Assessing On-Farm Pasture Availability and Forage Quality for Dairy Feed Planning

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Introduction

Feed planning on pasture is an important management strategy for improving profitability for pasture-based dairy farms (Murphy, 1994). Prescribed grazing plans as required by the USDA Natural Resources and Conservation Service, rely on feed budgeting information (Kevin Kaija, personal communication). Yet, little on-farm information is available concerning pasture productivity, utilization and forage quality in New England states that can be used for planning purposes.

Objectives

- 1) To collect quantitative information on pasture production and quality for a variety of soil types and specie mixtures on Vermont farms,
- 2) To assess a method using on-farm records as a way to estimated pasture yield and availability as compared to more intensive hand sampling, and
- 3) To evaluate the impact of legume content on forage availability and quality.

Materials and Methods

Four grazing paddocks from two Vermont farms were monitored throughout the 2006 season in order to assess pasture growth rates, pre and post pasture mass, net mass, percent utilization, botanical composition, and pasture quality. The two farms participating in this project included Shelburne Farms of Shelburne, VT and Moultrup Farm of Richmond, VT. Both farms utilize a management intensive grazing system such that lactating cows are moved to new pasture between every milking. Shelburne Farms milks Brown Swiss cows and is located near Lake Champlain. Their pastures are on a variety of soils ranging from well-drained silt loams to moderate and poorly drained clays. The Moultrup farm milks Jersey cows and is located about 20 miles east of Shelburne and is adjacent to the Huntington River. Most of the pasture are fine and very fine sandy loam soils.

Pasture Mass and Dry Matter Yield – The day before and the day after each treatment paddock was grazed, a pre- and post-grazing measure of pasture yield was determined using the acrylic pasture plate method (Rayburn, 1997) taking the mean and standard deviation of 25 measurements per paddock. The difference between pre and post grazing yield was calculated as net pasture yield. Percent utilization was calculated by dividing net yield by pre-grazing yield times 100.



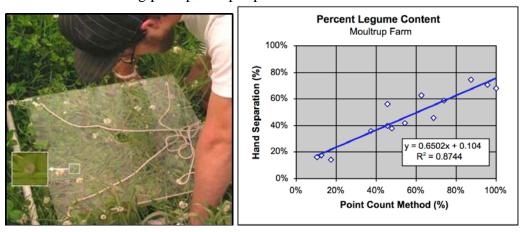
Pasture Quality and Botanical Composition – During each pre-grazing sampling, half of the 25 sites were hand sampled using a 2x2 ft wire quadrat placed over the plate meter. Forage was removed with hand clippers to a height similar to what the cows are observed to graze.

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A composite from all samples was thoroughly mixed and sub-sampled for quality analysis. Samples were sent to the University of Vermont Agricultural Testing Lab and analyzed for crude protein, soluble protein, acid detergent fiber (ADF), neutral detergent fiber (NDF), digestible NDF, net energy of lactation and minerals. A second sub-sample was hand separated into grasses, legumes, and forbs. Each was dried and weighed to determine percent botanical composition.



Indirect Method for Determining Legume Content – a point count method utilizing 24 equally spaced 3/8" holes drilled into the acrylic rising plate was found to correlate well to hand separations and was also used throughout the season to estimate legume content. Counts were made on each of the 25 rising plate points per paddock measurement.



Results

Growth and Pasture Utilization - Both farms in this project utilized managed intensive grazing as a method for pasturing their dairy animals (usually moving their milk cows to new paddocks between each milking). Pre-grazing mass was usually above 2500 lbs. per acre, more than adequate for optimum dry matter intake (Figure 1, Tables 2 and 4 in Appendix).

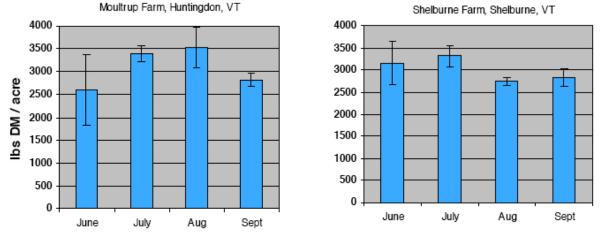


Figure 1. Pre-grazing mass means and standard deviations of the four paddocks from each farm through the 2006 grazing season

The Moultrup Farm utilized an average of 50% of their pasture each grazing (Figure 2, Table 2 in Appendix). Shelburne Farm had poorer utilization partially due to the excessive rain in 2006 along with their poorly drained soils (Figure 2, Table 4 in Appendix).

