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Nutrient Composition of Feeds

Data in Table 15-1 were compiled from commercial laboratories, literature data, *Nutrient Requirements of Beef Cattle* (National Research Council, 1996), and unpublished data provided by university researchers. When commercial laboratory data disagreed greatly with published data (>1.5 SD from the mean), the published data were used. The table includes means, standard deviations, and the number of samples (N) used to generate those statistics. Users should examine the standard deviation and N before using the mean value as an estimate of the nutritional content of a specific feed sample. Means derived from a large N will better reflect the total population. Means with a large standard deviation may represent the total population but may be a poor estimate for a specific sample.

All energy values in Table 15-1 were calculated from the mean nutrient data for each entry. Values for ME and NE_L assume the diet has 74 percent TDN. Neutral detergent insoluble crude protein (NDICP) and acid detergent insoluble crude protein (ADICP) are not used directly to formulate diets but are used to calculate energy. Ether extract values represent the total lipid content of a feed but is a poor index of the true fat content of many feeds. The concentration of fatty acids in a feed is a measure of the true fat content and should replace the ether extract assay (Sukhija and Palmquist, 1988). Ether extract values were retained in this edition because of the limited availability of fatty acid data for most feedstuffs. In some cases, data were used that were derived with different analytic techniques, especially neutral detergent fiber (NDF) because other data were not available (see section on Analytic Procedures in chapter 13). Lignin and ash concentrations are used only to estimate energy values and the majority of lignin values were determined using sulfuric acid acid detergent lignin (ADL). Fiber concentrations are not presented for animal-based feedstuffs because the values have little meaning. Concentrations of macro and trace minerals are included in the table; however, before using these values, examine the standard deviations. Soil concentrations of minerals are highly variable; geographic differ-

ences exist for the mineral concentrations of many feeds. For most trace minerals, the standard deviation is high. The use of mean values for copper, iron, manganese, selenium, and zinc is discouraged. Concentrations of molybdenum are provided only in reference to copper availability.

For a very limited number of entries, the concentrations of certain nutrients (NDICP, ADICP, and some minerals) were estimated. Values in the table with no N were estimated. Generally the estimates were from a larger population (e.g., the sulfur concentration for normal corn silage also was used for immature corn silage). For some hay crop forages, values for a specific maturity class were estimated from the *all samples* entries. For some forage classifications, estimates of NDICP and ADICP were calculated from the mean value as a percent of crude protein (CP) for the *all sample* entries and multiplying that value by the mean CP for the specific entry. Data for ground corn (dry and high moisture) was used for cracked dry and high moisture corn. Data for dry rolled sorghum was used for steam-flaked sorghum.

Common names were used to designate feeds. In contrast with previous editions, data for different species of cool season grasses (C-3) were combined into a single classification (Grasses, Cool Season). The classification was simplified because nutrient composition does not vary greatly among different species (Cherney et al., 1993). Similarly, common legumes (alfalfa, clover, trefoil) were combined into a single classification (Legumes, Forage). The standard maturity classifications were eliminated because data from commercial labs and published data often do not include specific maturity designations. Within the cool season grasses and forage legume categories entries were broken into low NDF, medium NDF, and high NDF. Typically less mature forages contain lower NDF concentrations, but growing conditions can alter that relationship. The NDF concentrations, included in each entry are in the table. Because of the widespread use of mixed legume and grass forages, entries were included for this type of forage. The difference in hemicellulose

concentrations between legumes and grasses was used to partition feeds into mostly (>70 percent) grass mixtures, mixtures with approximately equal amount grass and legume, and mostly (>70 percent) legume mixtures. Maturity classification for mixed forages was also based on NDF concentrations. Maturity of corn silage was estimated from dry matter content. Generally, as corn plants mature, dry matter increases (Wiersma et al., 1993).

REFERENCES

- Cherney, D. J., J. H. Cherney, and R. F. Lucey. 1993. In vitro digestion kinetics and quality of perennial grasses as influenced by forage maturity. *J. Dairy Sci.* 76:790-797.
- National Research Council. 1996. Nutrient Requirements of Beef Cattle. 7th rev. ed. National Academy Press, Washington, D.C.
- Sukhija, P. S., and D. L. Palmquist. 1988. Rapid method for determination of total fatty acid content and composition of feedstuffs and feces. *J. Agric. Food Chem.* 36:1202-1206.
- Wiersma, D. W., P. R. Carter, K. A. Albrecht, and J. G. Coors. 1993. Kernel milkline stage and corn forage yield, quality, and dry matter content. *J. Prod. Agr.* 6:94-99.

TABLE 15-1 Nutrient Composition and Variability of Some Feedstuffs Commonly Fed to Dairy Cattle (all values on a dry basis)

Entry No.	Feed Name/Description	International Feed No.	TDN IX %	TDN Equation Class	DE-IX PAF	ME-3X Mcal/kg	NEL-3X Mcal/kg	NEL-4X Mcal/kg	NEM-3X Mcal/kg	NEG-3X Mcal/kg	DM %	CP %	NDICP %	ADICP %	Ether Extract %	NDF %	ADF %	Lignin %	Ash %	
	ALFALFA <i>Medicago sativa</i>	Also see LEGUMES, FORAGE																		
1	Meal, 17% CP	1-00-023	56.4	Forage	1.00	2.60	1.96	1.19	1.11	1.27	0.70	90.3 222 1.4	19.2 221 3.3	3.1 70 0.3	2.4 54 0.1	2.5 221 0.6	41.6 220 7.1	32.8 5.1	7.6 1.2	11.0 84 2.3
2	ALMOND Hulls	4-00-359	58.4	Conc	1.00	2.53	1.89	1.14	1.07	1.22	0.65	86.9 23 5.6	6.5 32 2.5	2.3 4 0.3	1.8 3 0.4	2.9 23 2.0	36.8 30 11.2	28.7 30 8.5	14.9 11 3.0	6.1 16 0.5
3	APPLE Pomace, wet	4-25-450	57.1	Conc	1.00	2.48	1.86	1.12	1.06	1.18	0.62	35.9 65 29.4	7.7 65 3.8	3.7 3 0.9	3.1 4 0.7	5.0 22 1.9	52.5 65 9.5	43.2 65 6.6	15.4 5 2.6	2.6 16 1.1
4	BAKERY BYPRODUCT Byproduct meal	4-00-466	93.5	Conc	1.04	4.09	3.37	2.21	2.09	2.32	1.61	84.7 192 10.7	12.5 188 3.6	2.3 5 1.1	1.1 3 0.6	9.5 136 6.2	13.9 133 10.7	6.5 132 6.5	1.6 6 0.4	3.8 71 1.6
5	Bread, waste	4-00-466	89.3	Conc	1.04	3.99	3.25	2.09	1.98	2.21	1.52	65.3 72 10.7	15.0 70 2.7	0.6 1 2.7	0.5 2 0.4	2.2 2 2	8.9 66 10.5	3.1 66 4.3	0.1 1 1.4	2.8 10 1.4
6	Cereal byproduct	4-00-466	87.6	Conc	1.04	3.79	3.07	1.97	1.88	2.12	1.45	88.5 61 10.2	9.1 61 2.1	3.2 5 1.4	1.2 6 0.7	3.5 36 2.9	10.0 53 6.5	3.9 56 3.1	2.6 5 2.1	3.2 21 1.3
7	Cookie byproduct	4-24-852	95.0	Conc	1.04	4.11	3.40	2.24	2.12	2.33	1.63	90.1 37 4.3	9.7 36 3.1	1.9 4 1.0	0.5 4 0.3	10.6 25 4.5	12.7 33 8.9	6.5 33 5.3	2.6 4 2.1	3.0 5 1.1
8	BARLEY Grain, rolled	4-00-528	82.7	Conc	1.04	3.64	2.92	1.86	1.76	2.02	1.36	91.0 823 3.5	12.4 795 2.1	1.8 60 1.1	0.5 61 0.4	2.2 247 0.6	20.8 331 8.6	7.2 727 2.8	1.9 69 1.1	2.9 257 0.8
9	Malt sprouts	5-00-545	66.4	Conc	1.00	3.06	2.38	1.49	1.40	1.61	1.01	90.5 42 5.5	20.1 40 3.5	3.7 2 2	1.1 1 0.4	2.3 21 0.4	47.0 37 7.6	21.8 37 4.9	3.4 2 1.3	7.4 2 1.3
10	Silage, headed	3-00-512	60.2	Forage	1.00	2.68	2.03	1.24	1.17	1.33	0.76	35.5 504 9.6	12.0 528 2.6	1.6 25 0.6	0.9 265 0.4	3.5 68 0.7	56.3 387 7.0	34.5 528 4.9	5.6 84 1.5	7.5 166 2.1
11	BEET, SUGAR Pulp, dried	4-00-669	69.1	Conc	1.00	3.03	2.36	1.47	1.38	1.60	0.99	85.3 198 9.4	10.0 181 1.1	5.5 18 1.3	0.6 5 0.3	1.1 122 0.4	45.8 151 6.6	23.1 161 3.6	1.6 11 0.9	7.3 54 1.9
12	BERMUDAGRASS <i>Cynodon dactylon</i>	1-20-900	52.9	Forage	1.00	2.35	1.73	1.02	0.96	1.08	0.52	87.1 326 0.9	10.4 325 2.3	4.0 7 0.7	0.9 12 0.2	2.7 2 5.1	73.3 41 4.6	36.8 41 1.5	6.5 10 1.9	8.1 34 1.9
13	Tifton-85, hay, 3-4 wk growth	IFN	55.3	Forage	1.00	2.49	1.86	1.12	1.05	1.19	0.63	87.3 5 2.3	13.7 5 1.9	5.3 5 0.9	1.2 1.2 1.5	2.7 2 1.5	76.9 5 1.5	36.2 5 1.5	5.4 2 2	6.5 2 2
14	BLOOD Meal, ring dried	5-00-380	76.4	Animal	1.00	4.35	3.58	2.33	2.21	2.49	1.76	90.2 97 4.0	95.5 84 8.3	NA NA NA	NA NA NA	1.2 47 2.0	NA NA NA	NA NA NA	NA NA NA	2.5 31 1.4
15	Meal, batch dried (composition data from ring-dried)		65.9	Animal	1.00	3.76	3.04	1.95	1.84	2.11	1.41	90.2	95.5	NA	NA	1.2	NA	NA	NA	2.5
	BLUEGRASS <i>Poa pratensis</i>	See GRASSES, COOL SEASON																		
16	BREWERS GRAINS Dried	5-12-024	71.3	Conc	1.00	3.38	2.69	1.71	1.62	1.84	1.21	90.7 698 3.5	29.2 688 4.0	9.1 32 3.7	3.5 30 0.9	5.2 88 1.6	47.4 221 6.6	22.2 88 3.9	5.0 34 2.7	4.3 138 0.9
17	Wet	5-00-517	71.6	Conc	1.00	3.38	2.69	1.71	1.62	1.84	1.21	21.8 1309 5.0	28.4 1127 4.0	9.3 23 3.9	2.9 29 0.9	5.2 685 1.6	47.1 686 6.8	23.1 686 3.8	4.7 35 0.9	4.9 110 1.1
	BROME, SMOOTH <i>Bromus inermis</i>	See GRASSES, COOL SEASON																		
	CANARYGRASS, REED <i>Phalaris arundinacea</i>	See GRASSES, COOL SEASON																		
18	CANOLA Seed	5-08-109	127.4	Conc	1.00	5.60	4.92	3.52	3.36	3.28	2.38	89.9 1	20.5 1	3.4 0.3	1.3 0.1	40.5 1	17.8 1	11.6 1	2.7 1	4.6

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TABLE 15-1 (*continued*)

Entry No.	Feed Name/Description	International Feed No.	TDN-IX %	TDN Equation Class	PAF	DE-IX Mcal/kg	ME-3X	NEL-3X	NEL-4X	NEM-3X	NEG-3X	DM %	CP %	NDICP %	ADICP %	Ether Extract %	NDF %	ADF %	Lignin %	Ash %
							Mcal/kg	Mcal/kg	Mcal/kg	Mcal/kg	Mcal/kg									
19	Meal, mech. extracted	5-03-870	69.9	Conc	1.00	3.44	2.75	1.76	1.66	1.88	1.25	90.3 230	37.8 230	6.3 16	2.4 19	5.4 71	29.8 81	20.5 82	9.5 18	7.4 27
		N SD										1.1	1.1	2.5	0.7	5.5	6.6	5.1	4.3	1.2
20	CHOCOLATE Byproduct		102.7	Conc	1.04	4.46	3.77	2.56	2.43	2.56	1.81	95.2 21	11.9 21	0 1	0 3	20.5 16	23.8 19	15.7 19	3.2 1	2.1 15
		N SD										3.1	7.2			8.8	15.8	12.6		2.0
21	CITRUS Pulp dried	4-01-237	79.8	Conc	1.00	3.44	2.76	1.76	1.66	1.89	1.25	85.8 380	6.9 469	0.4 3	0.3 3	4.9 39	24.2 99	22.2 99	0.9 7	7.2 35
		N SD										8.5	0.6	0.3	0.1	1.3	3.5	4.5	0.1	4.2
	CLOVER, LADINO <i>Trifolium pratense</i>	See LEGUMES, FORAGE																		
	CLOVER, RED <i>Trifolium repens</i>	See LEGUMES, FORAGE																		
22	CORN, YELLOW Cobs	1-28-234	54.2	Conc	1.00	2.31	1.68	0.99	0.93	1.04	0.48	90.8 5	3.0 7	1.7 1	0.8 1	0.6 4	86.2 6	42.2 4	5.9 3	2.2 2
	Distillers grains with solubles, dried	N SD										0.3	0.3			0.1	7.3	3.5		
23		5-28-236	79.5	Conc	1.00	3.72	3.03	1.97	1.87	2.07	1.41	90.2 892	29.7 879	8.6 37	5.0 392	10.0 464	38.8 493	19.7 710	4.3 46	5.2 134
		N SD										1.8	3.3	3.4	2.6	3.4	7.8	4.6	2.8	1.1
24	Gluten feed, dried	5-28-243	74.1	Conc	1.00	3.43	2.73	1.73	1.64	1.87	1.24	89.4 131	23.8 186	3.6 9	1.4 22	3.5 68	35.5 122	12.1 142	2.0 10	6.8 25
		N SD										1.2	5.7	1.5	2.0	1.1	6.8	3.0	1.1	1.5
25	Gluten meal, dried	5-28-242	84.4	Conc	1.00	4.43	3.66	2.38	2.25	2.54	1.79	86.4 66	65.0 57	3.6 11	3.0 13	2.5 42	11.1 39	8.2 52	1.5 10	3.3 20
		N SD										10.1	7.8	2.7	2.0	1.1	10.1	4.7	0.8	1.2
26	Grain, cracked, dry	4-02-854	85.0	Conc	0.95	3.69	2.98	1.91	1.80	2.05	1.39	88.1	9.4	0.7	0.3	4.2	9.5	3.4	0.9	1.5
		N SD																		
27	Grain, ground, dry	4-02-854	88.7	Conc	1.00	3.85	3.12	2.01	1.90	2.16	1.48	88.1 1448	9.4 4457	0.7 66	0.3 50	4.2 659	9.5 1239	3.4 1204	0.9 157	1.5 567
		N SD										3.1	1.3	0.3	0.2	1.0	2.3	1.0	0.4	0.5
28	Grain, steam-flaked	4-02-854	91.7	Conc	1.04	3.97	3.24	2.09	1.98	2.24	1.55	88.1	9.4	0.7	0.3	4.2	9.5	3.4	0.9	1.5
29	Grain, rolled, high moisture	4-28-265	88.5	Conc	1.00	3.84	3.11	2.01	1.90	2.15	1.48	71.8	9.2	0.6	0.3	4.3	10.3	3.6	0.9	1.5
		N SD																		
30	Grain, ground, high moisture	4-28-265	91.5	Conc	1.04	3.96	3.23	2.09	1.97	2.23	1.55	71.8 4845	9.2 4761	0.6 61	0.3 38	4.3 1357	10.3 4729	3.6 4728	0.9 1123	1.5 2544
		N SD										5.1	0.9	0.3	0.3	0.7	2.7	1.6	0.2	0.6
31	Grain and cob, dry, ground	4-02-849	83.5	Conc	1.00	3.62	2.91	1.86	1.76	2.00	1.35	89.2 198	8.6 190	0.9 4	0.4 6	3.9 68	21.5 183	8.0 167	1.6 4.3	1.7 0.5
		N SD										3.0	1.6	0.1	0.3	1.4	12.5	4.3	0.5	0.5
32	Grain and cob, high moisture, ground	4-26-240	86.6	Conc	1.04	3.74	3.03	1.94	1.83	2.09	1.42	67.1	8.4	0.7	0.3	3.9	21.0	9.4	1.4	1.7
		N SD																		
33	Hominy	4-02-887	83.1	Conc	1.00	3.64	2.94	1.88	1.78	2.02	1.37	88.5 364	11.9 358	1.5 15	0.5 0.5	4.2 2.0	21.1 5.5	6.2 1.8	1.7 0.5	2.7 1.1
		N SD										1.5	2.4	0.5	0.2	1.8	6.9	3.7	0.4	0.3
34	Silage, immature <25% DM	3-28-247	65.6	Forage	1.00	2.87	2.21	1.36	1.28	1.48	0.89	23.5	9.7	1.4	0.9	2.5	54.1	2673	802	1381
		N SD																		
35	Silage, normal 32-35% DM	3-28-248	68.8	Forage	0.94	2.99	2.33	1.45	1.38	1.57	0.97	35.1	8.8	1.3	0.8	3.2	45	28.1	2.6	4.3
		N SD																		
36	Silage, mature >40% DM	3-28-249	65.4	Forage	0.87	2.84	2.19	1.35	1.28	1.46	0.87	44.2	8.5	1.3	0.9	3.2	44.5	27.5	3.1	4.0
		N SD																		
37	COTTON SEED Whole seeds with lint	5-01-614	77.2	Conc	1.00	3.55	2.91	1.94	1.83	1.96	1.31	90.1 1059	23.5 1124	2.4 71	1.9 4	19.3 27	50.3 953	40.1 1024	12.9 76	4.2 193
		N SD										4.6	2.6	1.2	0.1	1.4	5.8	4.4	3.2	2.1

(continues)

TABLE 15-1 (continued)

