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Reducing winter feeding costs

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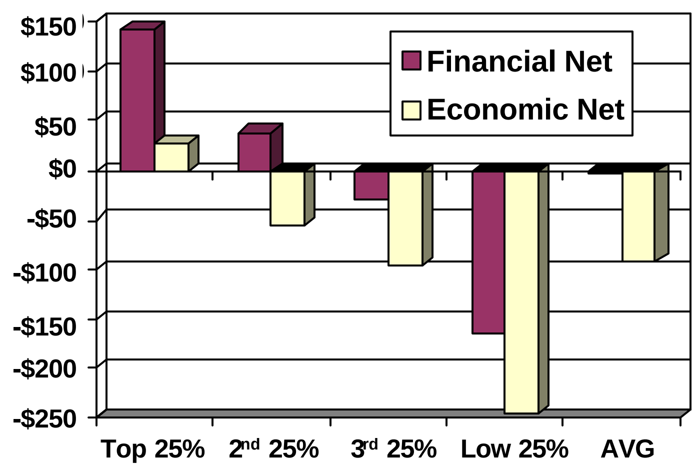
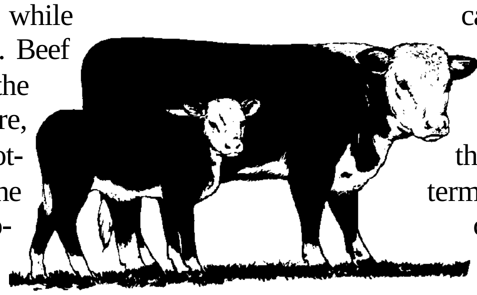
EXAMINATION OF DATA FROM THE STANDARDIZED PERFORMANCE ANALYSIS (SPA, Fig. 1) survey indicates most cow-calf producers do not realize a profit from their livestock production enterprise. Although making a profit is not the greatest motivation for many producers, the desire to streamline the operation and reduce operating costs is generally high for all producers.

Figure 1. Net Returns of Texas Cow/Calf Operations 1991-98 ($/cow) McGrann and Walter, 1999



Improvement in the "bottom line" can occur in two ways. The first is to increase the value of sales while maintaining the current level of input costs. Beef cattle producers have little control over the selling price of their product. Therefore, the second method of improving the bottom line, reducing input costs, is usually the more viable approach to improving the economic condition of the production enterprise.



In Texas, winter feeding costs are greater than 20% of the overall annual cost of cow ownership. Although use of hay and/or supplemental feed can be beneficial under certain environmental conditions and for some kinds or classes of animals, most producers depend too heavily on these items for winter feeding programs. Developing a pasture system that provides forages for harvest by the animal on a year-round basis could substantially reduce winter feeding costs. This publication discusses specific management practices that can help reduce those costs associated with livestock winter feeding programs.

Improving hay production

Forage Production

While reducing the need for supplementation (hay and/or concentrate) is desirable, some quantity of hay is required to avert risk in most livestock productions systems. Producing hay high in nutritive value is one of the easiest ways to reduce the need for crude protein (CP) supplementation. Most hay is produced from warm-season perennial grasses such as bermudagrass, bahiagrass, dallisgrass, or warm-season annual grasses such as sudangrass or pearlmillet. These can provide hay of high or low nutritive value depending on the management techniques employed.

Forage nutritive value relates to those constituents in forages that can be determined by laboratory analysis, such as the crude protein (CP) content and digestibility. There are two aspects of forage production under direct control of the manager that determine whether or not hay will be high in nutritive value: proper fertility and forage stage of maturity of when harvested.

Nitrogen (N) is second only to moisture in relative importance regarding dry matter (DM) production. There is a high positive correlation between fertilizer N and DM production, providing moisture is not severely limiting. As N rate increases, so does DM production, regardless of whether N is furnished as commercial fertilizer or as animal waste (poultry litter or cattle manure). Table 1 illustrates the typical bermudagrass response to increasing rates of N fertilizer. Depending on the level of DM production required a producer can decide in advance the level of N fertilizer necessary assuming adequate precipitation is available.

Table 1. Coastal bermudagrass dry matter (DM) yield as affected by fertilizer and broiler litter application rate.[1]

Application Rate (lbs/A)	DM 1992 (lbs/A	DM 1993 (lbs/A)
N-P_20_5-K_20 (lbs/ac)		
0-0-0	4780	4050
100-33-67	7140	6450
200-67-134	8680	8290
400-134-268	9640	10460
Poultry litter (tons/A)		
2 SPR + 2SUM [2]	7580	6930
4 SPR	8320	7450
4 SPR + 4 SUM	8850	7840
8 SPR	9810	9270

[1]Evers, 1998
[2]SPR is late spring and SUM is mid-summer

Forage Nutritive Value

It is important to understand the class of animal and their particular nutrient requirements during the winter. Dry, pregnant cows have a lower nutrient requirement compared to lactating or growing animals. Realizing these differences in requirements can help the producer determine the nutritive value to produce and conserve in the hay. For animals with higher requirements, more care is required in hay production, but careful attention to production details can reduce the need for expensive concentrate supplements.

