The True Cost of Hay

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Introduction

It is no secret that feed costs are a huge addition to livestock farm expenditures, and if you feed hay one of the main concerns is finding quality hay at a fair price. Is it more expensive to buy hay from another farmer, or to harvest your own off of your land? What should be considered when calculating the cost to produce a bale of hay? To know what home-grown, harvested forage costs, a rancher needs to calculate the unit cost of production for the ranch's hay enterprise. Many farmers base their hay harvesting on tradition. Their fathers and grandfathers harvested hay and it only seems logical to continue this simple strategy because it always worked for them. They do it because they feel they must, but many do not know the true cost of harvesting hay.

Inputs in the Cost of Hay

There are four basic concepts to remember when pricing a product or service.

1) the cost of production

This includes all inputs involving your production.

2) the prevailing market price

Ask around. How is the neighbors' hay priced and what is the quality?

3) Produce what your customer wants.

Make sure you produce the quality of hay your customer is looking for.

4) Sell quality products at reasonable prices and with quality service.

What is the quality of the harvested hay? Does it have a good nutrient analysis, or does it contain too many undesirable weeds?

It can be a challenge to produce good quality hay as a cash crop and meet the four concepts when weather, pests, and other obstacles cause a reduction in quality, quantity, or both.

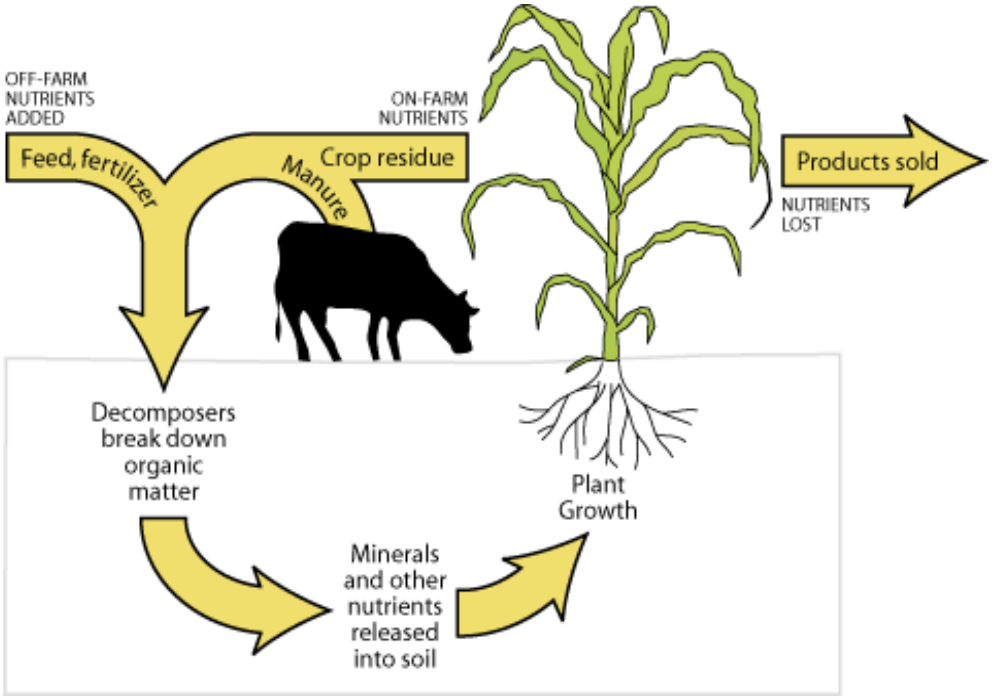
When calculating the true cost of hay, it is important to add all farm expenditures related to hay production. This includes land, whether owned or rented. Any costs for establishing and maintaining a forage crop such as seed, fertilizer equipment, and labor are important. Maintenance machinery can be costly in itself. "Machinery costs can often account for as much as 50% of the annual cost of producing and harvesting a forage crop." (Own or Custom-Hire Hay Harvesting and Hauling)