Entry No.	Feed Name/Description	International Feed No.	TDN IX %	TDN Equation Class	PAF	DE-IX			ME-3X		NEL-3X		NEL-4X		NEM-3X		NEG-3X		Ether Extract				
						Mcal/kg			Mcal/kg			Mcal/kg			Mcal/kg		DM %	CP %	NDICP %	ADICP %	NDF %	ADF %	Lignin %
38	Hulls	1-01-599 N SD	34.3	Conc	1.00	1.51	0.95	0.48	0.44	0.39	-0.13	89.0 135	6.2 134	3.0 10	1.1 1	2.5 84	85.0 106	64.9 108	22.5 10	2.8 75			
39	Meal, solvent, 41% CP	5-01-630 N SD	66.4	Conc	1.00	3.40	2.70	1.71	1.61	1.84	1.23	90.5 180	44.9 158	3.3 7	1.8 8	1.9 113	30.8 47	19.9 58	7.6 3	6.7 44			
40	FATS AND OILS																						
	Calcium soaps	IFN N SD	163.5	Fat	1.00	6.83	6.27	5.02	4.80	5.02	3.45	95.3	0	0	0	84.5	0	0	0	0	15.5		
41	Hydrolyzed tallow fatty acids	IFN N SD	176.3	Fat	1.00	7.37	6.76	5.41	5.17	5.41	3.72	99.8	0	0	0	99.2	NA	NA	NA	NA	0		
42	Partially hydrogenated tallow	IFN N SD	96.6	Fat + G	1.00	4.05	3.72	2.97	2.84	2.97	2.04	100.0	0	0	0	99.5	NA	NA	NA	NA	0		
43	Tallow	IFN N SD	147.4	Fat + G	1.00	6.17	5.66	4.53	4.33	4.53	3.12	99.8	0	0	0	99.8	NA	NA	NA	NA	0		
44	Vegetable oil	4-05-077 N SD	184.0	Fat + G	1.00	7.70	7.07	5.65	5.41	5.65	3.89	100.0	0	0	0	99.9	0	0	0	0	0		
45	FEATHERS																						
	Hydrolyzed meal		72.8 N SD	Animal	1.00	4.05	3.32	2.15	2.03	2.29	1.60	93.3 19 2.2	92	NA	NA	4.6	NA	NA	NA	NA	3.5		
46	Hydrolyzed meal with some viscera	5-13-540 N SD	80.1	Animal	1.00	4.32	3.58	2.36	2.24	2.47	1.73	91.5	85.0	NA	NA	8.8	NA	NA	NA	NA	5.5		
	FESCUE <i>Festuca sp.</i>		See GRASSES, COOL SEASON																				
47	FISH BYPRODUCTS																						
	Anchovy, meal, mech.	5-01-985 N SD	76.1	Animal	1.00	4.16	3.42	2.22	2.10	2.34	1.65	92.0 67 1.2	71.2	NA	NA	4.6 36 1.6	NA	NA	NA	NA	16.0 47 1.5		
48	Menhaden, meal, mech.	5-02-009 N SD	79.9	Animal	1.00	4.25	3.52	2.33	2.20	2.44	1.70	91.2 135 3.3	68.5 147 4.4	NA	NA	10.4 143 2.0	NA	NA	NA	NA	19.7 113 2.4		
49	GRASSES, COOL SEASON																						
	Pasture, intensively managed	2-02-260 N SD	66.6	Forage	1.00	3.14	2.46	1.54	1.45	1.67	1.06	20.1 13 1.7	26.5 13 5.6	3.9 11 0.4	1.1 1 0.4	2.7 1 7.5	45.8 13 5.8	25.0 13 1.2	2.1 1 1.2	9.8 13 1.2			
50	Hay, all samples	1-02-250 N SD	56.3	Forage	1.00	2.49	1.86	1.12	1.05	1.19	0.63	88.1 4767 1.1	10.6 4702 3.1	3.8 53 1.3	1.1 182 0.5	2.6 542 0.7	64.4 4695 6.2	39.5 4695 4.0	6.4 1010 1.1	7.0 1791 1.5			
51	Hay, immature <55% NDF	1-02-212 N SD	63.1	Forage	1.00	2.88	2.22	1.37	1.29	1.48	0.89	84.0	18.0	3.4	1.3	3.3	49.6	31.4	3.9	9.2			
52	Hay, mid maturity 55-60% NDF	1-02-243 N SD	59.7	Forage	1.00	2.67	2.02	1.23	1.16	1.33	0.75	83.8	13.3	3.9	1.2	2.5	57.7	36.9	4.3	8.8			
53	Hay, mature <60% NDF	1-02-244 N SD	56.0	Forage	1.00	2.48	1.85	1.11	1.04	1.18	0.62	84.4	10.8	7.4	1.1	2.0	69.1	41.6	5.9	7.0			
54	Silage, all samples	3-02-222 N SD	55.7	Forage	1.00	2.49	1.86	1.12	1.05	1.19	0.63	36.5 4377 11	12.8 4401 3.7	3.3 68 1.3	1.5 0.8	3.1 4388 0.9	60.7 4390 7.5	40.3 4390 5.4	6.9 1079 1.8	8.1 988 2.1			
55	Silage, immature <55% NDF	3-02-217 N SD	60.4	Forage	1.00	2.75	2.10	1.29	1.21	1.39	0.81	36.2	16.8	4.3	1.1	2.8	51.0	32.9	4.8	9.9			
56	Silage, mid maturity 55-60% NDF	3-02-218 N SD	56.0	Forage	1.00	2.56	1.92	1.16	1.09	1.25	0.68	42.0	16.8	4.3	1.1	2.4	58.2	35.2	6.8	8.7			
57	Silage, mature >60% NDF	3-02-219 N SD	53.2	Forage	1.00	2.39	1.76	1.05	0.98	1.11	0.55	38.7	12.7	3.2	1.4	3.0	66.6	41.1	7.4	8.0			

(continues)

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TABLE 15-1 (continued)

Entry No.	Feed Name/Description	International Feed No.	TDN-IX %	TDN Equation Class	PAF	DE-IX Mcal/kg	ME-3X Mcal/kg	NEL-3X Mcal/kg	NEL-4X Mcal/kg	NEM-3X Mcal/kg	NEG-3X Mcal/kg	DM %	CP %	NDICP %	ADICP %	Ether Extract %	NDF %	ADF %	Lignin %	Ash %	
GRASS-LEGUME MIXTURES																					
Predominantly grass (17-22% Hemicellulose)																					
58	Hay, immature <51% NDF	1-02-275	62.1	Forage	1.00	2.84	2.18	1.34	1.26	1.45	0.87	84.3	18.4	4.2	1.3	2.4	49.6	31.5	4.0	9.2	
		N										21	21	7	7	21	21	7	21		
		SD										2.3	3.1	0.3	0.5	1.8	2.0	1.0	1.0	1.2	
59	Hay, mid maturity 51-57% NDF	1-02-277	59.5	Forage	1.00	2.71	2.07	1.26	1.19	1.36	0.78	87.3	17.4	4.2	1.4	2.6	55.1	36.4	4.5	9.5	
		N										155	155	52	81	25	155	155	27	155	
		SD										5.3	2.9	0.7	0.3	0.6	1.5	2.1	1.1	1.7	
60	Hay, mature >57% NDF	1-02-280	57.0	Forage	1.00	2.55	1.92	1.16	1.09	1.24	0.67	84.7	13.3	4.4	1.3	2.3	62.5	42.1	5.5	7.9	
		N										149	149	3	68	52	149	149	51	149	
		SD										3.5	3.3	0.1	0.8	0.4	3.6	3.5	1.0	1.4	
61	Silage, immature <51% NDF	3-02-302	60.9	Forage	1.00	2.78	2.13	1.31	1.23	1.42	0.79	47.1	18.0	3.1	1.2	2.9	49.9	31.8	5.0	9.1	
		N										18	18	16	1	18	18	1	18		
		SD										14.7	2.5	0.4	1.0	1.0	1.3			1.3	
62	Silage, mid maturity 51-57% NDF	3-02-265	56.7	Forage	1.00	2.60	1.96	1.19	1.11	1.29	0.73	44.5	17.6	3.1	1.4	2.9	54.5	35.7	6.5	9.5	
		N										95	95	88	6	95	95	6	95		
		SD										12.6	3.0	0.5	0.6	1.6	1.9	0.8	1.6		
63	Silage, mature >57% NDF	3-02-266	53.6	Forage	1.00	2.43	1.80	1.08	1.01	1.15	0.59	38.5	15.4	3.1	1.8	2.6	61.7	42.2	6.9	9.0	
		N										166	166	159	9	166	166	9	166		
		SD										12.6	2.4	0.7	0.4	3.7	3.5	1.0	1.5		
Mixed Grass and Legume (12-15% Hemicellulose)																					
64	Hay, immature <47% NDF	1-02-275	62.1	Forage	1.00	2.86	2.20	1.35	1.27	1.47	0.88	83.1	19.7	3.9	1.3	2.5	45.4	30.8	5.1	8.8	
		N										42	42	19	16	42	42	16	42		
		SD										4.0	1.9	0.3	0.3	1.5	1.6	0.8	0.9		
65	Hay, mid maturity 47-53% NDF	1-02-277	58.8	Forage	1.00	2.70	2.05	1.25	1.17	1.35	0.77	85.3	18.4	4.6	1.5	2.3	50.8	35.8	5.7	9.3	
		N										184	184	5	90	61	184	184	61	184	
		SD										3.6	2.2	0.5	0.3	0.4	1.8	1.9	0.8	1.4	
66	Hay, mature >53% NDF	1-02-280	54.1	Forage	1.00	2.49	1.86	1.12	1.05	1.19	0.63	89.7	18.2	4.4	1.7	2.0	56.0	40.1	7.0	9.9	
		N										233	233	121	179	35	233	233	42	233	
		SD										4.9	2.2	0.7	0.6	0.4	2.4	2.6	1.1	1.6	
67	Silage, immature <47% NDF	3-02-302	59.5	Forage	1.00	2.76	2.10	1.29	1.21	1.39	0.81	45.9	20.3	3.1	1.4	2.3	45.3	30.8	5.8	9.8	
		N										45	45	41	8	45	45	8	45		
		SD										10.3	3.7	0.4	0.3	1.3	1.5	1.4	1.7		
68	Silage, mid maturity 47-53% NDF	3-02-265	57.7	Forage	1.00	2.66	2.01	1.23	1.15	1.32	0.74	44.1	19.1	3.5	1.6	2.5	50.4	35.4	5.9	10.1	
		N										171	171	1	164	29	171	171	30	171	
		SD										12.3	2.3	0.5	0.5	1.8	2.1	1.6	1.5		
69	Silage, mature <47% NDF	3-02-266	53.6	Forage	1.00	2.46	1.83	1.09	1.02	1.16	0.60	42.8	17.4	3.5	2.0	2.3	57.4	42.1	7.1	9.6	
		N										255	255	255	33	255	255	33	255		
		SD										13.5	2.3	0.8	0.3	2.9	2.9	1.0	1.3		
Predominantly Legume (10-13% Hemicellulose)																					
70	Hay, immature <44% NDF	1-02-275	60.7	Forage	1.00	2.81	2.15	1.32	1.24	1.43	0.85	83.8	20.5	2.9	1.5	2.0	41.7	30.5	5.8	9.2	
		N										157	157	120	119	157	157	119	157		
		SD										2.4	2.4	1.2	0.4	1.9	1.8	0.8	1.4		
71	Hay, mid maturity 44-50% NDF	1-02-277	57.8	Forage	1.00	2.66	2.02	1.23	1.15	1.32	0.75	84.2	19.1	3.1	1.6	2.0	47.2	35.4	6.7	9.1	
		N										296	296	210	195	296	296	195	296		
		SD										2.3	2.0	0.3	0.4	1.7	1.8	1.0	1.2		
72	Hay, mature >50% NDF	1-02-280	53.9	Forage	1.00	2.47	1.84	1.10	1.03	1.18	0.61	84.3	17.2	3.6	1.7	1.7	53.6	41.5	8.1	8.7	
		N										134	134	1	85	72	134	134	71	134	
		SD										2.5	2.4	0.5	0.3	3.3	3.5	1.3	1.4		
73	Silage, immature <44% NDF	3-02-302	57.1	Forage	1.00	2.65	2.00	1.22	1.14	1.31	0.74	43.2	20.0	2.8	1.7	2.2	42.2	31.1	6.7	11.5	
		N										193	193	191	165	193	193	165	193		
		SD										9.9	2.2	0.4	0.1	1.9	2.0	1.2	2.1		
74	Silage, mid maturity 44-50% NDF	3-02-265	55.3	Forage	1.00	2.55	1.92	1.16	1.09	1.24	0.67	43.3	19.0	2.7	1.7	2.1	47.0	35.4	7.3	10.8	
		N										505	505	496	314	505	505	314	504		
		SD										9.9	2.3	0.5	0.4	1.7	1.6	1.2	1.6		

(continues)

TABLE 15-1 (continued)

Entry No.	Feed Name/Description	International Feed No.	TDN-IX %	TDN Equation Class	PAF	DE-IX			NEL-3X		NEL-4X		NEM-3X		NEG-3X		Ether Extract			
						Mcal/kg	Mcal/kg	Mcal/kg	DM %	CP %	NDICP %	ADICP %	NDF %	ADF %						
75	Silage, mature >50% NDF	3-02-266	51.8	Forage	1.00	2.39	1.77	1.05	0.99	1.12	0.56	42.9	18.3	2.7	2.0	2.0	53.7	41.6	8.4	10.2
		N										339	339	2	337	87	339	339	92	339
		SD										11.6	2.4	0.5	0.8	0.4	3.0	3.1	1.8	1.8
76	LEGUMES, FORAGE Pasture, intensively managed	2-29-431	66.3	Forage	1.00	3.13	2.46	1.54	1.45	1.66	1.05	21.4 17	26.5 24	3.8 2	1.1 2	3.7 2	33.1 24	23.9 4	5.4 4	10.0 11
		N										6.5	5.6				7.8	6.4	0.9	1.4
77	Hay, all samples	1-20-648	58.9	Forage	1.00	2.73	2.08	1.27	1.19	1.37	0.79	87.8 12292	20.2 12218	2.4 237	1.6 825	2.1 1434	39.6 12178	31.2 12195	7.0 3692	10.0 4527
		N										1.4	2.6	0.9	0.4	0.5	6.3	4.6	0.9	1.2
78	Hay, immature <40% NDF	1-07-792	62.1	Forage	1.00	2.89	2.23	1.38	1.30	1.49	0.90	84.2	22.8	2.7	1.6	2.1	36.3	28.6	5.9	9.5
		N										181	210			210	125	210	50	159
		SD										3.3	2.1			0.3	0.5	2.4	2.6	2.2
79	Hay, mid maturity 40- 46% NDF	1-07-788	59.1	Forage	1.00	2.74	2.09	1.28	1.20	1.38	0.80	83.9	20.8	2.5	1.6	2.0	42.9	33.4	6.4	9.4
		N										268	296			296	214	296	107	262
		SD										3.2	2.3			0.3	0.4	1.2	2.0	1.1
80	Hay, mature >46% NDF	1-07-789	54.7	Forage	1.00	2.51	1.88	1.13	1.06	1.21	0.65	83.8	17.8	2.1	1.7	1.6	50.9	39.5	7.3	9.2
		N										218	237			237	155	237	56	205
		SD										2.9	2.6			0.4	0.4	3.7	3.6	1.1
81	Silage, all samples	3-07-796	56.6	Forage	1.00	2.62	1.98	1.20	1.13	1.29	0.72	39.1 8555	20.0 8576	2.9 255	1.6 8567	3.1 1325	45.7 8567	37.0 8562	8.1 2770	10.4 5183
		N										10.5	3.0	1.1	0.6	0.7	6.5	4.8	1.8	1.7
82	Silage, immature <40% NDF	3-07-795	60.5	Forage	1.00	2.83	2.18	1.34	1.26	1.45	0.86	41.2	23.2	3.4	1.6	2.3	36.7	30.2	6.2	11.1
		N										361	322			189	148	322	93	322
		SD										8.6	2.1			0.3	0.4	2.5	2.7	0.9
83	Silage, mid maturity 40-46% NDF	3-07-797	56.7	Forage	1.00	2.65	2.01	1.22	1.15	1.32	0.74	42.9	21.9	3.1	1.8	2.2	43.2	35.2	7.3	10.8
		N										884	750	2		250	188	750	750	129
		SD										10.0	1.8			0.5	0.3	1.5	2.1	1.5
84	Silage, mature >46% NDF	3-07-798	53.0	Forage	1.00	2.47	1.84	1.10	1.03	1.18	0.62	42.6	20.3	2.9	2.1	2.1	50.0	40.9	8.4	10.3
		N										754	731			121	99	731	731	731
		SD										10.2	1.8			0.6	0.4	3.0	3.1	1.3
85	LINSEED (Flax) meal, solvent	5-30-288	65.4	Conc	1.00	3.19	2.51	1.57	1.48	1.48	1.10	90.3	32.6	7.9	1.1	1.7	36.1	22.1	8.3	6.5
		N										6	6	1	2	2	6	6	1	1
		SD										1.5	4.9			5.7	5.7	3.1		
86	MEAT Meal, rendered	5-09-323	79.6	Animal	1.00	4.05	3.35	2.21	2.10	2.29	1.59	93.9 78	57.6 66	NA	NA	12.7 32	NA	NA	NA	22.9 12
		N										4.0	7.6			3.8				5.6
87	Meat and bone, rendered	5-00-388	61.9	Animal	1.00	3.19	2.54	1.63	1.54	1.71	1.09	94.0 62	54.2 62	NA	NA	10.4 54	NA	NA	NA	30.4 13
		N										4.9	5.6			2.8				7.5
88	MOLASSES Beet sugar	4-00-668	82.9	Conc	1.04	3.60	2.88	1.84	1.73	1.99	1.33	77.9 21	8.5 12	0.0	0.0	0.2 3	0.1 3	0.1 3	0.1 3	11.4 9
		N										1.7	1.1			0.1 0.1				1.3
89	Sugarcane	4-04-696	81.0	Conc	1.04	3.48	2.78	1.76	1.66	1.91	1.28	74.3 84	5.8 64	0.0	0.0	0.2 6	0.4 1	0.4 1	0.2 1	13.3 52
		N										3.3	2.1			0.2				2.3
90	OATS Grain, rolled	4-03-309	78.5	Conc	1.04	3.47	2.78	1.77	1.67	1.90	1.26	90.0 176	13.2 308	1.8	0.3	5.1 145	30.0 120	14.6 173	4.9 6	3.3 104
		N										2.0	1.8			0.9 0.9	10.5 10.5	5.6 5.6	2.5 2.5	0.5 0.5
91	Hay, headed	1-09-099	55.9	Forage	1.00	2.46	1.83	1.10	1.03	1.17	0.61	91.9 433	9.1 422	1.3	0.6	2.2 54	58.0 419	36.4 419	6.5 9	8.5 22
		N										1.2	2.9	0.3	0.4	0.6 0.6	6.3 6.3	4.5 4.5	1.4 1.4	4.0 4.0
92	Silage, headed	3-21-843	56.8	Forage	1.00	2.54	1.91	1.15	1.08	1.23	0.66	34.6 626	12.9 634	2.1	1.0	3.4 53	60.6 632	38.9 631	5.5 135	9.8 182
		N										10.6	1.6	0.4	0.5	0.8 0.8	5.7 5.7	4.2 4.4	1.4 1.4	2.3 2.3
ORCHARDGRASS <i>Dactylis glomerata</i>		see GRASSES, COOL SEASON																		
93	PEANUT Meal, solvent	5-08-605	74.8	Conc	1.00	3.85	3.12	2.00	1.90	2.14	1.48	92.3 55	51.8 51	5.8 2	1.1 2	1.4 25	21.4 15	13.5 15	4.6 1	5.8 11
		N										1.7	4.4			2.6 2.6	5.7 5.7	4.4 4.4		1.5 1.5

