Judging Crop Quality, Part I: Score Sheets for Evaluating Hay

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Abstract

Evaluating hay samples relative to their ideal forms and their feeding value for milk or meat production is an integral component of the Forage Crop Production course offered each semester at the University of Wisconsin - River Falls (UW-RF). Students gain hands-on learning and apply their forage evaluation skills by judging hay samples in one of two annual crop contest-show events. Score sheets initially available did not provide sufficient discriminatory power to effectively separate and place the large number and variety of hay samples entered in these contests. Expanded and more functional score sheets were developed over a 30-year period for legume hay, legume-grass hay, and grass hay. Objectives also included developing score sheets that were descriptive, logically organized, and easy for students to understand and use even by those lacking experience with forages. The score sheets thus function as a learning tool helping students understand the relationship between hay characteristics and forage quality. Students use visual, olfactory, and touch senses to characterize the hay samples and award points from a descriptive list with suggested point ranges for each category. Finally, the completed score sheets provide information of an educational nature to the entrants or other interested observers by explaining the sample rankings relative to an ideal forage and to other entries. This paper describes the general contest and judging procedures at UW-RF, the score sheets used, and the forage quality concepts and rationale incorporated into them.

Introduction

Determining how hay quality relates to feeding value is an important component of crop production-related courses offered in agricultural colleges and universities. Evaluating hay quality also can extend to vocational/technical schools, high school vocational agriculture, 4H activities, and the buying and selling of hay. At the University of Wisconsin River Falls (UW-RF) the Forage Crop Production course, crop contests, and crop shows give students both formal training and practical experience in evaluating forages, feed grains, other seed crops, and occasionally less common or exotic crops. Students enjoy participating in a crops contest event either as entrants submitting samples or as judges who evaluate and place forage samples. Forage crop products in the contests and shows include several classes of hay. For hay crops, the entrant's goal is to submit a sample that compares most favorably with the "ideal" hay for a particular class. The judge's job is to evaluate and place samples in comparison with the "ideal" hay for each class. The ideal hay is defined as one with the highest potential feeding value relative to animal performance as well as having the best physical and aesthetic qualities consistent with the class description.

Application of Forage Quality Concepts to Hay Judging

The feeding value of a hay crop to ruminant livestock is a function of its digestibility, crude protein and mineral concentrations, palatability and intake, and effects of anti-quality constituents (Collins and Fritz, 2003). Chemical properties affecting forage quality can be determined using wet chemistry or near infrared reflectance spectroscopy (NIRS) procedures (Dantoin, 1986). Quality expression equations based on chemical factors such as acid detergent fiber (ADF) and neutral detergent fiber (NDF) have been developed to calculate a forage quality index value known as relative feed value (RFV) (Collins and Fritz, 2003). More recently the term relative forage quality (RFQ) also has been defined using NDF digestibility and total digestible nutrients (TDN), including crude protein, and put forth as a means of assigning a forage quality rating that is well-correlated with animal performance (Undersander and Moore, 2003).

The chemical properties of forage that affect animal performance are closely associated with physical characteristics that include: stage of maturity, leafiness vs. steminess, plant species composition, insect or disease damage, weather damage, proper preservation, and the presence of weeds or trash. Laboratory analyses provide the best information for assessing the feeding value of stored forages; however, there are times when lab procedures and results may not be readily available or the cost may not be justified or affordable to the forage user. A classroom instructor may not have the facilities, time, and labor to run wet chemistry lab analyses, especially for undergraduate classes, and the more rapid, but expensive, NIRS technology is a luxury usually not available to students as an educational tool at that level. A readily available, practical

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teaching tool is needed for agricultural students to learn to evaluate hay using only their visual, olfactory, and touch senses and be able to relate such assessment to expected levels of animal performance.

