



1

# Why should I sample feed/forage? How do I use the results?

2018 Kansas Forage and Grassland Conference

Dale A. Blasi  
Extension Beef Specialist

Emporia, KS - December 11

2

## Why Test Forages?

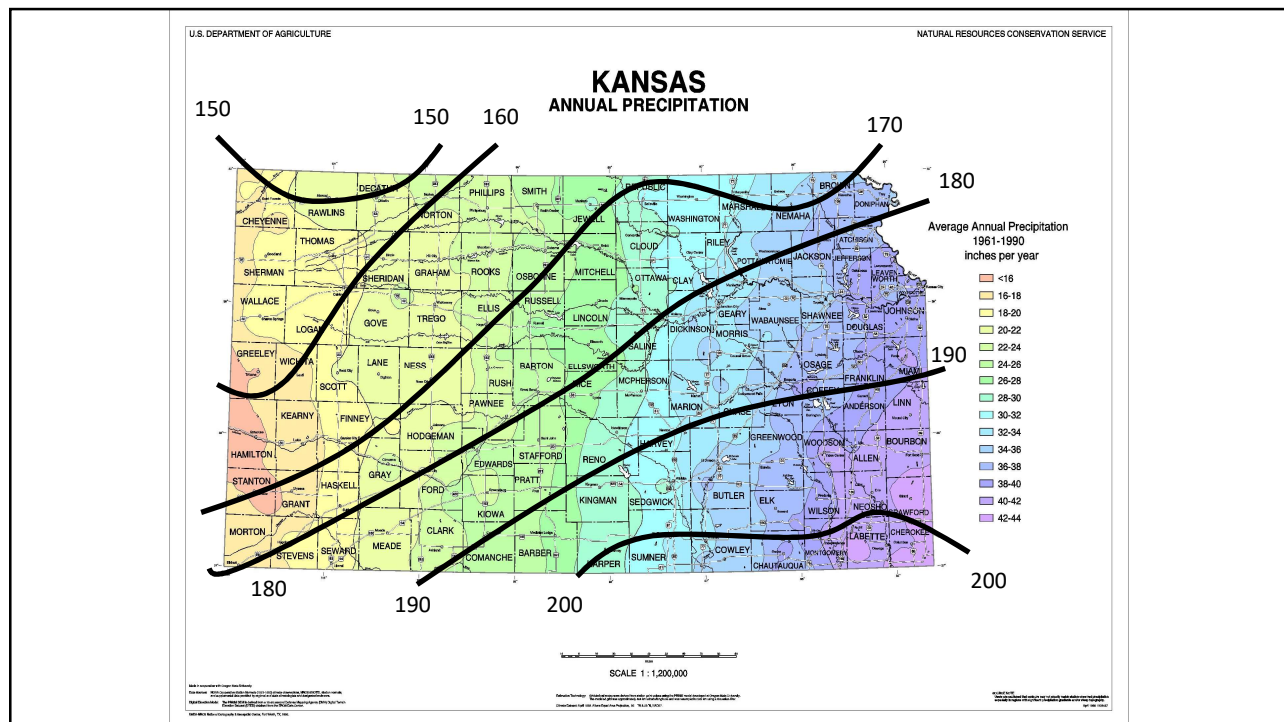
- Feed tests can help establish the dollar value of a forage
- Feed tests can establish the feeding value of your forages and help determine what feeds to feed or sell OR supplements to buy
- Feed tests are useful in evaluating production practices
  - Fertilization
  - Time of harvest
  - Method of harvest

3

## Forage plants are the product of their environment

- Soil
- Weather – growing conditions
- Animals
- Disease

4



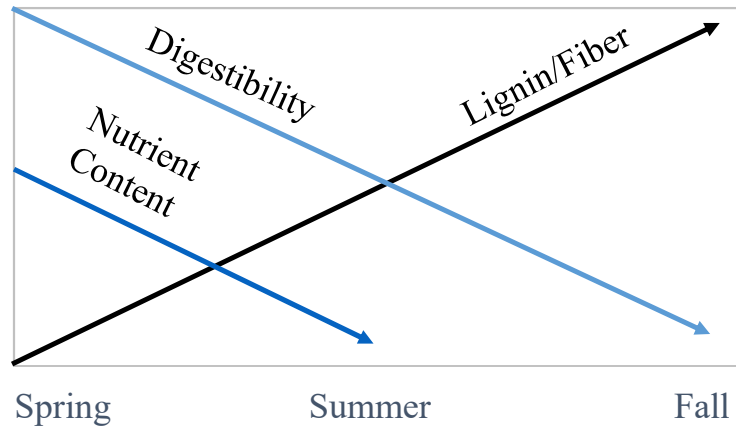
5

## Forage Quality/Utilization

- Pre-harvest
  - Stage of maturity
- Harvest
  - Height of cut
  - Baling moisture
- Post-harvest
  - Storage
  - Method of feeding

6

# Growth vs. Quality



7

## Factors that accelerate the maturation process

- Temperature
- Light
- Water

8

## Influence of Water

- A water deficiency minimizes the development of the plant, thereby retarding maturity.
  - Therefore:
- This equals increased digestibility while DM yields are reduced.