(continues)

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TABLE 15-1 (continued)

Entry No.	Feed Name/Description	International Feed No.	TDN-IX %	TDN-Equation Class	PAF	DE-IX Mcal/kg	ME-3X Mcal/kg	NEL-3X Mcal/kg	NEL-4X Mcal/kg	NEM-3X Mcal/kg	NEG-3X Mcal/kg	DM %	CP %	NDICP %	ADICP %	Ether Extract %	NDF %	ADF %	Lignin %	Ash %
94	POTATO Byproduct meal	4-03-775	80.7	Conc	1.00	3.51	2.84	1.85	1.75	1.94	1.30	35.4 79 23.1	10.5 79 8.4	5.2 2	2.3 2	10.8 28 7.8	22.1 79 14.3	16.5 79 11.0	2.3 2 2.2	12.8 7.4
95	RICE Bran	4-03-928	84.8	Conc	1.00	3.76	3.09	2.05	1.94	2.10	1.43	90.6 72 1.3	15.5 86 2.2	3.7 11 1.7	0.4 3 0.1	15.2 77 4.2	26.1 59 6.8	13.1 51 4.3	4.6 30 1.4	10.4 69 1.9
96	RYE, ANNUAL Silage, vegetative	3-21-853	60.0	Forage	1.00	2.72	2.08	1.28	1.20	1.37	0.79	29.7 787 8.8	16.1 1175 3.1	1.9 31 1.4	0.9 504 0.4	3.8 63 1.2	57.8 1174 6.3	34.9 1173 4.9	4.5 169 1.6	9.6 844 3.9
	RYEGRASS <i>Lolium sp.</i>	see GRASSES, COOL SEASON																		
97	SAFFLOWER Meal, solvent	5-04-110	52.5	Conc	1.00	2.60	1.96	1.19	1.11	1.27	0.70	93.5 5 0.3	29.0 5 0.2	2.0 1 1	1.2 1 1	2.4 3 2.9	53.8 5 1.6	39.1 5 1	14.5 1 1	4.7 1 1
98	SORGHUM, GRAIN TYPE Grain, dry rolled	4-04-380	80.6	Conc	0.92	3.53	2.83	1.80	1.70	1.95	1.30	88.6 438 3.4	11.6 437 1.8	2.8 2 1.8	1.0 2 0.8	3.1 90 0.8	10.9 61 5.0	5.9 62 2.7	1.1 2 0.6	2.0 74 0.6
99	Grain, steam-flaked	4-04-380	89.4	Conc	1.04	3.91	3.17	2.04	1.93	2.20	1.51	88.6 28.8 1160	11.6 9.1 1168	2.8 2.4 18	1.0 1.2 581	3.1 2.9 78	10.9 60.7 864	5.9 38.7 1162	1.1 2.0 144	2.0 2.0 181
100	Silage	3-22-371	56.7	Forage	1.00	2.48	1.85	1.11	1.04	1.18	0.62	28.8 1160 10.7	9.1 1168 2.6	2.4 1.2 1.0	1.2 1.2 0.6	3.6 2.9 0.7	63.3 60.7 8.2	40.7 38.7 5.9	5.9 6.5 1.4	10.9 7.5 2.9
101	SORGHUM, SUDAN TYPE Hay	1-04-480	54.4	Forage	1.00	2.39	1.77	1.05	0.98	1.11	0.56	86.5 487 1.2	9.4 726 2.2	2.8 2 0.5	1.2 1 0.6	2.3 48 0.6	64.8 717 5.2	40.0 717 4.1	6.0 130 1.3	8.7 172 2.2
102	Silage	3-04-499	54.4	Forage	1.00	2.41	1.79	1.07	1.00	1.13	0.57	28.8 438 9.2	10.8 140 3.2	2.4 1 0.4	1.2 1.2 0.4	3.6 14 1.0	63.3 139 7.2	40.7 139 5.1	5.9 32 1.5	10.9 37 3.2
103	SOYBEAN Hulls	1-04-560	67.3	Conc	1.00	3.01	2.34	1.46	1.37	1.58	0.98	90.9 130 1.9	13.9 138 4.6	3.5 18 0.5	1.0 16 0.3	2.7 77 1.4	60.3 88 7.4	44.6 87 5.1	2.5 24 2.5	4.8 45 0.7
104	Meal, expellers, 45% CP	5-12-820	88.5	Conc	1.00	4.35	3.61	2.38	2.25	2.49	1.76	89.6 546 2.5	46.3 546 3.2	9.6 16 5.9	0.4 3 0.1	8.1 473 3.2	21.7 70 8.0	40.0 70 2.8	6.0 16 0.8	8.7 20 0.9
105	Meal, nonenzymatically browned		82.9	Conc	1.00	4.17	3.41	2.21	2.09	2.37	1.66	89.0 2 0.1	50.0 14 1.6	27.0 2 4.9	1.6 0.8 0.8	2.3 8 0.3	29.7 14 6.2	9.5 14 1.9	3.7 2 0.6	6.8 8 0.6
106	Meal, solvent, 44% CP	5-20-637	80.0	Conc	1.00	4.05	3.31	2.13	2.02	2.29	1.59	89.1 11 1.2	49.9 111 1.2	0.7 44 0.2	0.4 0.4 0.2	1.6 87 0.7	14.9 2 1.3	10.0 3 0.1	0.7 66 0.6	6.6 66 0.6
107	Meal, solvent, 48% CP	5-20-638	81.4	Conc	1.00	4.16	3.41	2.21	2.09	2.37	1.66	89.5 561 1.9	53.8 549 2.1	0.7 21 0.2	0.4 0.4 0.2	1.1 41 0.4	9.8 248 5.6	6.2 248 3.0	0.5 8 0.5	6.4 119 0.7
108	Seeds, whole	5-04-610	101.0	Conc	1.00	4.77	4.05	2.75	2.62	2.76	1.97	90.0 51 6.7	39.2 48 5.4	2.3 2 0.3	0.6 3 0.3	19.2 12 4.5	19.5 27 9.2	13.1 27 7.0	1.2 1 0.4	5.9 5.9 0.4
109	Seeds, whole roasted	5-04-597	98.8	Conc	1.00	4.72	4.00	2.72	2.58	2.73	1.95	91.0 413 2.8	43.0 410 3.8	6.1 4 4.8	2.0 4 0.9	19.0 52 4.4	22.1 128 6.0	14.7 128 3.3	3.1 1.5 1.5	5.0 32 0.5
110	Silage, early maturity	3-04-579	59.9	Forage	1.00	2.73	2.09	1.29	1.21	1.37	0.79	40.4 18 17.6	17.4 20 5.1	2.5 17 0.7	1.4 17 0.7	5.7 2 6.0	46.6 20 4.0	36.9 20 0.5	6.5 3 0.5	12.2 3 1.5
111	SUNFLOWER Meal, solvent	5-30-032	59.9	Conc	1.00	2.90	2.24	1.38	1.30	1.49	0.92	92.2 47 1.4	28.4 48 5.0	5.5 3 0.4	1.4 3 2.3	40.3 36 2.3	30.0 16 6.6	9.5 16 6.4	7.7 20 0.4	
112	Oil seeds, whole	5-08-530	122.3	Conc	1.00	5.37	4.71	3.38	3.22	3.13	2.27	91.8 13 2.5	19.2 15 4.2	2.9 1 0.4	1.9 1 0.4	40.3 4 3.5	24.0 1 3.5	16.7 2 3.5	6.0 20 4.0	5.1 3 1.5
	TIMOTHY <i>Phleum pratense</i>	See GRASSES, COOL SEASON																		
	TREFOIL, BIRDSFOOT <i>Lotus corniculatus</i>	See LEGUMES, FORAGE																		

(continues)

TABLE 15-1 (*continued*)

Entry No.	Feed Name/Description	International Feed No.	TDN-IX %	TDN-Equation Class	PAF	ME-3X		NEL-3X		NEL-4X		NEM-3X		NEG-3X		Ether Extract		NDF %	ADF %	Lignin %	Ash %
						Mcal/kg	Mcal/kg	DM %	CP %	NDICP %	ADICP %										
113	TOMATO Pomace	5-05-042	65.5	Conc	1.00	2.99	2.37	1.52	1.43	1.56	0.96	24.7 4 20.1	19.3 22 4.8	8.0 1 0.1	3.8 2 0.1	13.3 4 4.9	60.0 4 5.8	47.6 4 2.8	13.3 3 10.8	5.5 3 1.9	
114	TRITICALE Silage, headed	3-26-208	57.2	Forage	1.00	2.57	1.94	1.18	1.10	1.25	0.69	32.0 107 10.9	13.8 107 4.0	2.2 2 0.8	1.0 86 0.8	3.8 16 0.6	59.7 107 8.3	39.6 107 5.7	5.8 18 3.4	9.7 41 3.8	
115	WHEAT Bran	4-05-190	71.5	Conc	1.00	3.23	2.55	1.61	1.52	1.74	1.12	89.1 103 1.3	17.3 81 1.1	2.8 8 0.3	1.4 64 0.8	4.3 22 8.4	42.5 22 5.5	15.5 21 1.6	3.0 43 1.6	6.3	
116	Grain, rolled	4-13-245	86.6	Conc	1.04	3.83	3.10	1.99	1.88	2.15	1.47	89.4 215 2.6	14.2 165 2.3	1.7 5 0.7	0.2 5 0.1	2.3 55 1.1	13.4 61 6.2	4.4 91 3.6	1.7 2 0.3	2.0 39 0.3	
117	Hay, headed	1-05-170	52.7	Forage	1.00	2.33	1.71	1.01	0.94	1.06	0.51	86.8 121 1.5	9.4 120 3.8	1.1 7 0.2	0.8 17 0.1	1.7 9 0.4	61.1 116 9.7	38.1 116 7.3	8.7 5 2.6	6.7 10 1.5	
118	Middlings	4-05-205	73.3	Conc	1.00	3.33	2.64	1.67	1.58	1.80	1.18	89.5 293 1.4	18.5 245 2.1	2.8 26 0.4	0.5 30 0.1	4.5 211 1.3	36.7 146 7.5	12.1 158 2.7	4.2 34 0.6	5.0 87 0.8	
119	Silage, early head	3-21-865	57.2	Forage	1.00	2.55	1.91	1.16	1.08	1.24	0.67	33.3 459 8.9	12.0 471 3.0	1.5 30 0.8	1.0 397 0.4	3.2 46 1.1	59.9 471 7.4	37.6 470 4.9	5.8 121 1.5	8.6 211 2.6	
120	Straw	1-05-175	47.5	Forage	1.00	2.04	1.44	0.82	0.76	0.83	0.29	92.7 131 1.9	4.8 161 1.9	2.1 8 0.2	1.4 8 0.3	1.6 37 0.6	73.0 107 7.1	49.4 109 6.4	8.8 9 0.9	7.6 64 2.8	
121	WHEY Wet, cattle	4-08-134	80.3	Animal	1.00	3.63	2.92	1.86	1.76	1.96	1.41	20.8 73 26.2	14.6 68 14.1	NA NA	NA NA	0.7 62 0.9	NA NA	NA NA	NA NA	9.8 16 2.7	

TABLE 15-2a. Nitrogen Fractions, RUP Digestibility, and Amino Acids of Feedstuffs

11	BEET, SUGAR Pulp, dried	4-00-669	Conc	10.0 N SD	5.5 18 1.1	0.6 5 0.3	4.5 2 4.6	90.5 2 4.6	5.0 1 1.8	2.0 2	66.2	76.3	80	3.23 11 0.96	2.54 11 0.36	3.18 11 0.24	5.10 11 0.46	4.35 11 0.59	1.24 11 0.19	1.10 11 0.19	2.93 11 0.20	3.38 11 0.39	0.81 11 0.09	4.70 11 0.50	31.46	13.83	3.94	
12	BERMUDAGRASS (<i>Cynodon dactylon</i>) Coastal, hay, early head	1-20-900	Dry	10.4	4.0	0.9	36.7	51.7	11.6	8.1	27.6	29.8	65	3.88	1.63	3.32	6.22	3.49	1.30	1.16	3.92	3.60	1.24	4.51	33.05	10.53	3.93	
13	Tifton-85, hay, 3-4 wk growth	IFN	Dry	13.7	5.3	1.2	36.7	51.7	11.6	8.1	27.4	29.6	65	3.88	1.63	3.32	6.22	3.49	1.30	1.16	3.92	3.60	1.24	4.51	33.05	10.53	3.93	
14	BLOOD Meal, ring dried	5-00-380	Conc	95.5 N SD	NA 84 8.3	NA	10.1 8 8.5	60.9 8 39.7	29.0 5 33.3	1.9 8 2.3	70.9	77.5	80	4.38 53 0.23	6.36 53 0.35	1.26 53 0.20	12.82 53 0.38	8.98 53 0.34	1.17 53 0.15	1.28 53 0.16	6.85 53 0.31	4.34 53 0.36	1.59 53 0.13	8.68 53 0.33	56.43	15.91	2.07	
15	Meal, batch dried (CP and amino acids from blood meal, ring dried)		Conc	95.5	NA	NA	10.1	60.9	29.0	1.9	70.9	77.5	65	4.38	6.36	1.26	12.82	8.98	1.17	1.28	6.85	4.34	1.59	8.68	56.43	15.91	2.07	
16	BREWERS GRAINS Dried	5-12-024	Conc	29.2 N SD	9.1 688 4.0	3.5 32 3.7	18.3 30 0.9	64.6 14 7.9	17.1 14 13.8	4.7 14 10.3	47.5	56.6	80	5.77	2.00	3.85	7.85	4.08	1.70	1.85	4.60	3.58	0.98	4.75	39.16	10.42	4.34	
17	Wet (Trp from brewers grains, dried)	5-00-517	Conc	28.4	9.3	2.9	48.3	42.5	9.2	4.6	29.4	35.4	85	4.47	2.25	3.85	9.61	3.40	1.93	1.96	5.57	3.61	0.98	5.14	40.81	8.33	4.66	
18	CANOLA Seeds, ground (Amino acids from canola meal)	5-08-109	Conc	20.5	3.4	1.3	35.2	59.5	5.3	20.1	15.5	21.3	50	7.01	2.80	3.83	6.77	5.62	1.87	2.54	4.06	4.42	1.46	4.73	42.56	13.20	4.39	
		N SD		1			2 4.4	2 0.6	1	2 1.7																		
19	Meal, mech. extracted	5-03-870	Conc	37.8	6.3	2.4	23.2	70.4	6.4	10.4	26.6	35.7	75	7.01	2.80	3.83	6.77	5.62	1.87	2.54	4.06	4.42	1.46	4.73	42.56	13.20	4.39	
		N SD		230 1.1	16 2.5	19 0.7	22 5.8	22 7.0	22 5.4	22 3.7				58 0.46	58 0.25	58 0.12	58 0.32	58 0.28	58 0.10	58 0.19	58 0.33	58 0.18	58 0.12	58 0.18				
20	CHOCOLATE Byproduct (N fractions and Kd from molasses, beet sugar)		Conc	11.9	0	0	74.1	25.9	0.0	3.2	14.7	18.1	90	2.25	1.57	3.60	6.52	2.25	1.57	0.90	3.82	3.82	0.67	5.84	31.91	7.05	4.92	
		N SD		21 7.2	1									1	1	1	1	1	1	1	1	1	1	1	1	1	1	
21	CITRUS Pulp dried	4-01-237	Conc	6.9 N SD	0.4 3 0.6	0.3 3 0.3	41.7 1 0.1	53.3 1 1	5.0 1	7.4 1	24.2	31.7	80	3.39 15 0.29	1.88 15 0.41	2.79 15 0.18	5.01 15 0.22	2.56 15 0.28	1.03 15 0.09	1.38 15 0.27	3.63 15 0.38	2.91 15 0.11	0.76 15 0.10	3.78	27.74	9.23	3.71	
22	CORN, YELLOW Cobs	1-28-234	Conc	3.0 N SD	1.7 1 0.3	0.8 1 12.9	45.0 2 7.9	49.4 2 0.6	5.6 2 2.9	2.8 2 0.7	35.2	41.5	60	4.00 1 1	2.94 1 1	3.50 1 1	12.66 1 1	2.78 1 1	2.50 1 1	2.12 1 1	4.72 1 1	3.59 1 1	0.69 1 1	4.78	42.16	6.59	5.93	
23	Distillers grains with solubles, dried	5-28-236	Conc	29.7	8.6	5.0	28.5	63.3	8.2	3.6	42.2	50.8	80	4.06	2.50	3.71	9.59	2.24	1.82	1.86	4.87	3.44	0.87	4.70	37.80	5.93	4.81	
		N SD		879 3.3	37 3.4	3	392 2.6	3	3	3	3			12 0.28	12 0.21	12 0.13	12 2.80	12 0.39	12 0.21	12 0.13	12 0.37	12 0.34	12 0.16	12 0.27				
24	Gluten feed, dried	5-28-243	Conc	23.8 N SD	3.6 9 5.7	1.4 22 1.5	48.0 7 2.0	43.2 7 8.5	8.8 7 9.8	7.7 7 3.5	24.0	30.0	85	3.85 11 0.7	2.93 11 0.23	3.10 11 0.17	8.98 11 0.57	2.74 11 0.27	1.61 11 0.1	2.13 11 0.21	3.68 11 0.26	3.48 11 0.15	0.56 11 0.07	4.46 11 0.13	35.39	7.74	4.55	