The following inputs should be included when determining fertilizer cost:

- Equipment:
    - Current market value and machinery depreciation

    - Annual repair costs
    - Management, labor, and fuel
    - Miscellaneous costs (hay wrap, twine, wire, etc)
- Fertilizer application:
    - Soil and/or hay analysis of fields
    - Cost to replace nutrients taken from previous harvest
    - Fuel, labor, and equipment
- Planting and Harvesting:
    - Seeds, labor, and fuel for application
- Hauling and Feeding:
    - Fuel, labor, and hay wastage
- Storage: Barn-stored or outdoor storage

According to *Oklahoma Farm and Ranch Custom Rates, 2011-2012*, the average cost of an 1,100 - 1,500-pound round bale at harvest can be up to **$31.75**. The combined costs of cutting, raking, and baling of a large round bale average **$26.00**, and the hauling cost of hay averages **$5.75**. This includes the machine operations performed for the customer with the custom operator furnishing the machine, fuel, labor, and other inputs directly



associated with the machine. Costs begin to add up when replacing the nutrients removed when hay is taken off the field.

Calculating Cost to Replace Nutrients Taken from Field

Fertilizer is one of the largest expenses when it comes to farming and ranching. When a farmer harvests a field, nutrients are also being harvested out of the soil.

Soil fertility is the soil's ability to provide essential plant nutrients in adequate amounts and proper proportions to sustain plant growth. Soil fertility is a component of soil productivity and is quite variable and strongly influenced by management.

When a plant dies and decays, the nutrients in the crop residues are released back into the soil to be used again by another plant. However, if the plant is harvested and taken out of the field, the nutrients are also removed. Unless hay is fed back to the cattle on the same ground where it is grown, nutrients can be lost.

Soil management includes using the best available knowledge, techniques, materials, and equipment in crop management. Proper utilization of crop residues can be a key management practice. Crop residues returned to the soil can improve soil productivity through the addition of ground cover, organic matter, and plant nutrients.

The organic matter also contributes to an improved physical condition of the soil, which increases water infiltration and storage and aids aeration. When the plant is harvested and taken away, nutrients must be replaced or soil fertility will decrease over time.

It is important to take a soil analysis and/or hay analysis of a field before determining the best quality and quantity of fertilizer to use. Using too little fertilizer will decrease yield and production of a field, and could lead to crop deficiencies in the crop. Too much fertilizer can reduce nutrient use efficiency, cutting into profits and causing negative environmental effects.

To estimate the amount of nutrients per ton being removed by a **1,200-pound round bale**, two hay analyses were taken from the Kerr Center Ranch's hay barn. The hay showed an average removal of **28.0 lbs nitrogen, 3.7 lbs. phosphorus, and 24.4 lbs. potassium, per ton of hay.**

In order to continue with a healthy and sustainable agriculture operation on the harvested fields, these nutrients must be replaced. This can be done by applying the required fertilizer needed to create an equilibrium between nutrients taken and needed. What would be the cost to replace the nutrients taken from the field? The following calculations show the cost of hay by ton and by bale in order to replace the nutrients taken from the field, according to the hay analysis of the Kerr Center Ranch. Cost of fertilizer per ton was found at a local store in Poteau, Oklahoma.

Cost per Ton of Grass Hay

Start by calculating the cost of K using potash (0-0-62) at $530 per ton:

24.4 lbs. K per ton hay /0.62 K_2O = 39.35 lbs. potash per ton hay
39.35 lbs. potash per ton hay/2000 lbs. = 0.019675 tons potash per ton hay
0.019675 tons potash per ton hay X $530 per ton= **$10.43 (K) per ton hay**