Score Sheet History and Revision

The forage judging score sheets available from University of Wisconsin-Extension when our contests began in the early 1970s listed only very general and briefly stated quality categories sources (Brickbauer et al., 1964). Maturity stages were described only as the fraction in bloom and leafiness was characterized as the percentage of the hay consisting of leaves. In our UW-RF contests there usually were up to 30 entries per class and it was common to have many tied scores among entries in a class at the conclusion of judging because of the failure of the score sheets to discriminate sufficiently between samples. The nature of the awards in each contest required that all ties be broken. Thus, it became apparent that score sheets were needed which would describe forage characteristics in more detail and allocate points so as to eliminate or at least minimize tie scores.

A second and equally desirable objective in developing new score sheets was to provide a logical approach to forage evaluation that made studying forage quality more meaningful for students having little or no forage experience prior to enrolling in the forage crops class. The current score sheets with their specific category descriptions and systematic approach make hay judging a hands-on forage quality learning exercise by helping students work through the judging process. The end result is a final score representing a relative quality rating for each sample. In addition, the score sheets are placed on display with the samples following the judging process and provide an explanation to the entrants and other interested observers as to how and why the samples were scored and placed.

We have score sheets for each of the following hay classes:

1. Legume Hay, must be 75% or more legume.
2. Mixed Legume-Grass Hay - 1st Cutting, 26- 74% Legume & 74 26% Grass.
3. Mixed Legume-Grass Hay - 2nd and Subsequent Cutting, 26 - 74% Legume & 74 26% Grass.
4. Grass Hay, must be 75% or more grass.

Figure 1:

LEGUME HAY SCORE SHEET
Univ. of Wisconsin – River Falls

[ ] DISQUALIFIED
[ ] Insufficient quantity
[ ] Does not meet class description

75% or More Legume

Sample Identification: _____

Date: _____

Event/Contest: _____
Judge(s): _____

A. Stage of Harvest / Maturity (1st cutting use lower end of point range) (2nd and subseq.cuttings use higher end of point range)	50 points	Points Given
1. Prebud	50	
2. Early - midbud	49-47	
3. Mid - late bud	46-44	
4. First flower	43-40	
5. Early bloom (10-30% of stems with flower)	39-35	_____
6. Mid-bloom (40-60% of stems with flower)	34-30	
7. Late bloom (70-100% of stems with flower)	29-20	
8. Seed stage	19-10	

B. Leafiness - Stemminess	30 points	
1. Very leafy, stems fine	30	
2. Leafy. stems fine	29-27	
3. Leafy. stems medium	26-24	
4. Leafy. stems coarse	23-19	_____
5. Slightly stemmy. few or some leaves lost	26-20*	
6. Stemmy, many leaves lost	19-14	
7. Very stemmy, most leaves lost	13-5	

*Intentional point range

C. Color	20 points	
1. Bright natural green	20	
2. Slightly faded green	19-17	
3. Faded to pale green	16-14	_____
4. Brownish or yellowish green	13-11	
5. Brownish yellow; badly weathered	10-5	
6. Dark brown or blackish	4-0	

TOTAL POINTS (A+B+C) Max. = 100 _____

D. Antiquality Penalties	Points Off	
1. Very dry, harsh, and brittle	0-8	____
2. Leaf disease damage	0-8	____
3. Insect damage	0-8	____
4. Moldy or musty	0-8	____
5. Nutrient deficiency symptoms	0-4	____
6. Heat damage odor	0-4	____
7. Bad odor from other causes	0-4	____
8. Other _____	0-4	____ Total 1-8 _____

E. Weeds, Trash, and Other Foreign Matter Penalty
Noninjurious or nonpoisonous: -1 point per 1% of forage mass ..._____
Injurious or poisonous: -3 points per 1% of forage mass ..... _____

TOTAL PENALTIES (D+E):_____

PLACING _____ FINAL SCORE _____

Mixed hay was divided into two classes because of differences in quality as affected by species and by maturity in first cutting versus second or subsequent cuttings in a season (Collins and Fritz, 2003; Undersander et al., 2004). The rationale for this will be explained later. Hay entry samples must consist of at least 15.2 to 20.3 cm (6 to 8 inches) of bale slice and must be a sampling from a normal on-the-farm hay baling operation, not something hand- or machine-cut and simulated into a bale-like package. Entries are assigned a coded identification for judging so that judges do not know an entrant's identity.