(continues)

TABLE 15-2a. (*continued*)

36	Silage, mature >40% DM (Amino acids from normal corn silage)	3-28-249	Wet	8.5	1.3	0.9	48.8	27.6	23.6	3.2	39.3	41.1	70	1.97	1.79	3.34	8.59	2.51	1.53	1.34	3.83	3.19	0.44	4.47	31.64	7.93	4.84
		N SD		705 3.9		41 0.2	5 11.5	5 6.2	5 5.9	5 1.2																	
37	COTTON SEED Whole seeds with lint	5-01-614	Conc	23.5	2.4	1.9	45.4	46.7	7.9	15.7	17.7	22.9	80	11.52	3.11	3.20	5.88	4.35	1.71	1.76	5.30	3.46	1.27	4.70	44.51	9.77	3.84
		N SD		1124 2.6	71 1.2	4 0.1	4 5	4 7.9	4 4.0	4 6.9					79 2.21	79 0.70	79 0.34	79 0.90	79 0.48	79 0.26	79 0.23	79 0.63	79 0.91	79 0.53	79 0.52		
38	Hulls (N fractions and Kd from canola hulls)	1-01-599	Conc	6.2	3.0	1.1	29.6	35.4	35.0	5.3	50.6	55.7	50	11.42	3.32	3.39	7.22	4.66	1.83	1.62	5.63	3.81	1.42	5.00	47.68	9.77	3.84
		N SD		134 3.6	10 0.3	1								3 1.57	3 0.21	3 0.14	3 0.56	3 0.61	3 0.10	3 0.17	3 0.29	3 0.20	3 0.15	3 0.21			
39	Meal, solvent, 41% CP	5-01-630	Conc	44.9	3.3	1.8	25.6	55.5	18.9	6.8	40.0	47.9	92	11.05	2.82	3.09	5.89	4.13	1.59	1.68	5.31	3.23	1.21	4.24	42.55	9.71	3.74
		N SD		158 4.1	7 0.9	8 0.5	14 6.1	14 16.5	14 15.9	14 2.8					50 0.73	50 0.20	50 0.20	50 0.25	50 0.29	50 0.10	50 0.23	50 0.14	50 0.15	50 0.06	50 0.31		
40	FATS AND OILS Calcium soaps	IFN N SD	Conc	0	0	0	0	0	0	0			0														
41	Hydrolyzed Tallow	IFN N SD	Conc	0	0	0	0	0	0	0			0														
42	Partially hydrogenated tallow	IFN N SD	Conc	0	0	0	0	0	0	0			0														
43	Tallow	IFN N SD	Conc	0	0	0	0	0	0	0			0														
44	Vegetable oil	4-05-077 N SD	Conc	0	0	0	0	0	0	0			0														
45	FEATHERS Hydrolyzed meal	N SD	Conc	92.0	NA	NA	23.4	23.7	52.9	6.6	62.1	65.4	65	6.93 156	1.15 156	4.85 156	8.51 156	2.57 156	0.75 156	5.09 156	4.93 156	4.73 156	0.73 156	7.52 156	42.68	6.02	1.76
46	Hydrolyzed meal with some viscera (N fractions and Kd from feather meal)	5-13-540 N SD	Conc	85.0	NA	NA	23.4	23.7	52.9	6.6	62.1	65.4	70	6.27 0.62	1.33 0.02	4.34 0.27	8.44 0.39	2.90 0.35	0.84 0.07	4.34 0.71	4.83 0.19	4.70 0.25	0.73 0.14	6.76 0.40	41.14	7.05	2.04
47	FISH BYPRODUCTS Anchovy, meal, mech.	5-01-985 N SD	Conc	71.2	NA	NA	32.4	37.9	29.7	3.2	51.2	56.2	90	5.70 11.3	2.41 19.8	4.74 17.5	7.74 2.0	7.91 2.81	3.02 0.91	0.94 3.99	4.12 4.20	4.37 0.91	1.18 3.92	5.43 4.20	46.62 4.05	16.97 3.82	6.48 6.32
48	Menhaden, meal, mech.	5-02-009 N SD	Conc	68.5	NA	NA	22.8	72.0	5.2	1.4	59.1	65.8	90	5.82 8.0	2.83 19.1	4.09 11.8	7.22 0.4	7.65 1.3	2.81 0.91	0.91 3.99	4.20 4.20	1.05 1.05	4.82 4.82	44.48 44.48	17.20 17.20	6.32 6.32	
49	GRASSES, COOL SEASON Pasture, intensively managed	2-02-260 N SD	Wet	26.5	3.9	1.1	30.7	63.5	5.8	12.3	22.2	25.5	75	4.28 11.3	1.88 17.8	3.38 3.4	6.22 4.5	3.46 3.46	1.37 1.37	0.93 0.93	4.60 4.60	3.56 3.56	1.33 1.33	4.41 4.41	34.49 34.49	10.03 10.03	3.97 3.97
50	Hay, all samples	1-02-250 N SD	Dry	10.6 4702	3.8 53	1.1 182	36.7	50.4	12.9	8.5	28.4	30.5	65	3.83 3.1	1.63 1.3	3.32 0.5	6.22 1.3	3.48 1.3	1.30 1.17	1.17 3.92	3.60 3.60	1.24 1.24	4.51 4.51	33.05 33.05	10.53 10.53	3.93 3.93	

(continues)

TABLE 15-2a. (*continued*)

63	Silage, mature >57% NDF	3-02-266	Wet	15.4	3.1	1.8	49.2	36.4	14.4	5.5	30.5	32.7	55	3.26	1.67	3.68	6.27	3.59	1.27	0.77	4.32	3.52	1.04	4.94	33.56	10.70	3.78	
		N		166		159																						
		SD		2.4		0.7																						
	Mixed grass and legume (12-15% Hemicellulose)																											
64	Hay, immature <47% NDF	1-02-275	Dry	19.7	3.9	1.3	43.8	48.8	7.4	15.1	17.9	19.4	75	4.50	1.79	3.79	6.81	4.31	1.43	1.30	4.34	4.00	1.38	4.89	37.24	11.57	3.84	
		N		42		19																						
		SD		1.9		0.3																						
65	Hay, mid-maturity 47-53% NDF	1-02-277	Dry	18.4	4.6	1.5	40.5	49.3	10.2	13.0	21.8	23.5	70	4.51	1.79	3.78	6.79	4.29	1.43	1.29	4.34	3.99	1.37	4.88	37.17	11.54	3.85	
		N		184		5		90																				
		SD		2.2		0.5		0.3																				
66	Hay, mature >53% NDF	1-02-280	Dry	18.2	4.4	1.7	33.6	51.3	15.1	9.5	30.1	32.0	65	4.47	1.79	3.75	6.76	4.25	1.43	1.30	4.34	3.98	1.36	4.86	36.99	11.49	3.87	
		N		233		121		179																				
		SD		2.2		0.7		0.6																				
67	Silage, immature <47% NDF	3-02-302	Wet	20.3	3.1	1.4	60.9	30.4	8.7	10.6	17.5	19.2	70	3.47	1.68	3.76	6.24	3.85	1.29	0.79	4.28	3.59	1.01	4.95	34.12	11.28	3.78	
		N		45		41																						
		SD		3.7		0.4																						
68	Silage, mid-maturity 47-53% NDF	3-02-265	Wet	19.1	3.5	1.6	58.9	33.2	8.0	8.5	19.1	21.0	65	3.47	1.68	3.76	6.24	3.85	1.29	0.79	4.28	3.59	1.01	4.95	34.12	11.28	3.78	
		N		171		1		164																				
		SD		2.3		0.5																						
69	Silage, mature >53% NDF	3-02-266	Wet	17.4	3.5	2.0	50.4	35.7	13.9	6.3	28.3	30.6	60	3.47	1.68	3.76	6.30	3.83	1.30	0.78	4.28	3.62	1.02	4.97	34.23	11.19	3.80	
		N		255		255																						
		SD		2.3		0.8																						
	Predominantly Legume (10-13.5% Hemicellulose)																											
70	Hay, immature <44% NDF	1-02-275	Dry	20.5	2.9	1.5	43.1	49.9	7.0	16.5	17.0	18.5	75	4.83	1.87	4.03	7.10	4.72	1.50	1.36	4.55	4.19	1.45	5.07	39.31	12.01	3.82	
		N		157		120																						
		SD		2.4		1.2																						
71	Hay, mid-maturity 44-50% NDF	1-02-277	Dry	19.1	3.1	1.6	42.4	48.1	9.5	15.5	19.5	21.0	70	4.83	1.87	4.00	7.08	4.69	1.50	1.36	4.55	4.19	1.44	5.06	39.21	11.96	3.83	
		N		296		210																						
		SD		2.0		0.3																						
72	Hay, mature >50% NDF	1-02-280	Dry	17.2	3.6	1.7	36.3	50.4	13.3	11.8	26.0	27.8	65	4.79	1.87	3.97	7.03	4.63	1.49	1.37	4.55	4.16	1.41	5.03	38.93	11.89	3.83	
		N		134		1		85																				
		SD		2.4		0.5																						
73	Silage, immature <44% NDF	3-02-302	Wet	20.0	2.8	1.7	61.2	29.8	9.0	11.9	16.9	18.4	70	3.67	1.68	3.69	6.03	4.18	1.33	0.78	4.23	3.71	0.97	4.97	34.46	12.13	3.86	
		N		193		191																						
		SD		2.2		0.4																						
74	Silage, mid-maturity 44-50% NDF	3-02-265	Wet	19.0	2.7	1.7	58.1	34.2	7.7	10.4	17.7	19.6	65	3.67	1.68	3.86	6.30	4.13	1.33	0.79	4.23	3.71	0.97	4.97	34.85	11.85	3.82	
		N		505		496																						
		SD		2.3		0.5																						
75	Silage, mature >50% NDF	3-02-266	Wet	18.3	2.7	2.0	51.6	35.1	13.3	7.2	26.4	28.6	60	3.67	1.68	3.84	6.34	4.06	1.34	0.78	4.23	3.72	0.99	4.99	34.86	11.65	3.84	
		N		339		2		337																				
		SD		2.4		0.5		0.8																				
	LEGUMES, FORAGE																											
76	Pasture, intensively managed	2-29-431	Wet	26.5	3.8	1.1	31.1	61.6	7.3	12.3	23.2	26.4	75	5.21	1.97	4.30	7.46	5.18	1.58	1.44	4.81	4.44	1.54	5.31	41.80	12.39	3.78	
		N		24		2		8		8																		
		SD		5.6				16.5		15.5		2.1																
77	Hay, all samples	1-20-648	Dry	20.2	2.4	1.6	41.9	49.2	8.9	16.6	18.8	20.2	70	5.14	1.95	4.22	7.35	5.08	1.56	1.42	4.78	4.37	1.50	5.23	41.18	12.34	3.79	
		N		12218		237		825																				
		SD		2.6		0.9		0.4																				

(continues)

TABLE 15-2a. (*continued*)

	OATS																										
90	Grain, rolled	4-03-309	Conc	13.2	1.8	0.3	65.2	28.8	6.0	17.4	11.6	14.6	75	6.82	2.44	3.75	7.30	4.18	1.71	2.85	5.16	3.46	1.19	5.19	41.20	10.15	4.15
	N	308		2	4	2	4	2	4	14.8				18	18	18	18	18	18	18	18	18	18	18	18		
	SD			1.8			27.3	28.3	2.4					0.44	0.25	0.22	0.34	0.25	0.09	0.18	0.22	0.13	0.09	0.41			
91	Hay, headed (Amino acids from oat silage, headed)	1-09-099	Dry	9.1	1.3	0.6	35.0	53.1	11.9	4.3	37.1	39.5	70	2.18	1.94	5.50	6.65	3.56	1.87	0.74	4.70	4.13	1.42	4.13	36.09	9.86	5.18
	N	422		7	8																						
	SD	2.9		0.3	0.4																						
92	Silage, headed	3-21-843	Wet	12.9	2.1	1.0	45.6	30.9	23.5	5.4	37.2	39.1	65	2.18	1.94	5.50	6.65	3.56	1.87	0.74	4.70	4.13	1.42	4.13	36.09	9.86	5.18
	N	634		5	630	2	2	2	2	2				3	3	3	3	3	3	3	3	3	3	3			
	SD	1.6		0.4	0.5	0.8	11.6	12.2	3.4					0.28	0.21	0.30	0.43	0.34	0.25	0.06	0.46	0.24	0.15	0.26			
93	PEANUT																										
	Meal, solvent	5-08-605	Conc	51.8	5.8	1.1	61.7	36.6	1.7	16.1	9.2	13.2	90	11.07	2.42	3.27	6.40	3.34	1.17	1.38	4.85	2.69	0.98	3.94	40.13	8.32	2.92
	N	51		2	2	2	2	2	2	2				22	22	22	22	22	22	22	22	22	22	22			
	SD	4.4					26.4	29.2	2.4	4.4				0.44	0.15	0.11	0.14	0.25	0.10	0.10	0.22	0.10	0.08	0.18			
94	POTATO																										
	Byproduct meal (N fractions and Kd from beet pulp)	4-03-775	Conc	10.5	5.2	2.3	4.5	90.5	5.0	2.0	66.2	76.3	90	2.47	1.84	3.14	5.34	4.21	0.95	1.34	3.62	3.11	0.67	4.40	29.75	14.15	3.19
	N	79		2	2									3	3	3	3	3	3	3	3	3	3	3			
	SD	8.4												0.30	0.20	0.13	0.25	0.73	0.08	0.19	0.14	0.26	0.04	0.19			
95	RICE																										
	Bran	4-03-928	Conc	15.5	3.7	0.4	32.6	49.0	18.4	5.0	40.7	47.7	65	7.80	2.78	3.42	7.10	4.65	2.05	2.23	4.76	3.87	1.17	5.24	42.84	10.85	4.79
	N	86		11	3	1	1	1	1	1				14	14	14	14	14	14	14	14	14	14	14			
	SD	2.2		1.7	0.1									0.33	0.07	0.19	0.32	0.18	0.12	0.11	0.39	0.15	0.03	0.24			
96	RYE, ANNUAL																										
	Silage, vegetative (N fractions and Kd from barley silage)	3-21-853	Wet	16.1	1.9	0.9	56.6	33.0	10.4	5.9	24.3	26.3	65	1.04	1.21	3.45	4.88	2.35	1.16	0.66	3.42	2.51	0.60	4.80	25.42	9.24	4.56
	N	1175		31	31	504								10	10	10	10	10	10	10	10	10	10	10			
	SD	3.1		1.4	0.4									0.13	0.23	0.78	2.53	1.23	0.15	0.01	0.80	0.37		1.21			
97	SAFFLOWER																										
	Meal, solvent (N fractions and Kd from canola meal)	5-04-110	Conc	29.0	2.0	1.2	23.2	70.4	6.4	10.4	26.6	35.7	75	8.72	2.52	2.86	6.50	3.16	1.45	1.62	4.57	2.78	1.41	5.04	39.01	8.10	3.72
	N	5		1	1																						
	SD	0.2																									
	SORGHUM, GRAIN																										
98	TYPE																										
	Grain, dry rolled	4-04-380	Conc	11.6	2.8	1.0	18.9	79.4	1.7	5.5	36.0	47.3	85	4.09	2.44	3.94	13.06	2.38	1.81	1.88	5.25	3.37	1.09	4.95	42.38	5.62	4.27
	N	437		2	2	2	2	2	1	2				115	115	115	115	115	115	115	115	115	115	115			
	SD	1.8					6.4	7.6		0.7				0.32	0.17	0.19	0.69	0.24	0.15	0.18	0.32	0.12	0.06	0.27			
99	Grain, steam-flaked (Amino acid data from sorghum grain)	4-04-380	Conc	11.6	2.8	1.0	33.2	21.9	44.9	2.5	58.6	61.3	85	4.09	2.44	3.94	13.06	2.38	1.81	1.88	5.25	3.37	1.09	4.95	42.38	5.62	4.27
100	Silage (N fractions and Kd from corn silage, normal)	3-22-371	Wet	9.1	2.4	1.2	42.4	37.3	20.3	4.1	39.4	41.7	70	4.07	2.47	3.91	13.04	2.64	1.93	0.64	5.24	3.59	1.16	5.00	43.04	6.13	4.48
	N	1168		18	1.0	581	0.6							4	4	4	4	4	4	4	4	4	4	4			
	SD	2.6												0.80	0.43	0.25	0.94	0.36	0.01	0.09	0.49	0.30	0.11	0.38			
101	SORGHUM, SUDAN																										
	TYPE																										
	Hay (Data from grass hay, mature)	1-04-480	Dry	9.4	2.8	1.2	28.4	52.9	18.7	5.0	41.4	43.9	60	3.83	1.63	3.32	6.22	3.48	1.30	1.17	3.92	3.60	1.24	4.51	33.05	10.53	3.93
	N	726		7	2.2	0.5																					
	SD																										
102	Silage (Amino acids from grass silage, mature)	3-04-499	Wet	10.8	2.4	1.2	37.6	29.7	32.7	3.7	48.6	50.5	55	3.06	1.66	3.60	6.23	3.35	1.23	0.77	4.37	3.42	1.07	4.91	32.90	10.18	3.74
	N	140		1	138	0.4	1	1	1	1																	
	SD	3.2																									

(continues)

TABLE 15-2a. (*continued*)