There is a close relationship in warm-season perennial grasses between N fertilizer and CP content. Table 2 illustrates the effect of commercial fertilizer and poultry broiler litter on bermudagrass CP content. To reduce the need for CP supplementation, all that is needed in many cases is to apply additional N to the forage to be harvested and conserved as hay.

For N fertilizer to be most effective, other soil nutrients such as phosphorus (P) and potassium (K) must also be adequate and soil pH must be appropriate for the forage species being produced. Note in Table 1 the increasing rates of phosphorus and potassium applied with higher rates of N. This is especially critical in hay systems where nutrients are mined and removed off site. Under the hay harvest scenario, fertilizer nutrients should probably be applied at a 4:1:4 ratio, or according to a soil test recommendation.

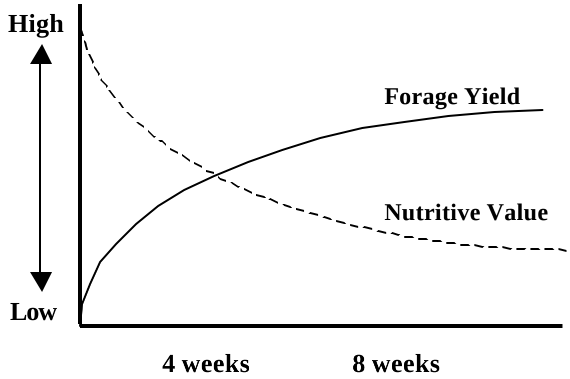
Besides appropriate fertility, the other critical element of hay production is harvesting the forage at the appropriate stage of maturity. Forage tissue cells are comprised of cell wall and cell contents. Cell contents are generally rapidly degradable and 98% digestible in the rumen, while cell wall constituents are more resistant to degradation. With increasing maturity, there is an increase in cell wall components. There is also an increase in lignin, which is an indigestible

Table 2. Coastal bermduagrass crude protein (CP) content as affected by fertilizer and broiler litter application rate.[1]

Application Rate	June 1	July 9	Aug 6	Sept 8	Oct 7	May 7	June 17	July 19	Aug 23	Sept 22
N-P_20_5-K_20 (lbs/ac)	----------	----------	----------	----------	--------- (% DM)	---------	----------	----------	----------	----------
0-0-0	11.2	9.4	9.8	10.0	8.9	11.5	9.4	6.6	8.9	8.1
100-33-67	13.2	10.1	13.1	11.8	9.0	19.8	8.5	9.3	9.5	9.3
200-67-134	14.2	11.2	15.0	14.6	11.5	20.3	9.8	11.7	10.0	10.3
400-134-268	16.8	13.1	16.9	16.4	14.3	21.8	14.3	12.8	11.1	12.9
Poultry litter (tons/A)										
2 SPR + 2SUM[2]	13.0	10.4	13.0	11.9	9.4	13.7	10.4	7.8	10.1	10.0
4 SPR	13.4	10.5	10.2	10.7	8.8	18.1	10.0	7.0	9.8	10.3
4 SPR + 4 SUM	13.8	11.3	15.5	14.2	9.6	17.0	11.7	10.0	10.9	11.8
8 SPR	15.9	13.8	13.1	12.5	10.1	22.3	14.3	9.5	9.5	10.6

[1]Evers, 1998
[2]SPR is late spring and SUM is mid-summer

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



forage component. Increased cell wall percentage and lignin are important in helping forages maintain their leaves and stems in an upright manner. Increased cell wall and lignin, however, have a negative effect on forage nutritive value and animal performance. Figure 2 illustrates, in a conceptual manner, the typical forage response to increasing maturity, while Table 3 demonstrates the actual effect of increasing stage of maturity on bermudagrass nutritive value.

