

# Nutritive Value of Feeds for Beef Cattle

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# **Objectives**

- · Discuss nutrient content of feeds.
- Present a table containing nutrient values for common Oklahoma feeds.

Animals require chemical elements and compounds to sustain bodily functions, for skeletal and tissue growth, and to support the reproductive process. The necessary chemical elements and compounds are referred to as nutrients and can be classified into six categories: water, carbohydrates, lipids or fats, proteins, minerals, and vitamins. Requirements for these nutrients are discussed in F-3010. The process of rumen fermentation allows ruminant animals to consume, digest, and acquire these necessary nutrients from a wide range of feed resources. Livestock producers must ensure that the animal's diet includes the proper balance of the six essential nutrients in a physical form that maintains digestive system health and function. In order to accomplish this, knowledge of available feed nutrient composition, physical and digestive characteristics, and the animal's nutrient requirements are necessarv.

Nutritive value is determined by nutrient concentration and nutrient digestibility. Nutrient concentration and digestibility data can be determined using digestion trials or by measuring chemical composition and applying this information to estimate digestibility. Table 1 contains average composition values for numerous feeds that are common in Oklahoma. Values in the table represent averages from numerous different sources, such as the National Research Council's Nutrient Requirements of Beef and Dairy Cattle publications, commercial laboratories, research trials, and other publications. Beef magazine also publishes a Feed Composition Guide that is updated annually. It is located at http://images.beefmag.com/files/13/feedcomp03.pdf.

It is imperative that producers recognize that values published in any table are merely averages and that variation among feed commodities, oilseeds, and particularly forages and roughages can be extreme. For this reason, producers are advised to have their feeds and forages tested for nutrient composition by commercial laboratories. In an effort to improve quality control and standardization among commercial laboratories, the National Forage Testing Association (NFTA) provides a unique certification service. At http://www.foragetesting.org, one can also view NFTA's recommendations for laboratory procedures and equations for use in predicting energy availability for different forage types.

Oklahoma Cooperative Extension Fact Sheets are also available on our website at: http://www.osuextra.com

## **Dry Matter**

Dry matter expresses the proportion of the feed that is not water. The moisture concentration is determined by weighing the feed sample soon after the sample has been collected. Next, the sample is placed in a drying oven until all of the water has been evaporated. Finally, the dried sample is weighed again and the dry matter content is calculated by difference.

#### **Fiber**

The first method of determining carbohydrates in feeds separated carbohydrates into crude fiber and nitrogen free extract (NFE) fractions. The crude fiber portion of the feedstuff was intended to represent the indigestible fiber fraction and NFE was supposed to represent the more readily digestible carbohydrates, such as sugars and starches. However, it was soon discovered that this system had serious limitations, particularly for fibrous feeds like forages.

Because of the wide variation in chemical analyses for crude fiber and NFE, the detergent fiber system was developed, which better reflects true carbohydrate digestibility in ruminants. The neutral detergent solubles (NDS) fraction is comprised of cell contents and has digestibility of near 100%. The neutral detergent insoluble fiber (NDF) fraction is made up of primarily cell wall tissue, which consists of hemicellulose, cellulose, and lignin. The NDF fraction also contains small amounts of silica and fiber-bound or heat-damaged protein. The NDF fraction of feeds and forages is quite variable in digestibility. Using an acid solution, the NDF residue can be further separated into acid detergent solubles (primarily hemicellulose) and acid detergent insoluble fiber (ADF). The ADF fraction contains cellulose, which has variable digestibility, and lignin, which is nearly indigestible.

The digestibility of forage fiber is proportional to the amount of lignin in the plant material. This relationship explains why some forages and feeds contain high NDF concentrations, but remain high in digestibility, while others may contain moderate or low NDF concentrations yet are low in digestible energy.

Table 1. Typical composition of feeds and forages.