114	TRITICALE Silage, headed (N fractions and Kd from barley silage)	3-26-208	Wet	13.8	2.2	1.0	56.6	32.9	10.5	5.9	24.3	26.4	65	3.84	2.53	3.04	5.86	1.83	1.31	1.43	4.78	2.14	1.03	3.68	31.47	5.82	4.16
		N		107	2	86								3	3	3	3	3	3	3	3	3	3	3	3	3	
		SD		4.0		0.8								0.45	0.33	0.22	0.08	0.19	0.11	0.11	0.47	0.16		0.36			
115	WHEAT Bran	4-05-190	Conc	17.3	2.8	1.4	33.7	62.5	3.8	20.0	14.6	20.7	75	6.84	2.82	3.15	6.16	4.05	1.57	2.10	3.97	3.26	1.37	4.50	37.68	10.75	4.17
		N		81		8	4	4	3	4			75	75	75	75	75	75	75	75	75	75	75	75	75		
		SD		1.1		0.3	13.1	15.3	2.3	8.1			0.34	0.19	0.13	0.19	0.24	0.09	0.15	0.21	0.13	0.15	0.24				
116	Grain, rolled	4-13-245	Conc	14.2	1.7	0.2	27.1	65.1	7.8	18.8	19.6	26.2	95	4.69	2.43	3.32	6.64	2.81	1.60	2.20	4.59	2.90	1.19	4.24	34.42	8.16	4.65
		N		165	5	5	6	6	6	6			278	278	278	278	278	278	278	278	278	278	278	278	278		
		SD		2.3	0.7	0.1	18.6	28.2	16.2	8.5			0.47	0.18	0.15	0.27	0.30	0.10	0.15	0.23	0.13	0.10	0.27				
117	Hay, headed (N fractions and Kd from oat hay; amino acids from wheat silage)	1-05-170	Dry	9.4	1.1	0.8	35	53.1	11.9	4.3	36.9	39.4	70	2.02	3.60	4.01	6.64	4.21	1.77	0.61	4.24	4.21	1.03	5.80	37.51	11.22	4.72
		N		120	7	17																					
		SD		3.8	0.2	0.1																					
118	Middlings	4-05-205	Conc	18.5	2.8	0.5	40.3	53.6	6.1	15.2	17.7	23.7	90	5.86	2.75	3.44	6.65	3.63	1.60	2.04	4.43	3.11	1.28	4.63	37.38	9.71	4.28
		N		245	26	30	4	4	3	4			120	120	120	120	120	120	120	120	120	120	120	120	120		
		SD		2.1	0.4	0.1	23	25.3	3.1	3.4			0.44	0.10	0.14	0.23	0.31	0.09	0.11	0.23	0.09	0.12	0.16				
119	Silage, early head	3-21-865	Wet	12.0	1.5	1.0	69.5	8.7	21.8	29.0	22.9	23.2	70	2.02	3.60	4.01	6.64	4.21	1.77	0.61	4.24	4.21	1.03	5.80	37.51	11.22	4.72
		N		471	30	397	2	2	2	2			5	5	5	5	5	5	5	5	5	5	5	5	5		
		SD		3.0	0.8	0.4	0.4	1.6	1.2	11.7			0.26	0.50	0.25	0.43	0.41	0.04	0.10	0.00	0.28	0.09	0.31				
120	Straw (Amino acids estimated)	1-05-175	Dry	4.8	2.1	1.4	9.3	51.4	39.3	1.4	76.4	78.3	65	1.08	1.64	1.78	3.25	3.25	1.19	1.07	2.08	3.25	1.42	2.67	21.61	15.04	5.51
		N		161	8	8	2	2	2	2																	
		SD		1.9	0.2	0.3	3.7	47.2	50.6	0.8																	
121	WHEY Wet, cattle (N fractions and Kd estimated)	4-08-134	Conc	14.6	NA	NA	90.0	10.0	0.0	5.0	4.6	6.0	95	2.09	1.89	5.12	8.95	7.42	1.41	2.04	2.94	5.94	1.48	4.92	42.16	17.60	3.34
		N		68										13	13	13	13	13	13	13	13	13	13	13	13	13	
		SD		14.1										0.12	0.17	0.24	0.39	0.45	0.10	0.21	0.47	0.28	0.13	0.30			

NOTE: Values for CP, NDICP, and ADICP are the same as those presented in Table 15-1. The N fraction and Kd data are a summary of published values. The example RUP values were calculated using the equations in the text and in the case of dry forages the N fractions (A,B, and C), the Kd of the B fraction, and the NDF values reported in the feed tables. Most of the amino acid values are courtesy of Degussa Corporation with a majority of the values obtained from the book, "The Amino Acid Composition of Feedstuffs" (Fickler et al., 1996). Exceptions are values for extruded soybean meal, whole sunflower seeds, safflower meal, and some of the data for nonenzymatically browned soybean meal (courtesy of Rhone-Poulenc Animal Nutrition), values for feather meal with some viscera (Cunningham et al., 1994), values for tomato pomace (US-Canadian Table of Feed Composition, 1982), and values for dried brewers grains, hominy, fish byproducts, linseed meal, and safflower meal (NRC, 1998). The amino acid values for the grass-legume mixtures of hays and silages were calculated from the values for all grass and all legume forages assuming 75% grass and 25% legume for predominantly grass, and 50% legume for mixed grass and legume, and 25% grass and 75% legume for predominantly legume.

Table 15-2b. Nitrogen Fractions and Amino Acid Composition of Less Commonly Used Feedstuffs, Which Are Cited in the Literature, But Were Not Included as Commonly Used Feedstuffs in Table 15-2a

Nutrient Composition of Feeds

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11	Straw (CP and amino acids estimated)	Dry	4.3	46.9	27.4	25.7	1.3	65	1.08	1.64	1.78	3.25	3.25	1.19	2.08	3.25	1.42	2.67	21.61	15.04	5.51	
		N SD		1	1	1	1															
12	BORAGE (<i>Borago officinalis</i>) Meal, dry	Conc N SD	32.5 2 1.3	31.8 2 0.1	48.6 2 4.5	19.6 2 4.4	7.9 2 2.7															
13	CANOLA Hulls	Conc N SD	16.1 2 1	29.5 2 5.7	35.5 2 5.3	35 2 0.4	5.3 2 0.8	70														
14	Seeds, coarse grind (AA from canola meal, mech. extracted)	Conc N SD	25	3.6	84.6	11.8	7.4	50	7.01	2.80	3.83	6.77	5.62	1.87	2.54	4.06	4.42	1.46	4.73	42.56	13.20	4.39
15	Meal, mech. extracted, heated (Amino acids from canola meal, mech. extracted)	Conc N SD	39.3	18.3	80.7	1.0	4.4	70	7.01	2.8	3.83	6.77	5.62	1.87	2.54	4.06	4.42	1.46	4.73	42.56	13.2	4.39
16	COCONUT Meal (Amino acids from NRC, 1998)	Conc N SD	21.3 2	28.0 2	65.1 2	6.9 2	8.7 2	90	10.87	1.78	3.42	6.21	2.65	1.60	1.32	3.84	3.06	0.87	4.89	39.19	6.76	4.08
17	CORN, YELLOW Distillers grains, dried (Amino acids from 1998 Swine NRC)	Conc N SD	22.2	39.5	41.6	18.9	7.9	75	3.63	2.54	3.83	10.6	2.98	1.73	1.13	3.99	2.50	0.81	5.00	37.61	7.92	4.60
18	Grain, dry, extruded (Amino acids from corn grain, dry)	Conc N SD	8.1	42.3	23.0	34.7	3.9	90	4.47	3.07	3.51	12.80	2.65	2.03	1.93	4.92	3.56	0.68	4.77	42.46	6.24	4.78
19	Silage <45% NDF (Amino acids from corn silage, mature)	Wet N SD	8.1	65.7	15.3	19.0	2.1	70	1.96	1.79	3.33	8.59	2.43	1.52	1.28	3.83	3.19	0.44	4.49	31.59	7.69	4.81
20	Silage 45 to 50% NDF (Amino acids from corn silage, normal)	Wet N SD	8.4	54.8	28.8	16.4	4.5	70	1.97	1.79	3.34	8.59	2.51	1.53	1.34	3.83	3.19	0.44	4.47	31.64	7.93	4.84
21	Silage 45 to 50% NDF (Amino acids from corn silage, normal)	Wet N SD	9.5	51.2	29.0	19.8	3.9	70	1.97	1.79	3.34	8.59	2.51	1.53	1.34	3.83	3.19	0.44	4.47	31.64	7.93	4.84
		N SD	8 1.5	8 17.3	8 14.0	8 5.3	8 1.2															

(continues)

Table 15-2b. (*continued*)

32	MILK Skim, dry powder	N SD	Conc 15 1.5	38.5				95	3.37 15 0.2	2.84 15 0.14	5.13 15 0.24	9.84 15 0.39	7.71 15 0.48	2.49 15 0.14	0.79 15 0.05	4.88 15 0.18	4.41 15 0.22	1.37 15 0.02	6.32 15 0.17	48.36 15 0.02	15.94 15 0.17	5.15	
33	PALM KERNEL Byproduct meal	N SD	Conc 7 1.9	9.6 6.1	80.8 7.6	9.6 2.2	1.6 0.4	75															
34	PEAS Field, raw	N SD	Conc 2 1.7	25.6 11.5	55.5 11.5	44.4 0.1	0.1 8.1	16.7 0.98	80 77 0.15	8.93 77 0.15	2.59 77 0.15	4.09 77 0.19	7.24 77 0.25	7.17 77 0.08	1.00 77 0.12	1.47 77 0.22	4.70 77 0.13	3.75 77 0.04	0.90 77 0.18	4.67 77 0.04	46.51 77 0.18	15.42 77 2.15	
35	Field, extruded (Amino acids from field, raw)	N SD	Conc 4 0.8	24.5 3.5	15.7 3.9	75.4 3.9	8.9 7	13.1 6.6	90	8.93 8.93	2.59 2.59	4.09 4.09	7.24 7.24	7.17 7.17	1.00 1.00	1.47 1.47	4.70 4.70	3.75 3.75	0.90 0.90	4.67 4.67	46.51 46.51	15.42 2.15	
	POULTRY LITTER	N SD	Conc 1 0	21.8 2	70.9 2	18.6 2	10.6 2	11.8 2	80														
36	RAPSEED Meal, solvent	N SD	Conc 6 2.5	38.4 6.6	23.4 6.6	69.2 6.6	7.4 2.6	13.1 4.3	70	6.17 268 0.52	2.80 268 0.21	3.93 268 0.15	7.09 268 0.18	5.62 268 0.41	2.04 268 0.10	2.54 268 0.18	4.06 268 0.16	4.42 268 0.18	1.30 268 0.08	5.09 268 0.23	42.52 268	13.22 268	4.80
37	Meal, solvent, heated (Amino acids from meal, solvent)	N SD	Conc 6 2.5	38.4 8	18.3 7.5	74.8 3.3	6.9 2.6	10.4 6	75	6.17 6.17	2.80 3.93	3.93 7.09	7.09 5.62	5.62 2.04	2.04 2.54	4.06 4.06	4.42 4.42	1.30 1.30	5.09 5.09	42.52 42.52	13.22 13.22	4.80	
38	RYE Grain	N SD	Conc 14 1.5	10.9				80	5.4 14 0.38	2.59 14 0.21	3.57 14 0.28	6.54 14 0.37	4.05 14 0.36	1.81 14 0.13	2.55 14 0.19	4.89 14 0.31	3.58 14 0.24	0.99 14 0.06	5.08 14 0.36	38.50 14 0.36	10.52 14 0.36	4.70	
39	SORGHUM, GRAIN TYPE Grain, extruded (Amino acids from grain, dry rolled)	N SD	Conc 1 1	8.3 1	33.2 1	21.9 1	44.9 1	2.5 1	85	4.09 4.09	2.44 3.94	3.94 13.06	13.06 2.38	2.38 1.81	1.81 1.88	5.25 5.25	3.37 3.37	1.09 1.09	4.95 4.95	42.38 42.38	5.62 5.62	4.27	
40	SUNFLOWER Meal, solvent, roasted (CP and amino acids from meal, solvent)	N SD	Conc 6 2.9	28.4 11	33.4 11.9	32.3 11.9	34.3 6.8	4.4 6	90	8.77 31 0.28	2.60 31 0.51	4.16 31 0.66	6.42 31 0.74	3.38 31 0.46	2.36 31 0.20	1.77 31 0.35	4.62 31 0.80	3.68 31 0.40	1.24 31 0.12	4.95 31 0.12	42.19 31 0.65	8.01 31 0.65	5.59
41	Silage (Trp estimated)	N SD	Wet 5 0.87	12.5				70	6.67 5 0.87	2.18 5 0.38	3.44 5 0.18	5.38 5 0.34	2.99 5 0.16	1.92 5 0.09	1.74 5 0.20	3.88 5 0.18	3.12 5 0.11	1.24 5 0.31	4.16 5 0.31	35.02 5 0.31	8.54 5 0.31	5.48	
42	TRITICALE Grain, ground	N SD	Conc 1 0.28	14.5 1	51.3 0.51	45.9 1	2.8 1	43 1	90	5.29 31 0.28	2.53 31 0.51	3.59 31 0.66	6.82 31 0.74	3.62 31 0.46	1.79 31 0.20	2.45 31 0.35	4.78 31 0.80	3.35 31 0.40	1.04 31 0.12	4.78 31 0.12	37.59 31 0.65	9.63 31 0.65	4.76
43	WHEAT Distillers grains, dried	N SD	Conc 2 1.8	42.3 2	21.1 2.1	76.9 2.5	2 0.4	26.1 0.8	80	2.59 1 1	3.16 1 1	3.53 1 1	6.12 1 1	1.55 1 1	1.41 1 1		4.43 1 1	3.05 1 1	1.09 1 1	4.54 1 1	31.47 1 1	4.93 1 1	4.48

NOTE: Amino acid values are courtesy of Degussa Corporation; exceptions are values for wheat distillers grains (Rhone-Poulenc Animal Nutrition).

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TABLE 15-3 Mineral Composition of Some Feedstuffs Commonly Fed to Dairy Cattle (all values on a dry basis)

Entry No.	Feed Name/Description	International Feed No.	Ash %	Ca %	P %	Mg %	K %	Na %	Cl %	S %	Co mg/kg	Cu mg/kg	I mg/kg	Fe mg/kg	Mn mg/kg	Se mg/kg	Zn mg/kg	Mo mg/kg
	ALFALFA <i>Medicago sativa</i>	Also see LEGUMES, FORAGE																
1	Meal, 17% CP	1-00-023	11.0 N SD	1.47 206 0.36	0.28 206 0.07	0.29 206 0.06	2.37 0.42	0.10 0.08	0.65 0.27	0.26 0.04	0.31	9 110 4	0.16	619 110 617	44 20 0.04	0.36 2 19	28 110 110	2.8 110 1.2
2	ALMOND Hulls	4-00-359	6.1 N SD	0.28 30 0.11	0.13 30 0.08	0.13 30 0.05	2.62 0.52	0.02 0.01	0.03 0.03	0.04 0.01	7 30 4	247 16 11	22 30 18	0.07 7 0.02	22 30 15	1.0 23 0.6		
3	APPLE Pomace, wet	4-25-450	2.6 N SD	0.20 54 0.11	0.14 54 0.03	0.09 54 0.03	0.73 54 0.25	0.04 0.04	0.03 0.01	0.07 0.01	11 54 5	185 54 190	17 54 18	14 54 10	0.7 54 0.5			
4	BAKERY BYPRODUCT Byproduct meal	4-00-466	3.8 N SD	0.20 168 0.20	0.36 168 0.24	0.13 168 0.10	0.42 13 0.26	0.72 41 0.50	1.20 41 0.73	0.14 0.05	1.05 1 4	273 168 330	30 5 27	0.29 168 0.21	46 168 50	1.1 168 0.7		
5	Bread, waste	4-00-466	2.8 N SD	0.14 57 0.10	0.20 57 0.06	0.05 57 0.06	0.23 57 0.33	0.85 57 0.41	0.94 21 0.03	0.17 0.03	4 57 8	140 57 170	10 57 3	16 57 6	0.6 57 0.6			
6	Cereal byproduct	4-00-466	3.2 N SD	0.17 48 0.27	0.29 48 0.16	0.10 48 0.05	0.33 48 0.16	0.59 48 0.27	0.69 24 0.39	0.10 0.03	4 48 1	252 48 164	26 48 16	80 48 47	1 48 0.5			
7	Cookie byproduct	4-24-852	3.0 N SD	0.23 29 0.28	0.29 29 0.16	0.13 29 0.13	0.46 29 0.17	0.68 29 0.46	1.20 20 0.08	0.13 0.03	5 29 5	235 29 288	27 29 20	38 29 31	1.0 29 0.7			
8	BARLEY Grain, rolled	4-00-528	2.9 N SD	0.06 319 0.02	0.39 321 0.06	0.14 287 0.02	0.56 287 0.12	0.02 229 0.02	0.13 31 0.07	0.12 139 0.01	0.35 16 0.28	6 241 3	70 241 60	22 519 12	0.11 241 0.09	38 237 0.6		
9	Malt sprouts	5-00-545	7.4 N SD	0.24 31 0.16	0.51 31 0.11	0.18 31 0.04	1.19 31 0.18	0.04 31 0.00	0.29 10 0.05	0.17 2 0.03	9 31 2	353 31 207	49 31 14	0.67 31 0.55	65 31 13	2.0 31 0.6		
10	Silage, headed	3-00-512	7.5 N SD	0.48 525 0.19	0.30 525 0.06	0.18 420 0.05	2.43 420 0.78	0.13 214 0.23	0.72 11 0.54	0.17 97 0.04	0.72 6 0.41	7 291 3	343 291 458	43 291 25	0.12 197 0.09	30 291 13	1.6 214 0.8	
11	BEET, SUGAR Pulp, dried	4-00-669	7.3 N SD	0.91 170 0.27	0.09 152 0.03	0.23 152 0.05	0.96 152 0.50	0.31 152 0.28	0.18 16 0.25	0.30 55 0.11	11 152 6	642 152 269	62 152 30	0.14 10 0.09	22 152 9	1.5 143 0.7		
12	BERMUDAGRASS <i>Cynodon dactylon</i>	Coastal, hay, early head	1-20-900	8.1 N SD	0.49 8 0.07	0.27 8 0.03	0.19 7 0.05	1.80 7 0.34	0.17 7 0.10	0.67 7 0.22	0.48 7 0.10	8 7 10	224 7 126	62 7 25		32 7 15		
13	Tifton-85, hay, 3-4 wk growth (Data from Coastal hay, adj. for ash)	IFN	6.5 N SD	0.39 2 0.22	0.22 0.19	0.15 0.06	1.40 0.05	0.14 0.23	0.54 0.54	0.38 0.04	0.38 0.41	8 3	224 453	62 9		32 143 0.7		
14	BLOOD Meal, ring dried	5-00-380	2.5 N SD	0.30 75 0.40	0.30 75 0.26	0.03 75 0.02	0.33 75 0.22	0.40 75 0.28	0.33 7 0.16	0.77 46 0.34	10 75 4	2453 75 420	9 75 6	0.77 13 0.84	33 75 14	0.6 75 0.8		
15	Meal, batch dried (Composition data from ring-dried)		2.5 N SD	0.30 31 0.30	0.30 75 0.03	0.03 75 0.33	0.33 75 0.40	0.40 75 0.33	0.33 7 0.06	0.77 0.34	10 344 6	2453 344 119	9 4 12	0.77 13 0.28	33 75 15	0.6 75 0.8		
	BLUEGRASS <i>Poa pratensis</i>	See GRASSES, COOL SEASON																
16	BREWERS GRAINS Dried	5-12-024	4.3 N SD	0.30 344 0.11	0.67 344 0.06	0.26 344 0.35	0.50 77 0.26	0.04 7 0.06	0.07 7 0.02	0.38 46 0.08	11 344 6	224 344 119	45 4 12	1.06 344 0.28	85 340 15	3.2 0.8		
17	Wet	5-00-517	4.9 N SD	0.35 427 0.22	0.59 427 0.10	0.21 427 0.26	0.47 427 0.26	0.01 13 0.01	0.12 1 0.190	0.33 0.06	9 389 7	247 389 270	49 389 13	1.06 389 17	91 389.0 1	3.4 389.0		
	BROME, SMOOTH <i>Bromus inermis</i>	See GRASSES, COOL SEASON																
	CANARYGRASS, REED <i>Phalaris arundinacea</i>	See GRASSES, COOL SEASON																
18	CANOLA Seed	5-08-109	4.6 N SD	0.44 1 1	0.68 1	0.21 1	0.91 1	0.03 1	0.42 1		12 1	253 1	48 1		88 1			

