Evaluating Hay Quality Based on Sight, Smell and Feel – Hay Judging

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Importance of Evaluating Hay Quality

During the winter, pasture production is low; therefore animal production relies heavily on stored forages. Haying is the most common method of storing forages in Oklahoma. In some cases, hay is the major, if not the only source of essential fiber, energy, protein, vitamins and minerals for many classes of livestock during the winter season. Unfortunately, many producers need to buy hay for the winter, especially during dry years when no additional forages have been produced and hayed during the growing season. Hay buyers must be aware that hay quality is much more variable than in any other agricultural commodity. Therefore, the hay should be visually inspected as well as lab analyses to determine quality. Less expensive hay is not always best. An uneducated decision disregarding hay quality may lead to higher costs such as low animal production or even animal death.

Hay quality varies due to different factors such as forage species, fertilization, stage of maturity, harvesting practices/curing and storage. Hay produced in Oklahoma consists of grass hay (such as Bermudagrass, lovegrass or tall fescue), legume hay (such as alfalfa and clovers), native hay (whatever is growing in a pasture or range site) and mixtures of these. As a rule of thumb, fertilized and less mature forages may have higher quality than unfertilized and mature ones. Furthermore, proper curing is essential for keeping hay absent of molds and spontaneous fire. Finally, proper storage will maintain the achieved hay quality for longer periods.

There are two methods for assessing hay quality: chemical analysis and visual inspection. Both methods are important and they complement each other. Chemical analysis quantifies not only values for ration formulation such as digestibility, intake and total digestible energy, but also the Relative Feed Value (RFV) or Relative Feed Quality (RFQ). Consult Fact Sheet PSS-2117 for more information on forage chemical analysis. The RFV or RFQ can be used for comparing different hay lots, however it is advised to use their values in conjunction with hay visual inspection. The RFV and RFQ analysis are performed based on a forage sample that represents the hay quality at sampling time. However, the hay quality at the time of purchase may be different from the sampling time due to leaf losses, nutrient leaching, mold growth, etc., which can occur during handling and storage. In addition, the sample utilized in the chemical analysis may not represent the overall quality of the hay lot due to improper sampling and/or high variation among hays of the same lot. Therefore, visual inspection is essential for validating the hay quality results from a chemical analysis and it must be performed before buying hay. The purpose of this Fact Sheet is to summarize important physical factors such as sight, smell and feel that should be considered during visual hay inspection. However, hay buyers should be aware that both visual inspection and chemical analysis must both be considered for determining the hay market value.

Hay Visual Inspection Components.

The visual inspection components of hay are physical factors such as leafiness, maturity, odor, color, softness, purity, condition of bales and other properties (penalties). It is recommended that the person responsible for judging the hay uses hay judging score cards. The hay judging score card (Table 1) illustrates how factors can be weighted differently, depending upon the use of the hay. Each of the factors should be considered in judging hays, but their relative importance should change according to the intended use of the hay. For example, hay leafiness has a higher importance for beef cattle (25 points) than for horses use (15 points); however, hay odor has a lower importance for beef cattle (15 points) than for horses (20 points). Copies of Table 1 can serve as the score cards for a particular lot of hay for sale or for hay shows. The evaluator should compare different hays using the same column (hay use). For other particular uses, evaluators may want to reassign weights to the various criteria and create another score card. It is recommended that the same person evaluates the

hays that will be compared because visual inspection is subjective and different people may assign different values for each factor. Finally, hays for evaluation should be randomly assigned, opened then evaluated in their inner portion. To validate the usefulness of the chemical analysis performed for a hay lot, make sure that hays (randomly assigned) from the same lot have similar physical conditions. In other words, make sure the hay lot is as homogenous as possible. The appearance, smell and feel attributes in Table 1 will be explained below, however the other attributes such as protein (crude protein, CP) and RFV values needs to be determined by analysis lab.

Leafiness refers to the proportion between leaves and stems, also called leaf-to-stem ratio. A higher proportion of leaves to stems are desirable because leaves have a higher amount of nutrients than stems. As a rule of thumb, two-thirds of the hay protein is in the leaves. Therefore, the higher the leafiness, the higher the nutritive value of a hay. Leafiness is important for both grass and legumes. However, extra importance should be given to legume leafiness because legume leaves are much more prone to shattering than grass leaves. Regardless the forage type, leaves will be prone to shattering when the hay is too dry (lower than 15 percent moisture). When inspecting leafiness, do not only estimate the proportion of leaves in the hay, but also touch the hay and feel how easy the remaining leaves are detaching from the stems. The hay may still contain a good amount of leaves, but if leaves are too dry they will easily detach during transportation decreasing the hay nutritive value after purchasing.

In summary, hay with ideal leafiness contain a high leaf-to-stem ratio, small fine stems, large intact leaves and very low leaf detachment at touch.