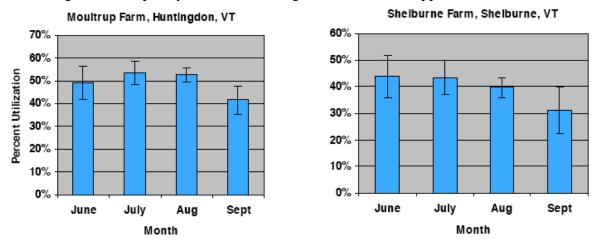


Figure 2. Pasture utilization means and standard deviations of the four paddocks from each farm through the 2006 grazing season

Pasture growth rates ranged from 38 to 98 lbs. per acre per day (Figure 3, Tables 2 and 4 in Appendix). The high amounts of rainfall in June seemed to enhance the pasture growth at the Moultrup farm which has a predominately course texture soil; whereas, the growth rate at Shelburne Farm was more variable across paddocks, particularly in the first half of the season when there was excessive rainfall.

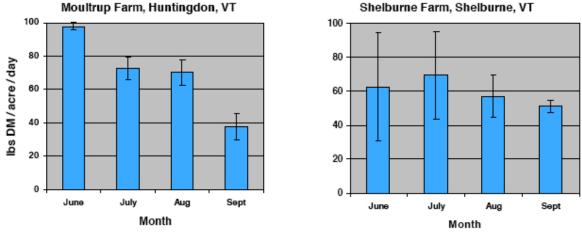
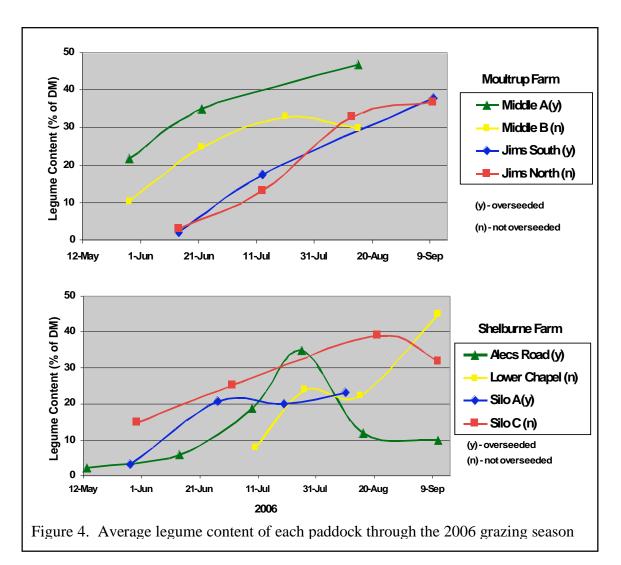


Figure 3. Pasture growth rate means and standard deviations of the four paddocks from each farm through the 2006 grazing season.

Legume Content - Legume content varied across paddocks but mostly varied with season (Figure 4, Tables 3 and 5 in Appendix). Generally, legume content increased as the season progressed with highest levels in August and September. Recently overseeded paddocks did not show any higher levels of legume content as compared to the non-overseeded ones except for Middle A and B at the Moultrup Farm. Jim's South and North paddocks were harvested for hay in the first cutting and then grazed which may explain why legume content was low in the first grazing. The wet fields at Shelburne Farms were difficult to graze in the first half of the season resulting in a higher amount of grass cover and low legume content.



Generally, legume content was only associated with higher pasture quality when it exceeded 30 percent of the botanical mixture; however, the relationship varied greatly and was also influenced by time of year (Figure 5, Tables 3 and 5 in Appendix).

