

What is Forage Quality?



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Take time to think about...

- ∞ What is forage quality to you?
- ∞ What are your goals?

Goals



Forage Goals

- ∞ Produce a healthy and nutritious animal feed
- ∞ Produce a quality feed product that will sell for a premium price



Quality

∞ How are you determining quality?

Visual/Physical

- ∞ Not a real “analysis”
- ∞ Can give a general idea of quality
- ∞ What do you look for?



Visual Hay Characteristics



- ∞ Stage of maturity
- ∞ Color
- ∞ Leafiness
- ∞ Foreign matter
- ∞ Smell

Analysis

∞ Who tests forages and why?

Why Bother to Test?

- ∞ Forages from the same field can vary greatly in quality
 - Impacted by maturity at harvest, weather, and storage
- ∞ Low quality forages have less available nutrients and need supplementation
- ∞ Low quality forages will sell for a lower price

Why Bother to Test?

- ∞ Let the customer knows what they are getting
- ∞ Set pricing
- ∞ Pursue the proper market based on its quality
- ∞ Balance a ration, especially K in dry cows
 - > 3% potassium is high
- ∞ Gauge soil fertility
- ∞ Are you getting dirt from harvest?

How to Collect a Hay Sample

- ✂ Sample each hay lot separately
 - A lot is forage from the same field, same cutting, same environmental conditions, and uniform composition
- ✂ Use a forage probe, no grab samples!
- ✂ 15-20 bales
- ✂ Take a representative sample
- ✂ Remember poor sampling will result in misleading values



Representative Samples



Sampling

- ✂ Push VERY hard before trying to core
- ✂ Take sample through:
 - short end of small and large square bales
 - Round side of round bales
- ✂ Mix samples together
- ✂ Place in bag and label
- ✂ Send immediately



Collecting a Haylage Sample

- ✧ Collect only freshly unloaded material
- ✧ Grab handfuls of silage
- ✧ Use 12-20 locations



The Test

Wet Chemical

- ☞ The “Gold Standard”
- ☞ High accuracy measuring feed mineral content
- ☞ More expensive
- ☞ Slower



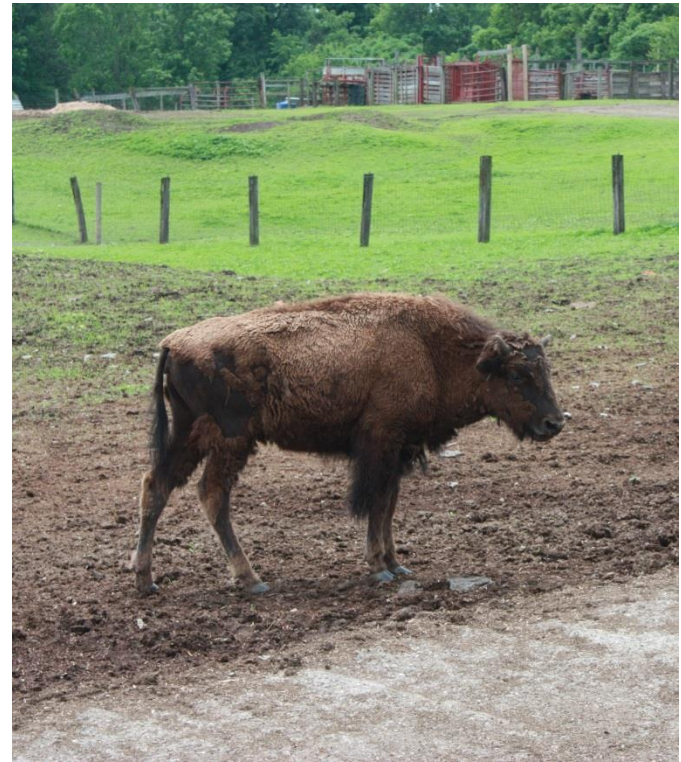
NIR

- ☞ High accuracy measuring crude protein and fiber
- ☞ Cheaper
- ☞ Faster
- ☞ NIR=Near Infrared Reflectance Spectroscopy

Basic Nutrients

🌀 Class Question:

- What are the 5 basic nutrients?