Ignie	lable 1. Typical composition of feeds and forages.	us alla lo	1953.														
						Dry	Dry Matter Basis	Sasis	!				:				
Peed No.	Type of Feed	Dry Matter	NDF %	eNDF a%of NDF	S %	DIP <sup>®</sup> % of CP	NOT %	NEm Mcal/cwt	NEg Mcal/cwt	₩ %	° 8	ተ %	<b>∡</b> %	ა %	D Wd	Mn ppm	Zn ppm
	Roughage																
_	Alfalfa Hay, early bloom	06	39	92	25	88	09	29	33	5.9	1.41	0.22	2.51	0:30	13	36	30
N	Alfalfa Hay, mid bloom	06	47	92	22	84	28	56	31	5.6	1.37	0.22	1.56	0.28	Ξ	28	31
က	Alfalfa Hay, full bloom	06	49	92	17	82	22	52	26	2.3	1.19	0.24	1.56	0.27	10	28	26
4	Alfalfa Cubes	91	46	40	18	70	22	55	29	2.0	1.30	0.23	1.90	0.35	တ	32	18
5	Alfalfa, Dehydrated 17% CP	92	45	9	19	41	61	61	35	3.0	1.42	0.25	2.50	0.24	တ	34	21
9	Bermuda Hay, vegetative	06	69	80	15	80	22	55	29	2.3	0.59	0.28	1.90	0.30	12	170	36
7	Bermuda Hay, early bloom	06	22	06	10	72	53	49	24	1.9	0.51	0.20	1.60	0.25	9	140	31
œ	Bermuda Hay, full bloom	06	79	86	80	89	47	39	15	1.8	0.43	0.18	1.40	0.21	∞	110	26
6	Corn silage	35	46	70	80	72	72	77	49	3.1	0.28	0.23	1.10	0.12	4	24	22
10	Cotton Seed Hulls	06	87	100	4	22	45	45	က	1.9	0.15	60.0	1.10	0.05	13	119	10
<del>-</del>	Fescue Hay, early bloom	87	89	86	13	72	22	22	59	8.4	0.45	0.37	2.50	0.21	=	200	34
12	Fescue Hay, full bloom	88	73	86	0	89	20	52	16	3.5	0.40	0.26	1.70	0.17	7	100	23
13	Peanut Hulls	91	74	86	ω	40	22	36	0	1.5	0.20	0.07	06.0				
4	Prairie Hay	91	73	86	9	63	52	20	12	2.0	0.40	0.15	1.10	90.0	4	29	34
15	Rice Hulls	92	81	06	က	45	13	35	0	6.0	0.14	0.07	0.50	0.08	က	320	24
16	Sorghum Silage	32	29	70	6	71	29	58	32	2.7	0.49	0.22	1.72	0.12	6	69	30
17	Sudan Grass Silage	31	64	61	10	72	28	99	31	3.0	0.58	0.27	2.40	0.14	37	66	29
18	Sunflower Seed Hulls	06	73	06	4	35	40	42	0	2.2	0.00	0.11	0.20	0.19			200