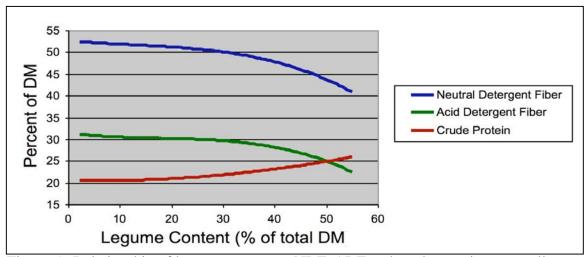


Figure 5. Relationship of legume content to NDF, ADF and crude protein across all paddocks on both farms for the 2006 grazing season.

Calcium was the only mineral that significantly correlated with legume content (Table 1)

Table 1. Correlation coefficients of legume content with various forage quality parameters.

<u>Parameter</u>	Correlation coefficient	<u>Significance</u>
Crude protein	0.41	*
Soluble protein	0.00	ns
Acid detergent fiber	-0.58	**
Neutral detergent fiber	-0.57	**
Net Energy of Lactation	0.53	**
Total digestible nutrients	0.58	**
Phosphorus	0.08	ns
Potassium	-0.09	ns
Magnesium	0.28	ns
Calcium	0.54	**

On-Farm Records

Using on-farm records to estimate net pasture yield showed a similar result to intensive hand sampling utilizing an acrylic pasture plate method (Figure 6).

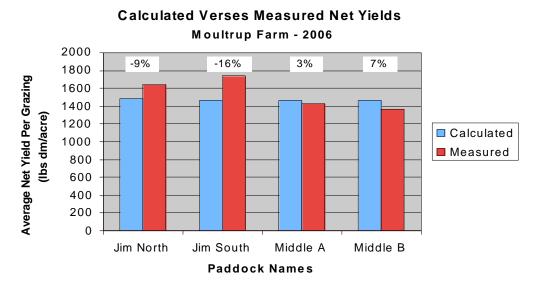


Figure 6. Net yields per grazing period averaged over the grazing season. *Calculated* yields were determined from estimating dry matter intake using on-farm records of milk production, fat composition and animal weight. *Measured* net yields were determined from the rising plate pre and post grazing yields.

Summary

On farm records have the potential to be used as a tool for estimating pasture productivity; however, indirect methods such as the use of a rising plate and point count methods for determining legume content can also enhance the data by estimating pounds of pre-grazing cover, percent utilization, and residual dry matter. These tools are relatively inexpensive to make and can be quite useful for collecting pasture data that can be used in feed planning, fine tuning a grazing program, extension demonstrations, or on-farm research.

References

Murphy, William. 1994. Greener pastures on your side of the fence (4 ed.). Arriba Publishing, Colchester, VT.

Rayburn, Edward. 1997. An acrylic plastic weight plate for estimating forage yield. West Virginia Un. Extension Service (http://www.caf.wvu.edu/~forage/pastplate.htm)

Acknowledgements

This project could not have been accomplished without the help, guidance and assistance of Nat Bacon of Shelburne Farms and Jeff Moultrup of Moultrup Farms.



The project was supported by the Northeast USDA-SARE program (http://www.uvm.edu/~nesare/index.html) through a Partnership Grant.

More information about pasture and grazing management in Vermont can be found at the following websites:

Vermont Crops and Soils Homepage: http://pss.uvm.edu/vtcrops/?Page=pasturegrazing.html

Vermont Pasture Network: http://www.uvm.edu/~pasture/



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APPENDIX

Table 2. Paddock area, soil type, treatments and grazing information for Moultrup Farm in 2006, Richmond, VT