Application of Forage Crop Training to Contest Needs

Forage Crop Production (Crops 263, 3 cr.) is offered each semester at UW-RF with one unit of the course devoted to forage crop quality. Also, two annual crop judging-show events are held each year that require the judging and placing of entries:

(1) A fall Crop Contest and Show with entry open to students, faculty, and other UW-RF staff.

(2) A spring Agricultural Technology Contest (ATC) open to competing high schools from throughout the state.

High school student teams compete in various written and practicum exercises in all the disciplines offered in the College of Agriculture, Food, and Environmental Sciences. In addition, the ATC features a very popular Tops of the Crops Contest in which each competing school enters crop samples. Points are awarded in each crop class based on relative placings and the school accumulating the most total points across all crop classes is the grand prize winner. There also is a special award to the school having the highest total score across all forage classes.

Both judging events include 12 or more crop classes, four of which involve hay. The hay classes are: Legume Hay; Mixed Legume-Grass Hay, 1st Cutting; Mixed Legume-Grass Hay, 2nd and Subsequent Cuttings; and Grass Hay. Judging of the forage crops entries in each contest is done by the students enrolled in the Forage Crop Production course that semester. The forage quality unit in the course includes training for judging the respective contests. Training consists of at least one lecture on forage quality characteristics and one two-hour lab period each for hay and silage evaluation. In the lab portion of the course students receive hands-on experience examining and rating samples representing a range of quality characteristics and then compare their ratings with those given by the instructor. An inventory of hay samples representing a variety of classes and qualities is maintained for this training.

For contest judging, the students are divided into teams for each hay class, and each team collectively assigns points for the characteristics listed on the score sheet for their class. Before beginning the score sheet judging, we usually advise the students to visually survey all of the entries that have been laid out in their class to gain a visual impression of the range of apparent quality represented.

Integrating Forage Quality Concepts into the Score Sheets

These score sheets (Figures 1-4) were developed and used for judging in contests usually involving 50 100 hay entries including a variety of legume and grass species as well as various mixtures of legumes and grasses. Hay containing a significant portion of grass or that is pure grass usually has a lower RFV than a legume hay when both are at equivalent stages of maturity because the grass contains a higher proportion of NDF than legumes (Collins and Fritz, 2003). Grass hay NDF digests more slowly than legume hay NDF and over a given period of time can reduce forage intake and animal performance, especially milk production. The slower digestibility rate is of less concern with non-lactating animals because the grass NDF ultimately has relatively high total digestibility (Undersander and Moore, 1993). Legumes generally have a higher crude protein percentage than grasses, which also is important for dairy production. Thus, we have set up maximum point totals of 100, 95, and 90 for the legume, legume-grass, and grass score sheets, respectively, to provide a bias in favor of legume forage (see Figures 1-4). Alternatively, if one does not want to utilize this pro-legume-biased approach, the mixed legume-grass and grass hay score-sheets can be modified by increasing the grass maturity maximum point ranges in each to 50 and thereby provide 100-point score sheet totals.

The samples entered in our

Figure 2: MIXED LEGUME - GRASS HAY, 1st CUTTING SCORE SHEET

Univ. of Wisconsin – River Falls

[ ] DISQUALIFIED
[ ] Insufficient quantity
[ ] Does not meet class description

26-74% Legume, 74-26% Grass

Sample Identification: _____

Date: _____

Event/Contest: _____

Judge(s): _____

A. Stage of Harvest / Maturity (45 pts)

Legume	25 pts	Grass	20 pts
1. Prebud	25	1. Leaves, early joint	20
2. Early - midbud	24-23	2. Jointed: boot stage	19-18
3. Mid - late bud	22-20	3. Heads emerging	17-15
4. First flower	19-17 _____	4. Pollen shedding	14-12 _____
5. Early bloom (10-30%)	16-14	5. Early seed stage	11-8
6. Mid-bloom (40-60%)	13-11	6. Mid-seed stage	8-6
7. Late bloom (70-100%)	10-8	7. Mature seed stage	5-3
8. Seed pods present	7-4	8. Seed shattering and/or plants deteriorating	2-0

