

Forage Sampling Procedures and Equipment

John W. Slocombe, extension agricultural engineer, machinery systems, Kansas State University

Lyle W. Lomas, head and animal scientist, Southeast Agricultural Research Center, Kansas State University



Forage sampling is used to gather information about hay or silage to determine its market value and ration formulation for livestock. To be useful, the sample must be representative of a particular lot, capturing properties of hundreds of thousands of pounds of a wide variety of plant material in a single, thumbnail-sized sample. The sample should accurately reflect leaf-stem ratio, legume/grass mix, and weeds present in a particular location within the same cutting.

Sampling variation can be costly when forage is undervalued. Forage analysis results are only as good as the sample provided to the laboratory. Most of the time, variation is the result of hay sampling procedures rather than lab errors. Proper sampling procedures are necessary to accurately assess forage quality.

Although some variation between samples is normal, for consistent, representative samples, researchers recommend the following forage sampling procedure.

1. Sample by forage lot.

The forage from every field and cutting is different. When sampling, divide hay into lots based on known differences. Identify your forage inventory and sample by lots. A forage lot is hay or silage taken from the same location, field, or farm, the same cutting (within a 48-hour period) at the same plant maturity,

with similar amounts of grass, weeds, rain damage, or preservative treatment. A lot may range from several bales to several tons of hay. Do not combine hays of different qualities or cuttings into one composite sample. Test results will not be useful for making feeding decisions. Keep a record of quantity and location of each lot sampled.

2. Sample at the optimum time.

Collect hay or silage samples as close to the time of feeding or sale as possible. Sampling immediately before feeding accounts for any heating or weathering losses that may have occurred during storage. This is impractical when marketing hay out of the field, for lots moving through marketing channels, or where individual lots of hay are hard to access. For silage, some producers sample and test the forage as it is going into storage, while others collect grab samples during the first few days of feeding from a new silage source. A sample taken at feeding time better represents the nutritional quality of what is being fed. Allow sufficient time for delivery to the lab, laboratory analysis, and ration formulation. This may take a week or more.

3. Select a sharp, well-designed coring device.

Forage tests are based on small samples that may represent several tons of forage. Several grab samples

from a windrow or bale or a single flake from a small rectangular bale are not sufficient. Use a sharp core sampler or hay probe to collect the forage sample from bales or stacks after harvest. A core sampler is a sharp tube used to collect an accurate cross section that represents the proportions of leaves and stems as they exist in the bale. The sampler tube should be 12 to 24 inches long. Probes longer than 24 inches generate very large samples, which may be difficult to analyze in the lab.

A greater number of small samples is more representative than fewer large samples. A core sampler should have an inside diameter of $\frac{3}{8}$ to 1 inch. A coring device with an extremely small-diameter may not cut or represent the leaf-stem ratio properly, and a very large-diameter probe may produce too large a sample for efficient shipping and laboratory processing. A sharp cutting tip improves the efficiency of sampling and helps to collect a more representative sample. Sharpen or replace cutting tips regularly. Using larger probes requires considerably more effort, an important consideration if sampling with a brace or a low-powered electric drill.

Core samplers may be available for loan from K-State Research and Extension specialists, nutrition consultants, or other producers. While the cost of owning a core sampler may seem high, it may be economical compared to livestock production losses from improperly balanced rations or feeding supplements when not needed.

4. Sampling bales and stacks of hay.

To sample bales and stacks of hay, take at least 20 cores, one each from widely separated bales or stacks representative of the lot being sampled. Sample large and small rectangular bales by taking cores (12 to 15 inches deep) from the center of the end of the bales. Sample large round bales by taking cores (also 12 to 15 inches deep) at waist height on the rounded, tight side. If only a few large square or round bales make up the lot, take multiple cores from each bale to equal at least 20 cores. Sample stacks and chopped hay 18 inches deep. Avoid sampling spoiled or weathered portions of bales or stacks that will not be fed. If using a hand brace or low-powered portable electric drill, you may be tempted to collect fewer than 20 cores. But sampling error and inadequate representation of the lot variability



Cattle are fed hay from a feeding bin.

increases if fewer than 20 cores are collected. Consider using an electric corded drill powered by a portable generator or charged battery if bale storage is at a remote location.

The 20 core samples from the lot should result in 1 pint to 2 quarts in volume — or about $\frac{1}{2}$ pound of material — and represent several tons of forage. Mix the hay cores in a clean, plastic pail and place the entire sample (all 20 core samples) into a clean, heavyweight plastic bag. Seal the bag tightly to maintain moisture.

