1865 THE UNIVERSITY OF MAINE Cooperative Extension

Rick Kersbergen

UMaine Cooperative Extension

Richard.kersbergen@maine.edu

Forage Quality

- Feed costs make a substantial dent in operating costs on livestock farms
- Supplement (grain) feeding will never substitute on an equal basis for quality forage
- Growing cool season grasses should be our “unfair advantage”

Feed Quality..Visual analysis..

- Maturity
- Color
- Leafiness
- Foreign Matter
- Odor and Condition

http://counties.cce.cornell.edu/washington/ag/Haymanual/

Recent Hay and Pasture Resources

- "On Pasture" http://onpasture.com/
- Hay School Webinars 2012

Session 1, March1, 2012:
http://connect.maine.edu/p7i3u0e7qta/

Hay School Session 2, March8, 2012:
http://connect.maine.edu/p1y6nzl1js7/

Hay School Session 3, March 15, 2012:
http://connect.maine.edu/p93j3s92sog/

Hay School Session 4, March 22, 2012:
http://connect.maine.edu/p166jw2atxp/

Hay School Session 5, April 5, 2012:
http://connect.maine.edu/p1un21yrfc3/

Some great resources…

Agronomy Facts 30

Forage quality in perspective

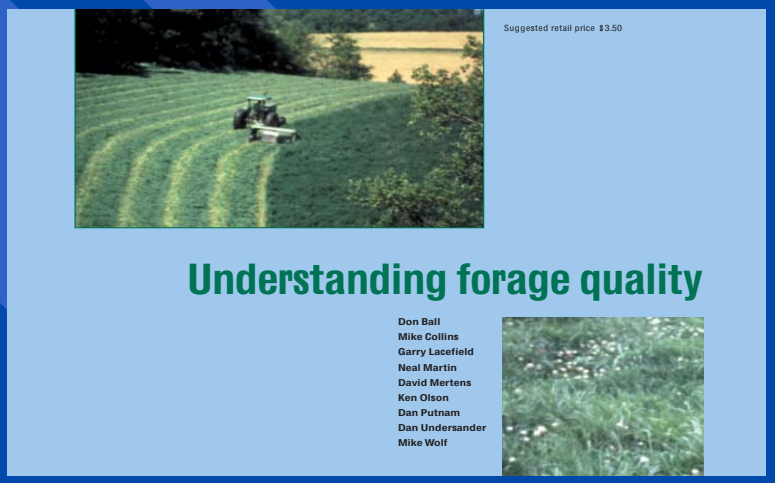
Fluctuations in milk prices, feed costs, and government programs are forcing dairy farmers to become more efficient with their farm operation. Since feed accounts for approximately one-half of the total cost of producing milk, and high quality forage optimizes the productivity of the animals, increasing the quality of forage available is one of the best methods of improving overall feeding efficiency. To effectively produce high quality forage, it is necessary

1. Maturity (harvest date). Maturity is the most important factor affecting forage quality. Forage quality is never static; plants continually change in forage quality as they mature (Figure 1). As plant cell wall content increases, indigestible lignin accumulates. In fact, forage plant maturity changes so rapidly that it is possible to measure significant declines in forage quality every two or three days.

http://www.forages.psu.edu/topics/forage_qa/perspective/what.html

http://forages.oregonstate.edu/

http://www.ag.auburn.edu/~schmisp/beef/pubs/fq.pdf



Suggested retail price $3.50

Understanding forage quality

Don Ball
Mike Collins
Garry Lacefield
Neal Martin
David Mertens
Ken Olson
Dan Putnam
Dan Undersander
Mike Wolf

What is forage quality?