Maturity is normally a main factor in assessing hay quality as it has a direct impact on nutritive value and intake. Immature plants normally provide more nutrients because they contain less fiber and are more digestible than mature plants. Animals normally consume immature hays faster than mature ones. Maturity is important for both grasses and legumes, however it has a higher impact in grasses than legumes.

- **Grasses** will become much more fibrous and indigestible at mature stages than legumes do. Highest quality grasses are cut before flowering. When inspecting grasses, look for seedhead formation. No seeahead formation indicates high quality. Grasses with 1 percent or less seedhead emergence with other seedheads enclosed in the uppermost leaves (preboot stage) indicates good hay quality. However, grasses with more than 1 percent seedhead formation (headed) indicate drop in hay quality.
- **Alfalfa** hay should be inspected based on purple flower petals appearance (blossoms). Presence of buds but no blossoms (Bud stage) indicates highest alfalfa hay quality. If there are 1 in 10 stems that have blossoms (early-bloom stage), alfalfa still holds very good hay quality. However, alfalfa quality starts to drop drastically as number of blossoms increases, and quality will be considered low when most stems have blossoms (Late-bloom stage). Also, as alfalfa bloom progresses, the less leafy (bottom leaves shatter) and more steamy and woody the plant becomes, lowering the hay quality.
- **Clovers** will also present the highest quality pre-bloom, but decrease in quality as blooming progresses. Clover inspection should be focused on flower (blossom) color/condition and seed maturity, if present. If the hay was cut before full-bloom and it was not weathered, it might be possible to identify the clover type by flower color; e.g., red clover will have red or purplish-red flowers, crimson clover will have crimson red flowers, and white/subterranean clover will have pinkish-white or white blossoms. Clover at full-bloom stage will have no or very few seeds. The higher the seed number, the closer to full-maturity stage. Finally, clover at full-maturity will have dark heads, plumps and mature seeds.

In summary, hay harvested during ideal maturity stage contains more green/young leaves than yellowish/dead leaves, high leaf-stem-ratio, small and/or fine stems, low number of seedheads and seed stems (mature blossoms for legumes).

Odor is mainly affected by forage moisture content at bailing. The smell of typical fresh cut hay is desirable. Hay that smells of mildew, mustiness or rotten odors indicates low quality. Odor should be always inspected regardless of the animal that will be consuming the hay. However extra importance should be given to hay odors if horses will be consumers. Horses may completely refuse hay with unpleasant odors. **When inspecting hay odors, compare the hay smell with fresh cut hay. The higher the difference in smell, the lower the quality.** Some hays that are baled with high moisture content (higher than 20 percent, roughly) will have a tobacco-like smell and brown color.

Color is important because **green hay is an indication that hay has been cured under good conditions**. However, judging hay on color alone is a mistake because green hay may be of inferior nutritional quality to off-colored hays, and **some brown hays are better than some green hays.** Sun bleaching causes hay to loose its green color, but bleached hay may be as good as green hay. If the green coloration is lost because of excess rain while in the windrow, the lack of green may

