Economics of Baleage *for Beef Cattle Operations*

Introduction and Overview

In recent years, there has been considerable interest from beef cattle producers in using baled silage or baleage as a way to reduce feeding expenses. This publication will discuss the costs of incorporating baleage into an existing beef cattle operation.

Since pasture, feed and forage costs constitute two-thirds of the operating expenses in a beef cow-calf operation, this examination certainly is warranted. Baleage is produced by baling higher moisture forage (typically 45-65 percent moisture) and wrapping the bales in plastic to exclude oxygen and allow the forage to ferment/ensile. Conserving forage as baleage reduces the risk of field curing, harvest and storage losses; retains more nutritive value; and makes the forage more palatable compared to conventional dry hay production and storage. As a result of the increased nutritional value of the baleage, the need to purchase supplements may be reduced. Use of baleage also may increase the opportunity to sell higher quality forage in a value-added venture for beef cattle producers.

Addition of baleage into a beef cattle operation will result in few operational changes, provided the operation is effectively managing its soil fertility and forage programs. The major difference producers will experience by choosing to begin baleage production is that the moisture content of hay at harvesting will be higher than for normal hay production. A moisture level target of 55-60 percent is desirable for baleage compared to 14-18 percent for normal hay production. The desired weight for bales to be converted into baleage is 1,500 to 2,000 pounds.

Due to the increased moisture levels needed to effectively store baleage, existing round balers may not be appropriate. Round balers that are manufactured to be able to harvest high-moisture forage will work best for baleage. Some manufacturers sell kits, however, that will convert balers to be able to handle hay that has higher moisture content. These kits are available for $300 to $1,000 but may not be available from every manufacturer or for all balers. The difference in purchase price between a conventional round baler and a high-moisture round baler is approximately $5,000, but these differences also can vary by manufacturer.

There are two major ways to store forage as baleage: through use of an individual bale wrapper (Figure 1) or an in-line wrapper that continuously wraps bales (Figure 2). Significant differences exist between the two systems. Most notably, the individual bale wrapper generally costs less and runs on the hydraulics of the tractor towing the wrapper, but it does not wrap bales as quickly (three to six minutes per bale), requires more labor, and uses more plastic (20-25 bales per roll of plastic). In contrast, the in-line bale wrapper costs significantly more, runs on its own gasoline-powered engine, wraps bales substantially quicker, and uses less plastic (30-40 bales per roll of plastic). Trailed versions of the individual bale wrappers can be operated with a 45-50 horsepower tractor or more. A 75 horsepower tractor is recommended, however, for the in-line wrappers, because the

Figure 1. Picture of individual bale wrapper. Photo credit: Dr. Michael McCormick, LSU AgCenter.

Figure 2. Picture of in-line baleage wrapper. Photo credit: Dr. Dennis Hancock, University of Georgia.

bale must be loaded into the machine. Some manufacturers suggest plastic caps be purchased to properly seal the ends of a row when using an in-line wrapper.

The purchase price for bale wrapping machines is nearly equivalent to a new round baler. Individual bale wrappers typically can be purchased for $20,000 to $25,000, but industry professionals suggest individual wrapping machines are difficult to find due to lack of popularity. An in-line wrapping machine is more expensive at $28,000 to $33,000. While the in-line initially may be more expensive to purchase, it has advantages in needing less labor, wrapping more bales per hour and not using as much plastic per bale as an individual bale wrapper.

Figure 3. Qualitative comparison of in-line and individual baleage wrappers.