Total Maturity Score _____

B. Leafiness – Stemminess (30 pts)	Legume 15 pts	Grass 15 pts
1. Very leafy, stems fine	15	15
2. Leafy, stems fine	14-12	14-12
3. Leafy, stems medium	11-9	11-9
4. Leafy, stems coarse	8-6 _____	8-6 _____
5. Slightly stemmy, few or some leaves lost	11-9*	11-9*
6. Stemmy, many leaves lost	8-5	8-5
7. Very stemmy, most leaves lost	4-2	4-2

*Intentional point range

Total Leafiness Score _____

C. Color	20 pts
1. Bright natural green	20
2. Slightly faded green	19-17
3. Faded to pale green	16-14
4. Brownish or yellowish green	13-11
5. Brownish yellow; badly weathered	10-5
6. Dark brown or blackish	4-0

Color Score _____

TOTAL POINTS (A+B+C) Max. = 95 _____

D. Antiquality Penalties	Points Off
1. Very dry, harsh, brittle	0-8 ____
2. Leaf disease damage	0-8 ____
3. Insect damage	0-8 ____
4. Moldy or musty	0-8 ____
5. Nutrient deficiency symptoms	0-4 ____
6. Heat damage - odor	0-4 ____
7. Bad odor, other causes	0-4 ____
8. Other _____	0-4 ____ Total 1-8 _____

E. Weeds, Trash, and Other Foreign Matter Penalty

Noninjurious or nonpoisonous: -1 point per 1% of forage mass... _____

Injurious or poisonous: -3 points per 1% of forage mass ..... _____

TOTAL PENALTIES (D+E): _____

PLACING _____

FINAL SCORE: _____

contests also usually represent a wide range of quality because of variations in stage of growth and cuttings during the season. Research with legumes such as alfalfa indicates that advancing maturity in second, third, and subsequent cuttings has a less deleterious effect on forage quality than in the first cutting (Undersander et al., 2004). Thus, in the mixed hay score sheet the points assigned to legume maturity decline less rapidly with advancing stage of maturity in the second and subsequent cuttings compared with the first cutting. When scoring pure legumes, the high end of the maturity point ranges can be used for later cuttings and the low end for earlier cuttings (if this characteristic can be determined). Cool-season forage grasses, except for timothy (*Phelum pratense* L.), produce an inflorescence only in the initial season's growth. The presence of the long inflorescence culms high in fiber causes grass plants to be relatively lower in quality than plants without an inflorescence (Collins and Fritz, 2003b). In northern states hay from first cuttings often contains grasses with inflorescences whereas second, third, or later cutting hay usually contains no grass inflorescences unless perhaps timothy or mid- to late-season grassy weeds such as foxtails (*Setaria* spp.). Bermudagrass (*Cynodon dactylon* (L.) Pers.), used in southern states, also may develop inflorescences with later cuttings (Collins and Fritz, 2003a). Therefore, the maturity sections for mixed legume-grass and pure grass hay have point scores slightly biased against first-cut headed or heading grasses versus later cuttings having only vegetative growth.