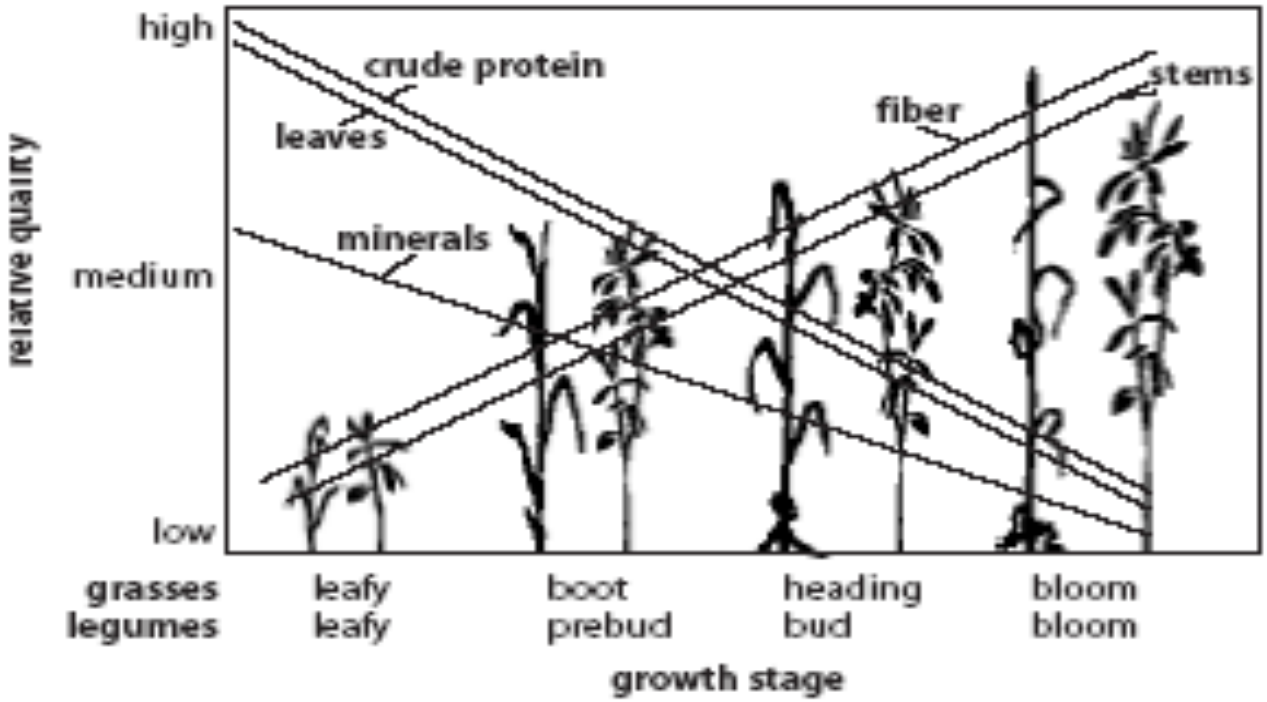
"..sum total of the plant constituents that influence an animal's use of the feed"

Forages provide the cheapest source of nutrients…

Forage Quality

- Number one factor in quality forage is ***Stage of Maturity***
- ***Cutting and harvest management is key to forage quality***
- ***<u>Quality forage>>economical feeding program>> healthy animals</u>***

Figure 3. Effect of plant maturity on forage intake and digestibility.



Source: *Adapted from Blaser, R., R.C. Hammes, Jr., J.P. Fontenot, H.T. Bryant, C.E. Polan, D.D. Wolf, F.S. McClaugherty, R.G. Klein, and J.S. Moore. 1986. Forage–animal management systems. Virginia Polytechnic Institute, Bulletin 86-7.*