	Š	Over							Forage			
Paddock Name	Area le	with legume	Grazing Date	Rest Period	Growth Rate	Pre Mass	Post Mass	Net Mass	Utili- zation	Me	Measured Intake	Calculated Intake*
<u>8</u>	acres			days	lbs/a/d	lb/a	lb/a	lbs/a	%	p/sql	lbs/cow/d	lbs/cow/d
North	0.90	No	6/15	1	1	3080	1369	1711	26%	1540	25.7	22.8
Pred	Predominate soil type:	type:	7/14	28	76.5	3436	1771	1665	48%	1499	23.1	20.6
Agaw	Agawam fine sandy loam	y Ioam	8/14	30	70.2	3737	1850	1887	51%	1699	25.7	20.4
0 - 5	0 - 5% slope		9/11	27	32.1	2684	1400	1284	48%	1156	17.5	19.8
			Average	28	9.69	3234	1597	1637	51%	1473	23.0	20.9
Ein												
South	0.90	Yes	6/15	1	1	3431	1533	1898	22%	1709	28.5	21.1
Pred	Predominate soil type:	type:	7/14	28	76.2	3590	1813	1777	46%	1599	24.6	20.6
Agaw	Agawam fine sandy loam	y Ioam	8/14	30	0.67	4026	1959	2067	51%	1860	28.2	20.8
0 - 5	0 - 5% slope		9/11	27	34.4	2854	1640	1214	43%	1093	16.6	19.8
			Average	28	63.2	3475	1736	1739	20%	1565	24.5	20.6
Middle A	0.90	Yes	5/29	1	•	2056	1155	006	44%	810	14.7	22.6
Pred	Predominate soil type:	type:	6/23	24	9.66	3347	1384	1963	26%	1766	29.0	21.1
Agaw	Agawam fine sandy loam	y Ioam	7/22	28	62.7	3014	1470	1545	51%	1390	21.1	21.1
0 - 5	0 - 5% slope		8/16	24	67.2	3016	1706	1311	43%	1180	17.9	20.6
			9/14	28	ı	•				•	1	19.5
			Average	26	76.5	3126	1520	1606	51%	1445	22.6	20.6
Middle B	0.90	No	5/29	1	1	1832	1064	768	42%	691	12.6	22.6
Pred	Predominate soil type:	type:	6/23	24	8.96	3184	1369	1814	21%	1633	26.3	21.1
Agaw	Agawam fine sandy loam	y Ioam	7/22	28	75.2	3326	1425	1901	21%	1711	25.9	21.1
0 - 5	0 - 5% slope		8/16	24	60.4	2753	1846	406	33%	816	12.4	20.8
			9/14	28	47.0	2926	1482	1444	46%	1300	19.7	19.2
			Average	26	2.69	2804	1531	1517	49%	1365	21.1	20.5
			Farm Average	27	67.3	3160	1596	1625	20%	1462	22.8	20.6
0		-	-									

*Calculated intake per cow per day is based on average cow weight and daily milk production

Table 3. Legume content and pasture quality for each grazing period at Moultrup Farm in 2006, Richmond, VT

	Over	7											
	seeded with	d Grazing	Legume		Soluble								
Paddock Name	legume		Content	CP*	Protein	ADF	NDF	NEI	TDN	Ca	۵	¥	Mg
			% of DM	%	%	%	%	Mcal/lb	%	%	%	%	%
Jim North	No	6/15	3%	21.9	47.3	30.7	52.1	0.62	89	0.56	0.46	3.23	0.20
		7/14	13%	22.4	41.3	30.3	53.3	0.63	89	0.55	0.43	3.70	0.21
		8/14	33%	22.3	44.1	26.9	47.9	89.0	71	0.55	0.41	3.43	0.19
		9/11	37%	29.0	46.7	25.8	45.5	0.70	72	0.75	0.51	3.62	0.25
		Average	22%	23.9	44.9	28.4	49.7	99.0	70	09.0	0.45	3.50	0.21
Jim South	Yes	6/15	2%	21.1	46.8	31.6	53.5	0.61	67	0.56	0.44	3.45	0.20
		7/14	18%	23.0	42.4	31.4	54.5	0.61	89	0.56	0.46	3.75	0.23
		8/14	14%	21.8	44.5	27.9	49.9	0.67	70	0.45	0.38	3.59	0.18
		9/11	38%	28.5	48.1	26.6	45.4	69.0	71	0.74	0.54	3.65	0.24
		Average	18%	23.6	45.5	29.4	50.8	0.65	69	0.58	0.46	3.61	0.21
מולינו	>	7/20	7000	0 40	0 7 7	30.4	7.2	0.63	8	0.43	7	2 7 2	000
	2	77.5	77.70	0.0	0.		0 1	0.	0	0	÷ :) - -	0.22
		6/23	35%	18.9	46.5	28.4	49.4	99.0	70	0.53	0.36	3.17	0.18
		7/22	1	1	1	1	1	1	1	1	1	1	1
		8/16	47%	24.0	44.0	28.6	48.6	99.0	70	0.83	0.43	3.41	0.25
		9/14	ı		1	,		1					,
		Average	35%	22.6	46.1	29.1	50.4	0.65	69	99.0	0.42	3.34	0.22
ם כוליוע	2	6/30	7007	72 5	7 2 7	707	т 1	77 0	07	00	С Ц	000	0,
מוממונים	2	1270	0.0	7.0	5	7.7	0	0.0	0	0.0		0.0	2
		6/23	25%	16.6	49.7	33.2	58.6	0.59	99	99.0	0.35	2.24	0.20
		7/22	33%	21.5	42.7	32.0	53.2	0.61	4	0.68	0.43	3.42	0.22
		8/16	30%	21.2	46.4	29.4	49.9	0.64	69	0.79	0.40	3.26	0.24
		9/14	1		1	1		1					
		Average	25%	20.7	46.1	31.0	53.3	0.62	89	0.63	0.41	3.08	0.21
		Farm Average	25%	7 2 7	45.6	79.	0.17	0.64	69	0.62	0.43	χ γ	0 21
		3000	201		200	2		5	ò	10:0		00:0	1