9

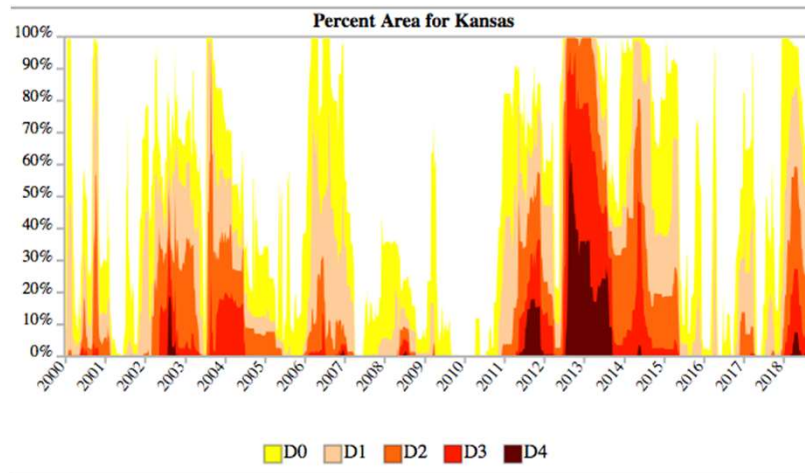
## Kansas Drought\*

- 1 out of 5 years in eastern Kansas
- 1 out of 3 years in western Kansas

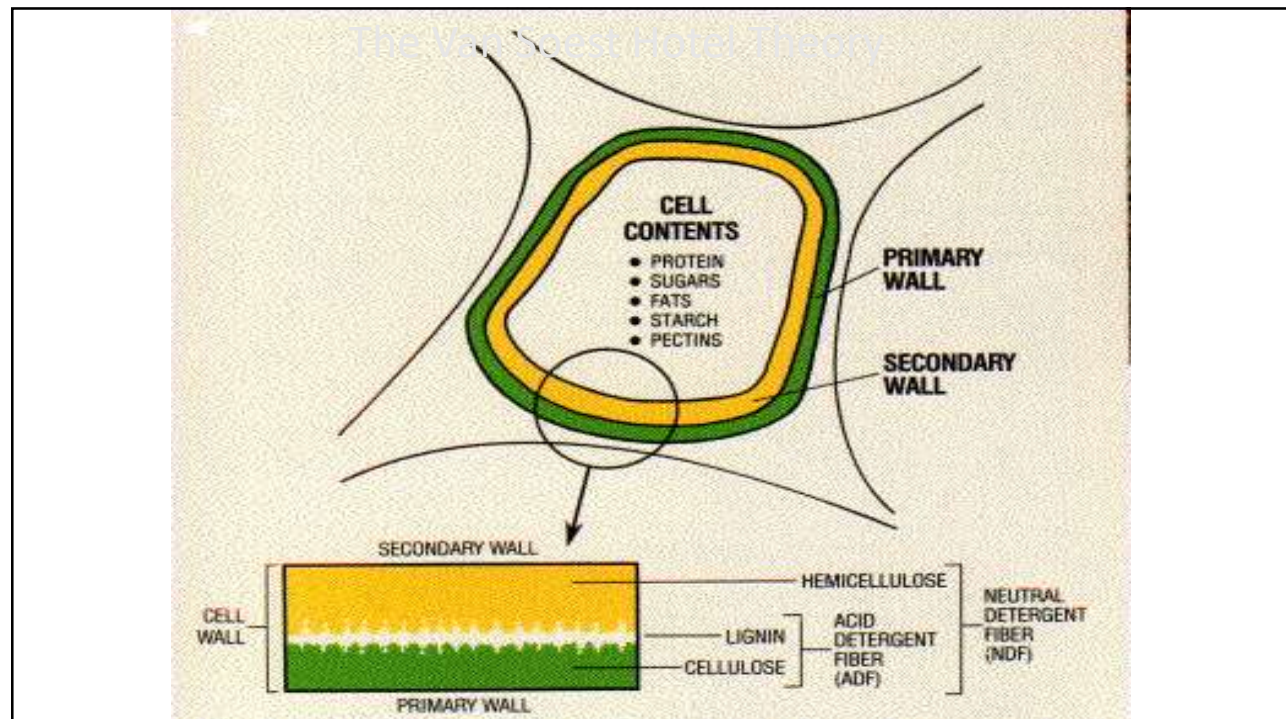
\* Years with less than two-thirds average annual precipitation

