Tall fescue is an excellent choice as a stockpiled forage because it maintains nutritive value well as a standing forage. Data from OSU also indicates that well-fertilized bermudagrass maintains 8 to 9 percent crude protein through mid-February even in eastern Oklahoma. The same study indicated that energy would be the limiting factor for cattle grazing stockpiled bermudagrass and that some energy supplementation would be required, especially for young or thin animals.

It is important to control livestock grazing, especially stockpiled forages. Uncontrolled animals will attempt to select the best diet and trample unwanted forage. By using electric fencing or multiple paddocks, producers can enhance forage harvest efficiency and see that little forage is wasted.

Cool-Season Forages

Another alternative to the use of hay would be the use of cool-season forage pastures. Oklahoma producers have used wheat pasture for many years with good success. Animal performance is generally good to excellent, and the cost of fresh forage relative to animal gain is usually less than that of hay and supplements or supplements alone unless livestock are continuously stocked on pasture. Figure 3 illustrates the relative costs of various cool-season feeding programs.

Most winter feeding programs in Oklahoma and across the southern United States involve some sort of hay plus supplement strategy. The supplements are usually either range cubes or molasses-based liquid supplements or blocks. As can be seen from Figure 3, this is an expensive way to winter a cow. Equally expensive is continuous stocking of winter annuals, in this case a rye-ryegrass combination. The least expensive method illustrated in Figure 3 involves the use of a rye-ryegrass combination that is limit-grazed. In a limit graze system, livestock are allowed to graze fresh forage on a limited basis (2 hours/day, every other day, etc.) and spend the remainder of their time on dormant grass pasture where they may also receive hay, depending on the class of animal.

Table 4. Estimated production costs per acre for hay harvest and storage. Based on 200-acre harvest area.

Activity	Cost/acre
Mowing	$ 5.78
Raking	$ 4.88
Baling	$13.82
Hauling	$10.50
TOTAL	$34.98

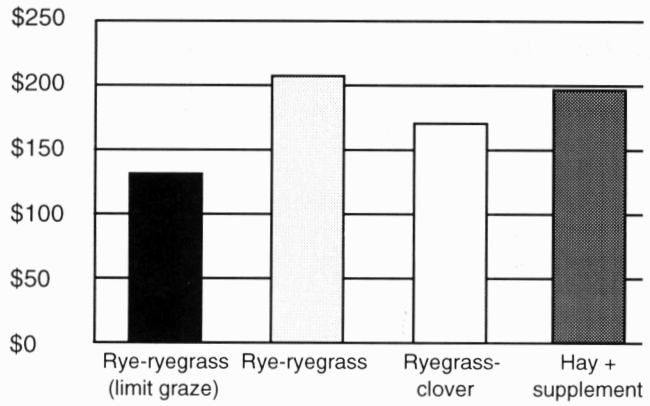

Figure 3. Estimated 5-month wintering cost per cow. Clary and Reeves, 1995.

This extends the quantity of forage produced in the cool-season pasture and requires less acreage to be established.

Producers who use bermudagrass can successfully overseed (sod-seed) cool-season annual combinations such as rye-ryegrass, wheat-ryegrass, and others into the dormant bermudagrass sod. The cereal grain is drilled into the short bermudagrass sod, and ryegrass is simply broadcast into the pasture with fertilizer as a topdressing to the cereal grain. Grazing can usually begin by mid to late November and continue until bermudagrass initiates growth the following spring. For additional information, refer to Extension publication F-2587, "Bermudagrass for Grazing or Hay."

Probably the least expensive method of feeding cattle during the winter involves the use of a cool-season perennial forage grass. Once established, the only annual cost associated with a cool-season perennial grass is that of maintenance fertilizer and/or lime. Animal performance is comparable to that of animals grazing cool-season annuals, and the reduced input cost should enable producers to realize a better return from the production system. The cool-season perennial forage grass presently used in eastern Oklahoma is tall fescue. Cool-season perennial grasses for use in western Oklahoma are under evaluation by OSU. Early results indicate that several of the pubescent and intermediate wheatgrasses, certain smooth and meadow bromegrasses, and possibly orchardgrass may be adapted to the environmental conditions encountered in the southern Great Plains, including western Oklahoma.

Regardless of whether a cool-season annual or perennial forage grass is used for winter feeding, it is critical that producers pay close attention to basic production fundamentals. Soils where the cool-season forages will be established should be sampled and fertilizer applied according to soil test recommendations. Without proper fertility, the forage produced can become expensive.