*CP - crude protein; ADF - acid detergent fiber; NDF - neutral detergent fiber; TDN - Total digestible nutrients

Table 4. Paddock area, soil type, treatments and grazing information for Shelburne Farm in 2006, Shelburne, VT

Grazing Rest Period Grate Mass Mass Mass Mass Net Date Preriod Period Rate Phost Mass Mass Mass Mass Mass Mass Mass Ma			Over)					Forage			
coad 3.50 Ves 5/14 - - 3009 2352 566 228/2 2297 - Predominate soil types: 6/15 3.1 1.6 80.2 3193 1831 186.8 188/6 2297 - 20% Vergennes clay 7/10 24 93.3 3533 2070 1462 47% 3180 - 20% Vergennes clay 8/16 19 53.3 2630 1784 846 32% 2960 - 9/12 26 5.3.7 3128 1887 1141 36% 3180 - 8/16 16 59.5 3050 1933 1117 36% 24/7 - 50% Vergennes clay 8/16 16 31.6 284 3187 170 -	Paddock Name		with legume	Grazing Date	Rest Period	Growth Rate	Pre Mass	Post Mass	Net Mass	Utili- zation	Measure Intake		Calculated Intake*
toad 3.50 Ves 5/14 - 3009 2352 666 22% 2297 - Predominate soil types: 6/15 31 16.8 2805 1573 1232 44% 2875 - 20% Vergennes clay 7/27 16 80.2 3193 1831 1363 43% 3180 - 8/16 19 53.3 3533 2070 184 846 32% 2960 - 8/16 16 80.2 3193 1831 1363 43% 3180 - Average 23 59.5 3050 1933 1117 36% 310 - 5/25 - - 3607 2026 1581 44 4110 - 5/26 - - 3607 2026 1581 447 4110 - 5/26 - - 30.1 30.2 30.2 30.2 30.2 30.2 30.2		acres			days	lbs/a/d	lb/a	lb/a	lbs/a	%	p/sql		lbs/cow/d
Predominate soil types: 6/15 31 16.8 2805 1573 1232 44% 2875 - 20% Vergennes clay 7/710 24 93.3 3207 1462 41% 3434 3412 - 3412 - 3412 1368 41% 3131 1363 41% 3180 - 3412 -	Alec Ros		Yes	5/14) і	,	3009	2352	929	22%	2297	1	22.8
80% Palatine silt loam 7/10		Predominate	soil types:	6/15	31	16.8	2805	1573	1232	44%	2875	1	20.7
20% Vergennes clay 7/27 16 80.2 3193 1363 43% 3180		80% Palatine	silt loam	7/10	24	93.3	3533	2070	1462	41%	3412	1	21.2
Section Sect		20% Vergenr	nes clay	7/27	16	80.2	3193	1831	1363	43%	3180	1	20.5
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6.50 Yes 6.50 Yes 5/29 2659 1754 906 34% 2871 2659 1043 33% 2871 2659 1043 33% 2871 2659 1043 33% 2871 2659 1754 906 34% 3924 2659 1754 906 34% 3924 2659 1751 1772 54% 3840 - 24% Palatine silt loam 24% Palatine silt loam 7/21 22 75.7 2965 1567 1398 47% 3029 - 20% Covington silty clay Average 24 65.3 2695 1774 41% 3369 3533 1638 1895 54% 3349 3533 1638 1895 54% 3342 3533 1638 1895 54% 3342 3533 1638 1895 54% 3406 22% Stockbridge story loam 8/12 22% Stockbridge story loam Average 23 60.0 3122 1695 1427 45% 2935 55% Palatine silt loam Average 24 65.3 2800 1774 50% 3496 55% Palatine silt loam Average 24 65.3 2800 1774 50% 2846 55% Palatine silt loam Average 24 65.3 2800 1774 50% 2846 55% Palatine silt loam Average 24 65.3 2800 1774 50% 2846 3533 1638 1835 1194 39% 3073 3533 1638 1835 1194 39% 3073		50% Vergenr	nes clay	8/16	18	67.7	2852	1784	1068	37%	2777	ı	19.8