10

# Drought in Kansas



11



12

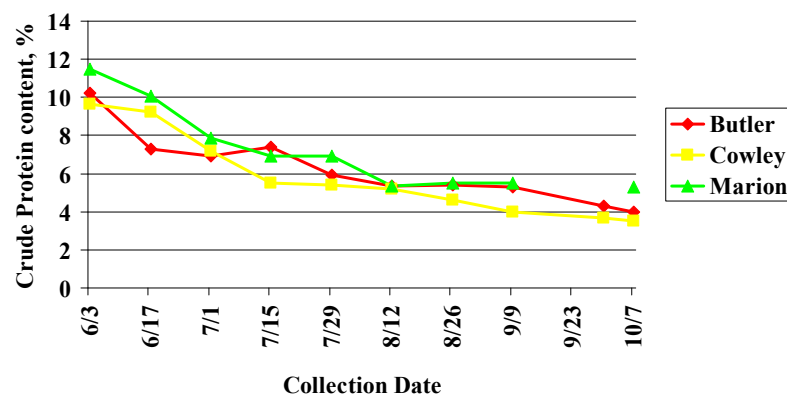
### Influence of Environmental Factors Upon Composition and Digestibility of Forages<sup>a</sup>

Item	Temp.	Light	Nitrogen	Water	Predation
Yield	+	+	+	+	-
Nitrate	-	-	+	+	+
Cell Wall	+	-	±	+	-
Lignin	+	-	+	+	-
Digestibility	-	+	±	-	+

<sup>a</sup> Van Soest et al., 1978.