Comparison of Major Wrapping Systems

In-line Wrapper

- More bales per hour
- Less labor
- No additional tractor required
- Can use less plastic
- Once a bale is exposed to air, must be fed very soon
- Higher purchase price

Individual Wrapper

- Lower purchase price
- Fewer bales per hour
- Bales can be transported individually while wrapped

Methods and Procedures

The following comparison of ownership and operating costs of the bale wrapping machines does not include any costs associated with forage production but does include the costs associated with the use of operating a round baler. This allows for one of three scenarios to be analyzed: 1) conventional round bale production, 2) high moisture baler used with an in-line wrapping system and 3) high moisture baler used with an individual bale wrapper. Costs associated with cutting, raking and tedding of hay are assumed to occur regardless of scenario and are not included in this analysis. Additional expenses of hauling from the field to a storage site also are not included since these costs likely will occur regardless of how hay is stored. It is highly recommended that producers choosing to produce baleage wrap all bales at the storage site and that the storage site is clean and well-drained. This will reduce wear and tear on all equipment and pastures.

Table 1 contains basic assumptions that will be used throughout the comparison of the costs of owning and operating a conventional round baler relative to an in-line or individual bale wrapping machine that is used in conjunction with a high-moisture baler. The annual loan payment is sizable, but the total operating costs (direct and indirect) may make it appealing to purchase this haying equipment. A 75 horsepower tractor is assumed to be used regardless of which wrapping machine is used, with diesel fuel costs assumed to be $3.30 per gallon. Cash costs of diesel fuel and repair and maintenance (excluding labor) are assumed to be $14 per hour to operate a tractor with this level of horsepower, and indirect costs (depreciation and interest) are $7.71 per hour, for a total cost of $21.71 per hour. For a conventional round baler, cash costs are $17.72 per hour ($3.74 per acre), and indirect costs are $22.16 per hour ($4.68 per acre). A high-moisture baler will have slightly higher cash costs ($20.53 per hour; $4.33 per acre) and indirect costs ($25.68 per hour; $5.42 per acre).

Operating costs ultimately are determined by how many hours per year the bale wrapper is used. An in-line wrapper is assumed to wrap 7.5 tons (as-fed basis) per hour compared to 3.75 tons (as-fed basis) per hour for an individual wrapper. A 100 cow operation feeding hay for 150 days, assuming a 1,200 pound cow eats 2 percent of body weight a day in dry matter, would need roughly 180 tons

Table 1. Equipment and Labor Assumptions for Conventional Round Baler and In-Line and Individual Bale Wrappers.

	Conventional Round Baler	High Moisture Round Baler	In-Line Wrapper	Individual Wrapper
Purchase Price	$31,500	$36,500	$30,000	$22,500
Estimated Useful Life	8 Years	8 Years	15 Years	15 Years
Estimated Annual Use	200 Hours	200 Hours	48 Hours	96 Hours
Repair and Maintenance Rate	90%	90%	5%	5%
Bales Wrapped in 1 Hour	N/A	N/A	48 Bales	15 Bales
Bales Wrapped per Plastic Roll	N/A	N/A	35 Bales	22.5 Bales
Length of Loan	5 Years	5 Years	5 Years	5 Years
Interest Rate	5.25%	5.25%	5.25%	5.25%
Annual Loan Payment	$7,326.06	$8,488.93	$6,977.20	$5,232.90

of dry matter for the winter. Approximately 48 hours would be needed to wrap the baleage using an in-line wrapper compared to 96 hours for an individual bale wrapper. Assuming a yield of 1.5 tons dry matter per acre and three cuttings of hay (1.76 tons of hay on an as-fed basis per cutting), 40 acres would provide enough dry matter, given the above feeding assumptions.

Costs associated with baling of hay are shown in Table 2. Per bale costs assume hay bales weigh 1,200 pounds on an as-fed basis to calculate the per bale cost.

Table 3 lists the estimated operating costs per ton on an as-fed basis for each of the two bale wrapping systems. Direct tractor and bale wrapper operating costs are $4.51 per ton on an as-fed basis ($215.59 per hour) for the in-line wrapper and $8.29 per ton on an as-fed basis ($122.39 per hour) for the individual wrapper. Anecdotal evidence from current owners of bale wrappers suggests this type of equipment is not prone to expensive repairs, but users should expect some repair costs, even if not to the level estimated in Table 3. Labor costs with the individual wrapper are higher because two people are needed to wrap baleage (one to load the bales on the wrapper and the second to operate the wrapper). Note that bales of baleage are assumed to weigh 2,000 pounds (as-fed basis) and contain 50 percent moisture. Assuming a cow would consume 3.6 tons of forage on an as-fed basis (1.8 tons dry matter basis) per winter feeding period, total wrapping and harvesting costs per cow would be $36.11 for the in-line wrapper and $49.70 for the individual wrapper, using 2,000 pound bales on an as-fed basis.