(continues)

TABLE 15-3 (continued)

Entry No.	Feed Name/Description	International Feed No.	Ash %	Ca %	P %	Mg %	K %	Na %	Cl %	S %	Co mg/kg	Cu mg/kg	I mg/kg	Fe mg/kg	Mn mg/kg	Se mg/kg	Zn mg/kg	Mo mg/kg
19	Meal, mech. extracted	5-03-870	7.4 N SD	0.75 27 1.2	1.10 79 0.11	0.53 79 0.20	1.41 79 0.07	0.07 79 0.13	0.04 9 0.01	0.73 32 0.19	5 29 3	296 79 251	62 79 12	1.09 19 0.99	61 79 7	2.7 79 0.6		
20	CHOCOLATE Byproduct		2.1 N SD	0.22 15 2.0	0.30 14 0.12	0.22 14 0.20	1.18 14 1.20	0.07 14 0.03	0.11 5 0.02	15 14 19	461 14 800	31 14 32	40 14 28	1.6 14 1.6				
21	CITRUS Pulp dried	4-01-237	7.2 N SD	1.92 35 4.2	0.12 90 0.53	0.12 90 0.03	1.10 90 0.01	0.06 90 0.16	0.08 18 0.06	0.10 47 0.05	8 90 3	151 90 145	9 90 3	11 57 3	0.9 90 0.5			
	CLOVER, LADINO <i>Trifolium pratense</i>			See LEGUMES, FORAGE														
	CLOVER, RED <i>Trifolium pratense</i>			See LEGUMES, FORAGE														
22	CORN, YELLOW Cobs	1-28-234	2.2 N SD	0.10 2 3	0.06 3 3	0.06 3 3	0.90 2 2	0.04 2 2	0.07 2	6 2	254 2	5 2	0.08 1	11 2	0.13 1			
23	Distillers grains with solubles, dried	5-28-236	5.2 N SD	0.22 134 1.15	0.83 649 0.10	0.33 649 0.14	1.10 648 0.07	0.30 647 0.23	0.26 90 0.27	0.44 278 0.10	8 648	178 265	27 648	0.39 12	65 648	1.9 556		
24	Gluten feed, dried	5-28-243	6.8 N SD	0.07 25 1.5	1.00 144 0.08	0.42 144 0.23	1.46 144 0.11	0.13 83 0.33	0.20 2 0.12	0.44 65 0.09	6 144	196 144	23 144	0.19 12	75 144	2.2 131		
25	Gluten meal, dried	5-28-242	3.3 N SD	0.06 20 1.2	0.60 57 0.06	0.14 57 0.28	0.46 57 0.16	0.05 57 0.29	0.11 1 0.09	0.86 23 0.17	4 57	138 73	15 24	0.34 0.3	49 59	1.1 0.8		
26	Grain, cracked, dry (Data from dry ground corn)	4-02-854	1.5 N SD	0.04 567 0.5	0.30 1185 0.07	0.12 1185 0.05	0.42 1185 0.03	0.02 554 0.06	0.08 143 0.08	0.10 322 0.01	3 572	54 572	11 327	0.07 45.00	27 327	0.8 542.0		
27	Grain, ground, dry	4-02-854	1.5 N SD	0.04 567 0.5	0.30 1185 0.07	0.12 1185 0.05	0.42 1185 0.03	0.02 554 0.06	0.08 143 0.07	0.10 322 0.01	3 4	54 53	11 24	0.07 0.05	27 20	0.8 0.5		
28	Grain, steam-flaked (Data from dry ground corn)	4-02-854	1.5 N SD	0.04 567 0.5	0.30 1185 0.07	0.12 1185 0.05	0.42 1185 0.03	0.02 554 0.06	0.08 143 0.07	0.10 322 0.01	3 572	54 53	11 24	0.07 0.05	27 20	0.8 0.5		
29	Grain, rolled, high moisture (Data from ground high moisture corn)	4-28-265	1.5 N SD	0.03 2544 0.6	0.30 4633 0.03	0.12 4633 0.03	0.43 4633 0.06	0.01 439 0.01	0.05 107 0.01	0.10 1317 0.01	1 853	59 853	7 853	0.07 3	21 5	0.7 0.4		
30	Grain, ground, high moisture	4-28-265	1.5 N SD	0.03 2544 0.6	0.30 4633 0.03	0.12 4633 0.03	0.43 4633 0.06	0.01 439 0.01	0.05 107 0.01	0.10 1317 0.01	1 853	59 853	7 853	0.07 3	21 5	0.7 0.4		
31	Grain and cob, dry, ground	4-02-849	1.7 N SD	0.06 83 0.5	0.29 158 0.09	0.13 158 0.07	0.49 158 0.04	0.03 55 0.14	0.07 2 0.16	0.10 48 0.01	3 54	91 54	10 54	0.07 11	27 52.0	0.8 0.5		
32	Grain and cob, high moisture	4-26-240	1.7 N SD	0.05 1381 0.28	0.28 2608 0.03	0.12 2608 0.01	0.48 2608 0.07	0.01 470 0.03	0.07 54 0.03	0.09 907 0.01	3 599	599 599	7 60	0.07 4	22 5	0.7 0.4		
33	Hominy	4-02-887	2.7 N SD	0.03 118 1.1	0.65 287 0.03	0.26 287 0.12	0.82 287 0.34	0.01 287 0.01	0.10 58 0.08	0.12 141 0.02	3 287	87 287	14 287	0.12 287	49 287	1.2 0.6		
34	Silage, immature <25% DM	3-28-247	4.8 N SD	0.29 69 2.1	0.24 70 0.10	0.19 70 0.10	1.30 70 0.50	0.01 20 0.01	0.30 20 0.15	0.14 20 0.15	6 56	157 55	46 56	0.04 0.04	29 56			
35	Silage, normal 32-38% DM	3-28-248	4.3 N SD	0.28 1027 1	0.26 1033 0.04	0.17 1033 0.04	1.20 1033 0.30	0.01 6991 0.01	0.29 468 0.10	0.14 27 0.02	6 912	104 909	36 914	0.04 11	24 915			
36	Silage, mature >40% DM	3-28-249	4.0 N SD	0.26 704 1.3	0.25 705 0.10	0.16 705 0.04	1.10 705 0.30	0.01 11 0.00	0.17 11 0.06	0.10 10 0.01	6 622	92 622	36 622	0.04 0.04	23 624			
37	COTTON SEED Whole seeds with lint	5-01-614	4.2 N SD	0.17 193 2.1	0.60 928 0.08	0.37 928 0.08	1.13 928 0.07	0.02 928 0.02	0.06 148 0.03	0.23 424 0.04	7 928	94 928	18 9	0.14 0.11	37 928	1.3 919		

(continues)

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TABLE 15-3 (continued)

Entry No.	Feed Name/Description	International Feed No.	Ash %	Ca %	P %	Mg %	K %	Na %	Cl %	S %	Co mg/kg	Cu mg/kg	I mg/kg	Fe mg/kg	Mn mg/kg	Se mg/kg	Zn mg/kg	Mo mg/kg
38	Hulls	1-01-599	2.8	0.18	0.12	0.17	1.16	0.02	0.06	0.07	5	68	22	17	0.8			
	N	75	118	118	112	113	109	11	68		106	107	102	105	102			
	SD	0.5	0.10	0.06	0.04	0.07	0.03	0.03	0.03		3	61	8	11	0.5			
39	Meal, solvent, 41% CP	5-01-630	6.7	0.20	1.15	0.61	1.64	0.07	0.07	0.40	14	149	24	0.30	67	3		
	N	44	185	185	65	185	97	3	30		59	60	61	2	55	18.0		
	SD	0.7	0.10	0.10	0.11	0.38	0.06		0.11		3	47	11		15	0.8		
FATS AND OILS																		
40	Calcium soaps	IFN	15.5	12.00	0	0	0	0	0	0	0	0	0	0	0	0	0	
	N																	
	SD																	
41	Hydrolyzed tallow fatty acids	IFN	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	N																	
	SD																	
42	Partially hydrogenated tallow	IFN	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	N																	
	SD																	
43	Tallow	IFN	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	N																	
	SD																	
44	Vegetable oil	4-05-077	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	N																	
	SD																	
FEATHERS																		
45	Meal		3.5	0.33	0.50	0.22	0.33	0.34	0.26	1.39	0.04	10	0.04	76	10	0.69	111	
	N																	
	SD																	
46	Meal with some viscera	5-13-540	5.5	1.36	0.77	0.06	0.24	0.27	0.47	1.75		12		625	12	0.69	100	0.8
	N	12	29	29	29	29	29	29	1	24		29		29	1	29	29	0.5
	SD	2.1	1.75	0.90	0.05	0.13	0.14		0.50		6		372	36	9			
FESCUE <i>Festuca sp.</i>																		
See GRASSES, COOL SEASON																		
FISH BYPRODUCTS																		
47	Anchovy, meal, mech.	5-01-985	16.0	4.06	2.69	0.27	0.79	0.96	0.80	0.78		10	3.41	234	12	1.47	114	0.2
	N	47	51	52	32	35	32	4			27	2	28	31	27	31	1	
	SD	1.5	0.54	0.45	0.05	0.27	0.33		0.23		2		63	6	0.25	17		
48	Menhaden, meal, mech.	5-02-009	19.7	5.34	3.05	0.20	0.74	0.68	0.80	1.16		7	1.19	562	32	2.26	112	1.8
	N	113	112	111	63	65	66	2	34		64	2	65	65	30	62	46	
	SD	2.4	1.15	0.53	0.05	0.25	0.27		1.01		4		354	23	1.5	24	0.9	
GRASSES, COOL SEASON																		
49	Pasture, intensively managed	2-02-260	9.8	0.56	0.44	0.20	3.36	0.02	0.56	0.20		10		275	75		36	
	N	13	13	13	13	13	1				13		13	13				
	SD	1.2	0.15	0.06	0.03	0.49					3		209	36			6	
50	Hay, all samples	1-02-250	7	0.58	0.23	0.20	2.01	0.04	0.50	0.21		9		156	72	0.06	31	1.5
	N	1791	4653	4653	4653	4653	1321	161	1448		1321		1321	1321	5	1321	1321	
	SD	1.5	0.23	0.06	0.05	0.53	0.08	0.32	0.06		6		157	52	0.06	30	1	
51	Hay, immature <55% NDF	1-02-212	9.2	0.72	0.34	0.23	2.57	0.03	0.42	0.24		9		199	84	0.06	27	
	N	34	42	42	42	42	4	3	5		8		8	8			8	
	SD	1.1	0.23	0.07	0.06	0.56	0.03	0.49	0.03		3		93	20			8	
52	Hay, mid-maturity 55-60% NDF	1-02-243	8.8	0.66	0.29	0.23	2.13	0.08	0.92	0.24		9		194	72	0.06	25	
	N	50	54	54	54	54	54	8	1	7		23		23	23		23	
	SD	1.6	0.23	0.13	0.11	0.72	0.06		0.15		4		146	26			7	
53	Hay, mature >60% NDF	1-02-244	7.0	0.47	0.26	0.18	1.97	0.02	0.66	0.17		8		180	90	0.06	25	
	N	399	413	413	413	413	51	49	56		342		342	342		342		
	SD	1.7	0.18	0.07	0.08	0.59	0.06	0.67	0.04		3		233	51			8	
54	Silage, all samples	3-02-222	8.1	0.55	0.29	0.23	2.54	0.05	0.67	0.21		9		331	74	0.09	30	2.2
	N	988	4365	4365	4365	4365	839	118	1388		879		879	879	3	879	879	
	SD	2.1	0.28	0.08	0.05	0.73	0.07	0.38	0.05		3		324	47			12	
55	Silage, immature <55% NDF	3-02-217	9.9	0.57	0.36	0.22	3.11	0.05	0.67	0.21		9		280	56	0.09	31	
	N	34	35	35	35	35	35					11		11	11			11
	SD	1.8	0.19	0.07	0.05	0.62					3		159	20			10	
56	Silage, mid-maturity 55-60% NDF	3-02-218	8.7	0.60	0.36	0.21	2.78	0.05	0.67	0.21		9		275	79	0.09	31	
	N	41	41	41	41	41	41					35		35	35		35	
	SD	1.5	0.21	0.07	0.04	0.71					2		181	35			9	

(continues)

TABLE 15-3 (continued)

Entry No.	Feed Name/Description	International Feed No.	Ash %	Ca %	P %	Mg %	K %	Na %	Cl %	S %	Co mg/kg	Cu mg/kg	I mg/kg	Fe mg/kg	Mn mg/kg	Se mg/kg	Zn mg/kg	Mo mg/kg
57	Silage, mature >60% NDF	3-02-219	8.0	0.56	0.31	0.20	2.42	0.05	0.89	0.20	9		327	90	0.09	30		
		N	135	135	135	135	135		5	7	128		127	128		128		
		SD	1.8	0.20	0.07	0.06	0.72		0.32	0.04	3		396	45		8		
GRASS-LEGUME MIXTURES																		
Predominantly Grass (17-32% Hemicellulose)																		
58	Hay, immature <51% NDF	1-02-275	9.2	1.01	0.31	0.26	2.83	0.03	0.74	0.28	9		117	53	0.09	25		
		N	21	21	21	21	21				14		14	14		14		
		SD	1.2	0.32	0.06	0.08	0.65				3		110	17		3		
59	Hay, mid-maturity 51-57% NDF	1-02-277	9.5	0.88	0.36	0.25	2.45	0.01	0.77	0.27	9		358	75	0.09	26		
		N	155	155	155	155	155	52	9	3	124		124	124		124		
		SD	1.7	0.22	0.07	0.05	0.74	0.01	0.41	0.02	2		302	20		5		
60	Hay, mature >57% NDF	1-02-280	7.9	0.73	0.27	0.21	2.09	0.10	0.71	0.29	8		124	74	0.09	24		
		N	149	149	149	149	149	14	8	9	98		98	98		98		
		SD	1.4	0.73	0.06	0.06	0.66	0.21	0.50	0.04	3		271	46		5		
61	Silage, immature <51% NDF	3-02-302	9.1	1.02	0.34	0.25	2.88	0.03	0.74	0.27	9		234	74	0.11	27		
		N	18	18	18	18	18				17		17	17		17		
		SD	1.3	0.31	0.05	0.05	0.44				2		217	31		5		
62	Silage, mid-maturity 51-57% NDF	3-02-265	9.5	0.89	0.36	0.26	2.64	0.01	0.45	0.25	9		264	78	0.11	30		
		N	95	95	95	95	95		2	3	85		85	85		85		
		SD	1.6	0.26	0.06	0.07	0.73		0.02		2		325	30		8		
63	Silage, mature >57% NDF	3-02-266	9.0	0.85	0.33	0.23	2.51	0.10	0.90	0.34	9		241	73	0.11	28		
		N	166	166	166	166	166		4		151		151	151		151		
		SD	1.5	0.22	0.06	0.06	0.61		0.33		2		321	35		6		
Mixed Grass and Legume (12-15% Hemicellulose)																		
64	Hay, immature <47% NDF	1-02-275	8.8	1.20	0.31	0.29	3.06	0.07	0.50	0.27	10		160	59	0.12	24		
		N	42	42	42	42	42	3	1	6.00	27		27	27		27		
		SD	0.9	0.26	0.04	0.06	0.62	0.06	0.10		3		452	18		8		
65	Hay, mid-maturity 47-53% NDF	1-02-277	9.3	1.04	0.32	0.25	2.59	0.03	0.80	0.24	9		197	59	0.12	25		
		N	184	184	184	184	184	23	3	11	115		115	115		115		
		SD	1.4	0.18	0.06	0.05	0.64	0.06	0.24	0.03	2		247	20		5		
66	Hay, mature >53% NDF	1-02-280	9.9	0.97	0.37	0.26	2.24	0.01	0.93	0.28	9		403	75	0.12	27		
		N	233	233	233	233	233	128	16	6	195		195	195		195		
		SD	1.6	0.17	0.08	0.04	0.85	0.01	0.14	0.04	2		249	19		5		
67	Silage, immature <47% NDF	3-02-302	9.8	1.08	0.35	0.28	2.89	0.01	1.77	0.16	9		328	71	0.14	29		
		N	45	45	45	45	45	1	1	3	2		36	36		36		
		SD	1.7	0.30	0.06	0.07	0.72		0.05		36		202	25		7		
68	Silage, mid-maturity 47-53% NDF	3-02-265	10.1	1.09	0.35	0.27	2.80	0.01	1.10	0.26	9		252	71	0.14	31		
		N	171	171	171	171	171	1	2	9	139		139	139		139		
		SD	1.5	0.26	0.05	0.06	0.63		0.10	3	3		219	26		9		
69	Silage, mature <47% NDF	3-02-266	9.6	1.06	0.33	0.24	2.70	0.02	0.52	0.31	9		262	72	0.14	30		
		N	255	255	255	255	255	2	3	5	210		210	210		210		
		SD	1.3	0.27	0.05	0.06	0.59		0.30	2		317	26		13			
Predominantly Legume (10-13.5% Hemicellulose)																		
70	Hay, immature <44% NDF	1-02-275	9.2	1.30	0.30	0.30	2.41	0.03	0.60	0.20	10		167	58	0.15	24		
		N	157	157	157	157	157				4.00		40	40		40		
		SD	1.4	0.18	0.04	0.06	0.49				6		165	18		6		
71	Hay, mid-maturity 44-50% NDF	1-02-277	9.1	1.17	0.30	0.27	2.34	0.08	0.43	0.26	9		141	49	0.15	24		
		N	296	296	296	296	296	8	1	13	103		103	103		103		
		SD	1.2	0.15	0.04	0.06	0.46	0.03	0.02	3		131	16		6			
72	Hay, mature >50% NDF	1-02-280	8.7	1.09	0.28	0.25	2.23	0.01	0.21	0.26	8		141	43	0.15	24		
		N	134	134	134	134	134	2	2	15	60		60	60		60		
		SD	1.4	0.17	0.04	0.04	0.51	0.01	0.04	2		299	15		6			
73	Silage, immature <44% NDF	3-02-302	11.5	1.16	0.36	0.30	2.95	0.01	0.60	0.32	11		279	70	0.17	36		
		N	193	193	193	193	193	4			31		31	31		31		
		SD	2.1	0.20	0.05	0.06	0.61	0.07		4		206	20		15			