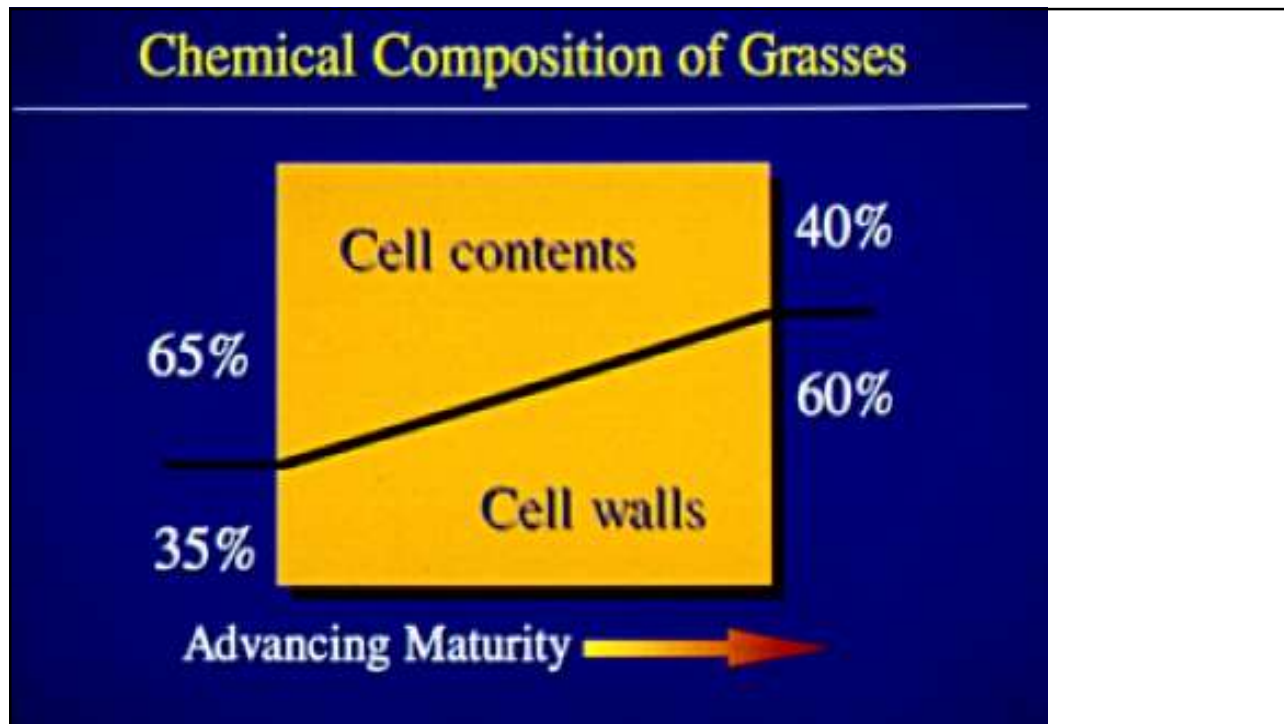
13

### % Crude Protein Content of Native Grass Hay by Harvest Date, 1997



14





15

### Nutrient Availability of Forage Components (Van Soest, 1983)

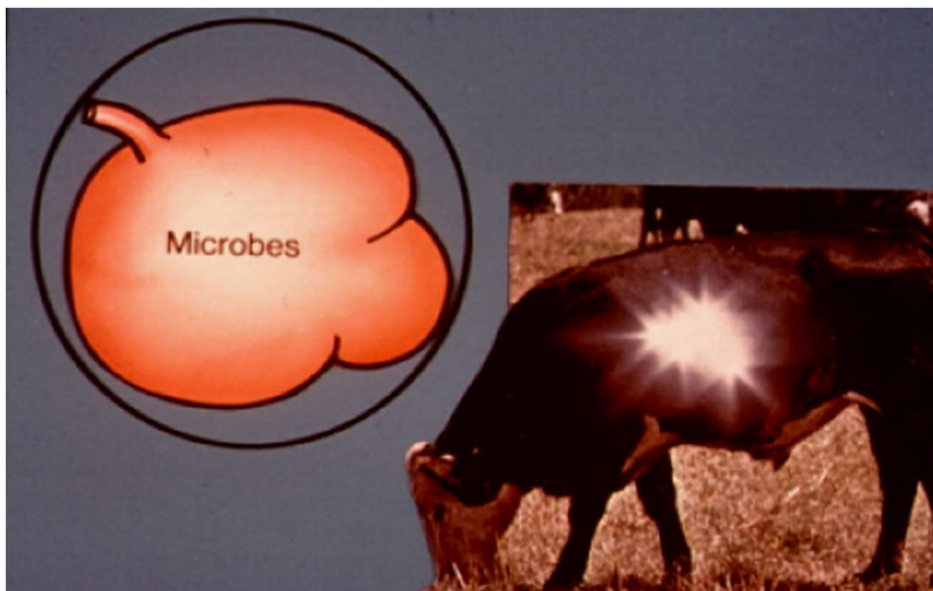
<u>Forage Fraction</u>	<u>Component</u>	<u>Nutrient Availability</u>
Cell Contents	Soluble sugars	Complete
	Pectin	Complete
	Soluble Protein	High
	Lipids	High
Cell Wall Elements	Hemicellulose	Partial
	Cellulose	Partial
	Lignin	Indigestible
	Silica	Indigestible

16





17



18

## Forage Dry Matter Intake

- Function of:
  - Fermentation rate
  - Rate of particle size reduction
  - Rate of particle passage rate

19

Forage Intake of Beef Cows as Affected by Stage of Production, Forage Quality and Supplement Type<sup>a</sup>

Stage of production & supplementation strategy	Forage Quality		
	Low	Medium	High
<i><b>Dry, pregnant cow</b></i>	<i>Intake expressed on % body wt, dry matter basis</i>		
Unsupplemented	1.5	2.0	2.5
Protein supplementation	1.8	2.2	2.5
Energy supplementation	1.5	2.0	2.5
<i><b>Lactating cow</b></i>			
Unsupplemented	2.0	2.3	2.7
Protein supplementation	2.2	2.5	2.7
Energy supplementation	2.0	2.3	2.7

<sup>a</sup>Adapted from Hibberd and Thrift, 1992

20



21

## Harvest Losses

---

- Respiration losses
- Mechanical losses
- Heat damage

22

## Weathering Damage of Large Round Bales

- **Most damage occurs in the outer 12 inches of the bale**
  - 50% of the hay in a bale with a radius of 30 inches is in the outer 9 inches of the bale
  - Proper core-sampling procedures must be adjusted to consider this change



23

## Hay Composition in Different Depths of Unprotected Large Round Bales

<u>Sampling interval, in</u>	<u>DM,%</u>	<u>% of DM</u>		
		IVDDM	NDF	ADF
0-3	56.4	43.0	59.5	46.7
3-6	75.5	50.2	58.1	45.1
6-9	81.0	52.1	58.0	45.2
9-12	82.4	53.0	56.2	43.3
12-30	83.9	55.0	53.5	41.5

24



25

## Developing a Sampling Protocol

26

## The Sampling Protocol should describe:

- Method of forage collection
- Key forage species
- Key sampling areas
- During transition periods, sampling should occur every 2 weeks
- Monthly during forage dormancy

27

## What is a forage lot ?

- A forage lot consists of forage harvested from one field:
  - at the same cutting and maturity within a 48-hour period
  - Usually contains fewer than 100 tons of hay.
- A forage lot should be similar for forage type, field (soil type), cutting date, maturity, variety, weed infestation, type of harvest equipment, weather during growth and harvest and storage conditions.