Table 1. Hay Judging Score Cards. **HAY SAMPLE NO.**

			Possible Scores For Types Of Usage				SAMPLE
			General	Beef	Horse	Dairy	SCORE
CHEMICAL ANALYSIS							
1. PROTEIN		**MAX =**	**50**	**25**	**40**	**45**	
Prime	>19%		45-50	24-25	35-40	40-45	
	17-19%		38-44	19-23	29-34	30-39	
	14-16%		24-37	15-18	21-28	20-29	_____
	11-13%		15-23	10-14	14-20	10-19	
	8-10		5-14	5-9	7-13	6-9	
Poor	<8%		0-4	2-4	0-6	0-5	
2. RELATIVE FEED VALUE		**MAX =**	**50**	**75**	**60**	**55**	
Prime	>151		45-50	70-75	51-60	50-55	
	125-151		38-44	58-69	41-50	44-49	
	101-124		24-37	43-57	31-40	33-43	_____
	86-100		15-23	28-42	21-30	20-32	
	77-85		5-14	13-27	11-20	7-19	
Fair	<77		0-4	0-12	0-10	0-6	
SUBTOTAL (1 and 2)		**MAX =**	**100**	**100**	**100**	**100**	
APPEARANCE, SMELL, & FEEL							
3. LEAFINESS		**MAX =**	**30**	**25**	**15**	**30**	
1. Very leafy			27-30	18-25	14-15	27-30	
2. Leafy			22-26	16-17	11-13	22-26	_____
3. Slightly stemmy			17-21	14-15	5-10	11-21	
4. Stemmy			0-16	10-13	0-4	0-10	
4. MATURITY AT HARVEST		**MAX =**	**25**	**20**	**15**	**30**	
1. Before bloom or heading			18-25	19-20	14-15	27-30	
2. Early bloom or early heading			16-17	17-18	11-13	22-26	_____
3. Mid-to-late bloom or heading			14-15	15-16	5-10	11-21	
4. Ripe Seed			5-13	10-14	0-4	0-10	
5. ODOR		**MAX =**	**15**	**15**	**20**	**10**	
1. Clean			14-15	14-15	19-20	10	
2. Dusty			11-13	11-13	17-18	8-9	_____
3. Moldy/Mousey			8-10	7-10	15-16	4-7	
4. Burnt			0-7	4-6	0-14	0-3	
6. COLOR		**MAX =**	**10**	**15**	**15**	**10**	
1. Natural green color			10	14-15	14-15	10	
2. Light green/slightly brown			8-9	11-13	11-13	8-9	_____
3. Yellow to brownish			4-7	5-10	5-10	4-7	
4. Brown or black			0-3	0-4	0-4	0-3	
7. SOFTNESS		**MAX =**	**10**	**15**	**20**	**10**	
1. Very soft and pliable			9-10	14-15	17-20	9-10	
2. Soft			7-8	11-13	11-16	7-8	_____
3. Slightly harsh			5-6	5-10	5-10	5-6	
4. Harsh and brittle			0-4	0-4	0-4	0-4	
8. PURITY (Other Forages)		**MAX =**	**5**	**5**	**5**	**5**	
1. < 5%			4-5	5	5	5	
2. 5 to 20%			2-3	2-4	2-4	2-4	_____
3. > 20%			0-1	0-1	0-1	0-1	
9. CONDITION OF BALE		**MAX =**	**5**	**5**	**10**	**5**	
1. Well-shaped & firm			4-5	4-5	7-10	4-5	
2. Somewhat misshapen			2-3	2-3	3-6	2-3	_____
3. Badly misshapen & broken			0-1	0-1	0-2	0-1	
10. PENALTIES MAX NEGATIVE POINTS =			**35**	**35**	**35**	**35**	
1. Molds			0-20	0-20	0-20	0-20	
2. Weeds			0-5	0-5	0-5	0-5	_____
3. Dirt/Other Foreign Matter			0-10	0-10	0-10	0-10	
4. Excessively Moist or Dry			0-25	0-30	0-35	0-35	
SUBTOTAL (3 through 10)		**MAX=**	**100**	**100**	**100**	**100**	
TOTAL (1 through 10)		**MAX =**	**200**	**200**	**200**	**200**	

General Scoring:
180 & Above = Excellent; 160 - 179 = Good; 130 - 159 = Fair; Below 130 = Poor.

be an indication nutrients have leached out. Hay baled with an excessively high water content usually turns dark green, brown or even black and may or may not be of high nutritional quality. **When inspecting hay color, consider the hay storage condition and short-term previous weather.** For example, off-colored hays stored outdoors in a field that received rainfall were prone to leaching. Therefore, its brownish color might indicate low nutrient content due to leaching. On the other hand, an off-colored hay stored indoor in a location absent of rain might contain good nutrient concentration because its brownish color might be related to sun bleaching.

Softness (or texture) is important because soft hay will be eaten in greater quantities than brittle hay. Brittle hay may or may not be nutritious. If animals have trouble eating it, they will not perform well because of low intake. **When inspecting hay softness, opt for soft over brittle hay.**

Purity may or may not be linked to the nutritive value of the hay. Sometimes the impurities can be better for animals than the main hay, e.g., immature legumes in mature grass hay. Nevertheless, hay that brings the top price is usually pure. Ration formulation is easier with uniform hay lots. Hay containing a single forage species is also more likely to be uniform from bale to bale within the same lot, which increases the buyer confidence in the product. Furthermore, impurities are indicators of bad pasture management except for purposely incorporating different species in the same field. **When inspecting hay purity, opt for pure hay. Impurities, even if desirable, indicate dubious quality, difficult to balance rations and non-uniform hay lots.**

Condition of bale is particularly important for those feeding small rectangular bales, a few at a time. The more hay is handled, the more likely poorly shaped bales are to break. **Opt for well-shaped bales because of the ease to store and load on trucks, and the decrease in losses.**

Penalties in hay judging occur when negative factors, often anti-quality factors, are detected. Certain weeds may be toxic, although many weeds make good forage. Seeing or smelling mold in hay indicates animals will not eat it readily and the nutritive value may be low because of improper curing (usually too wet). **Dirt and other objectionable foreign material may be harmful to animals and they distract from hay quality**. However, certain foreign material can be removed with magnets during the grinding process.

Experienced hay evaluators can quickly assess these and other factors related directly or indirectly to hay quality. Hay buyers sometimes have to predict what will happen in addition to what they actually see, feel and smell. One may predict that wet-feeling hay will mold if stored more than a few weeks. Hay may be discounted even though there may be no mold present at the time. If leaves break off the stems easily, judges may predict the leaves will be lost before animals can eat them.

In these examples, chemical analyses may indicate the hays are highly nutritious. The judge, however, takes into account factors impossible to detect with chemical analyses. Consequently, both physical and chemical evaluations are important in determining the value of a particular lot of hay.

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