(continues)

TABLE 15-3 (continued)

Entry No.	Feed Name/Description	International Feed No.	Ash %	Ca %	P %	Mg %	K %	Na %	Cl %	S %	Co mg/kg	Cu mg/kg	I mg/kg	Fe mg/kg	Mn mg/kg	Se mg/kg	Zn mg/kg	Mo mg/kg
74	Silage, mid-maturity 44-50% NDF	3-02-265	10.8	1.14	0.34	0.28	2.88	0.01	0.60	0.25	9	244	64	0.17	28			
		N	504	505	505	505	505	5		17	185		185	185		185		
		SD	1.6	0.21	0.04	0.06	0.52	0.08		0.06	2	231	21		6			
75	Silage, mature >50% NDF	3-02-266	10.2	1.17	0.33	0.26	2.77	0.03	0.60	0.26	9	339	66	0.17	29			
		N	339	339	339	339	339	4		13	240		240	240		240		
		SD	1.8	0.24	0.06	0.06	0.60	0.03		0.04	3	379	23		8			
76	LEGUMES, FORAGE Pasture, intensively managed	2-29-431	10	1.31	0.37	0.28	3.21	0.01	0.60	0.31	44	10	215	54	0.20	33	2.3	
		N	11	24	24	24	24	11	1	7	6	20	20	20	20	11		
		SD	1.4	0.36	0.08	0.09	0.94	0.11		0.06	0.05	5	120	27		8	1.7	
77	Hay, all samples	1-20-648	10.0	1.52	0.26	0.30	2.53	0.01	0.74	0.25	65	9	286	35	0.20	24	2.9	
		N	4527	11212	11272	11212	11212	4242	565	4250	38	4242	4242	902	4242	4242		
		SD	1.2	0.27	0.05	0.06	0.49	0.12	0.39	0.05	0.34	4	270	13	0.18	19	1.6	
78	Hay, immature <40% NDF	1-07-792	9.5	1.56	0.31	0.33	2.56	0.03	0.55	0.33	65	10	213	49	0.20	26		
		N	159	210	210	210	210			41	42		42	42		42		
		SD	1.3	0.27	0.04	0.06	0.47			0.06	2	135	17		6			
79	Hay, mid-maturity 40- 46% NDF	1-07-788	9.4	1.37	0.30	0.30	2.45	0.02	0.61	0.31	65	9	207	46	0.20	24		
		N	262	296	296	296	296			26	56		56	56		56		
		SD	1.1	0.20	0.04	0.06	0.41			0.07	2	113	14		5			
80	Hay, mature >46% NDF	1-07-789	9.2	1.22	0.28	0.27	2.38	0.02	0.48	0.23	65	9	250	44	0.2	24		
		N	205	237	237	237	237			21	53		53	53		53		
		SD	1.6	0.21	0.04	0.05	0.49			0.08	2	299	17		6			
81	Silage, all samples	3-07-796	10.4	1.34	0.32	0.27	2.87	0.06	0.62	0.24	65	10	367	50	0.18	29	2.4	
		N	5183	8479	8479	8479	8479	2729	374	3255	2	2729	2729	199	2729	2729		
		SD	1.7	0.26	0.06	0.05	0.59	0.09	0.33	0.04	0.15	3	490	22	0.17	8	1.3	
82	Silage, immature <40% NDF	3-07-795	11.1	1.39	0.36	0.30	3.03	0.03	0.55	0.30	65	9	401	67	0.18	31		
		N	322	322	322	322	322			16	171		171	171		171		
		SD	1.5	0.21	0.05	0.06	0.57	0.02	0.30	0.06		3	353	24		7		
83	Silage, mid-maturity 40-46% NDF	3-07-797	10.8	1.36	0.35	0.28	3.00	0.02	0.61	0.28	65	9	395	64	0.18	30		
		N	749	750	750	750	750			20	607		610	610		610		
		SD	1.5	0.23	0.05	0.05	0.56	0.01	0.41	0.05		3	311	26		8		
84	Silage, mature >46% NDF	3-07-798	10.3	1.3	0.33	0.26	2.87	0.02	0.48	0.28	65	9	403	63	0.18	29		
		N	731	731	731	731	731			9	607		610	610		610		
		SD	1.6	0.23	0.05	0.05	0.58	0.01	0.3	0.05	2	311	26		8			
85	LINSEED (Flax) Meal, solvent	5-30-288	6.5	0.40	0.83	0.55	1.22	0.09		0.37	19		369	39	1.05	69	2.0	
		N	1	5	5	5	5			2	5		5	10	5	63	0.6	
86	MEAT Meal, rendered	5-09-323	22.9	8.86	4.20	0.26	0.49	0.78	0.44	0.51	21		701	26	0.45	114	2.4	
		N	12	62	62	62	62	62		29	62		62	10	34	10	62	
		SD	5.6	2.58	1.14	0.27	0.16	0.31		0.13	8	560	33	0.68	82	1.9		
87	Meat and bone, rendered	5-00-388	30.4	10.60	4.73	0.24	1.02	0.71	0.44	0.39	10		602	22		94	2.7	
		N	13	51	51	51	51	51	2	13	51		51	51		51	51	
		SD	7.5	2.35	1.06	0.05	0.12	0.16		0.08	4	322	8		17	2.3		
88	MOLASSES Beet sugar	4-00-668	11.4	0.15	0.03	0.29	6.06	1.48		0.60	22		87	66		18	0.5	
		N	9	13	11	10	10	8		9	7		8	7		5	1	
		SD	1.3	0.05	0.01	0.01	0.29	0.08		0.05	1	25	12		0			
89	Sugarcane	4-04-696	13.3	1.00	0.10	0.42	4.01	0.22		0.47	66		263	59		21	1.6	
		N	52	32	31	12	16	9		9	8		11	11		5	4	
		SD	2.3	0.18	0.02	0.10	0.88	0.02		0.02	26		34	6		6	0.7	
90	OATS Grain, rolled	4-03-309	3.3	0.11	0.40	0.16	0.52	0.03		0.19	0.06	8		106	43	0.48	41	1.7
		N	104	221	228	205	204	101		30	8	183		184	193	68	196	156
		SD	0.5	0.05	0.06	0.02	0.09	0.07		0.02	4	62	16	0.30	10	0.7		
91	Hay, headed	1-09-099	8.5	0.37	0.22	0.17	2.01	0.33	1.08	0.14	8		250	59		23	1.6	
		N	22	403	403	403	403	403		51	180		403	403		403	403	
		SD	4.0	0.22	0.07	0.06	0.71	0.28	0.51	0.06	3	370	28		27	1.0		
92	Silage, headed	3-21-843	9.8	0.52	0.31	0.20	2.89	0.24	1.34	0.19	9		500	66		29	2.2	
		N	182	615	615	615	615	207	28	194	212		212	212		212	212	
		SD	2.3	0.21	0.07	0.05	0.77	0.30	0.91	0.05	4	595	30		9	1.3		
ORCHARDGRASS <i>Dactylis glomerata</i>		see GRASSES, COOL SEASON																

(continues)

TABLE 15-3 (continued)

Entry No.	Feed Name/Description	International Feed No.	Ash %	Ca %	P %	Mg %	K %	Na %	Cl %	S %	Co mg/kg	Cu mg/kg	I mg/kg	Fe mg/kg	Mn mg/kg	Se mg/kg	Zn mg/kg	Mo mg/kg
93	PEANUT Meal, solvent	5-08-605	5.8 N 11 SD 1.5	0.20 15 0.06	0.64 16 0.03	0.32 14 0.08	1.32 15 0.04	0.03 14 0.04	0.10 1 0.02	0.32 8 0.02	13 14 3	0.07 1 115	302 14 5	33 14 20	0.21 1 115	54 14 11	3.8 14 2	
94	POTATO Byproduct meal	4-03-775	12.8 N 22 SD 7.4	0.49 72 0.77	0.29 72 0.32	0.11 72 0.05	1.04 64 0.84	0.26 64 0.34	0.19 5 0.21	0.11 33 0.08	11 72 10	1006 72 608	26 72 20	25 72 10	1.6 64 1.2			
95	RICE Bran	4-03-928	10.4 N 69 SD 1.9	0.07 69 0.06	1.78 69 0.36	0.81 61 0.17	1.57 66 0.24	0.03 54 0.02	0.09 2 0.02	0.19 26 0.02	10 57 6	239 57 266	186 23 62	0.17 8 0.09	71 55 20	2.8 32 0.7		
96	RYE, ANNUAL Silage, vegetative	3-21-853	9.6 N 844	0.43 1155	0.42 1155	0.16 1155	3.34 1155	0.05 563	0.90 24 0.51	0.20 240 0.05	9 859 5	373 859 446	63 859 34	32 859 8	2.0 722 1.2			
	RYEGRASS <i>Lolium sp.</i>																	
97	SAFFLOWER Meal, solvent	5-04-110	4.7 N 1 SD 0.04	0.38 5 0.08	0.72 5 0.04	0.39 5 0.06	1.21 5 0.04	0.04 5 0.04	0.32 2	22 5 4	319 5 53	30 5 4	77 5 5	2.3 5 0.8				
98	SORGHUM, GRAIN TYPE Grain, dry rolled	4-04-380	2 N 74 SD 0.6	0.07 78 0.04	0.35 77 0.07	0.17 75 0.05	0.47 66 0.16	0.01 38 0.01	0.06 7 0.02	0.11 20 0.03	6 64 2	89 74 61	21 72 4	0.46 3 0.58	25 51 4	1.0 38 0.7		
99	Grain, steam-flaked (Data from dry-rolled sorghum)	4-04-380	2	0.07	0.35	0.17	0.47	0.01	0.06	0.11	6	89	21	0.46	25	1.0		
100	Silage	3-22-371	7.5 N 181 SD 2.9	0.50 1097 0.26	0.21 1097 0.08	0.27 1097 0.09	1.75 1097 0.70	0.02 865 0.04	0.60 26 0.19	0.12 317 0.03	9 865 6	392 805 309	65 865 56	0.03 2 0.01	31 298 18	1.9 298 1.4		
101	SORGHUM, SUDAN TYPE Hay	1-04-480	8.7 N 172 SD 2.2	0.54 681 0.21	0.20 681 0.06	0.32 681 0.09	2.36 528 0.71	0.03 528 0.06	1.16 329 0.42	0.13 5 0.03	10 528 307	284 528 11	44 528 12	34 528 0.9	2.3 528 0.9			
102	Silage	3-04-499	10.9 N 37 SD 3.2	0.64 131 0.41	0.24 131 0.07	0.31 131 0.08	2.57 63 0.97	0.03 5 0.05	0.56 53 0.22	0.15 63 0.05	11 63 6	990 63 796	79 63 72	33 63 15	2.7 63 2.2			
103	SOYBEAN Hulls	1-04-560	4.8 N 45 SD 0.7	0.63 81 0.07	0.17 79 0.07	0.25 73 0.03	1.51 71 0.14	0.01 75 0.02	0.05 5 0.03	0.12 37 0.04	10 72 2	604 73 249	26 74 8	0.21 4 0.10	35 73 6	1.6 67 0.7		
104	Meal, expellers, 45% CP	5-12-820	5.5 N 20 SD 0.9	0.36 64 0.23	0.66 64 0.08	0.30 64 0.17	2.12 64 0.39	0.04 64 0.04	0.10 9 0.09	0.34 15 0.06	17 15	169 111	39 38	72 54	3.8 3.0			
105	Meal, nonenzymatically browned		6.8 N 8 SD 0.6	0.39 14 0.08	0.75 14 0.05	0.30 14 0.01	2.32 14 0.03	0.10 14 0.03	0.40 14 0.03	0.40 14 0.03	15 1	111 64	38 64	14 14	14 6	14 6		
106	Meal, solvent, 44% CP	5-20-637	6.6 N 66 SD 0.6	0.40 26 0.11	0.71 29 0.04	0.31 19 0.03	2.22 21 0.24	0.04 12 0.03	0.13 6 0.04	0.46 5 0.04	22 15 8	185 15 39	35 15 3	0.21 42 0.16	57 13 7	0.1 1 0.1		
107	Meal, solvent, 48% CP	5-20-638	6.4 N 119 SD 0.7	0.35 256 0.10	0.70 256 0.08	0.29 243 0.03	2.41 246 0.25	0.03 237 0.02	0.13 96 0.05	0.39 142 0.05	16 243 4	206 237 124	40 237 12	0.13 34 0.19	58 13 17	5.9 1 2.5		
108	Seeds, whole	5-04-610	5.9 N 7 SD 0.4	0.32 27 0.19	0.60 27 0.12	0.25 27 0.04	1.99 27 0.29	0.01 27 0.02	0.04 2 0.06	0.31 12 0.06	13 27 3	148 27 85	29 6 6	0.28 6 0.15	49 27 7	3.8 27 2.8		
109	Seeds, whole roasted	5-04-597	5.0 N 32 SD 0.5	0.26 106 0.07	0.64 106 0.08	0.25 106 0.03	1.99 106 0.18	0.01 106 0.02	0.06 15 0.03	0.32 70 0.05	15 106 3	142 106 98	29 106 8	0.28 50 9	48 106 4.0	5.3 106 4.0		
110	Silage, early maturity	3-04-579	12.2 N 3 SD 0.29	1.07 18 0.13	0.37 18 0.07	0.35 18 0.80	2.25 18 0.01	0.01 18 0.01	0.22 3 0.03	0.20 14 0.05	14 9 4	656 9 263	75 9 30	42 9 11	3.1 9 1.4			
111	SUNFLOWER Meal, solvent	5-30-032	7.7 N 20 SD 0.4	0.48 23 0.17	1.00 23 0.25	0.63 19 0.10	1.50 19 0.24	0.04 14 0.03	0.12 1 0.10	0.39 9 0.10	32 12 20	298 12 70	45 12 5	0.50 1 10	88 12 8	2.7 12 0.8		
112	Oil seeds, whole	5-08-530	5.1 N 5 SD 1.5	0.71 6 0.47	0.51 6 0.18	0.34 6 0.06	1.06 6 0.69	0.01 6 0.01	0.21 4 0.03	0.20 6 7	20 6 46	144 6 10	35 6 21	53 6 0.8	1.8 6 0.8			
	TIMOTHY <i>Phleum pratense</i>																	

(continued)

310 Nutrient Requirements of Dairy Cattle

TABLE 15-3 (continued)

Entry No.	Feed Name/Description	International Feed No.	Ash %	Ca %	P %	Mg %	K %	Na %	Cl %	S %	Co mg/kg	Cu mg/kg	I mg/kg	Fe mg/kg	Mn mg/kg	Se mg/kg	Zn mg/kg	Mo mg/kg
	TREFOIL, BIRDSFOOT <i>Lotus corniculatus</i>		See LEGUMES, FORAGE															
113	TOMATO Pomace	5-05-042	5.5 3 SD	0.22 10 0.11	0.47 10 0.20	0.28 9 0.07	0.98 9 0.26	0.12 9 0.23	0.15 6 0.06		11 9 3	541 9 574	11 9 3	54 9 10	1.8 9 0.3			
114	TRITICALE Silage, headed	3-26-208	9.7 41 SD	0.57 107 0.30	0.33 107 0.07	0.19 107 0.06	3.01 40 0.88	0.05 25 0.08	0.21 25 0.06		7 60 2	404 60 323	66 60 34	37 47 12	1.8 40 1			
115	WHEAT Bran	4-05-190	6.3 43 SD	0.13 44 0.03	1.18 43 0.23	0.53 31 0.09	1.32 31 0.16	0.04 27 0.01	0.16 4 0.03	0.21 16 0.03		11 22 2	157 24 51	122 22 29	0.50 7 0.37	85 20 27	2.5 14 0.9	
116	Grain, rolled	4-13-245	2.0 39 SD	0.05 135 0.03	0.43 136 0.14	0.15 61 0.03	0.50 61 0.14	0.01 22 0.01	0.11 3 0.03	0.15 35 0.03		5 56 3	72 56 55	42 56 17	0.28 35 0.37	40 55 13	1.3 40 0.8	
117	Hay, headed	1-05-170	6.7 10 SD	0.31 110 0.18	0.20 110 0.07	0.13 110 0.04	1.71 110 0.72	0.06 20 0.12	0.38 44 0.24	0.13 0.05		8 110 4	319 110 419	62 110 36		25 110 13	1.4 110 1.5	
118	Middlings	4-05-205	5 87 SD	0.16 195 0.15	1.02 196 0.20	0.42 181 0.11	1.38 182 0.18	0.03 170 0.03	0.10 16 0.02	0.18 58 0.05		10 176 4	158 177 80	125 175 27	0.46 9 0.42	91 171 24	2.5 165 0.8	
119	Silage, early head	3-21-865	8.6 211 SD	0.38 223 0.16	0.29 459 0.08	0.16 459 0.05	2.28 459 0.69	0.07 249 0.13	0.83 36 0.49	0.17 179 0.05		7 322 4	391 322 399	72 322 36		27 322 10	1.7 249 1.0	
120	Straw	1-05-175	7.6 64 SD	0.31 137 0.22	0.10 134 0.05	0.14 123 0.08	1.55 125 0.62	0.12 91 0.23	0.60 8 0.35	0.11 41 0.04		6 120 4	172 120 113	67 121 81		16 116 7	1.3 88 1.5	
121	WHEY Wet, cattle	4-08-134	3.1 16 SD	1.37 58 1.20	1.04 58 0.70	0.22 58 0.13	3.32 58 0.84	1.40 58 2.55	2.41 16 3.70	1.15 18 1.42		2 58 7	131 58 195	4 58 5	0.06 11 0.06	16 33 24	1.3 9 2.7	