28

## Select Uniform Lots of Hay

	Hay field 1 <sup>st</sup> cut		Hay field 2 <sup>nd</sup> cut		
	Grass infested	Pure	Grass infested	Pure Rain Damage	Pure No Rain
Lot #	1	2	3	4	5

29

## Segregate Each Lot as It is Harvested and Stored

- When segregating by quality, a better job can be done nutritionally by feeding according to specific animal production requirements
- This will greatly facilitate access so that it may be retrieved as needed
- This is especially important step in a hay marketing operation.

30

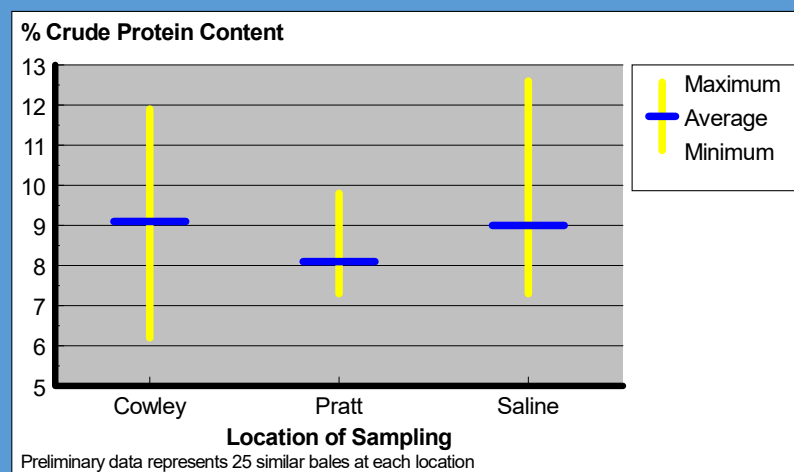


## Where Does Variation Arise?

- Field Variation
  - Weed infestation
  - Soil and fertility differences
- Harvest Variation
  - Equipment/conditioner differences
  - Management philosophy
- Sampling Error
  - Location of bale
  - Location/depth of core sample

31

## Variation in Crude Protein Content of Cane Hay - Preliminary Results



32

## Nitrate Variation in Sudan Hay Bales From the Same Field – C. Garten 1989

- Nitrate content of 23 bales collected from the same field averaged 2,764 ppm but varied from 1,525 to 6,250 ppm on an as-fed basis
- Thus, the nitrate level in individual bales varied more than TWO – FOLD from the average.

33

## Recommended Number of Large Round Bales to Sub-sample and Composite

Forage Type	Precision of average CP Estimate, %	Confidence Interval		
		99%	95%	80%
1 <sup>st</sup> alfalfa	±1	19	11	5
	±5	76	44	19
3 <sup>rd</sup> alfalfa	±1	12	7	3
	±5	47	27	12
Prairie hay	±1	4	2	1
	±5	15	9	4
Sudan hay	±1	7	4	2
	±5	28	16	7

Blasi, et al., 1995

34



35

Bales should be probed from the sides,  
not the ends

36

Do Not Submit a flake of hay or use the “grab” sample technique

37

## When Do You Sample?

Forages should be sampled as close to the time of feeding or sale as possible

38

## Sampling Silage

- Sampling silage at harvest will give one an idea about the feeding value prior to feeding.
- Because of fermentation changes, another sample should be tested when feeding begins.
- Multiple samples should be collected, combined and then sub-sampled from the total before submitting to a laboratory.

39

## Collecting a feed sample

- The entire sample should be placed in a plastic bag and sealed to retain the moisture level at the time of sampling.
- The sample(s) should be labeled properly.
- The sample(s) should then be stored in a cool place until it is shipped to the laboratory.
- Send the sample(s) to the laboratory A.S.A.P. via UPS or USPS.

40

## Methods of Feed/Forage Testing

- **Physical** – Sight, smell and touch are useful, although frequently misleading indicators of feed value.
- **Chemical** – When representative feed samples are tested chemically, accurate predictions of animal performance usually can be made.
- **NIR Spectroscopy** – Rapid, low-cost computerized method with questionable reliability

41

## Net Energy of Native Range Calculated from ADF

- $\%TDN = 88.9 - (0.779 \times ADF)$
- $ME \text{ (Mcal/kg)} = (TDN\% \times 0.044) \times 0.82$
- $NE_m \text{ (Mcal/lb)} = (1.37 \times ME) - (.138 \times ME^2) + (.0105 \times ME^3) - 1.12 / 2.204$
- $NE_g \text{ (Mcal/lb)} = (1.42 \times ME) - (.174 \times ME^2) + (.0122 \times ME^3) - 1.65 / 2.204$

NRC (1996)