Summary

Survey information indicates that one of the major costs involved in livestock operations is winter feeding. Most live-

stock producers have high feeding costs because of one or more of the following:

a. Use of hay that is low in nutritive value
b. Feeding hay for an extended period of time
c. Too much dependence on concentrate feeds
d. Too little use of forages (stockpiled or growing) for winter feeding

Hay that is low in nutritive value results from a poor fertility program, harvest at an advanced stage of maturity, and/or improper care during harvest and storage. Use of inferior hay decreases animal performance and may require the purchase of concentrates to boost animal performance. Either scenario reduces profitability. Likewise, lack of forages for winter feeding programs results in feeding hay and/or concentrates for an extended period of time. This also reduces profitability of the production system. Producers should evaluate their winter feeding programs and determine if changes should be made to reduce the winter feed costs of their livestock production enterprise. For additional information, contact the local county agricultural Extension agent.

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Clary, Greg and Sim Reeves. 1995. Estimated winter pasture and cow wintering costs. Symposium on Annual Ryegrass, 31 Aug. - 1 Sept.,1995, Tyler, TX. Texas A&M University Agr. Exp. Sta. MP-1770.

McGrann, James and Shawn Walter. 1995. Reducing costs with IRM/SPA data. Proc. NCA Cattlemen's College, PE102. Nashville, TN.

Taliaferro, C.M., G.L. Williams, Jim Enis, S.W. Coleman, and F.T. McCollum. 1995. Performance of forage bermudagrass varieties in Oklahoma tests, 1992-1994. Oklahoma Cooperative Ext.ension Service Production Technology 95-11.

Other Extension publications that may be of interest:

ALFALFA

E-943 Forage Harvest Management - Discussion with cost benefit analysis
PSS-2072 Blister Beetles and Alfalfa
PSS-2089 Alfalfa Stand Establishment
PSS-2097 Alfalfa Weevil and Its Management
AGEC-539 Alfalfa Marketing Plan
EPP-7150 Alfalfa Forage Insect Control
EPP-7184 Alfalfa Aphids in Oklahoma
PT-95-24 Alfalfa Varieties for Oklahoma-1995 FORAGES
PSS-2559 Tall Fescue in Oklahoma
PSS-2584 Forage Budgeting Guidelines
PSS-2585 Forage Legumes for Oklahoma
PSS-2586 Wheat for Pasture
PSS-2587 Bermudagrass for Grazing or Hay
PSS-3020 Production and Management of Old World Bluestems Forage Grasses: What is Available and What Should You Use? Proc. of Forage Management College. Nov. 14, 1995. Vinita, OK. Okla. Coop. Ext. Serv.
Forage Legumes for Eastern Oklahoma. Proc. of Forage Management College. Nov. 14, 1995. Vinita, OK. Okla. Coop. Ext. Serv.
PT-95- 13 Arrowleaf Clover
PT-95- 14 Cool-season Perennial Forage Grasses for Oklahoma
PT-95- 17 Red Clover
PT-95-28 Cool-season Perennial Forage Grass Establishment and Management
PT-95-29 White Clover
PT-96-36 Selecting Forages for Nutrient Recycling
PT-96-15 Cool-Season Perennial Forage Grasses for Oklahoma: Spring 1996 Data

FORAGENUTRITIVE VALUE

PSS-2117 Forage Quality Interpretations
PSS-2588 Hay Judging
PSS-2589 Collecting Forage Samples forAnalysis

GRAZING MANAGEMENT

PSS-2567 Grazing Systems for Pastures
PSS-2570 Reducing Winter Feeding Costs
NREM-2869 Management Strategies for Rangeland and Introduced Pastures
NREM-2870 Drought Management Strategies
PSS-2871 Stocking Rate: The Key to Successful Livestock Production. OSU Extension Facts (in press)

MACHINERY & STORAGE

AGMACH$ Agricultural Field Machinery Cost Estimation Software. OSU Oklahoma Cooperative Extension Service.
BAE-1716 Round Bale Hay Storage

SOIL FERTILITY

PSS-2207 How to Get a Good Soil Sample
PSS-2225 OSU Soil Test Interpretations
PSS-2239 Causes and Effects of Soil Acidity
What Do I Have to Work With? Proc. of Forage Management College. Nov. 14,1995. Vinita, OK. Okla. Coop. Ext. Serv.

WEEDS

1995 Suggested Retail Cost for Herbicides in Oklahoma. Proc. of Forage Management College. Nov. 14, 1995. Vinita, OK. Okla. Coop. Ext. Serv.
Basal Herbicide Application Techniques. Proc. of Forage Management College. Nov. 14,1995. Vinita, OK. Okla. Coop. Ext. Serv.
E-832 1996 OSU Extension Agent's Handbook of Insect, Plant Disease, and Weed Control. ($ 15)
PSS-2761 Weed Control in Alfalfa
NREM-2850 Eastern Red Cedar and its Control
PT-95-12 Broomsedge Management
Suggested Weed Control in Pasture and Range. Proc. of Forage Management College. Nov. 14,1995. Vinita, OK. Okla. Coop. Ext. Serv.
Weed and Brush Control in Grasslands. Proc. of Forage Management College. Nov. 14, 1995. Vinita, OK. Okla. Coop. Ext. Serv.

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The author wishes to acknowledge Larry A. Redmon for providing material for this fact sheet.

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