Score Sheet Criteria

Stage of harvest (maturity)

Plant maturity is the most important characteristic influencing the feeding value of hay (Collins and Fritz, 2003a); therefore, it is allotted the greatest proportion of score sheet points (50 for the pure legume hay score sheet, Figure 1). Maturity of legumes is determined by closely examining stem tips for buds, flowers, or possibly seed pods. Alfalfa (*Medicago sativa* L.) flower petals are usually purple but in some cultivars they also can be yellow, white, green, or a combination of colors. In hay discolored by weathering in the field or heating in storage, the flower color may be bleached out and one has to look carefully for the flower petal parts. Inexperienced students may fail to detect the presence of legume flowers and seed pods, especially those of alfalfa; unless a special effort is made to show them the visual characteristics in a variety of hay samples. The presence of buds, if not obviously visible, often can be confirmed by squeezing a shoot tip between the thumb and forefinger. A bud will feel like a small pea among the emerging leaf and bract parts. The maturity of clovers (*Trifolium* spp.) can be determined by the absence or presence of buds or heads along with the color of the heads. A large brownish head indicates advancing maturity and can be checked for seeds by rubbing between the palms and then carefully blowing away the chaff and other non-seed inflorescence parts. Grass maturity is determined by looking for stem jointing, boot formation, or inflorescences (Moore et al., 1991). If inflorescences are present, one should attempt to determine if seeds have formed and are immature or mature and shattering. Coarse stems and leaves discolored by age or disease are another indication of advanced maturity in both legumes and grasses.

Figure 3: MIXED LEGUME-GRASS HAY, 2nd and SUBSEQUENT CUTTING SCORE SHEET

Univ. of Wisconsin – River Falls

[ ] DISQUALIFIED
[ ] Insufficient quantity
[ ] Does not meet class description

26 - 74% Legume, 74 - 26% Grass

Sample Identification: _____

Date: _____

Event/Contest: _____

Judge(s): _____

A. Stage of Harvest /Maturity (45 pts)

Legume	25 pts	Grass	20 pts
1. Prebud	25	1. Leaves. early joint	20
2. Early - midbud	24-23	2. Jointed; boot stage	19-18
3. Mid - late bud	22-21	3. Fully jointed. If nonheading, relative stage of maturity determined by other "indicators" in forage sample-- legumes, annual grasses, or weeds	17-10
4. First flower	20-19		
5. Early bloom (10-30%)	18-17		
6. Mid-bloom (40-60%)	16-14		
7. Late bloom (70-100%)	13-11		
8. Seed pods present	10-5		

Score _____

Total Maturity Score: _____

B. Leafiness – Stemminess (30 pts)

	Legume 15 pts	Grass 15 pts
1. Very leafy. stems fine	15	15
2. Leafy. stems fine	14-12	14-12
3. Leafy, stems medium	11-9	11-9
4. Leafy. stems coarse	8-6	8-6
5. Slightly stemmy. few leaves lost	11-9*	11-9*
6. Stemmy. many leaves lost	8-5	8-5
7. Very stemmy. most leaves lost	4-2	4-2

*Intentional point range

Total Leafiness Score: _____

C. Color

	20 pts
1. Bright natural green	20
2. Slightly faded green	19-17
3. Faded to pale green	16-14
4. Brownish or yellowish green	13-11
5. Brownish yellow: badly weathered	10-5
6. Dark brown or blackish	4-0

Color Score _____

TOTAL POINTS (A+B+C) Max. = 95 _____

D. Antiquality Penalties

	Points Off	
1. Very dry. harsh. brittle	0-8	_____
2. Leaf disease damage	0-8	_____
3. Insect damage	0-8	_____
4. Moldy or musty	0-8	_____
5. Nutrient deficiency symptoms	0-4	_____
6. Heat damage (odor and color)	0-4	_____
7. Bad odor. other causes	0-4	_____
8. Other _____	0-4	_____ Total 1-8 _____