42

## Relative Feed Value (RFV)

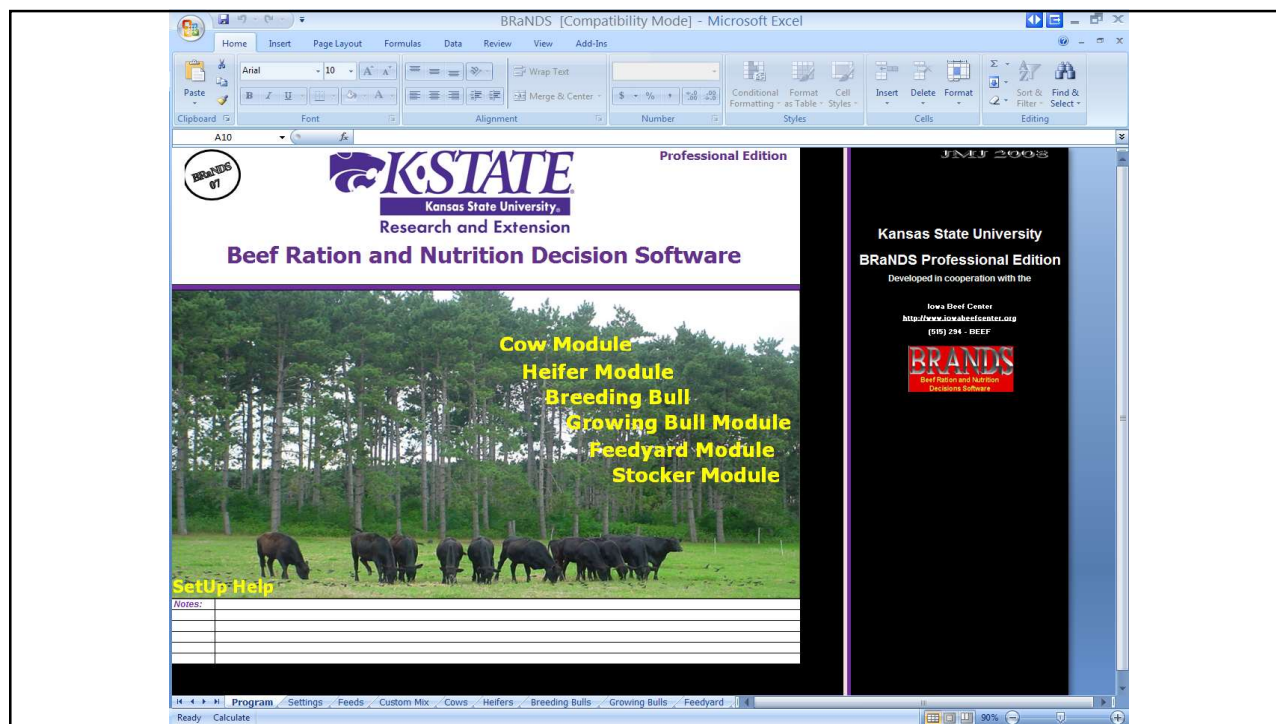
- RFV has no units but is used only as an index to compare the potential of two or more like forages for energy intake
- Forages with NDF = 53% and ADF = 41% represent a RFV of 100.

43

## How Do I Use the Results?

44





45

BRaNDSt [Compatibility Mode] - Microsoft Excel

HomeInsertPage LayoutFormulasDataReviewViewAdd-Ins

ClipboardFont

Font

Paragraph

Paragraph

Alignment

Alignment

Wrap Text

Wrap Text

General

General

Conditional Formatting

Conditional Formatting

Format

Format

Call

Call

Insert

Insert

Delete

Delete

Format

Format

Sort & Filter

Sort & Filter

Find & Select

Find & Select

Editing

Editing

A128

KSSTATE

Research and Extension

Feed Library

Limit library name to 8 spaces.