Information on costs associated with a conventional round baler compared to an in-line wrapper and individual wrapper are contained in Table 4. Readers should note the annual loan payments are higher with use of a wrapping machine but reflect inclusion of the payment associated with use of a round baler that can handle hay that is higher in moisture content. The cost differential between the two types of round balers is assumed to be $5,000 and results in an annual loan payment of $1,162.87 more for

Table 2. Estimated Hourly and Per Acre Costs for Conventional and High-Moisture Round Hay Balers.

	Conventional Baler	High-Moisture Baler
Per Hour Tractor Cost ($3.30/gal. diesel)	$14.00	$14.00
Labor ($9.60/hour)	$9.60	$9.60
Per Hour Baler Repair and Maintenance	$17.72	$20.53
Per Hour Direct Tractor and Baler Costs	$41.32	$44.13
Per Hour Tractor Indirect Costs	$7.71	$7.71
Per Hour Round Baler Indirect Costs	$22.16	$25.68
Total Tractor and Baler Costs Per Hour	$71.19	$77.52
Total Tractor and Baler Cost Per Acre	$15.22	$16.56
Total Tractor and Baler Cost Per Ton (As-Fed Basis)	$8.63	$9.38
Total Tractor and Baler Cost Per Ton (Dry Matter Basis)	$10.15	$11.04

Note: Labor costs increased by 10 percent when converted to per acre and per bale basis to account for preparation of equipment.

Table 3. Estimated Per Ton As-Fed Basis Costs for In-Line and Individual Bale Wrappers.

	In-Line Wrapper	Individual Wrapper
Tractor Operating Cost ($3.30/gal. diesel)[1]	$0.30	$0.93
Bale Wrapper Repair and Maintenance	$0.04	$0.05
Plastic Costs ($89/roll)	$2.54	$3.96
Gas Costs ($3.30/gal.)	$0.07	$0.00
Labor ($9.60/hour)	$0.22	$1.40
Direct Tractor and Bale Wrapper Costs	$3.16	$6.35
Indirect Tractor and Bale Wrapper Costs	$1.35	$1.94
Total Wrapping Costs	$4.51	$8.29
Total Wrapping and Harvesting Costs[2]	$10.03	$13.81

[1] Total diesel and repair and maintenance costs associated with operating a 75 horsepower tractor.
[2] Sum of total wrapping costs and $5.52 per ton as-fed basis cost with high moisture round baler use.
Note: Labor costs increased by 10 percent when converted to per bale basis to account for preparation of equipment.

the high-moisture round baler compared to a conventional round baler.

General Results, Break-even Herd Size and Sensitivity Analysis

Ultimately, the economics of purchasing a baleage wrapper are most influenced by improvements in forage quality and forage utilization. Forage quality from baleage, when compared to hay, generally is improved for two main reasons: 1) the ability to harvest at target crop maturity levels more consistently and 2) less dry matter loss and prevention of weathering.

One of the primary benefits of using baleage is reduced forage loss due to exposure to the elements. As a result, the forage maintains a higher nutritional value when fed to cattle. The other primary benefit is that by using bale-wrapping technology, producers can harvest and store higher quality forages such as winter annual grasses, legumes and Bermuda grasses. While theoretically these higher quality forages can be harvested using conventional hay equipment, it is difficult to do this on a routine basis because of the risk of weather damage. During the spring, a sequence of days that provide adequate drying conditions to safely and properly put up winter annual hay is rare. Moreover, during summer months, producers inevitably end up delaying cutting hay or have hay get wet after cutting due to random summertime rainfall events. In either case, forage quality is decreased. Depending on the length of the delay, the quality can deteriorate to the point it becomes the nutritional equivalent of straw.

