

# CASE

*Curriculum for Agricultural  
Science Education*

**Principles of Agricultural Science – Animal**

# Reading Labels

Unit 5 – Lesson 5.3 Feedstuffs

# Terminology

- Crude Fiber (CF)
  - The part of feeds containing the cellulose, lignin, and other structural carbohydrates as determined by the proximate analysis.
- Crude Protein (CP)
  - A measure or estimate of the total protein in a feed determined by multiplying the total nitrogen content by 6.25.

# Terminology

- **Dry Matter (DM)**
  - The total amount of matter, as in a feed, less the moisture it contains.
- **Metabolizable Energy (ME)**
  - The total amount of energy in feed less the losses in feces, combustible gases, and urine. Also called available energy.

# Terminology

- Total Digestible Nutrients (TDN)
  - A standard evaluation of the usefulness of a particular feed for livestock, which includes all the digestible organic nutrients; protein, fiber, nitrogen-free extract, and fat.

Sample Description	Farm	Code	Sample
GRASS HAY		103	12640010

### Analysis Results

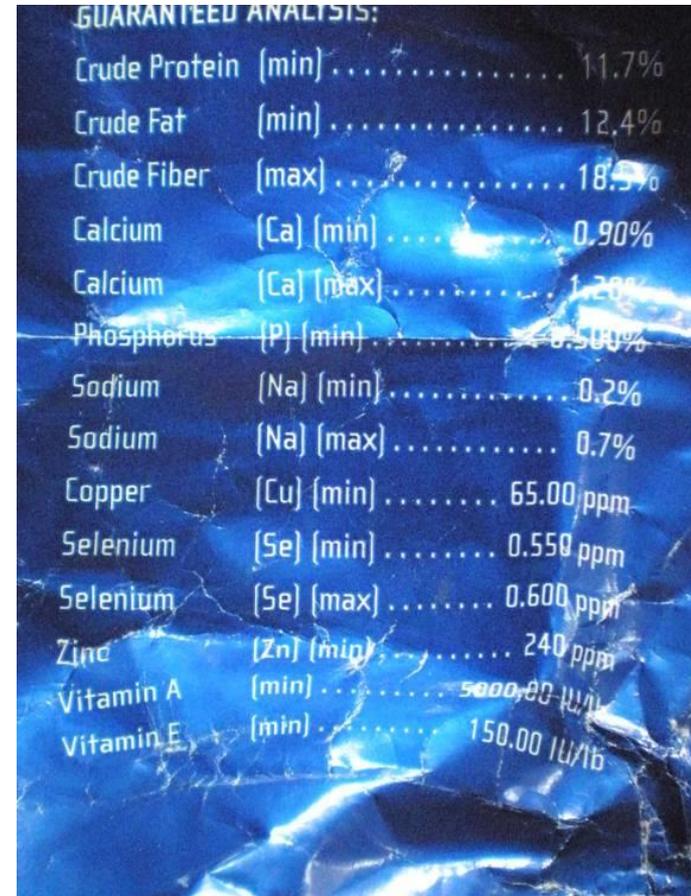
Components	As Fed	DM
% Moisture	8.5	
% Dry Matter	91.5	
% Crude Protein	7.7	8.4
% Available Protein	6.9	7.6
% ADICP	.8	.8
% Adjusted Crude Protein	7.7	8.4
Soluble Protein % CP		29
Degradable Protein %CP		63
% NDICP	2.5	2.7
% Acid Detergent Fiber	36.1	39.5
% Neutral Detergent Fiber	56.8	62.1
% Lignin	5.0	5.5
% NFC	19.5	21.3
% Starch	3.2	3.5
% WSC (Water Sol. Carbs.)	14.2	15.5
% ESC (Simple Sugars)	8.8	9.6
% Crude Fat	2.1	2.3
% Ash	7.90	8.63
% TDN	52	56
NEL, Mcal/Lb	.46	.50
NEM, Mcal/Lb	.45	.50
NEG, Mcal/Lb	.22	.24
Relative Feed Value		87
% Calcium	.37	.40
% Phosphorus	.24	.26
% Magnesium	.12	.13
% Potassium	1.95	2.13
% Sulfur	.12	.13
% Chloride Ion	.38	.42
Horse TDN, %	39	43
Horse DE, Mcal/lb	.79	.86
% Lysine	.27	.29
% Methionine	.10	.11

# Feed Analysis

The chemical or material analysis of a feedstuff that is determined at a laboratory.

# Feed Labels

- Contains less information than an analysis report.
- May use estimates rather than exact percentages of nutrients.