SaveRestoreDelete

Producer: KSU Winter Ranch Mgt Seminar

HelpMore Tips

Library: feedmill

ClearCowsHeifers

Breeding Bulls

Growing Bulls

Feedyard

Stocker

Custom Mix

Pink Feeds

\* Select #

\* Feedstuff

\* Lb/unit

\* \$/unit

Units Inventory

\* DM %

\* TDN %

\* ME in Mcal/lb

\* ME g Mcal/lb

\* CP %

\* DIP % of CP

Solubility % of CP

\* NDF %

ADF %

\* % NDF % of NDF

HC %

Salt %

Water

8.3

100

100

1

DRY ROUGHAGE

2000

\$100.00

1.00

88.00

58.00

0.56

0.31

17.00

80.00

25.00

46.00

37.00

82.00

22.00

2

Alfalfa- mid bl

2000

\$60.00

1.00

85.00

55.00

0.52

0.27

15.00

80.00

22.00

50.00

40.00

82.00

20.00

3

Alfalfa- late b

2000

\$60.00

1.00

85.00

50.00

0.44

0.19

13.00

80.00

20.00

55.00

45.00

82.00

18.00

4

Alfalfa- mature

2000

\$60.00

1.00

85.00

50.00

0.44

0.19

13.00

80.00

20.00

55.00

45.00

82.00

18.00

5

Alfalfa Meal

2000

\$200.00

1.00

88.00

61.00

0.61

0.35

18.00

80.00

22.00

45.00

35.00

6.00

25.00

6

Bluegrass- mid

2000

\$60.00

1.00

85.00

63.00

0.64

0.38

14.00

80.00

22.00

68.00

52.00

82.00

20.00

7

Bluestem past-

2000

\$60.00

1.00

28.00

65.00

0.67

0.41

11.00

8

Bluestem-dorman

2000

\$60.00

1.00

80.00

43.00

0.32

0.08

4.00

9

Brome-prebloom

2000

\$60.00

1.00

88.00

58.00

0.58

0.32

16.00

10

Brome-midbloom

2000

\$60.00

1.00

89.00

54.00

0.51

0.25

10.00

11

Brome-Mature

2000

\$60.00

1.00

90.00

50.00

0.44

0.19

5.00

12

Buffalo-vegetat

2000

\$60.00

1.00

26.00

66.00

0.68

0.42

13.00

13

Buffalo-dormant

2000

\$60.00

1.00

80.00

46.00

0.37

0.12

5.50

14

Clover- mid blo

2000

\$60.00

1.00

89.00

55.00

0.52

0.26

15.00

15

Corn Cobs

2000

\$60.00

1.00

85.00

50.00

0.44

0.19

3.20

70.00

15.00

88.00

65.00

56.00

10.00

16

Cottonseed hull

2000

\$60.00

1.00

91.00

42.00

0.31

0.07

4.10

17

Fescue-winter,

2000

\$60.00

1.00

35.00

54.00

0.51

0.25

11.00

18

Fescue-winter, no N

2000

\$60.00

1.00

86.96

52.20

0.47

0.22

10.20

80.00

20.00

69.10

47.10

75.00

19.00

19

Fescue-Late blo

2000

\$60.00

1.00

88.00

53.00

0.48

0.23

7.50

20

Ladino Clover

2000

\$60.00

1.00

85.00

65.00

0.67

0.40

22.00

80.00

28.00

36.00

22.00

82.00

30.00

21

Koschia Hay

2000

\$60.00

1.00

89.00

50.00

0.44

0.19

11.00

22

Oat Straw

2000

\$50.00

1.00

88.00

50.00

0.44

0.19

4.40

70.00

5.00

70.00

60.00

82.00

8.00

23

Orchard Grass

2000

\$60.00

1.00

85.00

65.00

0.67

0.40

8.40

80.00

15.00

65.00

45.00

82.00

15.00

24

PrairieHayEarly

2000

\$60.00

1.00

90.00

55.00

0.52

0.26

9.00

25

PrairieHayLate8

2000

\$60.00

1.00

90.00

51.00

0.45

0.20

5.80

26

Red Clover

2000

\$60.00

1.00

85.00

55.00

0.52

0.27

16.00

80.00

25.00

46.00

34.00

82.00

28.00

27

Soybean Stover

2000

\$50.00

1.00

85.00

40.00

0.27

0.04

12.00

70.00

15.00

75.00

60.00

82.00

15.00

28

Sudan Grass

2000

\$60.00

1.00

85.00

56.00

0.53

0.28

8.80

80.00

18.00

68.00

55.00

82.00

18.00

29

Wheat Straw

2000

\$60.00

1.00

100.00

41.00

0.64

0.11

3.50

31.00

20.00

78.90

98.00

100.00

30

Wheat straw-Amm

2000

\$60.00

1.00

90.00

50.00

0.43

0.18

9.00

31

(your own)

ProgramSettingsFeedsCustom MixCowsHeifersBreeding BullsGrowing BullsFeedyard

46

BRaND5 [Compatibility Mode] - Microsoft Excel

File name:

### Inputs

Feeding period - start: 1/15/11  
 Feeding period - end: 2/15/11  
 Mature cow size: large  
 Breed type: British, higher milk  
 Current condition score: 5  
 Desired condition change: +1/4 CS/mol  
 Production stage: 3rd trimester  
 Notes for Summary Printout

Calf birth weight: moderate  
 Wind exposure: full  
 Hair condition: clean\_dry  
 Hair coat: heavy\_winter  
 Temperature: 10 a colder 20 degrees F  
 Maintenance adj:  
 Cow group size - 1st calf:  
 2nd calf:  
 Mature:  
 head  
 Wt. overwrite: 1400 lbs.