By using baleage technology, less time is needed between cutting and baling and that decreases the risk of rain damage. As a result, declines in forage quality due to rain-induced delays in harvesting are reduced greatly. Consequently, the conserved forage is of higher quality and also can produce higher yields due to more frequent cuttings.

The practical implication for cattle producers from all of these factors is that the need for supplementation also may be reduced and can result in additional cost savings for the operation. The following discussion examines the effects of the factors from several perspectives.

Table 4. Comparison of Costs Associated with Conventional Hay Production and Use of Bale Wrapping Machines.

	Conventional Hay Baler	In-Line Wrapper and High-Moisture Baler[1]	Individual Wrapper and High Moisture Baler[1]
Total Investment Costs	$31,500.00	$66,500.00	$59,000.00
Annual Loan Payment	$7,326.06	$15,466.13	$13,721.83
Difference in Loan Payment[2]	N/A	$8,140.07	$6,395.77
Total Direct Costs Per Hour	$41.32	$195.04	$152.28
Total Indirect Costs Per Hour	$29.87	$98.07	$143.65
Total Costs Per Hour	$71.19	$293.11	$199.91
Total Direct Costs Per Ton, As-Fed Basis	$5.05	$6.34	$9.52
Total Indirect Costs Per Ton, As-Fed Basis	$3.57	$3.70	$4.29
Total Costs Per Ton, As-Fed Basis	$8.63	$10.04	$13.81

[1] Includes costs of purchasing (operating) high-moisture round baler and bale wrapping machine.
[2] Annual loan payment of bale wrapper and high-moisture round baler less annual loan payment for conventional baler.

Savings from Reduced Losses

Cost savings for the operation through use of a bale wrapper depend upon how much additional forage will be saved through wrapping bales in plastic. Hay that is harvested and stored without protection from the elements can result in 25 percent or more of the crop's dry matter being lost prior to being fed, while dry matter loss for plastic wrapped bales typically is about 5 percent.

In the following example, a hay field is expected to produce 4.5 tons of hay (dry matter basis) per acre over three cuttings (1.5 dry matter tons per acre per cutting). As previously mentioned, a cow is expected to consume 1.8 tons of hay (dry matter basis) during a 150-day winter feeding period. Direct costs per acre are expected to be $525 per acre when accounting for fertilization, labor, fuel and repair and maintenance costs for equipment using a conventional round baler. This cost is adapted from the annual LSU AgCenter and University of Georgia enterprise budgets and does not include interest on operating capital[1]. The direct cost per acre translates into $116.67 per ton of dry matter ($99.17 per ton, as fed). Cows are assumed to consume 1.8 tons dry matter during the winter, resulting in cost per cow of $210, but that does not account for hay loss. Assuming 25 percent hay loss, this raises the cost per cow to $280.

[1]Repair and maintenance costs often are calculated as a percentage of purchase price and theoretically should result in higher production costs per acre when using a high-moisture round baler compared to a conventional round baler. In practice, this often is not the case, so we assume equal hay production costs regardless of which type of round baler is used.

Direct per bale costs for the in-line wrapper are $3.16 compared to $6.35 for the individual wrapper. Assuming that hay loss is only 5 percent for bales wrapped in plastic, total per cow costs are $233.04 and $245.11 for the in-line and individual wrapper, respectively. Cost savings are then $46.96 per cow for the in-line wrapping system and $34.89 per cow for the individual wrapping system compared to costs with a conventional round baler. Based on these cost savings, an operation would need to have 173 cows to pay for the annual loan payment on the high-moisture round baler and in-line wrapping system compared to 183 cows for an individual wrapper. Supplementation costs may be reduced as a result of the use of bale wrapping systems and could result in further cost savings, which would reduce the number of cows needed to pay for the annual payment on the loan.

