Hay Contest Evaluation and Organization for Teaching and Promoting Hay Quality

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ABSTRACT

A methodology for conducting competitive exhibitions or hay contests was developed to evaluate, teach, and promote hay quality. Exhibits are subjected to a forage analysis and a visual appraisal for economically important variables. The criteria for visual appraisal are particularly appropriate for hay produced and marketed in the Wyoming environment. This model is a standardized, rigorous, yet flexible approach used to coordinate county and state fair events in Wyoming.

COMPETITIVE EXHIBITIONS of commercially produced hay have gained popularity in recent years. Also known as hay shows or hay contests, some of these events are becoming widely publicized and have entrants competing from different regions of the USA. These shows include the World's Forage Analysis Superbowl (6) begun in 1984 and more recently the National Hay Show (2) initiated by the American Forage and Grassland Council in 1991. When the Wyoming Cooperative Extension Service (WCES) initiated hay shows in 1987, detailed criteria relating to economically important characteristics of hay quality were outlined to evaluate these events. The primary author of this article had experience judging similar events in Oklahoma, but other hay evaluation criteria (1, 7, 8, 9, 11, 14, 15) were reviewed. The final model for judging these events incorporated criteria relevant to conditions for producing and marketing hay in Wyoming. This article presents a standardized, rigorous, yet flexible model developed for these exhibitions. These events combine modern concepts of forage analysis (8, 9, 13, 15) with a standardized visual appraisal developed for Wyoming-produced alfalfa (*Medicago sativa* L.) hay. Education, promotion, and recognition are primary objectives. More specifically, these events can teach forage analysis and visual appraisal as well as encourage the application of these concepts in the production and marketing of high-quality hay. Finally, formal recognition, awards, and publicity increase the visibility of those who produce and exhibit high-quality hay.

THE COMPETITIVE EVENT AS A TEACHING RESOURCE

Land-grant institutions continue to apply current scientific knowledge to solve practical problems (10). In view of this, the WCES is interested in teaching and promoting new technology to improve management and profitability of crops and other resources. Unfortunately, the effectiveness of extension service programming to improve the quality and yield of commercially produced crops can be difficult to quantify, because unlike classroom teaching, progress is rarely measured with an exam. However, extension education programs such as on-site forage testing (12) have been used to improve hay-producer awareness of forage quality at a state fair.

Another approach for increasing awareness has also been demonstrated with participants of competitive exhibitions of hay (4). Competition predisposes exhibitors to new concepts if excellence is rewarded and recognized. Participants learn by comparing the results of evaluated entries. The attributes and economic significance of high-placing entries are explained in terms of nutritive value and certain visual appraisal criteria. Educational brochures, video tapes, presentations, or scheduled lectures at these exhibitions can reinforce the relationship of hay quality to marketing. These events can relate quality to profitability. Hay producers can be encouraged to tailor commodities to various specialty markets, a form of economic development. Exhibits, if evaluated and ranked according to standardized criteria, can broaden the perspectives of both participants and observers. Exhibitors and observers who compare the quality of entries might then be encouraged to modify production practices.

ORGANIZATION AND SUPPORT

Successful exhibitions require publicity, participation of hay producers, and cooperation of county and state fair boards. All parties make important contributions, but one or two individuals should take responsibility for planning and coordinating all events leading to a final exhibition at a state fair. Because potential entrants need time to understand and prepare for an event, preparations must be initiated well in advance. Responsibility at the local level will increase once events are established. Procedures for local and state exhibitions should be explained at meetings, promoted in newsletters and the popular press, and posted in county locations frequented by hay producers. Personal invitations or contacts with potential participants by university extension agents are effective, if not crucial, the first year.

County events in Wyoming specify that exhibitors submit a five-bale entry per class and state events specify a

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Abbreviations: WCES, Wyoming Cooperative Extension Service; CP, crude protein; ADF, acid detergent fiber; NDF, neutral detergent fiber; RFV, relative feed values; DMD, dry matter digestibility; DMI, dry matter intake.

Table 1. Example of Wyoming state fair hay exhibition protocol.

Sponsored by Wyoming State Fair and Wyoming Hay Producers

DEADLINE FOR ENTRIES—2 AUG. 1991
$825 IN CASH PREMIUMS

1. Any Wyoming hay producer is eligible to enter hay produced in either 1990 or 1991. Hay exhibited at any 1990 fair may not be entered again. Exhibitors may make one entry per class.
2. For baled hay classes, one large or three small square bales will constitute one entry. Bales may be wire or string-tied.
3. Hay entered and sampled for a county fair exhibition may be re-entered at the state fair without reprobing or re-sampling. Exhibitors who have not entered a county contest must follow instructions detailed below.
4. All three bales of each entry will be probed with a hay coring tool by the county agent to collect a forage sample. An aggregated subsample from each entry must be sent by the Agent or the UW extension agronomist to a designated lab by 2 August. Samples can be submitted directly to: Extension Agronomist, HC 31 Box 2720A, Riverton, WY 82501. Specify intent to enter the Wyoming State Fair Hay Exhibition.
5. Judging factors to be considered will include relative feed value, crude protein, maturity, texture, leaf capture and retention, color, bale conformation, odor, and freedom from foreign material and mold.
6. Entries must be delivered to the Ft. Laramie Building on the Wyoming Fairgrounds no later than 2000 h (8:00 pm), Tuesday, 20 August. Judging will be on Wednesday, 21 August. All entries will become property of the fair board to help pay for cost of the event.