E. Weeds, Trash, and Other Foreign Matter

Noninjurious or nonpoisonous: 1 point for each 1% of hay mass..... _____

Injurious or poisonous: 3 points for each 1% of hay mass..... _____

TOTAL PENALTIES (D+E) = _____

PLACING _____ FINAL SCORE _____

The two Mixed Legume-Grass Hay score sheets (Figures 2 and 3) have parallel point columns for the legume and grass components for the Stage of Harvest because of possible maturity and morphology differences between legume and grass species. A first-cutting mixed hay may contain a late-maturing alfalfa still in the bud stage along with an early maturing orchardgrass (*Dactylis glomerata* L.) cultivar in the seed-forming stage. The Mixed Legume-Grass Hay 2nd and Subsequent Cutting score sheet and the Grass Hay score sheet (Figure 4) also have a parallel, but slightly different, grass maturity point-scoring column because of the possible lack of grass heads in such hay. Although regrowths of most cool-season grasses do not head and flower again, there will be some decline in digestibility as the plants age beyond the fully jointed stage, thus decreasing point scores are given. The score sheets suggest using the maturity or relative growth of other "indicator plants" to estimate an equivalent maturity for the non-headed grasses. Indicators might include species such as alfalfa, clovers, foxtails, barnyardgrass (*Echinochloa crusgalli* (L.) Beavu.), or mid- to late-season broadleaved weeds.

Leafiness - Steminess

Leafiness-steminess is allotted the second-highest point total (30 for pure legume hay) because leaves of most most hay species are 10-20 percentage units higher in both digestibility and crude protein than stems (Buxton et al., 1985). Leaves also have higher concentrations of minerals than stems. Approximately 50% of the dry weight a very leafy, fine-stemmed alfalfa hay is leaf tissue (Collins and Fritz, 2003a). There can be significant differences in the initial steminess, or subsequent leaf loss, of legumes compared with grasses prior to or at harvest, thus the parallel scoring columns. The legume is much more likely to shatter leaves than the grass.

Figure 4: GRASS HAY SCORE SHEET
Univ. of Wisconsin – River Falls

[ ] DISQUALIFIED
[ ] Insufficient quantity
[ ] Does not meet class description

75% or More Grass

Sample Identification: _____
Date: _____
Event/Contest: _____
Judge(s): _____

A. Maturity, first crop	40 pts
1. Leaves,early joint	40
2. Jointed.boot stage	39-37
3. Heads emerging	36-34
4. Pollen shedding	33-29
5. Early seed stage	28-24
6. Mid-seed stage	23-19
7. Mature seed stage	18-14
8. Seed shattering or plants deteriorating	13-5

A. 2nd or subsequent crop	40 pts
1. Leaves, early joint	40
2. Jointing	39-37
3. Fully jointed. If nonheading. relative stage of maturity determined by other "indicators" in forage sample--legumes, annual grasses. or weeds	36-20

Maturity Score_____

B. Leafiness - Stemminess	30 pts
1. Very leafy, stems fine	30
2. Leafy. stems fine or short	29-27
3. Leafy. stems medium	26-24
4. Leafy. stems coarse	23-19
5. Slightly stemmy. few or some leaves lost	26-20*
6. Stemmy. many leaves lost	19-14
7. Very stemmy. most leaves lost	13-5

*Intentional point range

Leafiness Score _____

C. Color	20 pts
1. Bright natural green	20
2. Slightly faded green	19-17
3. Faded to pale green	16-14
4. Brownish or yellowish green	13-11
5. Brownish yellow	10-5
6. Dark brown or blackish	4-0

Color Score _____

TOTAL POINTS (A+B+C) Max. = 90 _____

D. Antiquality Penalties	Points Off	
1. Very dry, harsh. brittle	0-8	____
2. Leaf disease damage	0-8	____
3. Insect damage	0-8	____
4. Moldy or musty	0-8	____
5. Nutrient deficiency symptoms	0-4	____
6. Heat damage (odor and color)	0-4	____
7. Bad odor. other causes	0-4	____
8. Other _____	0-4	____ Total 1-8 _____

E. Weeds, Trash, and Other Foreign Matter Penalty
Noninjurious or nonpoisonous: -1 point per 1% of forage mass _____
Injurious or poisonous: -3 points per 1% of forage mass _____

TOTAL PENALTIES (D + E) _____

PLACING _____ FINAL SCORE _____

Color

Color, allotted 20 points on all the hay score sheets, is another readily identifiable characteristic indicative of forage quality. There can be discoloration due to pre-harvest factors such as advanced maturity, leaf disease damage, or nutrient deficiencies; bleaching from exposure to rain and sun in the field at harvest; and browning from heat damage or white mold formation due to baling and storing at a moisture content above the recommended maximum.