Many operations are not of sufficient size to generate cost savings to pay the note on the equipment purchase, but purchase of a bale wrapper still may be feasible. The following tables illustrate the estimated total savings for operations of different sizes. Per cow cost increases are shown, with assumptions about hay loss under each scenario as they were described previously.

This analysis uses a standard assumption that 25 percent of stored hay is lost between when it is cut in the field and fed to the herd. Numerous research trials conducted around the country, however, have demonstrated losses range from 10 percent to greater than 70 percent when field curing, storage and feeding losses accumulate. Since these losses will vary not only by operation, but also by year, it is helpful to look at various combinations of total losses from harvesting to feeding.

The following chart shows the total net savings from purchasing an in-line wrapper at various hay feeding losses. The calculations used in the chart are based on a 5 percent storage and handling loss for using baleage. This number is widely reported by producers, Extension Service agents and Extension Service

Table 5. Additional Per Ton (As Fed Basis) Costs for In-Line Bale Wrapper.

Total Tons of Baleage Harvested (As Fed Basis)	Savings Due to Reduced Hay Losses[1]	Annual Ownership Cost[2]	Increase in Operation Costs	Cost Increase Per Ton (As Fed Basis)
90	$3,390.25	$8,140.07	$4,749.82	$52.78
180	$6,780.50	$8,140.07	$1,359.57	$7.55
270	$10,170.75	$8,140.07	($2,030.68)	($7.52)
360	$13,561.00	$8,140.07	($5,420.93)	($15.06)
450	$16,951.25	$8,140.07	($8,811.18)	($19.58)
540	$20,341.49	$8,140.07	($12,201.43)	($22.60)
630	$23,731.74	$8,140.07	($15,591.68)	($24.75)
1,000	$37,669.43	$8,140.07	($29,529.37)	($29.53)

[1] Savings calculated as difference in feeding efficiency due to reduced feeding losses.
[2] Annual loan payment of bale wrapper and high-moisture round baler less annual loan payment for conventional baler.

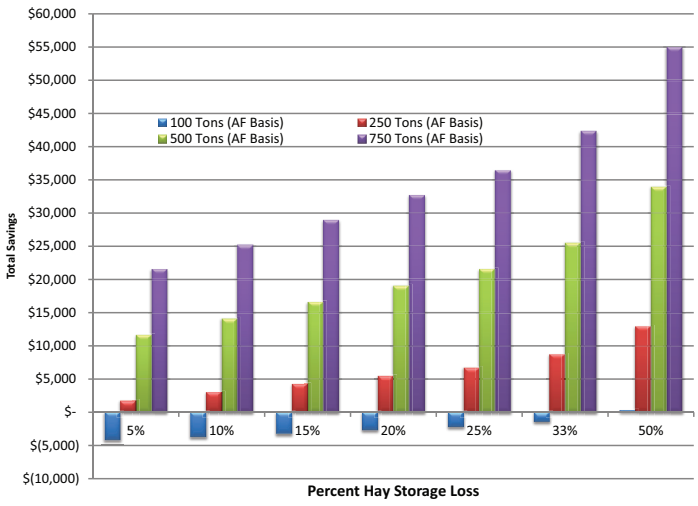
Table 6. Additional Per Ton (As Fed Basis) Costs for Individual Bale Wrapper.

Total Tons of Baleage Harvested (As Fed Basis)	Savings Due to Reduced Hay Losses	Annual Ownership Cost[1]	Increase in Operation Costs	Cost Increase Per Ton (As Fed Basis)
90	$3,103.60	$6,395.77	$3,292.17	$36.58
180	$6,207.20	$6,395.77	$188.57	$1.05
270	$9,310.80	$6,395.77	($2,915.03)	($10.80)
360	$12,414.40	$6,395.77	($6,018.64)	($16.72)
450	$15,518.00	$6,395.77	($9,122.24)	($20.27)
540	$18,621.60	$6,395.77	($12,225.84)	($22.64)
630	$21,725.20	$6,395.77	($15,329.44)	($24.33)
1,000	$34,484.45	$6,395.77	($28,088.68)	($28.09)

[1]Annual loan payment of bale wrapper and high-moisture round baler less annual loan payment for conventional baler.

specialists as being representative of losses expected from baleage. Interested readers will want to know that each additional 5 percentage point increases in dry matter loss in the baleage system lowers expected savings by about $1,106 per year across the herd sizes shown in Figure 4.

