3-1977

Southern Regional Beef Cow-Calf Handbook: Hay Feeding Systems

Garry D. Lacefield
University of Kentucky, garry.lacefield@uky.edu

J. Kenneth Evans
University of Kentucky

Joe Burns
University of Tennessee

AGR-61
SOUTHERN REGIONAL BEEF COW-CALF HANDBOOK:
HAY FEEDING SYSTEMS
ISSUED: 3-77
REVISED:
Garry Lacefield and J. Kenneth Evans, Extension Forage Specialists, University of Kentucky
Joe Burns, Extension Forage Specialist, University of Tennessee

Forages (pasture, hay and silage) constitute the most feed consumed by beef cattle. The most convenient approach in producing feed is to provide quality pastures during as much of the year as possible and permit animals to graze growing forage to the maximum. To provide a year-round feed supply, however, one must usually rely on stored feed when growth is inadequate to meet animal needs.

Hay is the most common source of stored feed used in most beef cattle operations. Nutrients provided in hay harvested at the proper stage of plant growth and undamaged by weather usually cost less to produce than those in other forms of feed, with the exception of pasture or silage.

The primary objective of any hay feeding program should be to provide ample quantities of high quality hay to meet, in so far as possible, the animal's needs. High quality hay is early cut, green, leafy, pleasant smelling and free of foreign material and toxic factors. Such hay when chemically analyzed will usually be high in protein and low in fiber content.

Quality of hay is influenced by many conditions, such as, 1) forage species and mixtures, 2) available moisture during the growing season, 3) fertility level of sod, 4) stage of maturity when harvested, 5) extent to which the hay is damaged by handling and weather, 6) leaf content, and 7) amount of weeds and other foreign material. For more detailed information concerning quality. hay production see Southern Regional Beef Cow-Calf Handbook SR-5004 "Quality Hay Production."

Since there are many factors which affect hay quality, most beef-cattle producers usually have on hand a hay supply with wide quality variation. Most farms also have a variety of animals which have different nutritional needs. If the hay is stored in such a manner that it can be identified and separated according to quality; hay quality and animal requirements can be more closely matched. For specific animal requirements see SR-2000 "Nutrient Requirements of Beef Cattle."

Hay can be most efficiently fed when it is separated according to quality and animals are separated and fed according to needs. This system allows the matching of hay quality to livestock needs so that the highest quality hay is fed to livestock that have the highest nutrient requirements. Best quality hay should be fed to young calves, yearlings, bred heifers, and lactating cows, leaving the lower quality hay for the mature, dry pregnant cows whose nutrient requirements are much lower.

Types of Hay Packages

Developments over the past few years have led to considerable change in haymaking. The introduction of new types of haymaking machines, along with increased cost and difficulty in obtaining farm labor, has brought about increased interest in the mechanization of handling, storing, and feeding hay. Farmers can select from many different machines which package hay in small round bales, small rectangular bales, large round bales, and large stacks. Big package equipment is now available for making a variety of sizes of both large round bales and stacks.

Considerable variation can exist in package weights of hay made with a given machine. This variation occurs as a result of moisture content, type of hay, tightness of package, and storage conditions. These variations along with the difficulties in weighing big packages has led to a common problem of overestimating package weights. Research observations show normal weights to be ½ to ¼ of the specified capability of the machines. Thus overestimating package weights can result in providing at feeding only 50 to 80% the amount of hay desired.

Quality of hay stored in big packages can be equal to conventional bales when packages are made and stored properly. Alabama workers found no difference in nutrient content of hay baled in conventional bales and stored under shelter and large round bales stored in the field (Table 1).

Table 1. Chemical composition and digestibility of Johsongrass hay for two methods of baling and storing.

	Conventional bales[1]		**Round Bales[2]**	
	% At baling	**% At feeding**	**% At baling**	**% At feeding**
Crude protein	11.20	11.97	12.83	11.94
Ash	6.73	9.53	6.71	9.54
Dry Matter Digestibility	70.52	63.43	70.03	64.82

[1]Outside storage covered with tarpaulin
[2]Outside storage no cover
Source: L.A. Smith, W.B. Anthony, E.S. Renoll, and J.L. Stallings. "Hay in Round and Conventional Bale Systems," Agricultural Experiment Station, Circular 216, Auburn University, Auburn, Alabama; June 1975.