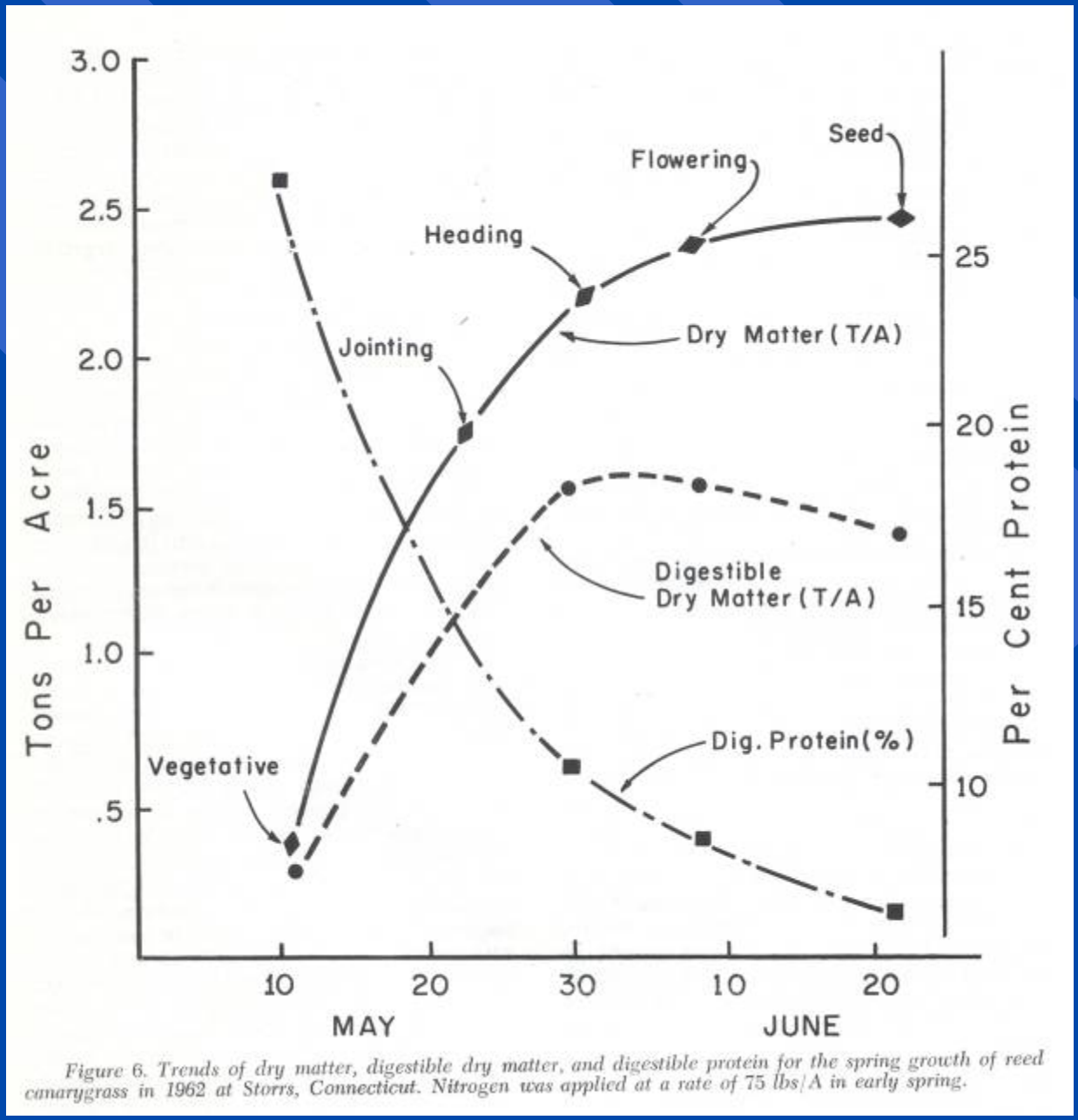
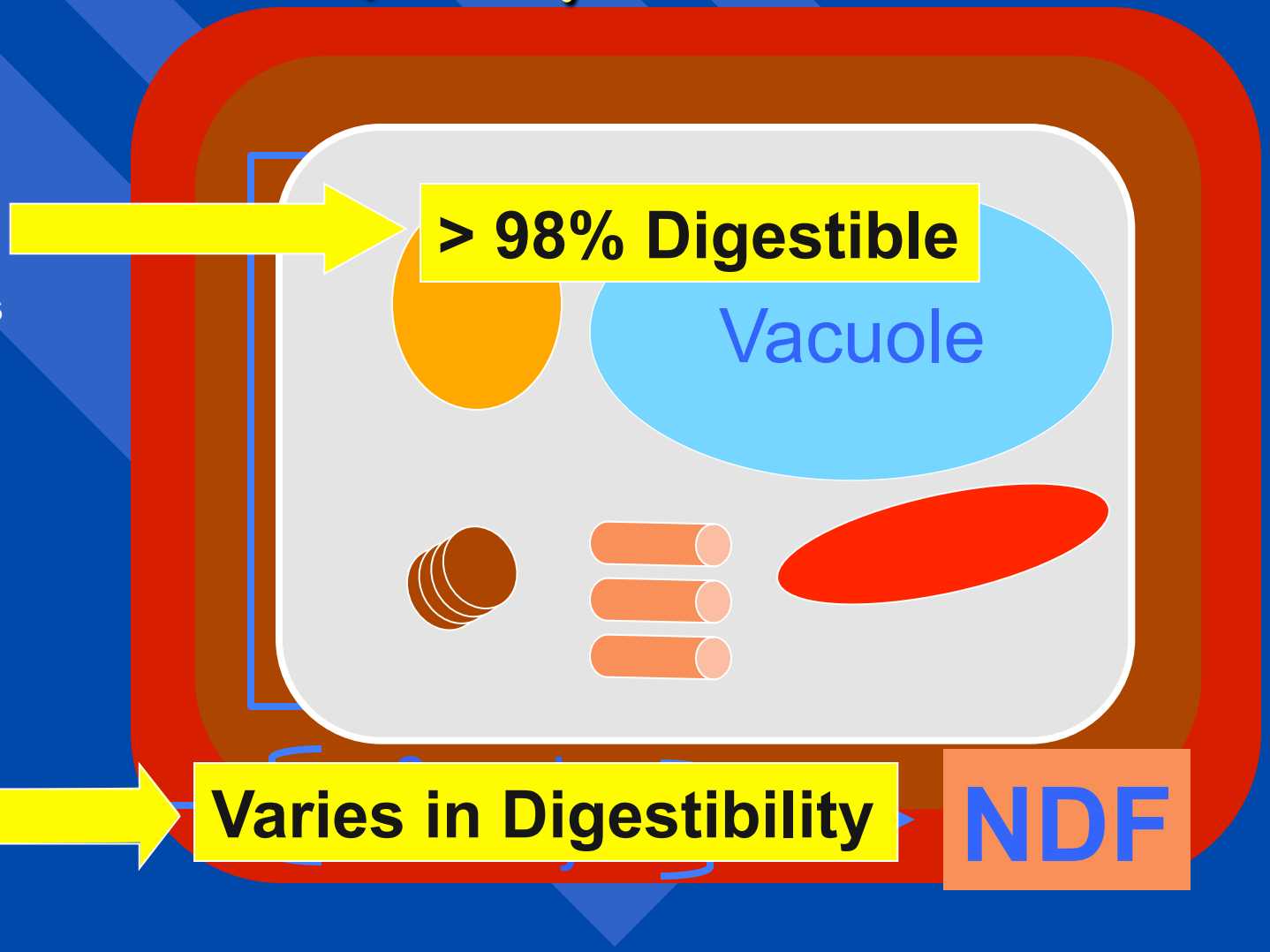