CLASSES
1. Green alfalfa hay, baled
2. Brown alfalfa hay, baled
(Discoloration due to rain, sun bleach or fermentation)
3. Grass hay, baled (Preferable that grass hay does NOT contain a legume but up to 10% will be permissible)
4. Alfalfa hay, cubed (for the cube class, one bushel measure will make one entry)

PREMIUMS FOR EACH CLASS

1st	2nd	3rd	4th	5th	6th
$75	50	30	20	15	10

First place in each class will receive a plaque. Entry with highest crude protein of exhibition will receive $25.00 and a plaque.

three-bale entry. Cash awards and placings may vary at the county level. At some locations, cash awards and expenses for forage analysis of entries are covered entirely by the fair board. Some exhibitions may require entry fees or seek support from banks or farm-related businesses. In Wyoming, expenses for the state fair exhibition are funded by the State Department of Agriculture. The state event (Table 1) consists of direct entries and top-placing county exhibits.

DISCUSSION OF CRITERIA AND PROCEDURES FOR SCORING AN EXHIBITION

County extension agents take possession of and sample each bale of each entry with conventional hay coring equipment (15). All entries are analyzed for specific hay quality variables (8, 9, 13, 15), which include crude protein (CP), acid detergent fiber (ADF), and neutral detergent fiber (NDF) at a laboratory certified by the National Forage Testing Association (15). All hay samples are analyzed for the above variables by wet chemistry as outlined by the U.S. Hay Quality Committee (15). Relative feed values (RFV) are calculated from ADF and NDF values according to the formulas used by Linn and Martin (8) and the National Hay Testing Program (15). Entries are scored on the basis of RFV, CP, and a visual appraisal.

Each exhibit should represent a homogeneous, harvest lot of commercially produced hay. A harvest lot is considered to be one cutting from one field (15). Quality differences between alfalfa harvests in Wyoming are somewhat predictable with traditional hay-making practices. Nevertheless, classes for alfalfa are not separated by harvest (i.e., 1st, 2nd, 3rd) because a skilled, determined producer can make high-quality hay from any cutting in Wyoming if environmental conditions permit.

Entries within classes are arranged in side-by-side comparisons. Each five-bale exhibit is mini-stacked, two by two, with strings down and butt-ends forward. The fifth bale of each entry is centered on top of the stack, also with strings down and butt-end forward. The bindings of the fifth bale are cut with flakes exposed for a visual appraisal. Uniform presentation of entries is imperative. If possible, observers should be able to move completely around each entry. More frequently, space limitations require that exhibits be queued along a wall in an exhibition hall. If so, all entries should be queued front-side on the entry with the longest bales. Odd-sized bales will then be displaced on the backside of the display. If exhibits are placed along a wall, a gap of at least 15.2 to 20.3 cm (6–8 inches) should be allowed between entries. Exhibits at the state fair competition are stacked side by side in a 1 by 3 bale configuration, also with strings down, butt-ends forward and flakes exposed in the top bale. Entries of large rectangular or large round bales require only a single bale. Visual appraisals for large bale entries are conducted by removing an 20.3-cm (8-inch) cube from the bale with a keyhole saw. A 35.24-L (1-bushel) measure constitutes one entry in the cubed hay class. Cubes are scored and ranked only on the basis of nutrient content.

The scoring system developed for Wyoming Competitive Hay Exhibitions (Table 2) uses separate score sheets for different classes. The RFV and CP for each exhibit are entered in sections I.A and I.C, respectively. Only values calculated on a dry-matter basis are used on the score sheet. Values for forage dry matter digestibility (DMD) and dry matter intake (DMI) must be calculated before the RFV of a forage can be determined. The procedure for calculating RFV is: RFV = (DMD × DMI)/1.29. Dry matter digestibility = 88.9 − (0.779 × ADF). Dry matter intake as a proportion of body weight = 120/forage NDF. These formulas are reproduced here as presented in cited references (5, 8). Values for ADF and NDF in these formulas are the dry matter percentages of these components in the forage. A detailed explanation appears in Linn and Martin (8).