6.50 Yes 5/29 - - 2659 1754 906 34% 2871 - Fredominate soil types: 5/29 - - 2659 1754 906 34% 3924 - 56% Stockbridge stony loam 7/21 22 75.7 2965 1567 1398 47% 3029 - 20% Covington silty clay 7/21 22 75.7 2965 1567 1398 47% 3029 - 20% Covington silty clay 8/11 20 66.3 2685 1681 701 26% 3037 - 7.80 No 7/3 - - 3533 1638 1895 54% 2616 - Predominate soil types: 7/25 21 90.1 3439 1725 174 50% 3369 - 70% Covington silty clay 7/25 21 90.1 3439 1725 174 50% 2616 - 70% Covington si				9/12	26	47.7	2786	2178	809	22%	2372	,	20.1
6.50 Ves 5/29 - - 2659 1754 906 34% 3924 - Fedominate soil types: 56% Stockbridge stony loam 4/28 29 64.4 3299 1527 1772 54% 3840 - 24% Palatine silt loam 3/11 20 66.3 2695 1567 1398 47% 3029 - 20% Covington silty clay 9/4 23 54.6 2682 1981 701 26% 3037 - 7.80 No 7/3 - - 3533 1638 1895 54% 3369 - Predominate soil types: 7/25 21 90.1 3439 1725 1714 50% 2616 - 10% Covington silty clay loam 8/22 27 41.4 2802 1796 1006 36% 2616 - 22% Stockbridge stony loam 9/12 20 48.5 2716 1625 1095 40% 2846 - <t< td=""><td></td><td></td><td></td><td>Average</td><td>27</td><td>44.3</td><td>3082</td><td>2039</td><td>1043</td><td>33%</td><td>2871</td><td></td><td>20.6</td></t<>				Average	27	44.3	3082	2039	1043	33%	2871		20.6
Predominate soil types: 6/28 29 64.4 3299 1527 1772 54% 3840 - 56% Stockbridge stony loam 7/21 22 75.7 2965 1567 1398 47% 3029 - 24% Palatine silt loam 8/11 20 66.3 2695 1557 1160 43% 3015 - Average 24 65.3 2695 1557 1187 41% 3369 - 7.80 No 7/3 - - 3533 1638 1895 54% - Predominate soil types: 7/25 21 90.1 3439 1725 1714 50% 3342 - 70% Covington silty clay 8/22 27 41.4 2802 1796 1006 36% 2616 - 5% Palatine silt loam Average 23 60.0 3122 1695 1427 45% 2935 -	Silo A	6.50	Yes	5/29	ı	ı	2659	1754	906	34%	3924	1	21.6
1,21 22 75.7 2965 1567 1398 47% 3029 - 1588 1488 1		Predominate	soil types:	6/28	29	64.4	3299	1527	1772	54%	3840		21.3
24% Palatine silt loam 8/11 20 66.3 2695 1535 1160 43% 3015 - 20% Covington silty clay 44 23 54.6 2682 1981 701 26% 3037 - Average 24 65.3 2860 1673 1187 41% 3369 - 7.80 No 7/25 21 90.1 3439 1725 1714 50% 3342 - Predominate soil types: 7/25 21 90.1 3439 1725 1714 50% 2616 - 10% Covington silty clay 8/22 27 41.4 2802 1796 1006 36% 2616 - 22% Stockbridge stony loam 9/12 20 48.5 2716 1695 1427 45% 2935 - 5% Palatine silt loam Average 23 60.0 3122 1695 1427 45% 2935 -		56% Stockbr		7/21	22	75.7	2965	1567	1398	47%	3029	1	21.0