Table 4. Recommended growth stage to harvest and harvest intervals for various hay crops.[1]

Plant Species	Stage of Harvest and/or Interval
Alfalfa	15- to 18-inch height for first cutting, mow every 4 to 5 weeks or when 15" 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 18"
Oat, barley, wheat, rye	Boot to early head stage
Soybean, cowpea	Mid to full bloom and before bottom leaves begin to fall
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" high
Birdsfoot trefoil	Cut at correct stage for companion grass
Sudangrass, sorghum-sudan hybrids, pearl millet	30 to 40"

[1] Ball et al., 1996

Table 3. Effect of clipping frequency on yield and nutritive valueof 'Coastal' bermudagrass hay.[1]

Clipping Interval (wk)	DM Yield (tons/ac)	Leaf (%)	Crude Protein (%)	Lignin (%)
1	6.3	---	21.4	---
2	7.8	87.6	20.8	9.4
3	8.6	81.3	18.8	9.6
4	9.7	74.8	17.0	10.3
6	12.6	57.7	13.8	11.2
8	12.5	51.4	12.2	12.0

[1] Barton and Hanna, 1995

Best management practices include both fertility and stage of maturity to conserve high nutritive value and reduce the dependency on supplemental feed purchases. Although nutritive value also declines for legumes with increasing maturity, the effect is not as dramatic as with grasses.

Forage nutritive value is highest when plants are immature; however, there must be adequate DM in the field to justify the cost of mowing and baling the forage. Information contained in Table 4 suggests various stages of growth for different forage species resulting in a good compromise of DM production and forage nutritive value.

Since the producer, controls both the quantity and nutritive value of forages conserved as hay, the amount of purchased feed for winter feeding programs can be reduced if care is taken to produce hay that is high in nutritive value. These concepts apply equally to ensiled forage.

Harvesting and Storage

Best management practices do not end with adequate fertility 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. Some of the harvested DM and nutrients may be lost in the field if precipitation falls on the harvested forage while field curing. Raindrop impact can shatter the leaves of legume hay crops and will leach valuable nutrients from most forage species. Rather than cut forages for hay that have a chance of being rained on prior to baling, producers should leave the forage standing and harvest later when curing conditions are improved.

Field-cured grass hay should have a moisture content of approximately 15 to 20% at baling. It is important to use practices that will rapidly reduce the moisture content of hay to this moisture. Plant respiration will continue until the moisture content decreases to approximately 40%. Continued respiration uses highly digestible plant nutrients that are important for good animal performance. Methods for quickly reducing the moisture content of harvested forages include the following:

- ✓ Using mowers with crimpers (conditioners). These are most beneficial for larger-stemmed grasses like sudangrass.
- ✓ Tedding the harvested forage.
- ✓ Using commercial hay drying agents.

Wrapping large-stemmed hays with plastic wrap may reduce nutrient losses. Curing hay properly is also essential to reduce the potential for spontaneous combustion of stored hay. High moisture hay produces 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.

Hay should be properly stored to minimize DM 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, however, the misconception that large round bales can be stored outside under virtually any condition and still provide hay of good nutritive value. Any hay will lose nutrients if not properly stored.

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 5.

Table 5. Effect of storage system on dry matter (DM) loss of ryegrass hay stored for 7 months.[1]

	------------------- LOSSES	-------------------		
Storage System	**Handling (%)**	**DM (%)**	**Animal Refusal (%)**	**Total (%)**
Ground	15.0	27.6	22.0	49.2
Gravel	1.2	31.2	16.8	65.2
Tires	2.0	35.4	6.3	43.7
Rack	5.2	26.0	6.3	37.5
Rack w/cover	0.0	12.3	1.5	13.8
Barn	0.0	2.3	1.2	3.5

[1] Nelson, et al., 1983

Losing any amount of DM increases the cost of as-fed hay; however, losing 50% doubles the cost of an already expensive forage. Round bales should be stored to minimize exposure to the elements. The best storage technique is inside a barn. 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 DM loss in the field, these producers may be correct. If round bales are to be stored outside, they should be stored in rows oriented north and south with square ends butted together. Ideally, the rows should be 2 to 3 feet apart running up and down a slight slope to facilitate drainage. The round bales should also be stored on a concrete pad, if possible, or other sites that minimize the uptake of moisture from the ground. Suggestions include placing round bales on a gravel pad, crossties, or pallets. A non-flammable buffer around the bales helps minimize the potential for loss in case of a grass fire.

Hay Feeding

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

The Bottom Line on Hay

Most livestock producers should seek to minimize hay feeding. Hay should be used as a tactical solution to a short-term problem with pasture availability due to drought or ice/snow cover. Most smaller producers (<100 head cows) should probably purchase their hay. Hay should be purchased based on a) nutritive value determined by a forage analysis and b) weight adjusted to a dry matter basis. This provides a fair and equitable manner in which to purchase hay and enables the purchaser to know up front the quantity of nutrients being purchased.

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 ice or snow cover. Although hay will probably never be completely eliminated from livestock production systems, many 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 five 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 (warm- or cool-season) to accumulate in the pasture for grazing at a later time.