19	Wheat Silage	33	62	61	13	62	29	58	32	3.2	0.40	0.28	2.10	0.21	တ	80	27
20	Wheat Straw	91	81	98	က	40	42	43	0	1.8	0.16	0.05	1.30	0.17	2	35	9
21	Wheat Straw, ammoniated	85	92	86	6	75	20	20	12	1.5	0.15	0.05	1.30	0.16	2	35	9
	Grazed Forage																
70	Borman Appropriation	30	O C	Ca	2	o L	S	73	07	0	97.0	0 21	1 00	0 0 0	7	107	20
, ac	Bermida Poot stage	00 75	9 6	000	5 6	93	0 0	, o v	5 6	0.0	0.40	- S.O.	1.90	0.00	5 5	160	200
0 0	Bermida fall mature	8 8	77	9 5	2 α	2 6	2 4	g 4	S 4	1.0	0.09	0.20	1.30	0.00	<u> </u>	140	8 6
30	Bermuda, winter, mature	06	80	100	2	55	4 4	34	. P	1.5	0.30	0.15	1.00	0.15	_	45	15
31	Bermuda, stockpiled, SeptOct.35	Oct.35	70	100	13	70	22	55	59	2.5	99.0	0.24	0.88	0.26	9	151	27
32	Bermuda, stockpiled, NovDec. 85	Jec. 85	74	100	Ξ	92	54	90	25	2.1	0.52	0.22	0.55	0.27	2	117	26
33	Bermuda, stockpiled, JanFeb.	eb. 90	77	100	7	09	47	39	15	1.5	0.48	0.18	0.32	0.25	4	116	26
34	Fescue, vegetative	59	09	40	18	80	64	99	39	4.5	0.50	0.40	2.50	0.24	13	175	36
35	Fescue, boot stage	33	92	100	12	75	22	22	58	3.8	0.45	0.30	1.80	0.21	10	150	32
36	Fescue, mature	20	74	100	œ	20	49	42	18	3.2	0.38	0.20	1.40	0.18	7	120	26
37	Fescue, stockpiled, NovDec.		72	100	13	75	52	47	22	2.7	0.45	0.30	1.80	0.21	12	150	32
38	Fescue, stockpiled, JanFeb.		22	100	=	89	40	27	က	2.2	0.38	0.20	1.40	0.18	7	120	26
39	Native Range, April-June	30	89	100	4	75	20	74	47	3.2	0.30	0.20	1.60	0.15	Ξ		
40	Native Range, July-August	35	71	100	10	70	64	65	39	3.0	0.33	0.15	1.50				
41	Native Range, SeptOct.	46	22	100	7	92	29	28	32	2.5	0.28	0.12	1.10				
42	Native Range, NovDec.	75	78	100	2	65	22	52	26	2.2	0.25	60.0	0.80				
43	Native Range, JanMarch	82	80	100	4	22	49	42	18	1.7	0.23	0.07	0.60				