### Ration Balancing Screen

Producers: KSU Winter Ranch Mgt Seminar Feed Library: feedmill

Ration Composition  
 Formulate ☐ Save ☐ eNDF Level: 35.0%  
 Consumption Ratio: 100.0%  
 Energy Supplement  
 Balanced for (head): 1

	lbs./day	waste	TMR mix	DM	% of	As-fed
Alfalfa-late b	5.0	x				
Brome-Mature	8.00	10.0	x	19.14%		17.32%
Native-Winter	32.00		x	75.60%		76.97%
DDGW/S		5.0	x			
36 natural	2.50	5.0	x	5.26%		5.71%

Ration Evaluation  
☒ Scale intake? yes  
 Feed delivered corresponds with mature cow.

	Mature cow
Dry matter intake	33.9 lbs.
Estimated DMI	34.4 lbs.
Consumption	98%
Net energy reqmt.	150%
Met. protein reqmt.	94%

Water: 13.5 gallons/ hd.  
 81.4% Ration DM  
 Crude Protein: 41.8 % ByPass  
 33.7 % Soluble

47

BRaND5 [Compatibility Mode] - Microsoft Excel

File name:

D41

status low low low low warning low low low low low ok low ok  
 Conc. 0.06% 0.63% 0.10% 26.05 0.17 107.87

### Batch Mix Sheet

Select either batch size or number of head  
☒ Mix - based on number of head

Number of head: 0 head  
 Mixes per day:  
 Increment: 1 head

☐ Mix - based on batch size

Batch size lbs:  
 Increment: 1.00%  
 0 head lbs./day

### Formulation Printouts

Select button to print the desired report.

- ☐ Ration Summary
- ☐ Mineral & Vitamin Report
- ☐ Nutrient Graph
- ☐ Ration Adequacy
- ☐ Ration Adequacy Graph
- ☐ Blend Mix Sheet
- ☐ Feed Analysis

### Ration Plan Sheet

Select up to 3 different rations to feed and print report.

Ration #1  
 Head on Feed:  
 Date starting:  
 Date ending:  
 Notes:

Ration #2  
 Head on Feed:  
 Date starting:  
 Date ending:  
 Notes:

Ration #3  
 Head on Feed:  
 Date starting:  
 Date ending:  
 Notes:

### Feed Requirement for Period

The daily use values listed below are based on the number and maturity of animals listed above in the input section.

46 Day(s)	2/15/11 through 4/1/11	Head	2	% Storage shrink
Print				

Daily Requirement Period - Total Feed Period - Runk Feed

48

BRaND5 [Compatibility Mode] - Microsoft Excel

Print Preview

Print Page Setup Zoom Previous Page Next Page Show Margins Close Print Preview

1/10/2011

**KSTATE**  
Kansas State University  
KSU Winter Ranch Hgt Seminar **Cow Ration Summary**

Inputs		Ration \$ / ton		\$35.51
Feeding period -	2/15/11 4/1/11	Calf birth wt.	moderate	
Mature cow size	1400 lbs	Wind exposure	full	
Breed type	Brahm_higher_milk	Hair condition	clean_dry	
Current condition score	5	Hair coat	heavy_winter	
Desired condition change	+1/4 CS/mo	Temperature	10 o colder	
Production stage	Early lactation	Maint. Adjustment		

Daily Ration Summary	Feed lbs./hd.	% of DM	Head count one group	Ration Statistics	mature
Alfalfa-late b	10.00	20.0%		Dry matter intake (lb/hd/d)	38.8
Brome-Mature				Estimated DM1	38.3
Native-Winter	34.00	70.0%		Consumption	101%
OSOW/S				Net energy rmt.	152%
36 natural	5.00	8.2%		Metab. protein rmt.	93%

Projected performance		Daily net gain above pregnancy
DMI : Wt (%)		2.77
30 day BCS change (pts)		0.08
Desired ADF	(lbs)	0.77
Ration projected ADF		0.25
Excess protein-N (Ead) (Mc/d)		
Feed \$/hd/day		\$1.36
Feed cost/group/day		

Feed Delivered		Feed Consumed		Ration Dry Matter		TDN		NE-m / g		Fat	
49.0 lbs.	48.3 lbs.	80.5 %	64.4 %	0.89	0.42 Mcal/lb	2.62 %					

Crude Protein		CP Degradability		DIP Ratio		CP Solubility		NRC		eNDF	
10.4%	72.7%	1.41	33.3%	36.7%	27.8%						

Salt		Calcium		Phosph.		Magnes.		Potash		Sulfur	
0.22%	0.58%	0.29%	0.18%	0.22%	0.53%	0.14%					

**Notes**  
ADF : NDF 9.1% 58.0% VFA:ABU 1011.8 68.7

Iowa Beef Center — Cow Module Kansas State University Research and Extension

49

## Livestock Feeding Programs

- Can be improved by relying on forage analyses to plan and balance rations.
- However, lab analyses are only useful if the sample represents what your animal consumes.

50

Dale A. Blasi  
Kansas State University

[dblasi@ksu.edu](mailto:dblasi@ksu.edu)