Basic Nutrients

- ✎ Energy
 - Fat and carbohydrates
- ✎ Protein
- ✎ Vitamins
- ✎ Minerals
- ✎ Water

05/03/12 05/04/12			Components	AS Fed	DM
ANNUAL RYEGRASS MAY 1ST			% Moisture	6.0	
WASHINGTON CTY YOUNG FRMRS PROJECT			% Dry Matter	94.0	
AARON GABRIEL			% Crude Protein	9.5	10.1
415 LOWER MAIN STREET			% Available Protein	8.6	9.2
HUDSON FALLS, NY 12839-2629			% ADICP	.8	.9
			% Adjusted Crude Protein	9.5	10.1
-----			Soluble Protein % CP		34
ENERGY TABLE - NRC 2001			Degradable Protein %CP		54
-----			% NDICP	2.8	3.0
Mcal/Lb Mcal/Kg			% Acid Detergent Fiber	16.7	17.8
-----			% Neutral Detergent Fiber	33.6	35.7
DE, 1X	1.36	3.00	% Lignin	3.8	4.0
ME, 1X	1.17	2.58	% NFC	43.4	46.2
NEL, 3X	0.68	1.49	% Starch	3.4	3.7
NEM, 3X	0.71	1.57	% WSC (Water Sol. Carbs.)	33.0	35.1
NEG, 3X	0.44	0.97	% ESC (Simple Sugars)	13.9	14.8
-----			% Crude Fat	3.0	3.2
TDN1X, %	69		% Ash	7.31	7.78
-----			% TDN	69	74
			NEL, Mcal/Lb	.74	.78
COMMENTS:			NEM, Mcal/Lb	.74	.79
1.EFFECTIVE 4/01/12, PREPAID			NEG, Mcal/Lb	.47	.51
POSTAGE MAILER FEES WILL			Relative Feed Value		196
INCREASE TO \$4 FOR INDIVIDUAL			% Calcium	.45	.48
MAILERS AND \$10 FOR LARGE			% Phosphorus	.24	.26
MAILERS. VISIT OUR WEBSITE FOR			% Magnesium	.08	.08
INFO ON OUR NEW UPS SERVICE.			% Potassium	1.95	2.07
WWW.DAIRYONE.COM/FORAGE/SERVICE			% Sulfur	.13	.14
S			% Chloride Ion	.19	.20
2.KD IS A COMPLEX CALCULATION					
THAT MAY YIELD VALUES EXCEEDING			IVTD 24hr, % of DM		91
THEORETICAL LIMITS. A DEFAULT			NDFD 24hr, % of NDF		74
MAX KD IS REPORTED FOR THIS			kd, %/hr		6.50
SAMPLE.					
3.THIS SAMPLE WAS TESTED TWICE			% Lysine	.22	.24
FOR ACID DETERGENT FIBER,			% Methionine	.11	.12
NEUTRAL DETERGENT FIBER AND					



Terms

- ∞ Dry Matter
- ∞ NDF
- ∞ ADF
- ∞ Crude Protein
- ∞ Energy
- ∞ Relative Feed Value
- ∞ Relative Forage Quality



Terms

∞ Class Question:

- How are “Dry Matter” and “As Fed” different?

Terms

Dry Matter

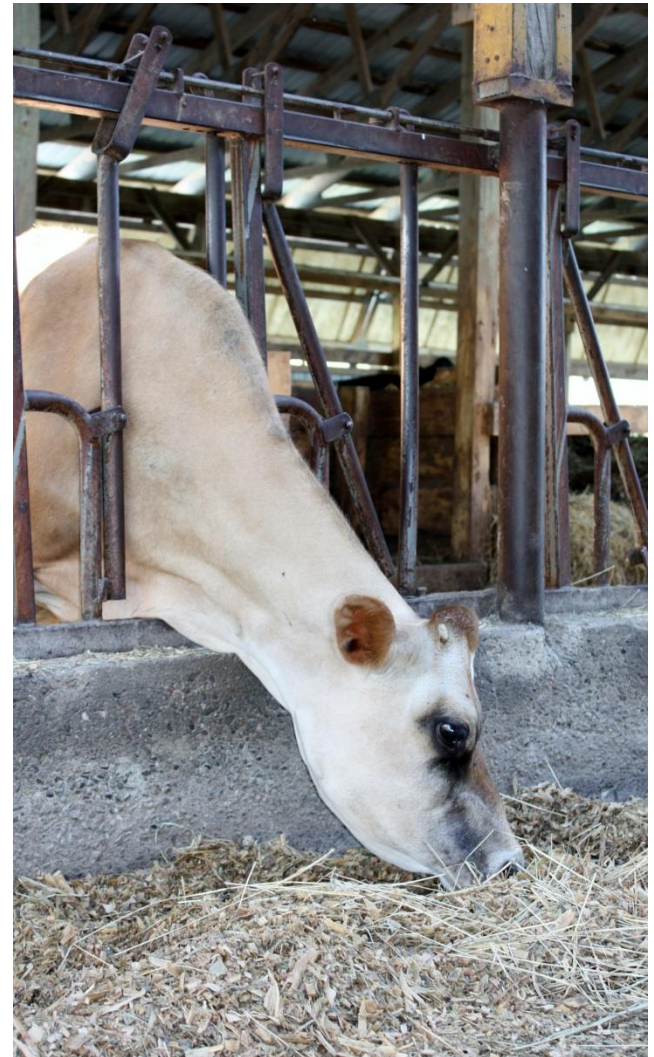
- ✧ The non-moisture portion of the feed
- ✧ Expressed as a percent
- ✧ Makes it easy to compare feeds on an equal basis