20% Covington silty clay 9/4 23 54.6 2682 1981 701 26% 3037 - Average 24 65.3 2860 1673 1187 41% 3369 - 7.80 No 7/3 - - - 3533 1638 1895 54% - Predominate soil types: 7/25 21 90.1 3439 1725 1714 50% 3342 - 70% Covington silty clay loam 8/22 27 41.4 2802 1796 1006 36% 2616 - 9/12 20 48.5 2716 162 1095 40% 2846 - 5% Palatine silt loam Average 23 60.0 3122 1695 1427 45% 2935 - Average 24 57.2 3028 1835 1194 39% 3073 -		24% Palatine	silt loam	8/11	20	66.3	2695	1535	1160	43%	3015	,	20.8
Average 24 65.3 2860 1673 1187 41% 3369 - 7.80 No 7/3 - - 3533 1638 1895 54% - Predominate soil types: 7/25 21 90.1 3439 1725 1714 50% 3342 - 70% Covington silty clay 8/22 27 41.4 2802 1796 1006 36% 2616 - 22% Stockbridge stony loam 9/12 20 48.5 2716 1622 1095 40% 2846 - 5% Palatine silt loam Average 23 60.0 3122 1695 1427 45% 2935 - Average 24 57.2 3028 1835 1194 39% 3073 -		20% Covingt	on silty clay	9/4	23	54.6	2682	1981	701	79%	3037		20.4
7.80 No 7/3 - - - - 3533 1638 1895 54% - Predominate soil types: 7/25 21 90.1 3439 1725 1714 50% 3342 - 70% Covington silty clay 8/22 27 41.4 2802 1796 1006 36% 2616 - 22% Stockbridge stony loam 9/12 20 48.5 2716 1622 1095 40% 2846 - 5% Palatine silt loam Average 23 60.0 3122 1695 1427 45% 2935 - Farm				Average	24	65.3	2860	1673	1187	41%	3369	ı	21.0
ss: 7/25 21 90.1 3439 1725 1714 50% 3342 - slay 8/22 27 41.4 2802 1796 1006 36% 2616 - relay 9/12 20 48.5 2716 1622 1095 40% 2846 - relayerage 23 60.0 3122 1695 1427 45% 2935 - Farm Average 24 57.2 3028 1835 1194 39% 3073 - relayerage 24 57.2 3028 1835 1835 1194 39% 3073 - relayerage 24 57.2 3028 1835 1835 1194 39% 3073 - relayerage 24 57.2 3028 1835 1194 39% 3073 - relayerage 24 57.2 3028 1835 1194 39% 3073 - relayerage 24 57.2 3028 1835 1194 39% 3073 - relayerage 24 57.2 3028 1835 1194 39% 3073 - relayerage 24 57.2 3028 2000 2000 2000 2000 2000 2000 200	Silo C	7.80	No	7/3	ı	ı	3533	1638	1895	54%		1	20.8
Slay 8/22 27 41.4 2802 1796 1006 36% 2616 - Ny 9/12 20 48.5 2716 1622 1095 40% 2846 - Average 23 60.0 3122 1695 1427 45% 2935 - Farm Average 24 57.2 3028 1835 1194 39% 3073 -		Predominate	soil types:	7/25	21	90.1	3439	1725	1714	20%	3342	,	20.7
9/12 20 48.5 2716 1622 1095 40% 2846 - Average 23 60.0 3122 1695 1427 45% 2935 - Farm Average 24 57.2 3028 1835 1194 39% 3073 -		70% Covingt	on silty clay	8/22	27	41.4	2802	1796	1006	36%	2616	1	20.1
Average 24 57.2 3028 1835 1194 39% 3073 -		22% Stockor loam	lage stony	9/12	20	48 5	2716	1622	1095	40%	2846		20.7
Farm Average 24 57.2 3028 1835 1194 39% 3073 -		5% Dalatine	cilt loam	Average	2 6	0.09	2122	1605	1427	45%	2037		20.6
24 57.2 3028 1835 1194 39% 3073 -		370 Falatille	SIL IOBIII	Avel age	S N	2	2 2 2 2	22	4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4	, ,	6673	ı	0.0
				Average	24	57.2	3028	1835	1194	36%	3073	,	20 B

