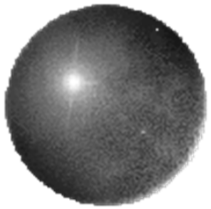


Feed Analyses

Dr. Charles C. Stallings
Professor of Dairy Science
Virginia Tech

Wet Chemistry

- ✓Can be done on any sample since it is the standard to which the NIR is calibrated
- ✓Should be used to determine macro and micro mineral content
- ✓Should be used on non traditional feeds and TMR's

NIR Analysis

- ✓Can be used on hays, hay crop silages, corn, corn silages, and small grain silages
- ✓Can be used with traditional TMR's containing corn and hay crop silages and hays
- ✓Fast, nondestructive method

NIR Analysis

- ✓Can include dry matter, protein, ADF, NDF, ADF protein, lignin, starch, sugar, fat, and ash

In vitro/in situ analyses (Cumberland Valley Analytical Services)

- ✓ In vitro fiber digestibility – 6, 12, 24, 30, or 48 hrs. for NDF digestibility
- ✓ In vitro starch digestibility – 2, 7, 24 hr.
- ✓ In situ digestibility –

  Protein at 16 hrs.

  Starch at 2 and 7 hrs.

  NDF at 30 and 48 hrs.

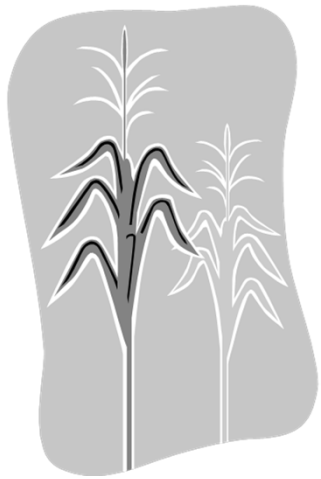
  Dry matter at 30 and 48 hrs.

Energy Supply to Lactating Dairy Cows

Remember that 70% of the diet dry matter is carbohydrate (fiber, starch, sugar) and environmental factors that impact digestibilities such as degree of processing, growing conditions, and hybrid type impact energy availability

Prediction of energy from fiber for corn silage– Penn State equation

NEl, mcal/kg = (1.044 – (.0124 * ADF, %DM)) * 2.2

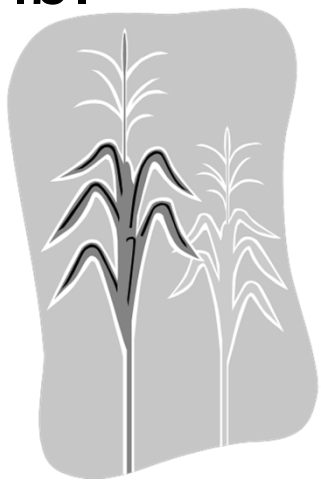


Prediction of energy from fiber for corn silage – Penn State equation

Corn silage with 30% ADF

NEl, mcal/kg = (1.044 – (.0124 * 30)) * 2.2

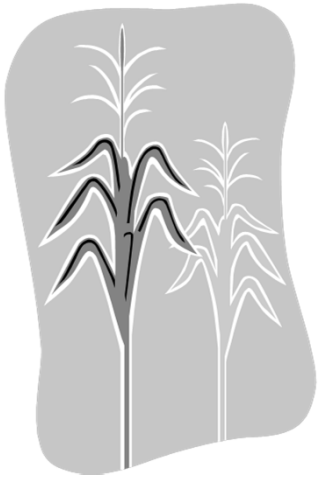
= 1.48 mcal/kg or .67 mcal/lb.



MILK2006

http://www.uwex.edu/ces/dairynutrition/

Modified by: Randy Shaver, Joe Lauer, Jim Coors, and Patrick Hoffman of the University of Wisconsin



MILK2006 is a silage performance index

- Must know or estimate silage dry matter, crude protein, NDF, NDF protein, ash, ether extract, and DM yield
- NDF digestibility and starch can be measured with different methods or use default equations similar to MILK2000

Assumptions used in calculations using digestibility of components

- Crude protein = .93 * CP %
- Fat = (.97 * (fat % -1)) * 2.25
- NDF = (NDF % * NDF digestibility)
- Non fiber carbohydrate = (starch % * dig.) + (non starch NFC % * .98)

Starch digestibility and 35% DM

Kernel processed = 121.6 – (.88 * DM %)

= 121.6 – (.88 * 35)

= 91%

Unprocessed = 144.8 – (1.67 * DM %)

= 144.8 – (1.67 * 35)

= 86%

Starch digestibility and 30% DM

Kernel processed = 121.6 – (.88 * DM %)

= 121.6 – (.88 * 30)

= 95%

Unprocessed = 144.8 – (1.67 * DM %)

= 144.8 – (1.67 * 30)

= 95%

Example corn silage

35% dry matter

8.8% crude protein

3.2% fat

45% NDF

27% starch

59% NDF digestibility

4.3% ash

1.3% NDF protein

Kernel processed

Net energy calculation (mcal/kg)

NEl =[(((d-protein) + (d-fat * 2.25) + (d-NDF) + (d-starch) + (d-NFC)]

-7) * .0245) - .12

Net energy calculation (mcal/kg)

NEl =[(8.8 * .93) + (((3.2 – 1) * .97) * 2.25) + (45 * .59) + (27 * .91) + (13 *.98)]

=[(((8.2 + 4.4 + 26.6 + 24.6 + 12.7) -7) * .0245) - .12]

= 1.58 mcal/kg or .72 mcal/lb.

Where energy comes from in the example corn silage

- Protein = 11%
- Fat = 6%
- Fiber (NDF) = 35%
- Starch = 32%
- Nonstarch NFC = 17%

Energy (mcal/kg) from corn silage and NDF digestibility (NDFD) at 35% DM

MILK2006

50% NDFD	1.47	(.67 mcal/lb.)
54	1.50	(.68)
58	1.52	(.69)
62	1.54	(.70)
66	1.58	(.72)
70	1.61	(.73)

Effect of starch digestibility on NE of silages at differing DM's

	30%	35%	40%
Kernel processed – mcal/kg or mcal/lb.			
Yes	1.50	1.50	1.47
	(.68)	(.68)	(.67)
No	1.52	1.47	1.39
	(.69)	(.67)	(.63)

Energy (mcal/kg) from corn silage in relation to starch and NDF content

Starch:NDF
15:57
20:52
25:47
30:42

Energy (mcal/kg) from corn silage at 59% NDF digestibility (NDFD) & KP

	35% DM		30% DM
Starch:NDF			
15:57	1.39	(.63)	1.39
20:52	1.45	(.66)	1.45
25:47	1.50	(.68)	1.50
30:42	1.56	(.71)	1.56

Energy (mcal/kg) from corn silage at 59% NDF digestibility (NDFD), 35%DM

	KP	No-KP
Starch:NDF		
15:57	1.39 (.63)	1.39 (.63)
20:52	1.45 (.66)	1.43 (.65)
25:47	1.50 (.68)	1.47 (.67)
30:42	1.56 (.71)	1.52 (.69)

Overview of MILK2006

- Digestibility of crude protein, fat, and nonstarch NFC is constant; NDF and starch is not
- NDF digestibility affects both energy in silage and intake of silage
- Silage dry matter % determines starch digestibility considering processing if no starch digestibly is measured
- NDF intake and digestibility determines silage intake