As Fed

- ✧ Includes moisture
- ✧ Nutrient content will be “lower” because of the increased moisture content

Fiber

- ✎ Types of fiber are cellulose, hemi-cellulose, and lignin.
 - Structure of the cell walls
 - Varies in digestibility



Terms

NDF

- ✎ Measure of hemicellulose, cellulose, and lignin
- ✎ Structural carbohydrates
- ✎ NDF is negatively correlated with intake
- ✎ **Commonly used as a quality parameter**

ADF

- ✎ Measure of cellulose and lignin
- ✎ As lignin content increases, digestibility of the cellulose decreases.

Terms

- ✎ Crude Protein includes both the true protein and the non-protein Nitrogen
- ✎ What is “non-protein Nitrogen?”



Non-Protein Nitrogen

- ✂ Although not true protein, it supplies Nitrogen which can be used to form microbial protein
- ✂ They have a value that is equivalent to protein for ruminants

Question

Class Question:

- After water, which nutrient is needed in the largest quantity?

Energy

- ∞ Used in all biological processes and is essential for life
- ∞ Divided into many categories



Energy

- ∞ Gross Energy (GE)
- ∞ Digestive Energy (DE)
- ∞ Metabolizable Energy (ME)
- ∞ Net Energy for Lactation (NEI)
- ∞ Net Energy for Maintenance (Nem)
- ∞ Net Energy for Gain (NEg)



Relative Feed Value

- ✎ Used to compare legume and legume/grass hay and silage quality
- ✎ Estimates the digestibility (from % ADF) and potential intake (from % NDF)
- ✎ Compares alfalfa and alfalfa/grass mixes
- ✎ Easy comparison for nutrient content and pricing



Relative Feed Value

- ∞ DDM (Digestible Dry Matter) is the % of the DM that is digestible
- ∞ DMI and DDM are used
- ∞ DDM is assumed constant for all forages
- ∞ Crude protein is not used; the only values that are used are ADF and NDF

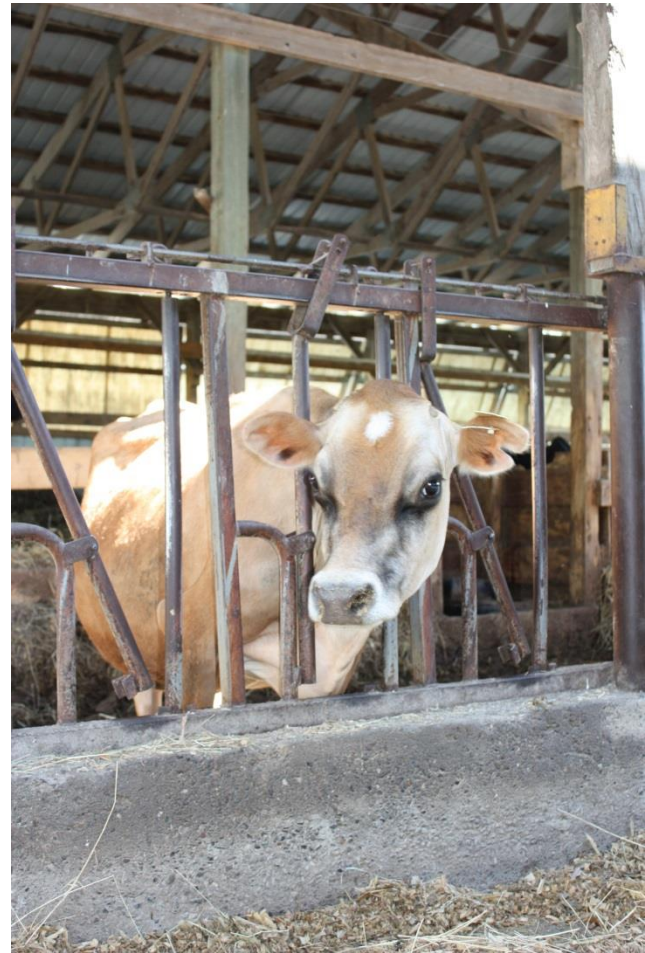


Relative Forage Quality

- ✂ Evaluates how much the animal will eat and the total digestible nutrients
- ✂ Gives the producer a better idea of the performance they can expect from their animals
- ✂ Easily compares grasses and legumes against each other
 - When analyzing grasses, they tend to have more fiber when compared to alfalfa, but this fiber tends to be more easily digestible for the animal
 - You could have similar RFV's and have different animal performance because the fibers are not able to be digested in the same way.