The RFV value for each exhibit is manipulated to derive an RFV score for each exhibit (I.B). The RFV score is calculated by dividing the RFV value for each exhibit (A) by the mean RFV value for all exhibits (a) within a class and then multiplying the result by 100. Similarly, the CP score (I.D) for each exhibit is calculated by dividing the CP value for each exhibit (C) by the mean CP value for all exhibits (c) within a class and then multiplying the result by 100. Independent scores for CP and RFV in Section I are necessary because the CP content of hay is influenced by factors unrelated to those affecting RFV (8). Consequently, this scoring system was designed to recognize that some dairies pay separate cash bonuses for

Table 2. Example of scoring system for competitive hay exhibitions in Wyoming.

(____) Alfalfa-baled, green (X) Alfalfa-baled, brown (____) Alfalfa-cubed (____) Grass-baled
Use separate sheet for each class and/or additional sheets within class when necessary

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Exhibitor no.	1	2	3	4	5	6	7	8	
I. Nutritional analysis									Mean value
A. Relative feed value (RFV)	152.5	218.2	178.2	134.9	170.0	173.9	163.4	168.3	(a) 169.9
B. RFV score = (*A*/*a*) 100	89.8	128.4	104.9	79.4	100.1	102.4	96.2	99.1	(b) 100
C. Crude protein (CP)	18.0	21.9	19.8	18.0	21.0	20.0	17.6	21.3	(c) 19.7
D. CP score = (*C*/*c*) 100	91.3	111.2	100.5	91.4	106.6	101.5	89.3	108.1	(d) 100
II. Appraisal criteria									Add points
A. Leaf capture	8.5	9.5	8.0	9.0	7.5	8.5	5.0	8.0	Stemmy to leafy (1-10)
B. Leaf retention	8.5	9.5	7.5	7.5	7.0	8.5	5.0	8.0	Detached to attached (1-10)
C. Texture	8.0	9.0	3.0	9.0	7.0	8.0	6.0	8.5	Hard and coarse to soft and pliable (1-10)
D. Color	4.0	4.0	3.0	4.0	4.0	4.0	4.0	4.0	Dark brown to bright green (1-5)
E. Maturity	3.0	3.5	3.0	3.0	3.0	3.0	3.0	3.0	Seed-bearing to immature (1-4)
F. Bale package conformation	5.0	5.0	4.0	5.0	4.0	4.5	4.0	5.0	Loose irregular to tight symmetrical (1-5)
G. Total (sum of I.B, I.D, and II.A-F)	218.1	280.1	233.9	208.3	239.2	240.0	212.5	243.7	
III. Defects									Subtract points
A. Foreign material			−1		−3				Weeds and debris (0- -10)
B. Condition									Mold or dust
C. Purity									Other hay type in bale (0- -5)
D. Moisture content				−4					Subtract 2 points per unit above 18% for small square bales or 15% for large bales
Grand total	218.1	280.1	232.9	204.3	236.2	240.0	212.5	243.7	
Rank	6	1	5	8	4	3	7	2	

RFV and CP values above a minimum standard. Cash bonuses and minimum standards may vary by dairy, region, or year.

Criteria in the visual appraisal section begin with two different scores for "leafiness" (Table 2, II.A). The first is leaf capture in the bale and the second is leaf retention by the stems in the bale flakes. Exposed flakes from the open bale of each entry are first examined for the presence or "capture" of leaves. "Leafy" entries score higher while "stemmy" entries score lower. Leaf retention, on the other hand, relates to the degree that leaves remain attached to stems when flakes are handled or taken apart. Flakes earning high scores for leaf retention (II.B) tend to have a high score for leaf capture. Nevertheless, an evaluator or judge must be alert for entries with flakes having an abundance of leaves that are mostly unattached or poorly attached to the stems. Such entries could earn high scores for capture but much lower scores for retention. This distinction is important, because hay with excellent leaf capture but poor retention might be fed more efficiently in a bunk than on the ground where more leaves could be lost. Because alfalfa leaves are higher in quality than stems (3, 13), hay with high scores for both capture and retention of leaves will frequently have high values for CP and RFV.

Texture (Table 2, II.C) varies widely among harvest lots. Some types of hay, if stemmy, weedy, or fermented, may have a distinctly hard, coarse texture when compared with a softer, more pliable, well-cured, leafy hay (1, 3). Stem size, fiber content and maturity at harvest, although somewhat important, do not influence hay texture as much as environmental conditions during curing or baling. Soft, pliable, leafy hay merits a higher score than does coarse, stemmy hay.