By-product Feeds         Purporduct Feeds         Repair Mat Pellols with Hulls         9         34         15         64         64         64         64         64         64         64         64         64         64         64         64         75         60         88         59         32         0.07         0.15         0.27         0.43         7         22         48           Com Clumer Feed         90         46         4         20         27         92         104         73         105         0.27         0.43         7         22           50         Distillers Grains with Solubles, 90         46         4         31         47         88         99         66         100         0.25         0.83         110         0.40         7         2         7         40         5.5         0.25         0.83         110         0.40         7         2         7         40         5.5         0.00         0.10         11         2         2         17         7         40         5.5         0.00         0.11         1         2         2         1         4         7         4         4         1         7         7	44	Wheat Forage, vegetative	21	20	14	22	84	71	92	48	4.0	0.35	0.36	3.10	0.22	10	85	35
48 Corn Clutier Feed Corn Clutier Scalars with Solubles, 90 46 4 51 77 89 89 68 100 025 0.83 1.10 0.40 11 28 90 0.00 0.00 0.00 0.00 0.00 0.00 0.00	47	By-product Feeds Barley Malt Pellets with Hulls	06	20	34	18	64	89	71	44	<del>1</del> .	0.19	0.68	0.27	0.85	9	32	61
Sometimes contains with Solubles, 92   46   4   31   47   88   99   68   10,0   0.25   0.56   0.50   0.40   0.50   0.50   0.50   0.40   0.50   0.50   0.50   0.50   0.40   0.50   0.50   0.50   0.50   0.50   0.40   0.50	84 0	Corn Gluten Feed	06	0 4 6	36	24	75	80	88	59	3.2	0.07	0.15	0.27	0.43	۲ <del>۱</del>	22 28	73
50         Distiliers Grains with Solubles, 92         46         4         31         47         88         99         68         100         0.65         0.65         0.69         0.69         0.69         0.69         0.69         0.70         77         40         55.5         0.23         0.34         12         30         30         40         75.2         77         40         55.5         0.24         1.80         0.19         1.2         30         60         1.4         70         72         77         40         55.5         0.34         1.20         0.34         1.2         30         60         60         1.4         70         72         77         40         55.5         Muhat Madell         80         60         0.31         1.20         0.31         1.20         0.31         1.20         0.32         1.00         0.31         1.20         0.31         1.20         0.32         1.00         0.31         1.20         0.31         1.20         0.32         1.00         0.32         1.00         1.20         1.72         7.7         4.4         5.5         1.00         1.10         1.20         1.10         1.20         1.10         1.10         1.10	D T	Corn	0	Ç.	t	3	7	26	† 2	2	0.00	20.0	50.50	2	5	=	0	8
Sample Manage Ma	20	Distillers Grains with Solubles,	92	46	4	31	47	88	66	89	10.0	0.25		0.50	0.40			89
Second Continuency		sorghum																
See Breat Hull flat         91         23         0         14         70         72         77         49         190         0.07         1.70         1.80         0.19         12         366           54         Sovjeean Hulli Syrroduct         90         64         28         12         72         77         84         56         2.6         0.53         0.18         1.40         0.12         18         10           55         Wheat Brain         89         36         2         12         72         77         84         56         2.6         0.35         0.18         1.40         0.12         11         128           57         Wheat Middlings         89         36         2         1         72         75         81         56         0.16         0.17         10         0.12         11         128           57         Wheat Middlings         89         30         0         20         77         75         89         59         54         0.10         0.12         11         128           58         Wheat Middlings         89         9         0         0         4         4         0         10	21	Grain Screenings	06			14	92	65	29	40	2.5	0.25	0.34					30
53         Rice Mill By-product         91         60         0         7         60         42         43         0         57         0.40         0.31         2.20         0.30           54         Wobbean Hulls         90         64         4         17         72         77         74         45         56         0.53         0.13         1.40         0.24         14         10         5         14         0.03         14         10         0.24         14         10         0.24         14         10         0.24         14         10         0.24         14         10         0.24         14         10         0.24         14         10         0.24         14         10         0.24         14         12         77         78         84         56         0.13         1.40         0.24         14         18         14         47         45         56         44         0.12         10         0.24         44         10         0.24         44         10         0.04         10         12         10         47         45         86         46         0.10         12         47         45         86         46	25	Rice Bran, full fat	91	23	0	14	20	72	77	49	19.0	0.07	1.70	1.80	0.19			40