TABLE 15-4 Compositions of Inorganic Mineral Sources and Element Absorption Coefficients for Dairy Cattle on a 100% Dry Matter Basis

Mineral Element Source	International Feed No. ^a	Dry Matter ^b	Crude Protein Equivalent (CPE) = N% x 6.25	Primary Mineral Element Content	Absorption Coefficient (AC) of Primary Element
Calcium Sources		(DM%)	(CPE%)	<i>Ca</i> (%)	<i>AC of Ca</i>
Bone meal, steamed, fg ^c	6-00-400	97	13.2	30.71	0.95
Calcium carbonate, CaCO ₃ , fg	6-01-069	100	— ^d	39.39	0.75
Calcium chloride anhydrous, CaCl ₂ , cp ^{e,g}	NA ^f	100	—	36.11	0.95
Calcium chloride dihydrate, CaCl ₂ • 2H ₂ O, cp ^g	NA	100	—	27.53	0.95
Calcium hydroxide, Ca(OH) ₂ , cp	NA	100	—	54.09	0.55
Calcium oxide, CaO, cp ^g	NA	100	—	71.47	0.50
Calcium phosphate (monobasic), Ca(H ₂ PO ₄) ₂ , from defluorinated phosphoric acid, fg	6-01-082	97	—	16.40	0.95
Calcium sulfate dihydrate, CaSO ₄ • 2H ₂ O, cp	6-01-089	97	—	23.28	0.70
Curacao, phosphate, fg	6-05-586	99	—	34.34	0.70
Dicalcium phosphate (dibasic), CaHPO ₄ , from defluorinated phosphoric acid, fg	6-01-080	97	—	22.00	0.94
Dolomitic limestone (magnesium), fg	6-02-633	99	—	22.30	0.60
Limestone, ground, fg	6-02-632	100	—	34.00	0.70
Magnesium oxide, MgO, fg	6-02-756	98	—	3.07	0.70
Oystershell, flour (ground), fg	6-03-481	99	—	38.00	0.75
Phosphate, defluorinated, fg	6-01-780	100	—	32.00	0.70
Phosphate rock, fg	6-03-945	100	—	35.00	0.30
Phosphate rock, low-fluorine, fg	6-03-946	100	—	36.00	0.30
Soft rock phosphate colloidal clay, fg	6-03-947	100	—	17.00	0.30
Phosphorus Sources		(DM%)	(CPE%)	<i>P</i> (%)	<i>AC of P</i>
Ammonium phosphate (dibasic), (NH ₄) ₂ HPO ₄ , fg	6-00-370	97	115.9	20.60	0.80
Ammonium phosphate (monobasic), (NH ₄)H ₂ PO ₄ , fg	6-09-338	97	70.9	24.74	0.80
Bone meal, steamed, fg	6-00-400	97	13.2	12.86	0.80
Calcium phosphate (monobasic), Ca(H ₂ PO ₄) ₂ , from defluorinated phosphoric acid, fg	6-01-082	97	—	21.60	0.80
Curacao, phosphate, fg	6-05-586	99	—	14.14	0.85
Dicalcium phosphate (dibasic), CaHPO ₄ , from defluorinated phosphoric acid, fg	6-01-080	97	—	19.30	0.75
Phosphate, defluorinated, fg	6-01-780	100	—	18.00	0.65
Phosphate rock, fg	6-03-945	100	—	13.00	0.30
Phosphate rock, low-fluorine, fg	6-03-946	100	—	14.00	0.30
Phosphoric acid, -H ₃ PO ₄ , fg ^{g,l}	6-03-707	75	—	31.60	0.90
Sodium phosphate (monobasic) monohydrate, NaH ₂ PO ₄ • H ₂ O, fg	6-04-288	97	—	22.50	0.90
Sodium tripolyphosphate (meta- and pyro-phosphate) Na ₅ P ₃ O ₁₀ , fg	6-08-076	96	—	25.00	0.75
Soft rock phosphate, colloidal clay, fg	6-03-947	100	—	9.00	0.30
Sodium Sources		(DM%)	(CPE%)	<i>Na</i> (%)	<i>AC of Na</i>
Bone meal, steamed, fg	6-00-400	97	13.2	5.69	0.90
Phosphate, defluorinated, fg	6-01-780	100	—	4.90	0.90
Potassium chloride, KCl, fg	6-03-755	100	—	1.00	0.90
Sodium bicarbonate, NaHCO ₃ , fg	6-04-272	100	—	27.00	0.90
Sodium carbonate monohydrate, Na ₂ CO ₃ • H ₂ O, cp	NA	100	—	37.08	0.90
Sodium chloride, NaCl, fg	6-04-152	100	—	39.34	0.90
Sodium phosphate (monobasic) monohydrate, NaH ₂ PO ₄ • H ₂ O, fg	6-04-288	97	—	16.68	0.90
Sodium selenate decahydrate, Na ₂ SeO ₄ • 10H ₂ O, cp	NA	100	—	12.46	0.90
Sodium selenite, Na ₂ SeO ₃ , fg	6-26-013	98	—	26.60	0.90
Sodium sesquicarbonate dihydrate, Na ₂ CO ₃ + NaHCO ₃ • 2H ₂ O, fg	NA	100	—	30.50	0.90
Sodium sulfate decahydrate, Na ₂ SO ₄ • 10H ₂ O, cp	6-04-292	97	—	14.27	0.90

(continues)

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TABLE 15-4 (*continued*)

Mineral Element Source	International Feed No. ^a	Dry Matter ^b	Crude Protein Equivalent (CPE) = N% x 6.25	Primary Mineral Element Content	Absorption Coefficient (AC) of Primary Element
Sodium Sources (<i>continued</i>)		(DM%)	(CPE%)	Na (%)	AC of Na
Sodium tripolyphosphate(meta- and pyro-phosphate, $\text{Na}_5\text{P}_3\text{O}_{10}$, fg	6-08-076	96	—	31.00	0.90
Chloride Sources		(DM%)	(CPE%)	Cl (%)	AC of Cl
Ammonium chloride, cp	NA	100	163.63	66.28	0.90
Calcium chloride anhydrous, CaCl_2 , cp ^g	NA	100	—	63.89	0.90
Calcium chloride dihydrate, $\text{CaCl}_2 \cdot 2\text{H}_2\text{O}$, cp ^g	NA	100	—	48.23	0.90
Cobalt dichloride hexahydrate, $\text{CoCl}_2 \cdot 6\text{H}_2\text{O}$, cp	NA	100	—	29.80	0.90
Cupric chloride dihydrate, $\text{CuCl}_2 \cdot 2\text{H}_2\text{O}$, cp	NA	100	—	41.65	0.90
Magnesium chloride hexahydrate, $\text{MgCl}_2 \cdot 6\text{H}_2\text{O}$, cp	NA	100	—	34.88	0.90
Manganese dichloride, MnCl_2 , cp	NA	100	—	56.34	0.90
Manganese chloride tetrahydrate, $\text{MnCl}_2 \cdot 4\text{H}_2\text{O}$, cp	NA	100	—	35.80	0.90
Potassium chloride, KCl, fg	6-03-755	100	—	47.30	0.90
Sodium chloride, NaCl, fg	6-04-152	100	—	60.66	0.90
Zinc chloride, ZnCl_2 , cp	NA	100	—	52.03	0.90
Potassium Sources		(DM%)	(CPE%)	K (%)	AC of K
Potassium bicarbonate, KHCO_3 , cp	6-29-493	99	—	39.05	0.90
Potassium carbonate, K_2CO_3 , cp	NA	100	—	56.58	0.90
Potassium chloride, KCl, fg	6-03-755	100	—	50.00	0.90
Potassium iodide, KI, fg	6-03-759	100	—	21.00	0.90
Potassium sulfate, K_2SO_4 , fg	6-06-098	98	—	41.84	0.90
Magnesium Sources		(DM%)	(CPE%)	Mg (%)	AC of Mg
Dolomitic limestone (magnesium), fg	6-02-633	99	—	9.99	0.30
Limestone, ground, fg	6-02-632	100	—	2.06	0.30
Magnesium carbonate, $\text{MgCO}_3 + \text{Mg(OH)}_2$, fg	6-02-754	98	—	30.81	0.35
Magnesium chloride hexahydrate, $\text{MgCl}_2 \cdot 6\text{H}_2\text{O}$, cp	NA	100	—	11.96	0.90
Magnesium hydroxide, Mg(OH)_2 , cp	NA	100	—	41.69	0.70
Magnesium oxide, MgO , fg	6-02-756	98	—	56.20	0.70
Magnesium sulfate heptahydrate, $\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$, fg	6-02-758	98	—	9.80	0.90
Sulfur Sources		(DM%)	(CPE%)	S (%)	AC of S
Ammonium phosphate (dibasic), $(\text{NH}_4)_2\text{HPO}_4$, fg	6-00-370	97	115.9	2.16	
Ammonium phosphate (monobasic), $(\text{NH}_4)\text{H}_2\text{PO}_4$, fg	6-09-338	97	70.9	1.46	
Ammonium sulfate, $(\text{NH}_4)_2\text{SO}_4$, fg	6-09-339	100	134.1	24.10	
Bone meal, steamed, fg	6-00-400	97	13.2	2.51	
Calcium phosphate (monobasic), $\text{Ca}(\text{H}_2\text{PO}_4)_2$, from defluorinated phosphoric acid, fg	6-01-082	97	—	1.22	
Calcium sulfate, dihydrate $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$, fg	6-01-089	97	—	18.62	
Cupric sulfate pentahydrate, $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$	6-01-720	100	—	12.84	
Dicalcium phosphate (dibasic), CaHPO_4 , from defluorinated phosphoric acid, fg	6-01-080	97	—	1.14	
Ferrous sulfate heptahydrate, $\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$, fg	6-20-734	98	—	12.35	
Magnesium sulfate heptahydrate, $\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$, fg	NA	98	—	13.31	
Manganese sulfate monohydrate, $\text{MnSO}_4 \cdot \text{H}_2\text{O}$, cp	NA	100	—	18.97	
Manganese sulfate pentahydrate, $\text{MnSO}_4 \cdot 5\text{H}_2\text{O}$, cp	NA	100	—	13.30	

(continues)

TABLE 15-4 (*continued*)

Mineral Element Source	International Feed No. ^a	Dry Matter ^b	Crude Protein Equivalent (CPE) = N% x 6.25	Primary Mineral Element Content	Absorption Coefficient (AC) of Primary Element
Sulfur Sources (<i>continued</i>)		(DM%)	(CPE%)	S (%)	AC of S
Phosphoric acid, -H ₃ PO ₄ , fg ^g	6-03-707	75	—	1.55	
Potassium sulfate, K ₂ SO ₄ , fg	6-06-098	98	—	17.35	
Sodium sulfate decahydrate, Na ₂ SO ₄ • 10H ₂ O, cp	6-04-292	97	—	9.95	
Zinc sulfate monohydrate, ZnSO ₄ • H ₂ O, fg	6-05-555	99	—	17.68	
Cobalt Sources		(DM%)	(CPE%)	Co (mg/kg)	AC of CO
Cobalt carbonate, CoCO ₃ , fg	6-01-566	99	—	460,000	
Cobalt carbonate hexahydrate, CoCO ₃ • 6H ₂ O, cp	NA	100	—	259,000	
Cobalt dichloride hexahydrate, CoCl ₂ • 6H ₂ O, cp	NA	100	—	247,800	
Copper (Cupric) Sources		(DM%)	(CPE%)	Cu (mg/kg)	AC of Cu
Cupric chloride dihydrate, CuCl ₂ • 2H ₂ O, cp	NA	100	—	372,000	0.05
Cupric oxide, CuO, cp	NA	100	—	798,800	0.01
Cupric sulfate pentahydrate, CuSO ₄ • 5H ₂ O, cp	6-01-720	100	—	254,500	0.05
Iodine Sources		(DM%)	(CPE%)	I (mg/kg)	AC of I
Ethylenediaminodihydroiodide (EDDI), fg	6-01-842	98	—	803,400	0.90
Potassium iodide, KI, fg	6-03-759	100	—	681,700	0.90
Iron Sources		(DM%)	(CPE%)	Fe (mg/kg)	AC of Fe
Ammonium phosphate (dibasic), (NH ₄) ₂ HPO ₄ , fg	6-00-370	97	115.9	12,400	0.40
Ammonium phosphate (monobasic), (NH ₄)H ₂ PO ₄ , fg	6-09-338	97	70.9	17,400	0.40
Bone meal, steamed, fg	6-00-400	97	13.2	26,700	0.40
Calcium phosphate (monobasic), Ca(H ₂ PO ₄) ₂ , from defluorinated phosphoric acid, fg	6-01-082	97	—	15,800	0.40
Dicalcium phosphate (dibasic), CaHPO ₄ , from defluorinated phosphoric acid, fg	6-01-080	97	—	14,400	0.40
Ferrous sulfate heptahydrate, FeSO ₄ • 7H ₂ O, fg	6-20-734	98	—	218,400	0.60
Phosphate rock, fg	6-03-945	100	—	16,800	0.40
Phosphoric acid, -H ₃ PO ₄ , fg ^g	6-03-707	75	—	17,500	0.40
Soft rock phosphate, colloidal clay, fg	6-03-947	100	—	19,000	0.40
Manganese (Manganous) Sources		(DM%)	(CPE%)	Mn (mg/kg)	AC of Mn
Manganese carbonate, MnCO ₃ , cp	6-03-036	97	—	478,000	0.0015
Manganese chloride, MnCl ₂ , cp	NA	100	—	430,000	0.0120
Manganese chloride tetrahydrate, MnCl ₂ • 4H ₂ O, cp	NA	100	—	277,000	0.0120
Manganese oxide, MnO, cp	6-03-056	99	—	774,500	0.0025
Manganese sulfate monohydrate, MnSO ₄ • H ₂ O, cp	NA	100	—	325,069	0.0120
Manganese sulfate pentahydrate, MnSO ₄ • 5H ₂ O, cp	NA	100	—	227,891	0.0100
Selenium Sources		(DM%)	(CPE%)	Se(mg/kg)	
Sodium selenate decahydrate, Na ₂ SeO ₄ • 10H ₂ O, cp	NA	100	—	213,920	
Sodium selenite, Na ₂ SeO ₃ , cp	6-26-013	98	—	456,000	
Zinc Sources		(DM%)	(CPE%)	Zn (mg/kg)	AC of Zn
Zinc carbonate, ZnCO ₃ , cp	NA	100	—	521,400	0.10
Zinc chloride, ZnCl ₂ , cp	NA	100	—	479,700	0.20
Zinc oxide, ZnO, cp	6-05-533	100	—	780,000	0.12
Zinc sulfate monohydrate, ZnSO ₄ • H ₂ O, fg	6-05-555	99	—	363,600	0.20

(continues)

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TABLE 15-4 (*continued*)

Mineral Element Source	International Feed No. ^a	Dry Matter ^b	Crude Protein Equivalent (CPE) = N% x 6.25	Primary Mineral Element Content	Absorption Coefficient (AC) of Primary Element
Fluorine Sources		(DM%)	(CPE%)	<i>Fl</i> (mg/kg)	
Ammonium phosphate (dibasic), $(\text{NH}_4)_2\text{HPO}_4$, fg	6-00-370	97	115.9	2,100	
Ammonium phosphate (monobasic), $(\text{NH}_4)\text{H}_2\text{PO}_4$, fg	6-09-338	97	70.9	2,500	
Calcium phosphate (monobasic), $\text{Ca}(\text{H}_2\text{PO}_4)_2$, from defluorinated phosphoric acid, fg	6-01-082	97	—	2,100	
Curacao, phosphate, fg	6-05-586	99	—	5,550	
Dicalcium phosphate (dibasic), CaHPO_4 , from defluorinated phosphoric acid, fg	6-01-080	97	—	1,800	
Phosphate, defluorinated, fg	6-01-780	100	—	1,800	
Phosphate rock, fg	6-03-945	100	—	35,000	
Phosphoric acid, H_3PO_4 , fg ^c	6-03-707	75	—	3,100	
Soft rock phosphate, colloidal clay, fg	6-03-947	100	—	15,000	

NOTE: The compositions of hydrated mineral sources (e.g., $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$) are shown including the waters of hydration. Mineral element compositions of feed-grade sources vary by source, processing method, site of mining, and manufacturer. Sources should be analyzed or manufacturer's analyses should be used when available. Element composition of a source is listed if specific element concentration is $\geq 1.0\%$ for macromineral elements, or $\geq 10,000\text{ mg/kg}$ for micromineral elements, except for fluorine concentrations which are listed because of potential toxicity.

^aFirst digit denotes the class of feed: 1, dry forages and roughages; 2, pastured, range plants, and forages fed green; 3, silages; 4, energy feeds; 5, protein supplement; 6, minerals; 7, vitamins; 8, additives. The other five digits identify the individual feed.

^bDry matter contents have been estimated for the sources; actual analysis will be more accurate.

^cfg = Feed-grade source.

^dNone present.

^ecp = Chemically pure form.

^fNA = Not available.

^gUse caution when handling and mixing; can be extremely hazardous.