Figure 4. Total Savings from Purchasing an In-Line Bale Wrapper at Various Hay Storage Losses and Baleage Losses of 5 Percent.



Savings From Increased Forage Quantity and Quality

One of the primary advantages of baleage is the ability to harvest and store higher quality forage and/or harvest more often due to diminished weather concerns. Improved forage quality can result in heavier weaning weights for cow-calf producers or decreased need for supplementation to produce the same size calves. Using this approach, it is possible to estimate the savings from feeding higher quality forage.

Data from a one-year study conducted by the University of Florida at the Santa Fe Research Station were used in the UGA Basic Balancer to estimate dollars per feeding day for Bermuda grass hay and baleage. The forage quality and quantity results reported in the study were combined with the previously described per acre forage production costs to arrive at a dollar per ton (dry matter basis) for hay and baleage. The results from the University of Florida study and the resulting cost assumptions are listed in Table 7.

Table 7. Results From the University of Florida Baleage Research Trial and Assumptions Used in Baleage Versus Hay Comparison. *

Item	Hay	Baleage
Number of Cuttings	3	5
Tons of Dry Matter per Acre	4.05	6.25
Crude Protein (Percentage)	10.1	12.9
TDN (Percentage)	53.8	57.1
Cost (Dollars per Acre)	$400.00	$452.50
Cost (Dollars per Ton of Dry Matter)	$100.00	$72.40
Ration Cost (Dollars per Day)	$1.86[1]	$1.26[2]

* Adapted from Hersom, et al. "Utilization of Round Bale Silage as a Compliment to Hay Production." 2007 University of Florida Beef Report.
[1] Ration figured as peak lactation for 1,000 pound cow. 22 pounds of hay (AF) and 6.80 pounds 50:50 corn gluten and soybean hull mixture costing $225 per ton.
[2] Ration figured as peak lactation for 1,000 pound cow. 45.4 pounds of baleage (AF) and 3.70 pounds 50:50 corn gluten and soybean hull mixture costing $225 per ton.

If no allowance is made for storage and feeding losses, it costs 60 cents per day less to feed a cow using baleage as opposed to hay. As a result, we can calculate the number of feeding days required per year to justify purchasing an in-line baleage wrapper. These results are shown in Column A of Table 8.

Table 8. Number of Days Required and Dollars per Day Savings Required to Break Even on Purchase of In-Line Wrapper Under Various Feeding Scenarios and Cow Herd Sizes.

Herd Size	Annual Feeding Days Required to Break Even on Purchase of In-Line Wrapper at 60 Cents per Head Savings From Improved Forage Quality Only (Column A)	Dollars per Day Differential Required to Break Even on Purchase of In-Line Wrapper With 150-day Feeding Period (Column B)	Annual Feeding Days Required to Break Even on Purchase of In-Line Wrapper at 60 Cents per Head Savings From Improved Forage Quality Plus Savings From Reduced Storage and Feeding Losses (Column C)
25	426	$1.71	284
50	213	$0.85	142
75	142	$0.57	95
100	107	$0.43	71
125	85	$0.34	57
150	71	$0.28	47
175	61	$0.24	41
200	53	$0.21	36
225	47	$0.19	32
250	43	$0.17	28
500	21	$0.09	14

In general, we can say cow-calf operations with less than 100 cows will find it difficult to justify purchasing an in-line baleage wrapper if storage and feeding losses are similar to those assumed in this analysis. Conversely, the results of this analysis indicate producers with herds larger than 150 cows should strongly consider purchasing an in-line baleage wrapper since it takes only a very few feeding days to recoup the additional operating costs and amortized payments.