Hay Losses During Feeding
Hay losses during feeding can be expected with any feeding system. The amount of loss varies with the particular system used. The major objective for all feeding systems should be to keep losses to a practical minimum level, thus permitting animals to utilize the majority of hay offered at feeding.
Kinds of feeding losses include: trampling, leaf shatter, chemical and physical deterioration, fecal contamination, overconsumption, and refusal. These losses are associated with feeding method, intervals between feedings, amounts fed at one time, weather conditions, and number of animals being fed.
Feeding losses in various research trials have ranged from less than 2% under conservative feeding methods to over 60% where no attempts were made to reduce loss. Feeding losses of 3-6% are quite common and acceptable for most conservative feeding programs, although the lower losses are usually associated with systems of feeding requiring high labor inputs and daily feeding.

Methods of Feeding Different Package Types
Conventional bales
Conventional bales are stored under shelter and are usually either moved from the shelter and placed in some type of structure (bunk, manger, rack, wagon, trough, etc.) or transported to an outside area where cattle are located. Either system requires considerable labor inputs. Where conventional bales are transported to an outside area and fed on sod, the amount of hay wasted will be small when only a one-day hay supply is given, and hay is fed in such a manner that all animals have access. An advantage of field feeding is that manure can be distributed around different feeding areas in the field rather than concentrated in the barn or along a feed bunk.

Small round bales
Although not as common as in the past, the small round baler is still in use on some farms. The most common use of the small round baler is for baling grass hay in late summer, leaving the bales in the field where they are dropped for winter use. This method is satisfactory when proper management is used. Excessive losses usually occur when animals are turned into a field containing small round bales where no attempt is made to restrict the amount of hay to which animals have access. Research using small round bales has shown an additional hay requirement of approximately 35 percent was needed when animals were allowed unrestricted access to small round bales as compared to allowing animals only a three week supply of bales. One small round bale will furnish enough feed for one cow for 2-4 days depending on the amount of growth around the bales. If animals are restricted to a two-week feed supply by using temporary electric fences, considerable saving of hay will result. Once the hay supply in the fenced area is used, the fence can be moved to provide another two weeks hay supply.

Feeding big packages
A major conclusion drawn from research as well as from farmers using a big package system is that unrestricted animal access to large round bales or stacks will result in excessive feeding waste. To reduce this waste many techniques have emerged. It is generally agreed that some type of barrier between the hay and the feeding animal will reduce waste. This barrier can be a device such as an electric wire, feeding racks, panels, wagons, gates, etc.

Feeding racks
Feeding racks are now available in a variety of shapes and sizes. In addition, blueprints are available through some Universities for home construction of feeding racks. Racks can result in hay savings, as shown by research from Purdue University (Table 2). Where no rack was used an additional 23 to 39% more hay was required depending on type and size of package.

Feeding Rack

Table 2. Hay fed per cow-day and wastage associated with feeding large hay packages with and without racks.

Package Type	Dry matter/cow day		Additional hay needed without racks
	No Rack	Rack	
	- lbs -	- lbs -	---- % ----
Hesston 10 Stack	28.38	21.01	35.1

Vermeer 605 Bale	24.00	19.58	22.6
Hawk-Bilt 480 Bale	27.45	19.80	38.7

Source: Adapted from V.L. Lechtenberg, W.H. Smith, S.D. Parsons and D.C.Petritz. Journal of Animal Science, 39:1011-1015, 1974.

In an Auburn University study, animal performance and feed efficiency were compared using different systems of feeding hay (Table 3). Steers fed round bales in panels made best gains, gains of those receiving round bales on sod without protection were intermediate, and cattle on conventional bales gained the least. Hay required per 100 pounds of gain was reduced 40% by using panels with round bales. Utilization of conventional bales on sod and round bales in panels was essentially the same.

Table 3. Daily feed available and steer performance for three hay feeding systems.

Item	Conventional bales on sod	Round bales on sod	Round bales with panels
Hay (dry matter basis) lbs/day	9.11	19.13	12.29
Corn lbs/day	2.00	2.00	2.00
CSM 41% lbs/day	1.50	1.50	1.50
Animal, No.	17	17	17
Days on test, No.	79	79	79
Initial average wt., lbs	535	538	538
Final average wt., lbs	615	635	646
Gain, lbs	80	97	108
Average daily gain, lbs	1.01	1.23	1.37
Hay required/lb of gain	9.00	15.58	8.99

Adapted from: Hay in Round and Conventional Bale Systems. L.A. Smith, W.B. Anthony, E.S. Renoll and J.L. Stallings. Circular 216, Auburn University. June 1975.