Calculating the cost of P and N using diammonium phosphate (DAP: 18-46-0) at $580 per ton and ammonium nitrate (AN: 34-0-0) at $470 per ton:

a. 3.7 lbs. P per ton of hay/0.46 P_2O_5 = **8.04 lbs.** DAP per ton hay
8.04 lbs. P_2O_5 per ton hay/2000 lbs.= 0.00402 tons DAP per ton hay
0.00402 tons DAP x $580 per ton DAP= **$2.33 (P) per ton hay**
b. 8.04 lbs. DAP per ton of hay/0 .18 N= **1.45 lbs. N**
28.0 lbs. N - 1.45 lbs. N = 26.55 lbs. of additional N needed
c. 26.55 lbs. N per ton hay/0.34 AN = 78.09 lbs. AN per ton hay
78.09 lbs. AN per ton hay/ 2000 lbs. = 0.039048 tons AN per ton hay
0.039048 tons AN X $470 per ton= **$18.35 (N)**
d. $18.35 N + $2.33 P + $10.43 K= **$31.11** to replace nutrients taken by one ton of hay
e. $31.75 per round bale/1200 lbs.= $0.026458 fertilizer cost per lb. hay
$0.026458 x 2,000 lbs. = $52.92 + $31.11= **$84.03 cost per ton of grass hay**

To replace the nutrients taken from the field, **39.35** pounds of potash, **8.04** pounds of DAP, and **78.09** pounds of AN, per ton of hay, would need to be added, at a cost of **$31.11 per ton of hay**. The maintenance cost at **$31.75** per 1,200-pound round bale, expressed on a per-ton basis, is **$52.92 per ton of hay**. When the maintenance and nutrient replacement costs are dded together, the cost per ton of grass hay will equal **$84.03**.

Cost per 1,200-Pound Round Bale

Calculate cost to replace nutrients per ton:

1200 pound bale/2000=.6 X $84.03 per ton of grass hay= **$50.42 per bale.**

Conclusion

After calculating the costs using the Kerr Center hay analysis, the true cost of a ton of grass hay including fertilizer costs, machinery use, labor, and fuel can cost up to $84.03. The cost of a 1,200-pound round grass hay bale is approximately $50.42. While expenses vary from year to year, hay is still an expensive component of a livestock operation.

Ways to Reduce Loss of Profit

Grazing Management

What are some alternatives to the loss of profit in hay? One practice is called grazing management. Grazing management is the manipulation of animal grazing to achieve optimum and sustained animal, plant, land, environmental, or economic results while ensuring a continuous supply of forages to grazing animals. Grazing management builds fertility of the soil, recycles nutrients by the livestock, and leaves enough crop residues to provide a ground covering to reduce erosion. The process of rotational grazing involves moving the herd of livestock from one area to another, providing a time of rest for the pasture the cattle previously grazed.

The benefits of a managed system are:

- Extending the grazing season to reduce hay need
- Reducing labor
- Maintaining high amounts of organic matter to improve rapid nutrient recycling to the soil
- Decreasing soil and nutrition loss and increasing infiltration in the soil
- Managing a healthy and productive pasture that will ensure the full productive potential of grazing land.

Thus, decreasing the amount of fertilizer needed in the soil, reducing the time and labor needed to harvest, and decreasing the amount of fuel loss needed to run equipment for harvesting, hauling, and feeding, saves money.

Feeding Methods

Hay feeding methods can have a large impact on how much is lost. Hay feeders come in a wide assortment of shapes and sizes. The purpose behind hay feeders is to reduce hay wasted while providing a safe way to feed livestock. The most common way livestock waste hay at feeding occurs when the livestock pull and tug on the bales and scatter hay

across the ground. The hay becomes exposed to ground moisture, precipitation, mud, and animal waste. Much of the hay is stomped into the soil, and becomes less desirable for livestock. A hay bale set out on its own with no hay feeders can lose up to 45-50% of content as waste. Adding a feeder, such as a hay ring, cant cut the loss in half.

Round bale feeder types: (top left) modified cone feeder with sheeted bottom; (top right) conventional open bottom steel ring feeder; (bottom left) polyethylene pipe open bottom ring feeder; (bottom right) sheeted.