54         Soybean Hulls         90         64         28         12         77         84         55         2.6         0.53         0.18         140         0.12         18         10           55         Wheat Brann         89         46         4         17         72         70         74         47         56         0.15         1.00         140         0.12         18         10           57         Wheat Brann         89         36         4         17         72         75         81         56         46         0.15         1.00         140         0.24         11         128           58         Wheat Mill Run         90         37         0         17         72         75         81         59         54         0.10         1.00         120         12         17           58         Wheat Weat, Shorts         89         90         10         4         7         4         4         0.12         1.0         1.0         1.0         1.0         1.0         1.0         1.0         1.0         1.0         1.0         1.0         1.0         1.0         1.0         1.0         1.0         1.0	23	Rice Mill By-product	91	09	0	7	09	42	43	0	2.7	0.40	0.31	2.20	0.30			31
55         Wheat Bran         89         46         4         17         72         70         74         45         0.13         1.29         140         0.24         14           56         Wheat Bland         89         36         2         1         7 <td>54</td> <td>Soybean Hulls</td> <td>06</td> <td>64</td> <td>28</td> <td>12</td> <td>72</td> <td>77</td> <td>84</td> <td>22</td> <td>5.6</td> <td>0.53</td> <td>0.18</td> <td>1.40</td> <td>0.12</td> <td>18</td> <td></td> <td>38</td>	54	Soybean Hulls	06	64	28	12	72	77	84	22	5.6	0.53	0.18	1.40	0.12	18		38
56         Wheat Middlings         89         36         2         19         78         79         87         58         4.6         0.15         1.00         140         0.24         11         128           57         Wheat Mill Run         90         37         0         20         75         80         88         59         44         0.12         1.00         1.20         0.22         21           Feed Grains         Feed Grains         89         99         68         4.3         0.12         1.00         1.00         0.27         0.10         0.22         2.7           65         Com Grain, whole of a cacked, rolled, or ground 89         12         0         14         77         89         100         69         2.3         0.05         0.44         0.10         1.10         0.27         0.40         0.12         1.00         1.00         1.1         0.02         0.27         0.40         0.12         1.00         1.2         0.1         0.1         1.1         1.2         0.1         0.1         1.1         0.1         1.1         1.1         1.2         1.2         1.1         1.2         1.2         1.2         1.2         1.2         <	22	Wheat Bran	89	46	4	17	72	20	74	47	4.5	0.13	1.29	1.40	0.24	41		96
57         Wheat Shorts         89         37         0         17         72         75         81         53         4.4         0.12         1.00         1.20         0.22         21           Feed Grains           64         Corn Grain, steam flaked         88         9         68         4.3         0.02         0.30         0.40         0.12         3         8         8         9         68         4.3         0.02         0.30         0.40         0.12         3         8         8         9         68         4.3         0.02         0.37         0.02         0.37         0.02         0.37         0.02         0.37         0.02         0.37         0.04         0.32         0.04         0.03         0.40         0.14         5         1         4         4         0.03         0.04         0.03         0.04         0.03         0.04         0.03         0.04         0.03         0.04         0.03         0.04         0.03         0.04         0.03         0.04         0.03         0.04         0.03         0.04         0.03         0.04         0.03         0.04         0.03         0.04         0.03         0.04         0.03	26	Wheat Middlings	83	36	2	19	78	79	87	28	4.6	0.15	1.00	1.40	0.24	=		96