Under conditions where racks or panels are not used, a large group of animals is needed to eat the hay in a relative short period of time. Waste can be reduced by having at least 1 cow for each foot of outside dimension of the hay package.

Electric wire

An electric wire has also been used with success to restrict animal access to packages. The wire is relatively inexpensive however, it must be moved at intervals and is less dependable, over time, than racks. Some problems have been encountered with this method. Where large numbers of cattle are feeding along the wire, cattle can be forced into the wire or post, thus destroying the barrier. In addition, extended power failures have also resulted in allowing animals unrestricted access to the hay. These problems can be minimized by frequent observation during feeding.

Fence line feeders

Three-sided permanent feeders can be built into a fence line for feeding big packages. This system allows easy access to the feeding area with most moving equipment. Once the package is in place, cattle can eat from three sides. Concrete or rock pad can be placed around the feeding area to offset muddy conditions during feeding.

Package reducing methods

Several pieces of equipment are available for grinding, unrolling, or cutting and windrowing large hay packages. These methods usually require additional equipment but have worked well under proper management.

Sites of big package feeding

Since most big packages are fed outside, a decision regarding a site for feeding should be made with caution. Packages to be moved from storage to pasture for feeding can be fed in one area throughout the feeding season or fed at a different area in the field at each feeding. Both systems have advantages and disadvantages. Feeding in only one area causes excessive sod destruction, and usually involves muddy conditions. Some farmers who feed in one area prefer to feed on concrete or have large gravel hauled in where the hay can be placed on a solid foundation. Also some who feed in only one area feed the lowest quality hay first, causing excessive hay wastage; but providing a foundation for further feeding. Feeding in one area permits selection of a convenient area which is easily accessible with moving equipment and reduces the size of area in which sod is killed. In addition to sod kill, heavy traffic on sod during wet conditions can

result in sod compaction and ruts in the field. Feeding in different spots each day allows manure to be spread more uniformly over the field and improves fertility of bare or thin spots in the pasture.
Under either system where sod kill is encountered, reseeding of these areas should be completed as soon after the feeding season as possible.

Several conclusions can be made relative to hay feeding.
1.Try to produce, harvest, and store only high quality hay.
2.Match hay quality to animals needs.
3.When feeding outside, feed on a well-drained site to reduce bottom spoilage.
4.Restrict animal access with racks or panels and length of feeding period.
5.Restrict animal access to small round bales left in the field by using temporary fence.
6.Force clean up of hay by animals which have low nutrient requirements before feeding more hay.

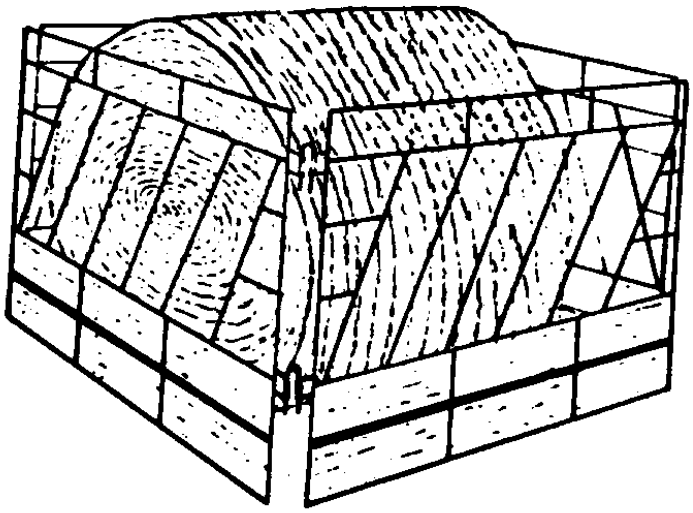

Figure 1. Feeding racks are available in various sizes, shapes, colors, and prices.. Blueprints are now available through some Universities for home construction of feeding racks and/or panels. University of Kentucky Plan No. 11.731-3 or Oklahoma State University Plan No. OK724-28.