There can be significant savings when using stockpiled forages compared to traditional hay feeding. Savings are realized because producers can forego 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. Information derived from agricultural engineers indicates production costs associated with harvesting and hauling hay can approach $35/acre when harvesting 200 acres per year (Table 6). Costs are even higher if only 100 acres are harvested.

The use of stockpiled forage is not new. Producers using rangelands have utilized stockpiled forage for winter grazing for many years. Because of this feeding strategy, hay is generally not fed on rangelands except during periods of heavy ice, snow cover, or during a drought. What may be somewhat novel, however, is that producers using *introduced forages* can also take advantage of stockpiled forage for winter grazing.

Table 6. Estimated production costs per acre for hay harvest and storage. Based on one trip across a 200-acre hay meadow.[1]

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

[1] Huhnke and Bowers, 1994

Data from Arkansas, Oklahoma, and Texas indicates bermudagrass does not lose its nutritive value as quickly during the fall as previously thought. Crude protein and energy values may remain adequate for mature dry, pregnant cows and reduce or even eliminate the amount of hay fed during November and December. While cattle are using stockpiled bermudagrass, a cool-season pasture can be stockpiled for limited grazing during the winter. During many years, little or no hay would be fed.

Warm-season grasses used for stockpiling should be fertilized late in the growing season (approximately 40-60 days prior to the first anticipated frost). Forage should be grazed short prior to fertilizer application in order to start with a short forage height. This allows the producer to capture an optimum amount of quantity and nutritive value when the bermudagrass goes dormant. When using stockpiled forages, it may be beneficial to use a strip or rotational stocking system to encourage animals to harvest 60%-65% of the allocated portions of the field. Uncontrolled animals will attempt to select the best diet and trample and waste some of the stockpiled forage. By using electric fencing or multiple paddocks, producers can enhance forage harvest efficiency and see that little forage is wasted. Stockpiled bermudagrass should be used up by January 1 due to reduced levels of digestible energy late in the season.

Cool-Season Forages

Another alternative to the use of hay would be the use of cool-season forage pastures. Many Texas producers have overseeded bermudagrass pastures with cereal grains, ryegrass, and/or clovers for many years with good success. Animal performance is generally good to excellent and the cost of fresh forage relative to animal performance is usually less than that of hay and supplements or supplements alone. For late winter calving cows, annual ryegrass may be the only cool-season pasture required. It is critical, however, to remove the ryegrass crop prior to the onset of warm-season grass growth. Ryegrass competition for sunlight, moisture, and nutrients can delay warm-season grass growth or even kill the warm-season grass.

Most winter feeding programs in Texas and across the southern US involve some sort of hay plus supplement strategy. The supplements are usually either range cubes or molasses-based, urea supplements. These products are very expensive winter feedstuffs. Equally expensive is continuous stocking of small grain pastures with late winter calving cows. The least expensive method for late winter calving cows usually involves annual ryegrass and some limit-grazing program until the rapid growth phase takes place in early spring. 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. Some times animals may also receive a limited amount of hay, which depends on the class of animal and amount of dormant forage in the pasture. This stretches the availability of cool-season forage produced and requires less acreage to be established per animal fed.

Producers who use bermudagrass can successfully overseed (direct drill) cool-season annual combinations such as small grains, ryegrass and/or clovers into the dormant bermudagrass sod. The cereal grain is usually drilled into the short bermudagrass sod and ryegrass may be dribbled into the exposed seed furrow using the same drill or broadcast into the pasture as a fertilizer topdressing to the cereal grain. Grazing can usually begin by December and continue through May until bermudagrass initiates growth. The use of small grains is expensive unless fall calving cows are only allowed to limited-graze the forage or the pasture is used for winter stocker calves.

Possibly the least expensive method of feeding cattle during the winter may involve 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. Evaluation of cool-season perennial grass varieties is currently under way at several locations in Texas.

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 very expensive.

Summary

Survey information indicates one of the major costs involved in livestock operations is winter feeding. Most livestock producers have high feeding costs because of one or more of the following:

a) Use of hay that is low in nutritive value due to poor pre- and post-harvest management.
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. Improper storage and feeding strategies can result in loss of hay due to deterioration and fouling, thus increasing hay cost. Use of hay that is low in nutritive value decreases animal performance and may require use of supplemental feed to boost animal performance. Likewise, lack of forages for winter feeding programs results in feeding hay or supplement (or both!) for an extended period of time. This also increases input costs of the production system. Producers should evaluate their winter feeding programs and determine if changes should be made to increase the use of forage in the field to reduce winter feeding costs of their livestock production enterprise. For additional information, contact your local county agricultural Extension agent.

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