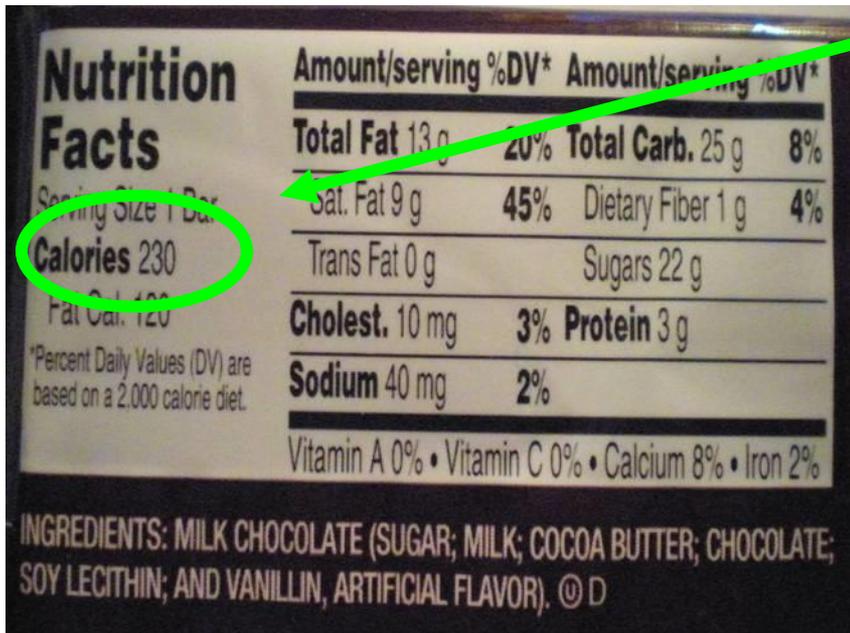
GUARANTEED ANALYSIS:		
Crude Protein	(min)	11.7%
Crude Fat	(min)	12.4%
Crude Fiber	(max)	18.5%
Calcium	(Ca) (min)	0.90%
Calcium	(Ca) (max)	1.20%
Phosphorus	(P) (min)	0.500%
Sodium	(Na) (min)	0.2%
Sodium	(Na) (max)	0.7%
Copper	(Cu) (min)	65.00 ppm
Selenium	(Se) (min)	0.550 ppm
Selenium	(Se) (max)	0.600 ppm
Zinc	(Zn) (min)	240 ppm
Vitamin A	(min)	5000 IU/lb
Vitamin E	(min)	150.00 IU/lb

# Guarantees

- Guarantees allow for some flexibility in mixing a feed.
- Usually expressed as a percentage (%).
- Minimum – the least amount of a nutrient included in the feed (i.e., protein & fat).
- Maximum – the greatest amount of a nutrient included in the feed (i.e., fiber).

# Nutrition vs. Feed Label - Energy

## Candy Bar



Nutrition Facts			
Amount/serving	%DV*	Amount/serving	%DV*
<b>Total Fat</b> 13 g	20%	<b>Total Carb.</b> 25 g	8%
Sat. Fat 9 g	45%	Dietary Fiber 1 g	4%
Trans Fat 0 g		Sugars 22 g	
<b>Cholest.</b> 10 mg	3%	<b>Protein</b> 3 g	
<b>Sodium</b> 40 mg	2%		
Vitamin A 0% • Vitamin C 0% • Calcium 8% • Iron 2%			

Serving Size 1 Bar  
**Calories** 230  
Fat Cal. 120

\*Percent Daily Values (DV) are based on a 2,000 calorie diet.

INGREDIENTS: MILK CHOCOLATE (SUGAR; MILK; COCOA BUTTER; CHOCOLATE; SOY LECITHIN; AND VANILLIN, ARTIFICIAL FLAVOR). © D

## Nutrition labels

- Calories on a label are expressed in “food” calories.
- A food calorie is equal to one kilocalorie.
- One food calorie equals 1000 calories.

# Nutrition vs. Feed Label – Energy

## Feed labels

- Energy expressed in megacalories per kilogram or Mcal/kg.
- One megacalorie equals 1,000,000 calories.

## Dog Food Label

<i>Ingredients &amp; Nutrition Information</i>			
<b>GUARANTEED ANALYSIS</b>			
Crude Protein (Min)	25.0%	Calcium (Ca) (Min)	1.1%
Crude Fat (Min)	10.0%	Iron (Fe) (Min)	200 mg/kg
Crude Fiber (Max)	4.0%	Selenium (Se) (Min)	0.2 mg/kg
Moisture (Max)	14.0%	Vitamin A (Min)	10,000 IU/kg
Linoleic Acid (Min)	1.5%	Vitamin E (Min)	100 IU/kg
<b>CALORIE CONTENT</b>			
Metabolizable Energy (ME)			
3.69 Mcal/kg			
16.74 Mcal/lb			
.36 Mcal/cup			

# Nutrition vs. Feed Label



- Feed labels express energy content in megacalories per kilogram.
- Nutrition labels express energy content in food calories based on a serving size.
- How do these relate?

# Energy Content of a Candy Bar

- First change food calories (230 calories) to calories. Since there are 1000 calories per food calorie, multiply the calories by 1000.
  - There are 230,000 calories in a candy bar.
- The candy bar is 43g, the next step is to determine the calories per gram.
  - Divide the total calories by 43.
  - The result is 5348.8 calories per gram.

# Energy Content of a Candy Bar

- Feed composition tables are expressed in Mcal/kg. The next step is to determine the calories per kilogram.
  - To do this, multiply by 1000.
  - There are 5,348,800 calories per kilogram of candy bar.
- Finally, convert calories to megacalories. There are 1,000,000 calories per megacalorie.
  - Divide 5,348,800 by 1,000,000.
  - The result is 5.35 Mcal/kg.

# Energy Comparison in a Candy Bar

Candy Bar ~ 43g

- 230 food calories/ 43g
- 230000 calories/ 43g
- 5348.8 cal/ 1g
- 5348800 cal/ 1kg
- **5.35 Mcal/kg**

- Digestible energy for beef cattle in common feeds
  - Corn ~3.66 Mcal/kg
  - Alfalfa ~2.56 Mcal/kg
  - Oats ~ 3.40 Mcal/kg

# References

Cheeke, P.R. (1991). *Applied animal nutrition: Feeds and feeding*. Englewood Cliffs, NJ: Prentice Hall.

Ensminger, M.E. (1991). *Animal science*. Danville, IL: Interstate Publishers, Inc.