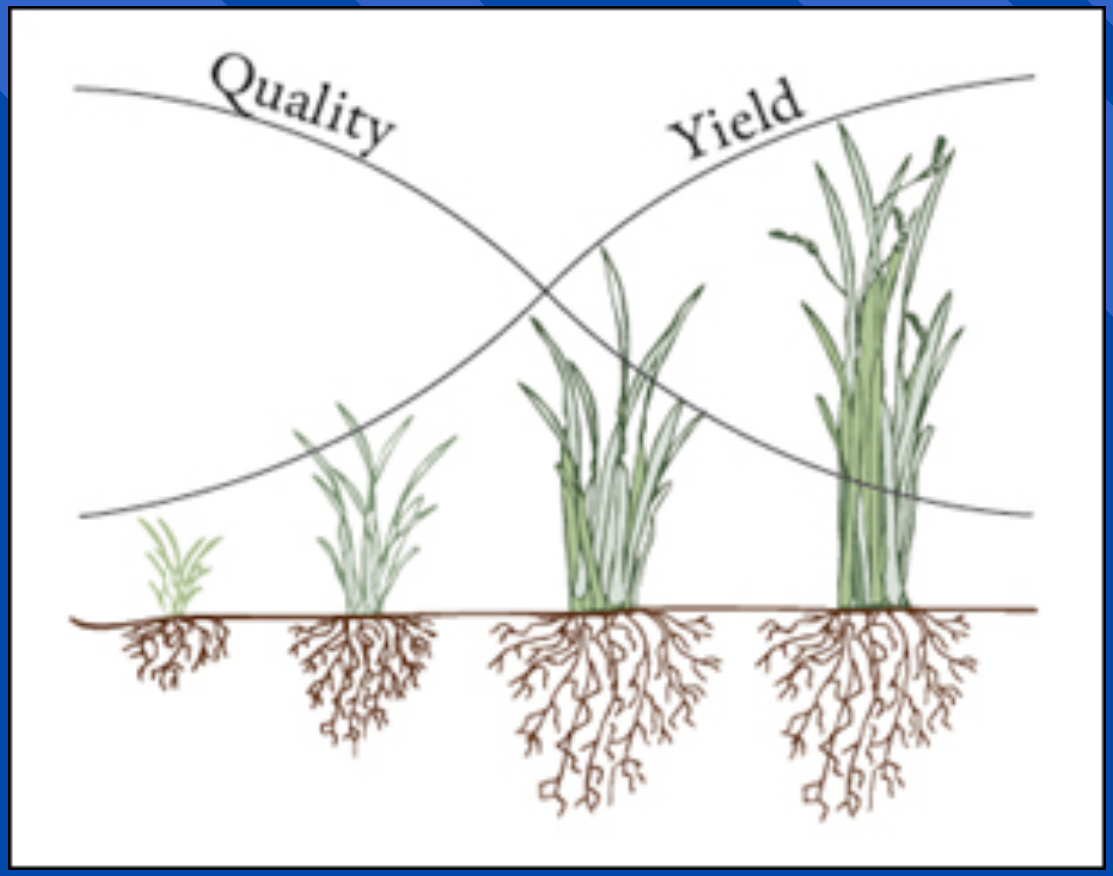