Anti-quality Penalty Characteristics

Another characteristic affecting quality is often referred to as "condition" and includes terms such as harsh or brittle, moldy or musty, insect or disease damaged, heat damaged, or bad odors. An anti-quality penalty section allows evaluation and point assignment for such characteristics. These points are then subtracted from the point total accumulated for the major quality factors of maturity, leafiness, and color.

Weeds, Trash and Other Foreign Material

A penalty category for weeds, trash, and other foreign material also subtracts points from the quality score. The points assigned can be weighted to more seriously penalize for the presence of poisonous or physically harmful weeds or foreign

materials. Penalty points are determined by estimating the percentage of the forage mass contaminant and deducting one point for each percent of non-poisonous or non-harmful weeds or foreign materials and three points for each percent of poisonous weeds or harmful materials. An example of trash or foreign material not harmful to livestock but which contributes little or nothing to forage value includes corn stalks or straw, probably present as residue from the previous year's crop. Examples of potentially poisonous weeds sometimes found in hay include field horsetail (*Equisetum arvense* L.), old-man-in-the-spring (*Senecio vulgaris* L.), and kochia [*Kochia scoparia* (L.) Schrad.] (Cheeke, 1998). Examples of physically harmful plant species in hay might include thistles (*Cirsium* spp.) or field sandbur (*Cenchrus longspinus* Hack.). Students lacking plant identification skills may fail to notice even common weed species present in hay unless a special effort is made to familiarize them with the most likely hay weeds in your area. Some weed species may have little adverse effect on forage quality. Examples include common dandelion (*Taraxacum officinale* Weber) and quackgrass [*Eletrigia repens* (L.) Neveski]. Penalizing for the presence of weeds that are not poisonous, physically harmful, or unpalatable is more for the purpose of characterizing the sample as a "less-than-ideal forage" rather than for any practical reason affecting the feeding value of the forage.

Once every sample has been scored and the scores totaled, finalizing the rankings can be facilitated by arranging the samples, especially the top five or six, in order by numerical score and visually checking them to be sure that the scores appear to be consistent with the characteristics observed. If not, the samples should be re-examined category by category to determine if the scoring was indeed correct and consistent among samples. All score sheets should be double-checked for arithmetic accuracy of score totals. Accuracy in maintaining sample identity must also be stressed. Incorrect score totals or misidentified samples pointed out after placings have been made and the ribbons or prizes awarded can be very embarrassing.

Concluding Comments

Collectively, these score sheets are the result of over 30 years of experience in dozens of contests involving nearly 2000 students and thousands of samples. They evolved over the years incorporating ideas gathered by the authors from the experience of training students to evaluate forages in the labs and contests, suggestions by the students using them, forage quality information gleaned from the literature in general, and the forage quality information that exists in Wisconsin from research and extension sources. Results obtained with their use in placing samples probably will not agree 100% with laboratory analysis results for ranking the samples anymore than the results of visually judging and placing dairy cows or meat animals are going to agree completely with milk production, rate of gain, or dressing percentage record rankings. However, these score sheets make visual, and sensory evaluation of hay a relatively systematic, broadly accurate, and straight forward procedure that can be followed by individuals having a minimum of formal training in forage species identification and forage quality characteristics. The score sheets can function as teaching tools for students to gain an understanding of the effects of hay characteristics on forage quality. Thus, they should provide acceptable results for most hay evaluation applications attempting to utilize the relationship between the physical and sensory characteristics of forage and known quality factors that affect animal performance.

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