The two most common feeders are standard rings without skirting and rings with skirting. Both have their pros and cons. Standard hay rings are easier to manage. They are light, easy to place, and inexpensive. The downside to rings without skirting is that they cannot hold loose hay at the bottom of the ring like skirted rings can. Oklahoma State University conducted research on the amount of hay wasted by four popular hay feeders. According to their study, standard rings (without skirting) can lose up to 21% of hay to waste, while hay wastage with skirting rings can be reduced approximately 13%. Rings with skirting are rings with a solid skirting at the bottom, approximately 12-14 inches in height. According to Dr. Dave Lalman, Extension Beef Specialist, a farmer can save up to 8% of hay loss just by adding a skirt to the hay ring. Eight percent may not seem like much, but let's say for an example, a farmer has **100 head of cattle**, and in **120**

days (average length of hay feeding period in Oklahoma) those cattle consume **25 pounds** per head per day. That would add up to about **300,000 pounds of hay.** Then multiply that by **8% hay saved**, and that would give **24,000 pounds, or 12 tons of hay saved.**

120 Days X 100 Head X 25 lbs./Head/Day= 300,000 lbs. X 8% saved= 24,000 lbs. or 12 tons of hay saved

Even with skirting, round bale feeders tend to still waste a significant amount of hay. The hay is pulled from the ring, and ends up on the ground to get trampled or spoiled. To minimize waste, some feeders have cones added. The bale is suspended in the cone-shaped top, made of steel bars or chains, to eliminate ground contact. Air circulation through the bottom will keep the hay dry, which reduces loss through mold and rot. Combining a cone feeder with a round bale feeder provides substantial saving and stretches out the hay supply. The addition keeps the hay in the feeder as cattle are eating and cuts hay loss to a minimum. Research conducted by Dr. Lalman and other scientists with OSU's Division of Agricultural Sciences and Natural Resources shows that using a cone-shaped feeder with a sheeted bottom should reduce hay waste to approximately 5-6 % of the original bale weight.

Storage

Barn-stored and outdoor-stored hay are two ways to store hay bales for later use. Both have their advantages and disadvantages.

Barn Storage

Outdoor Storage

Barn-stored hay usually has a higher nutritional value, and a reduced percentage of spoilage compared to outside-stored hay. For hay stored inside, soil moisture and hay

contact are reduced, as well as precipitation, to decrease spoilage. The disadvantages for indoor storage are the welcoming of unwelcome critters such as skunks, raccoons, and opossums. Storage space becomes limited, and careful storage of bales must be managed to prevent the bales' falling or exerting too much pressure on the sides of barns.

Storing bales outside increases the amount of storage space available. The disadvantages of storing outside are potential spoilage, excessive heat exposure, and decreased nutritional value. Bales stored outdoors should be placed on gravel or pallets end to end in north-south rows with at least a foot between controlled vegetative rows. The outdoor sites should be in areas where there are no floodplains or standing water, as little shade as possible, and an open breeze. This allows for proper drainage, sunlight penetration, and airflow between the rows to facilitate drying. Stacking of bales outside should be avoided unless the bales are covered securely. Leaving hay bales uncovered will decrease the nutritional value of hay due to heat, moisture, and higher risk of spoilage. Uncovered hay can lose 5-20% of its original weight to waste in just nine months. By elevating bales on gravel or pallets to reduce soil moisture/hay contact, loss can be reduced by 3-15%. If covered and elevated, the loss could be up to 2-4%, which is similar to barn-stored hay. Enclosed barn hay losses are usually less than 2%.

Weathering is normal if hay bales are stored outside. It is best to feed outside-stored bales within nine months after harvesting. An important key to reducing the weathering of a round bale is the tightness of the outer layer. The looser the outer layer, the more likely it is that the inner layer will become spoiled. An easy way to check whether the outer layer is loose is to press the palm of the hand against the outside layer. If it moves more than half an inch, then the outer layer is too loose, and significant loss can be expected.

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p. 7 Lalman *et al.*

p. 8 Ball *et al.*