Figure 6. Trends of dry matter, digestible dry matter, and digestible protein for the spring growth of reed canarygrass in 1962 at Storrs, Connecticut. Nitrogen was applied at a rate of 75 lbs/A in early spring.

Plant Constituents of "Forage Quality"



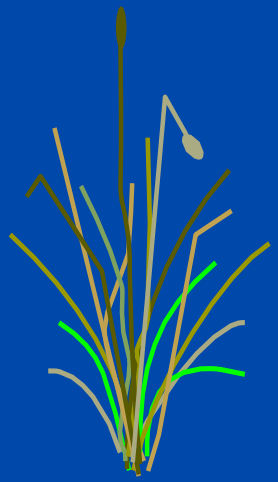
Always balancing yield with quality



THEREFORE ...

- HIGH IN PROTEIN
- LOW IN FIBER
- HIGH IN ENERGY

ENHANCED INTAKE AND HIGH ANIMAL PERFORMANCE



- LOW IN PROTEIN
- HIGH IN FIBER
- LOW IN ENERGY

DECREASED INTAKE AND LOW ANIMAL PERFORMANCE

What makes a quality forage?

- Nutrient content
- Digestibility
- Intake potential

Major factors influencing quality

- Maturity (harvest date)
- Crop species (grasses vs legumes)
- Harvest and Storage
- Environment (climate)
- Soil fertility
- Variety

Minor factors

--Weeds

--Insect pests

--Plant diseases

--Anti-quality factors

Forage Testing


FIRST CLASS
Acct. No.
1ST CLASS MAIL / PERISHABLE
NO POSTAGE NECESSARY IF MAILED IN THE UNITED STATES
First Class Mail
PLANT SAMPLES
PERISHABLE
BUSINESS REPLY MAIL
PERMIT
ITHACA, N.
DAIRY ONE
730 WARREN ROAD
ITHACA, NY 14850-9877
CERTIFIED ANALYSIS

Forage Analysis

- "Wet Chemistry" analysis
- Van Soest fiber analysis (net energy system)
- NIRS **Near-infrared spectroscopy**
- **Digestibility measurements**

Forage analysis measurements

- Crude protein

ACP, ADICP, Sol P, Degradable P

- ADF, NDF (Structural components)
- NSC or NFC (Non-structural or non-fiber) "cell contents"
- Lignin
- Fat
- ASH
- Net energy, TDN
- Minerals
- IVTD NDFD

For more detail descriptions, go to the DairyOne website

http://www.dairyone.com/

Dairy One

FORAGE TESTING LABORATORY
DAIRY ONE, INC.
730 WARREN ROAD
ITHACA, NEW YORK 14850
607-257-1272 (fax 607-257-1350)

Sampled	Recvd	Printed	ST	CO
	01/06/14	01/06/14		

FIRST WET EARLY #1

UNIV OF MAINE - KERSBERGEN, RICHRD
COOPERATIVE EXTENSION
5741 LIBBY HALL ROOM 105 B
ORONO, ME 04469

ENERGY TABLE - NRC 2001

	Mcal/Lb	Mcal/Kg
DE, 1X	1.35	2.98
ME, 1X	1.16	2.56
NEL, 3X	0.67	1.48
NEM, 3X	0.71	1.56
NEG, 3X	0.44	0.96
TDN1X, %	66	

Sample Description	Farm	Code	Sample
MMG SILAGE		302	20076890

FIRST WET EARLY #1

Analysis Results

Components	As Fed	DM
% Moisture	43.1	
% Dry Matter	56.9	
% Crude Protein	9.3	16.3
% Available Protein	9.0	15.8
% ADICP	.3	.5
% Adjusted Crude Protein	9.3	16.3
Soluble Protein % CP		46
Degradable Protein%CP		75
% NDICP	2.2	3.9
% Acid Detergent Fiber	17.7	31.2
% Neutral Detergent Fiber	31.4	55.1
% Lignin	2.0	3.5
% NFC	12.7	22.3
% Starch	.5	.9
% WSC (Water Sol. Carbs.)	9.9	17.3
% ESC (Simple Sugars)	9.2	16.2
% Crude Fat	2.0	3.6
% Ash	3.79	6.66
% TDN	38	66
NEL, Mcal/Lb	.36	.63
NEM, Mcal/Lb	.37	.65
NEG, Mcal/Lb	.22	.39
Relative Feed Value		109
% Calcium	.32	.56
% Phosphorus	.18	.31
% Magnesium	.11	.20
% Potassium	1.12	1.96
% Sulfur	.11	.20
% Chloride Ion	.17	.30
% Lysine	.33	.58
% Methionine	.12	.20

Dairy One

FORAGE TESTING LABORATORY
DAIRY ONE, INC.
730 WARREN ROAD
ITHACA, NEW YORK 14850
607-257-1272 (fax 607-257-1350)

Sampled	Recvd	Printed	ST	CO
	01/06/14	01/06/14		

1ST WET LAKE #2
UNIV OF MAINE - KERSBERGEN, RICHRD
COOPERATIVE EXTENSION
5741 LIBBY HALL ROOM 105 B
ORONO, ME 04469

ENERGY TABLE - NRC 2001

	Mcal/Lb	Mcal/Kg
DE, 1X	1.22	2.70
ME, 1X	1.03	2.28
NEL, 3X	0.58	1.29
NEM, 3X	0.61	1.35
NEG, 3X	0.35	0.77
TDN1X, %	61	