Color of hay (Table 2, II.D), while a strong clue to environmental conditions during harvest, is not a reliable measure of either nutrient content or potential intake of hay by livestock (13). Bright green, mold-free, leafy hay is attractive and in high demand for the horse hay market. Buyers of horse hay in Wyoming frequently tend to be more concerned with hay condition and color than with nutrient content (16). Mold is a concern for any livestock feeder, but most knowledgeable hay buyers for beef (*Bos taurus*), dairy, or sheep (*Ovis aries*) interests are primarily interested in nutrient content if the hay is in good condition. Hay discoloration may result from fermentation, sun-bleach, a heavy dew, or precipitation, but effects on quality are variable (13). Color is not considered a firm indicator of nutritive value, but green hay competes in a different class than does brown or discolored hay due to marketing nuances in Wyoming. Some harvest lots of rapidly cured alfalfa hay are bright-green, but not particularly high in nutritive value. Such hay might be attractive to buyers of horse hay, even though below minimum quality standards desired by dairies. On the other hand, some discoloration is acceptable to dairies if the hay is mold-free and high in nutritive value. In Wyoming contests, hay with evidence of fermentation, sun-bleach, or rain damage automatically competes in the brown class, although some of these entries could possibly market as green hay. Marginal importance is given to color as a scoring criterion, because a broad spectrum of intermediate shades and colors exist within both classes. Most of the eight exhibits in the class for brown hay in Table 2 achieved a high score for color. Each of these entries showed evidence of discoloration for various reasons, but most would have marketed as green hay.

Stage of maturity (Table 2, II.E) also appears in the appraisal section, but much greater importance is placed on nutrient content, leaf capture, leaf retention, and texture. This is because some Wyoming hay, even when harvested in a rather advanced stage of maturity with a high fiber content and a lower RFV, can be found to contain as much as 20% CP (3). Such hay sometimes has superi-

Table 3. Example of display card showing results of forage analysis and visual appraisal.

LOT #2	1st Place alfalfa, brown	Comments
Exhibitor	Telephone	This would market as green hay, but discoloration due to mild fermentation in the flake places this entry in the class for brown hay.
Address		
Relative feed value (RFV)	218.2	Leaf capture in the bale and leaf retention by the flake are excellent!
Crude protein (CP)	21.9%	
Total digestible nutrients (TDN)	73%	Crude protein and relative feed value exceed minimum prime standard by wide margins.
Acid detergent fiber (ADF)	22.6%	
Neutral detergent fiber (NDF)	30.4%	This dairy quality hay would command a cash bonus from some buyers.
Digestible dry matter (DDM)	73%	
Moisture	16%	Forage quality variables are expressed on a dry matter basis.

or capture and retention of leaves when produced by skilled haymakers under conditions that permit a rapid cure.

Points for bale package conformation (Table 2, II.F) are included because a large portion of Wyoming hay moves to remote markets. Shippers prefer a firm, dense, symmetrical package that is easier to load and more profitable to transport.

Potential defects are included in Table 2 (Section III.A-D). Up to 10 points can be deducted from an exhibit for such foreign material as weeds, twigs, soil, stones, or other debris. Hay in poor condition (substantial amounts of mold or dust) may be disqualified by a judge or cost an entry up to 15 points. Purity or homogeneity of hay type within a class is also important. Alfalfa entries containing grass, or grass entries containing alfalfa, can be penalized. An entry with excessive moisture when sampled indicates that the hay has not yet stablized and could spoil. Small square bales exceeding 18% moisture or any type of large bale exceeding 15% moisture are docked 2 points per unit of moisture above these designated limits.

Grand totals for each exhibit are achieved by summing the items specified in Section II.G, then subtracting any defects which occur in Section III. Exhibits are ranked from highest to lowest scores, unless disqualified in Section III.B.

Display cards (Table 3) with results of each forage analysis are attached to respective exhibits. Additional observations, correlating nutrient content and the visual appraisal, are recorded on a comments card when an exhibit demonstrates an important concept or principle in forage quality. An attempt is made to relate comments to factors that impact hay marketing when possible. Both cards are posted on each exhibit for study by participants and interested parties. Depending on regional emphasis, other quality factors such as total digestible nutrients, digestible dry matter, net energy for lactation, Ca and P content can also be included.

Cubed alfalfa hay is judged solely on nutrient content in Wyoming. Hardness criteria for cubes have not been necessary because cubes with a lower fiber content tend to have a greater bulk density than cubes with a higher fiber content. This is important to shippers of export-quality cubes, because a high bulk density reduces transportation costs and improves profits. Hay with a low fiber content tends to have a higher proportion of cell solubles that serve as a binder to produce harder, more dense cubes.

SUMMARY

Competitive exhibitions of commercially produced hay are increasing in popularity on local, state, and national levels. The WCES has developed and implemented a methodology for evaluating such events in Wyoming that combines modern concepts of forage analysis with a procedure for the visual appraisal of hay. This approach to visual appraisal might be modified and adapted for other hay-producing regions. In Wyoming, this model is utilized to improve awareness and foster improvement and increase appreciation for forage quality among hay producers at county and state fair hay shows.

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