5. Sampling chopped silage crops and baleage.

Producers can either sample chopped silage crops as they are stored or as they are removed from storage for feeding. For sampling silage to be stored, collect a representative handful or two of chopped forage from each of several loads coming from a particular field at harvest. Mix the samples thoroughly and place in a sealable plastic bag, squeezing out excess air. Store the samples in a freezer, and submit the frozen composite sample to the laboratory.

A more accurate representation of silage quality being fed occurs when samples are taken at the time of feeding. Collect grab samples at both morning and evening feeding when feeding a new silage lot. Avoid sampling spoiled silage from the top of a bunker or from the transition layer between lots in an upright or bunker silo.

When sampling from the face of a bunker silo or from a plastic silage bag, mechanically remove the forage as it will be fed and collect grab samples from that volume and freeze. The accumulated grab samples (amounting to several quarts weighing 2 to

4 pounds) should be mixed thoroughly, sealed in a plastic bag, and frozen for shipment or delivery to the testing laboratory.

It may be more practical to sample when filling the silo. Although some nutritional changes occur during normal fermentation, they are usually small. If forage is excessively moist at harvest and the silo seeps, or if it is harvested too dry and the silage heats excessively during ensiling, consider sampling again at time of feeding by taking several grab samples to account for nutritional changes during ensiling.

Sampling wet or wilted forage being stored as baled silage can be done either by core sampling bales before wrapping or sampling the wrapped bales closer to the time of feeding. If sampling plastic-wrapped bales that will not be fed immediately, reseal quickly to prevent spoilage.

6. Keep good records.

Record name, date the crop was harvested, date sampled, and an identifier code or number for the lot on the bag in permanent marker. When you receive the test results, this helps you identify the proper lot for correct feeding or marketing. The lot identification should match your records of lot locations. It is also a good practice to write a brief description of the type of forage included in the sample. Some laboratories use this information in the analysis procedures. Keep a record of similar information for reference.

7. Ship samples immediately.

Hay and silage samples are perishable. Ship or deliver samples to the laboratory as soon as possible to prevent moisture loss and microbial deterioration of the sample. Mail samples early in the week to minimize the shipping time to the lab. Avoid sending samples over a weekend or holiday.

Types and Sources of Forage Sampling Equipment

Below are names, addresses, and descriptions of many of the hay sampling probes available. This list is not intended to be exhaustive and is not an endorsement of these probes or a disparagement of other probes by omission.

Sierra Hay Probe. Sierra Testing Service, 9450 E. Collier Road, Acampo, CA 95220. Telephone: (209) 333-3337. www.sierratestingservice.com

Penn State Forage Probe. NASCO-Ft. Atkinson, 901 Janesville Avenue, Box 901, Fort Atkinson, WI 53538-0901. Telephone: (800) 558-9595. www.enasco.com

Oakfield Sampler. Oakfield Apparatus, Inc., 971 S. Main Street, Fond du Lac, WI 53065. Telephone: (920)933-3604. www.soilsamplers.com/hay_samplers.html

Colorado Hay Probe. UDY Corp., 201 Rome Court, Ft. Collins, CO 80524. Telephone: (970)482-2060. www.udyone.com/hayprobeinfo.htm

Frontier Mills Sampler. Frontier Mills, Inc., 2002 SD Highway 314, Yankton, SD 57078. Telephone: (605) 665-2441. www.frontiermills.com

Star Quality Samplers. Star Quality Samplers, 5719 114A Street, Edmonton, AB Canada T6H 3M8. Telephone: (780) 434-3367. www.starqualitysamplers.com/forage.php

HMC Hay Probe. Hart Machine Co., 1216 SW Hart Street, Madras, OR 97741. Telephone: (541) 475-3107.

Hay Chec Hay Sampler. Hodge Products, Inc., P.O. Box 1326, El Cajon, CA 92022. Telephone: (800) 854-3565. www.haychec.com

AMS Hay and Forage Probes. AMS, Inc., 105 Harrison St., American Falls, ID 83211. Telephone: (800) 635-7330. www.ams-samplers.com/itemgroup.cfm

Best Harvest Hay Sampler. Best Harvest Inc., P.O. Box 20428, Saint Petersburg, FL 33742. Telephone: (888) 947-6226. www.bestharveststore.com/Bale-Hay-Sampler-Probes-c10

Forageurs Hay Probe. Forageurs Corp., P.O. Box 564, Lakeville, MN 55044. Telephone: (952) 469-2596.



Brand names appearing in this publication are for product identification purposes only. No endorsement is intended, nor is criticism implied of similar products not mentioned.

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