Sample Description	Farm	Code	Sample
M&G SILAGE		302	20076930
1ST WET LAKE #2			

Analysis Results

Components	As Fed	DM
% Moisture	31.0	
% Dry Matter	69.0	
% Crude Protein	7.0	10.1
% Available Protein	6.6	9.6
% ADICP	.4	.5
% Adjusted Crude Protein	7.0	10.1
Soluble Protein % CP		33
Degradable Protein%CP		70
% NDICP	2.2	3.2
% Acid Detergent Fiber	25.5	37.0
% Neutral Detergent Fiber	43.4	62.9
% Lignin	3.1	4.5
% NFC	15.0	21.7
% Starch	1.3	1.9
% WSC (Water Sol. Carbs.)	11.8	17.1
% ESC (Simple Sugars)	11.4	16.5
% Crude Fat	1.8	2.6
% Ash	4.07	5.90
% TDN	42	61
NEL, Mcal/Lb	.37	.54
NEM, Mcal/Lb	.39	.57
NEG, Mcal/Lb	.21	.31
Relative Feed Value		89
% Calcium	.28	.41
% Phosphorus	.17	.25
% Magnesium	.12	.17
% Potassium	1.07	1.55
% Sulfur	.10	.14
% Chloride Ion	.26	.37
% Lysine	.25	.36
% Methionine	.09	.13

Dairy One

FORAGE TESTING LABORATORY
DAIRY ONE, INC.
730 WARREN ROAD
ITHACA, NEW YORK 14850
607-257-1272 (fax 607-257-1350)

Sampled	Recvd	Printed	ST	CO
	01/06/14	01/06/14		

2ND DRY

UNIV OF MAINE - KERSBERGEN, RICHRD
COOPERATIVE EXTENSION
5741 LIBBY HALL ROOM 105 B
ORONO, ME 04469

ENERGY TABLE - NRC 2001

	Mcal/Lb	Mcal/Kg
DE, 1X	1.26	2.78
ME, 1X	1.07	2.36
NEL, 3X	0.61	1.35
NEM, 3X	0.64	1.41
NEG, 3X	0.38	0.83
TDN1X, %	62	

Sample Description	Farm	Code	Sample
MMG HAY		102	20076920
2ND DRY			

Analysis Results

Components	As Fed	DM
% Moisture	9.4	
% Dry Matter	90.6	
% Crude Protein	11.8	13.1
% Available Protein	11.0	12.1
% ADICP	.8	.9
% Adjusted Crude Protein	11.8	13.1
Soluble Protein % CP		29
Degradable Protein%CP		65
% NDICP	4.2	4.6
% Acid Detergent Fiber	31.5	34.7
% Neutral Detergent Fiber	54.2	59.8
% Lignin	3.9	4.3
% NFC	19.6	21.7
% Starch	2.1	2.4
% WSC (Water Sol. Carbs.)	13.2	14.6
% ESC (Simple Sugars)	8.0	8.8
% Crude Fat	3.0	3.3
% Ash	6.18	6.82
% TDN	57	62
NEL, Mcal/Lb	.52	.57
NEM, Mcal/Lb	.54	.59
NEG, Mcal/Lb	.30	.33
Relative Feed Value		96
% Calcium	.42	.46
% Phosphorus	.24	.27
% Magnesium	.21	.23
% Potassium	1.31	1.45
% Sulfur	.18	.20
% Chloride Ion	.19	.21
% Lysine	.46	.51
% Methionine	.16	.18
Horse DE, Mcal/Lb	.89	.99

Dairy One

FORAGE TESTING LABORATORY
DAIRY ONE, INC.
730 WARREN ROAD
ITHACA, NEW YORK 14850
607-257-1272 (fax 607-257-1350)

Sampled	Recvd	Printed	ST	CO
	01/06/14	01/06/14		

1ST FERTILIZER
UNIV OF MAINE - KERSBERGEN, RICHRD
COOPERATIVE EXTENSION
5741 LIBBY HALL ROOM 105 B
ORONO, ME 04469

ENERGY TABLE - NRC 2001

	Mcal/Lb	Mcal/Kg
DE, 1X	1.17	2.57
ME, 1X	0.97	2.15
NEL, 3X	0.55	1.20
NEM, 3X	0.57	1.25
NEG, 3X	0.31	0.68
TDN1X, %	58	