RFV and RFQ

- ✎ Neither RFV nor RFQ are used in ration formulation
- ✎ Provides a great way to:
 - Gauge the price you should pay
 - Which animals you should be feeding it to
 - Type of performance you can expect from animals



Analysis

∞ What values are we looking for?

- Depends on many factors:
 - Our investment in that crop
 - What our animals require
 - What our customers are looking to purchase
 - What type of performance we want from our animals
 - The price we are hoping to sell the product for
 - Any others?

General Forage Standards for Livestock (RFV)

Quality	Crude Protein	ADF	NDF	DDM	DMI	RFV
Prime	>19%	<31%	<40%	>65%	>3.0	Above 151
1	17-19%	31-35%	40-46%	62-65%	2.6-3.0%	125-151
2	14-16%	36-40%	47-53%	58-61%	2.3-2.5%	103-124
3	11-13%	41-42%	54-60%	56-57%	2.0-2.2%	87-102
4	8-10%	43-45%	61-65%	53-55%	1.8-1.9%	75-86
5	<8%	>45%	>65%	<53%	<1.8%	Below 75

Crop	Crude Protein	ADF	NDF	Total Digestible Nutrients	Relative Feed Value
Alfalfa	18-22	28-32	38-47	64-71	90-127
Grass	10-18	35-48	45-65	49-62	60-111
Grass/ Legume Mix	9-17	32-47	42-58	56-62	80-105
Small Grains	8-16	35-46	48-67	55-64	95-120
Rye Grass	12-16	27-33	47-53	63-68	111-134
Tall Fescue/ Orchard Grass	12-16	30-36	50-56	61-66	101-122
Red Clover	14-16	28-32	38-42	64-67	142-164
White Clover	18-25	24-38	30-44	55-70	115-150
Warm Season Annual Grass	8-12	35-40	55-70	50-58	77-104

Analysis Results			

Components		As Fed	DM
-----		-----	-----
% Moisture		9.3	
% Dry Matter		90.7	
% Crude Protein		16.6	18.3
% Available Protein		15.2	16.7
% ADICP		1.4	1.5
% Adjusted Crude Protein		16.1	17.7
Soluble Protein % CP			36
Degradable Protein%CP			68
% NDICP		4.0	4.4
% Acid Detergent Fiber		26.5	29.3
% Neutral Detergent Fiber		34.4	37.9
% Lignin		4.7	5.1
% NFC		31.3	34.5
% Starch		2.7	3.0
% WSC (Water Sol. Carbs.)		15.0	16.5
% ESC (Simple Sugars)		9.4	10.4
% Crude Fat		3.1	3.4
% Ash		9.38	10.34
% TDN		62	69
NEL, Mcal/Lb		.66	.73
NEM, Mcal/Lb		.65	.72
NEG, Mcal/Lb		.40	.44
Relative Feed Value			162
% Calcium		.89	.98
% Phosphorus		.28	.31
% Magnesium		.28	.31
% Potassium		2.27	2.50
% Sulfur		.17	.19
% Chloride Ion		.45	.50
IVTD 24hr, % of DM			79
NDFD 24hr, % of NDF			46
kd, %/hr			5.94
-----		-----	-----

ADF and NDF are both low, which means less lignin

Over 10% ash in analysis means we are likely getting soil in our hay from field operations
Ex: rakes digging up soil

Relative feed value puts this feed in the "prime" category

Crude Protein is average

ADF is good, but NDF is higher (which means intake will be lower).

RFV of 114 is a
“2” on the
Prime-5 scale

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ME, 1X 1.17 2.58		% NFC	43.4	46.2
Both values are very low, which means they are highly digestible		% Starch	3.4	3.7
		% WSC (Water Sol. Carbs.)	33.0	35.1
		% ESC (Simple Sugars)	13.9	14.8
		% Crude Fat	3.0	3.2
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In Conclusion

- ∞ Test forages consistently and as “lots”
- ∞ Always take a representative sample
- ∞ Use the analysis to accurately price your product
- ∞ Use the analysis to make the best use of your feed to maximize animal performance
- ∞ Use the analysis to improve your future production

Questions or Comments?