Since forage and supplement costs can be highly variable, another perspective to consider when evaluating the economics of baleage is to determine the daily feed cost differential between baleage and hay for a 150-day feeding period. These differentials are presented in Column B of Table 8. For example, a herd with 25 cows would need to experience a feeding cost differential of $1.71 per day to cover the additional cost of the bale wrapper. Alternatively, a herd of 150 cows will only need to see a difference of 28 cents per head per day to justify purchasing a bale wrapper.

The final consideration would be the combination of lower feeding costs and reduced losses. This scenario is presented in Column C of Table 8. If hay losses are about 25 percent and baleage losses are approximately 5 percent, then producers with herd sizes as small as 75 cows rationally can consider purchasing an in-line bale wrapper on the basis of improved forage quality and reduced losses, since a relatively short feeding period of 95 days will pay for the additional operational and ownership costs of the bale wrapper.

Other Comparisons

Another scenario that may be considered is the cost of this equipment compared to a hay barn that could be constructed. While a complete analysis of this scenario is beyond the scope of this publication, a few items are worth considering.

A simple pole barn can be constructed for roughly a third to half of the combined cost of a bale wrapping machine and high-moisture round baler. Building a hay barn serves a useful function by providing shelter for hay and adding value to your property. But it also can increase property taxes and require the purchase of additional insurance to cover the potential loss of the barn. Barns can be depreciated for tax purposes, however, as can a bale wrapper.

Forage dry matter losses will occur regardless of whether a barn or bale wrapper is used on the farm. The exact percentage of hay loss that occurs when stored in a barn can vary. Use of a barn to store hay, however, requires that the hay is dry to prevent mold and/or fires. Producers can't always cut, harvest and store hay when it is dry. Use of a bale wrapper does not require that hay be dry when cut and wrapped. This results in the stored forage being of higher nutritional quality

and can result in reduced supplementation costs. Over time, the cost of a hay barn and additional supplementation can exceed the costs of owning and operating a bale wrapper.

In the end, producers should determine whether reduced storage losses or increased forage quantity and quality are their limiting factors. If storage and feeding losses are the primary concern, a hay barn likely will be more cost-effective. If improved timeliness of forage harvest and the resulting increases in quantity and quality are of primary importance, however, some type of bale wrapper likely would make the most sense.

Summary

For beef cattle producers who have been affected by lack of winter forage in recent years, use of baleage systems to harvest and store forage may be a worthwhile investment. Producers may need to focus on increasing the nutritional value of the baleage for the decision to purchase a bale wrapper and high-moisture baler to be economical. The high per hour costs of operation may make it cost-prohibitive for smaller cattle operations to purchase, but use in a custom wrapping situation can bring down the hourly costs and help a bale wrapper and/or high-moisture baler pay for itself. Use of a wrapping machine for hire or to sell may necessitate the purchase of additional equipment to prevent disfiguration of wrapped bales.

In general, producers with cow-calf operations that have at least 150 cows in the herd will find the decision to purchase a bale wrapper and high-moisture baler to be cost-effective compared to employing conventional hay-making systems. In contrast, producers with cow-calf operations of less than 100 cows are less likely to find such a purchase to be economical, unless they use the machinery in a custom hire enterprise. Cow-calf producers, particularly those with less than 200 cows, should use the information in this publication to fully evaluate the economics of a decision to purchase a bale wrapper and high-moisture baler.

J. Ross Pruitt
Assistant Professor and Extension Economist,
Department of Agricultural Economics and Agribusiness,
LSU AgCenter

R. Curt Lacy
Associate Professor and Extension Economist,
Department of Agricultural and Applied Economics,
University of Georgia

Visit our website: www.LSUAgCenter.com

William B. Richardson, LSU Vice President for Agriculture
Louisiana State University Agricultural Center
Louisiana Agricultural Experiment Station
Louisiana Cooperative Extension Service
LSU College of Agriculture

LSU AgCenter Pub. 3330 (online only) 12/13