Sample Description	Farm	Code	Sample
MMG HAY		102	20076950

1ST FERTILIZER

Analysis Results

Components	As Fed	DM
% Moisture	9.0	
% Dry Matter	91.0	
% Crude Protein	10.1	11.2
% Available Protein	9.3	10.2
% ADICP	.8	.9
% Adjusted Crude Protein	10.1	11.2
Soluble Protein % CP		34
Degradable Protein%CP		64
% NDICP	3.3	3.7
% Acid Detergent Fiber	35.8	39.3
% Neutral Detergent Fiber	59.9	65.8
% Lignin	5.2	5.7
% NFC	17.0	18.7
% Starch	1.4	1.5
% WSC (Water Sol. Carbs.)	10.8	11.9
% ESC (Simple Sugars)	6.2	6.8
% Crude Fat	2.1	2.3
% Ash	5.20	5.71
% TDN	53	58
NEL, Mcal/Lb	.44	.48
NEM, Mcal/Lb	.47	.51
NEG, Mcal/Lb	.24	.26
Relative Feed Value		82
% Calcium	.33	.36
% Phosphorus	.19	.21
% Magnesium	.15	.17
% Potassium	1.36	1.49
% Sulfur	.11	.12
% Chloride Ion	.21	.23
% Lysine	.39	.43
% Methionine	.14	.15
Horse DE, Mcal/Lb	.85	.93

Dairy One

FORAGE TESTING LABORATORY
DAIRY ONE, INC.
730 WARREN ROAD
ITHACA, NEW YORK 14850
607-257-1272 (fax 607-257-1350)

Sampled	Recvd	Printed	ST	CO
	01/06/14	01/06/14		

1ST NO FERTILIZER
UNIV OF MAINE - KERSBERGEN, RICHRD
COOPERATIVE EXTENSION
5741 LIBBY HALL ROOM 105 B
ORONO, ME 04469

ENERGY TABLE - NRC 2001

	Mcal/Lb	Mcal/Kg
DE, 1X	1.15	2.53
ME, 1X	0.95	2.10
NEL, 3X	0.53	1.17
NEM, 3X	0.55	1.22
NEG, 3X	0.30	0.65
TDN1X, %	58	

Sample Description	Farm	Code	Sample
MMG HAY		102	20076960

1ST NO FERTILIZER

Analysis Results

Components	As Fed	DM
% Moisture	8.9	
% Dry Matter	91.1	
% Crude Protein	8.3	9.1
% Available Protein	7.3	8.1
% ADICP	.9	1.0
% Adjusted Crude Protein	8.3	9.1
Soluble Protein % CP		34
Degradable Protein%CP		67
% NDICP	2.5	2.8
% Acid Detergent Fiber	36.2	39.7
% Neutral Detergent Fiber	58.7	64.4
% Lignin	5.7	6.2
% NFC	19.9	21.8
% Starch	1.7	1.9
% WSC (Water Sol. Carbs.)	13.2	14.5
% ESC (Simple Sugars)	6.6	7.3
% Crude Fat	2.0	2.2
% Ash	4.79	5.26
% TDN	53	58
NEL, Mcal/Lb	.45	.49
NEM, Mcal/Lb	.46	.51
NEG, Mcal/Lb	.23	.26
Relative Feed Value		84
% Calcium	.35	.38
% Phosphorus	.16	.18
% Magnesium	.14	.15
% Potassium	1.10	1.21
% Sulfur	.12	.13
% Chloride Ion	.15	.17
% Lysine	.32	.35
% Methionine	.11	.12
Horse DE, Mcal/Lb	.87	.96

Dairy One

FORAGE TESTING LABORATORY
DAIRY ONE, INC.
730 WARREN ROAD
ITHACA, NEW YORK 14850
607-257-1272 (fax 607-257-1350)

Sampled	Recvd	Printed	ST	CO
	10/09/13	10/14/13		
#329 90G				

UNIV OF MAINE - KERSBERGEN, RICHRD
COOPERATIVE EXTENSION
5741 LIBBY HALL ROOM 105 B
ORONO, ME 04469

ENERGY TABLE - NRC 2001

	Mcal/Lb	Mcal/Kg
DE, 1X	1.22	2.69
ME, 1X	1.03	2.27
NEL, 3X	0.58	1.28
NEM, 3X	0.61	1.35
NEG, 3X	0.35	0.77
TDN1X, %	62	

COMMENTS:
1.MILK/TON BY MILK2006
2.STARCH DIGESTIBILITY 7 HR., 4 MM. INTERPRET STARCH DIGESTIBILITY AS FOLLOWS:
HIGH > 75%,
MODERATE 59-74%,
LOW < 58%.
3.THIS SAMPLE WAS TESTED TWICE FOR CRUDE PROTEIN AND SULFUR TO CONFIRM THE VALUES LISTED.
4.* SCHWAB - SHAVER (SS) ADJUSTMENTS FOR STARCH DIGESTIBILITY.