*Calculated intake per cow per day is based on average cow weight and daily milk production

Table 5. Legume content and pasture quality for each grazing period Shelburne Farm in 2006, Shelburne, VT

	Over												
Paddock Name	with legume	Grazing Date	Legume Content	čP,	Soluble Protein	ADF	NDF	Nel	TDN	Ca	۵	¥	Mg
			% of DM	%	%	%	%	%	%	%	%	%	%
Alec Road	Yes	5/14	2%	25.2	44.1	27.1	55.7	09.0	66.7	0.33	0.47	3.83	0.21
		6/15	%9	19.5	48.1	31.7	51.4	0.61	67.3	0.47	0.40	3.61	0.21
		7/10	19%	20.5	46.7	29.3	46.3	0.65	69.2	0.68	0.41	3.84	0.23
		7/27	35%	21.3	43.3	28.1	48.1	99.0	70.1	0.49	0.37	4.13	0.22
		8/16	1	22.5	42.3	30.3	51.1	0.63	68.4	0.56	0.42	3.92	0.24
		9/12	20%	21.0	43.8	27.2	45.6	0.68	70.9	0.35	0.35	3.63	0.21
		Average	16%	21.7	44.7	29.0	49.7	0.64	69	0.48	0.40	3.83	0.22
Lower Chap	N _O	5/25	1	22.0	38.5	28.7	54.1	99.0	7.69	0.32	0.29	3.09	0.20
•		7/11	8%	16.4	46.0	30.8	52.5	0.62	0.89	0.48	0.31	3.20	0.21
		7/28	24%	20.4	43.6	33.7	55.0	0.58	65.7	0.73	0.40	3.47	0.28
		8/16	22%	20.2	42.1	27.9	47.8	0.67	70.3	99.0	0.33	3.27	0.25
		9/12	45%	25.0	46.0	21.9	40.3	0.70	75.1	0.63	0.37	3.08	0.21
		Average	25%	20.8	43.2	28.6	49.9	0.65	70	0.56	0.34	3.22	0.23
Silo A	Yes	5/29	3%	19.2	53.1	34.2	57.4	0.57	65.2	0.50	0.41	3.51	0.19
		6/28	21%	22.0	46.2	30.2	49.1	0.63	68.5	0.57	0.41	3.39	0.22
		7/21	20%	22.4	41.6	30.0	51.6	0.63	9.89	0.41	0.39	3.90	0.22
		8/11	23%	21.2	42.5	31.5	51.0	0.61	67.4	0.59	0.38	3.88	0.25
		9/4	1	25.3	45.3	25.8	45.5	0.70	72.0	0.84	0.43	3.61	0.25
		Average	17%	22.0	45.7	30.3	50.9	0.63	89	0.58	0.40	3.66	0.23
Silo C	No	7/3	25%	16.4	52.9	32.1	52.7	09.0	6.99	0.67	0.34	2.69	0.20
		7/25	26%	16.9	44.0	34.0	54.9	0.57	65.4	0.63	0.34	3.27	0.23
		8/22	36%	21.8	48.0	30.1	46.9	0.63	9.89	98.0	0.37	3.27	0.26
		9/12	16%	22.3	46.2	30.8	52.2	0.62	67.9	0.58	0.37	3.18	0.24
		Average	27%	19.4	47.8	31.8	51.7	0.61	4	69.0	0.36	3.10	0.23
	Fa	Farm Average	21%	21.0	45.4	29.9	50.6	0.63	69	0.58	0.38	3.45	0.23
		-1:5 +1-1			19	1 40) : : : : : : : : : : : : : : : : : : :	1)		

*CP - crude protein; ADF - acid detergent fiber; NDF - neutral detergent fiber; TDN - Total digestible nutrients