NEW PACKAGES AND PRICING EFFECTIVE 01/28/2013. VISIT OUR WEBSITE FOR MORE INFO WWW.DAIRYONE.COM*******

Sample Description	Farm	Code	Sample
FR CORN FORAGE		223	19755320
#329 90G			

Analysis Results

Components	As Fed	DM
% Moisture	68.8	
% Dry Matter	31.2	
% Crude Protein	2.2	6.9
% Available Protein	2.1	6.6
% ADICP	.1	.3
% Adjusted Crude Protein	2.2	6.9
Soluble Protein % CP		49
Degradable Protein%CP		74
% NDICP	.4	1.3
% Acid Detergent Fiber	6.7	21.6
% Neutral Detergent Fiber	11.2	36.0
% Lignin	.8	2.7
% NFC	14.9	47.8
% Starch	7.8	24.8
Digestible Starch%Starch		98
% WSC (Water Sol. Carbs.)	6.2	19.9
% ESC (Simple Sugars)	5.5	17.5
% Crude Fat	.6	2.0
% Ash	2.69	8.61
% TDN	20	63
NEL, Mcal/Lb	.21	.67
NEM, Mcal/Lb	.20	.63
NEG, Mcal/Lb	.11	.36
% Calcium	.06	.18
% Phosphorus	.06	.18
% Magnesium	.03	.11
% Potassium	.25	.79
% Sulfur	.03	.08
% Chloride Ion	.06	.19
IVTD 30hr, % of DM		74
NDFD 30hr, % of NDF		27
kd, %/hr		1.59
Milk Lbs./Ton of DM		1,699
Milk Lbs./Proc. Ton of DM		1,699
*SS NEL, Mcal/Lb		.58
*SS Proc. NEL, Mcal/Lb		.58
% Lysine	.05	.17
% Methionine	.03	.11

Table 3. Varieties and yield, 2013.

Hybrid	RM	Yield, 30% DM (tons/acre)*			Expected milk yield (lbs/acre)**,***	
American Organic 3 G03	94	25.0	ab		26,388	ab
American Organic 90 G	90	23.9	abc		.	.
American Organic PB 5503	85	20.9	bcd		21,045	b-j
Blue River 21L90	85	22.2	abcd		21,474	b-j
Blue River 33L90	93	21.2	abcd		18,145	g-j
Blue River 43L96	98	22.4	abcd		19,042	e-j
Schlessman 234gt3000	101	22.8	abcd		22,459	b-i
Schlessman 868 gt	86	21.7	abcd		20,273	c-j
Schlessman 901gt3110	90	21.6	abcd		22,068	b-j
Dairyland DS 7085	85	18.9	cd		17,963	hij
Dairyland HiDF 319707	97	24.2	abc		25,627	abc
Dairyland HiDF 3290-9	90	23.6	abcd		23,727	a-f
DeKalb DKC 38-04	88	24.2	abc		24,307	a-e
DeKalb DKC 43-48	93	23.0	abcd		23,227	a-h
DeKalb DKC 46-20	96	24.6	ab		24,839	a-d
Dynagro 26VP56	86	23.3	abcd		25,011	abc
Dynagro 31VP31	91	22.0	abcd		23,699	a-g
Dynagro 34VN19	94	20.8	bcd		20,292	c-j
Masters Choice MC4050	90	21.3	abcd		22,479	b-i
Masters Choice MC480	87	24.3	abc		25,200	abc
Masters Choice MCT4881GT	98	21.7	abcd		21,234	b-j
Mycogen 2H079	79	26.6	a		28,773	a
Mycogen F2F298	89	18.1	d		18,288	f-j
Mycogen TMF2Q413	95	18.2	cd		16,800	ij
Northrup King N19L 3110A	85	24.5	ab		16,630	j
Northrup King N29T 3220	92	23.3	abcd		23,121	b-h
Northrup King N36A 3000GT	96	21.9	abcd		21,715	b-j
Pioneer P1376XR bmr	102	22.0	abcd		17,411	ij
Pioneer P8906AM	89	22.1	abcd		21,582	b-j
Pioneer P9411HR	94	22.1	abcd		22,931	b-i
Pioneer P9807HR	98	21.5	abcd		22,388	b-i
Seedway SW 2901L	86	23.8	abc		22,654	b-i
Seedway SW 3301L	91	23.4	abcd		21,027	b-j
Seedway SW 3904L	94	23.7	abc		19,343	d-j
Seedway SW 3937.bmr	95	19.7	bcd		20,191	c-j

Traditional "rules"

- Forage maturity is number one factor in quality.
- Quality only declines after the plant is cut.
- More rapid drying will reduce losses
- Respiration losses are the most severe nutritional losses