Feed Grains         Com Grain, whole         88         96         66         10         42         88         99         68         4.3         0.02         0.35         1.10         0.02         13           Feed Grains         Com Grain, whole         88         9         60         10         42         88         99         68         4.3         0.02         0.37         0.40         0.12         3         8           Com Grain, whole         85         9         60         10         41         93         106         68         4.3         0.02         0.27         0.40         0.12         3         8           Wheat cracked, rolled, or ground         89         68         99         68         2.3         0.02         0.27         0.44         0.14         5         15           Milo, steam flaked         85         11         45         82         91         61         3.1         0.02         0.27         0.44         0.14         5         15           Milo, steam flaked         81         11         45         82         91         70         3.1         0.02         0.24         0.24         0.14         0.14         <	22	Wheat Mill Run	06	37	0	17	72	75	81	53	4.4	0.12	1.00	1.20	0.22	21		06
Feed Grains           64         Corn Grain, whole         88         9         68         4.3         0.02         0.30         0.40         0.12         3         8           65         Corn Grain, steam flaked         85         9         40         10         41         93         106         74         4.1         0.02         0.27         0.40         0.12         3         8           66         Wheat, cracked, rolled, or ground         89         16         5         11         45         82         91         60         6.4         0.40         0.12         3         8           66         Wheat, cracked, rolled, or ground         89         16         5         11         45         82         91         60         6.9         2.3         0.05         0.44         0.40         0.14         5         15           66         Wheat, cracked, rolled, or ground         89         16         7         82         91         100         69         2.3         0.05         0.44         0.40         0.14         5         15           68         Milo, steam flaked         82         91         102         76         3.1	28	Wheat Shorts	89	30	0	20	75	80	88	29	5.4	0.10	0.95	1.10	0.20	13		118
64 Corn Grain, whole 8 9 6 60 10 42 88 99 68 4.3 0.02 0.30 0.40 0.12 3 8 8 8 9 66 Wheat, whole 8 12 0 14 77 89 106 74 4.1 0.02 0.27 0.40 0.12 3 8 8 8 9 8 8 9 9 106 0.44 0.02 0.27 0.40 0.12 3 8 8 8 9 8 9 106 0.04 0.02 0.27 0.40 0.14 6 37 0.02 0.04 0.014		Feed Grains																
65 Corn Grain, steam flaked 85 9 40 10 14 77 89 106 74 4.1 0.02 0.27 0.40 0.12 3 8 8 6 9 40 Wheat, cracked, rolled, or ground 89 12 0 14 77 89 100 69 2.3 0.05 0.44 0.40 0.14 6 37 6 15 6 15 8 8 8 9 100 69 2.3 0.05 0.44 0.40 0.14 6 37 6 15 15 6 15 8 8 9 100 69 2.3 0.05 0.44 0.40 0.14 6 37 15 15 15 15 15 15 15 15 15 15 15 15 15	64	Corn Grain, whole	88	တ	09	10	42	88	66	89	4.3	0.02	0.30	0.40	0.12	က	8	18
66 Wheat, cracked, rolled, or ground 89 12 0 14 77 89 100 69 2.3 0.05 0.44 0.40 0.14 6 37 68 15 Milo, cracked, rolled, or ground 89 16 5 11 45 82 91 61 3.1 0.04 0.32 0.40 0.14 5 15 15 68 Milo, cracked, rolled, or ground 89 16 5 11 45 82 91 61 3.1 0.04 0.32 0.40 0.14 5 15 15 15 15 15 15 15 15 15 15 15 15 1	92	Corn Grain, steam flaked	85	တ	40	10	41	93	106	74	4.1	0.02	0.27	0.40	0.12	က	80	18
67 Milo, cracked, rolled, or ground 89 16 5 11 45 82 91 61 3.1 0.04 0.32 0.40 0.14 5 15 15 68 Milo, steam flaked 82 20 38 11 38 90 102 70 3.1 0.04 0.28 0.40 0.14 5 15 15 15 15 15 15 15 15 15 15 15 15 1		Wheat, cracked, rolled, or ground		12	0	14	2.2	89	100	69	2.3	0.05	0.44	0.40	0.14	9	37	40
High Protein Meals and Seeds  High Protein Meals and Seeds  Uctonseed, whole whole whole whole whole solvent Beal solvent Beal solvent Beal whole whol		Milo, cracked, rolled, or ground		16	2	1	45	82	91	61	3.1	0.04	0.32	0.40	0.14	2	15	18
High Protein Meals and Seeds         91         47         100         23         62         95         108         76         17.8         0.16         0.62         1.22         0.26         8         12           Cottonseed, whole         91         25         23         48         58         77         84         55         1.8         0.22         1.25         1.70         0.44         17         57           Peanut Meal, 48%         91         27         23         54         64         87         98         67         1.2         0.28         0.71         2.0         0.47         29           Soybean Meal, 48%         91         23         54         64         87         98         67         1.2         0.28         0.71         2.0         0.34         15         59           Soybean Meal, 48%         91         24         80         75         122         142         103         42         2.0         0.34         15         35           Sunflower Seeds, high oil         91         24         80         60         68         42         2.9         0.45         1.05         0.27         0.6         1.27         0.33 <th></th> <th>Milo, steam flaked</th> <th>82</th> <th>20</th> <th>38</th> <th><del>-</del></th> <th>38</th> <th>06</th> <th>102</th> <th>20</th> <th>3.1</th> <th>0.04</th> <th>0.28</th> <th>0.40</th> <th>0.14</th> <th>2</th> <th>15</th> <th>18</th>		Milo, steam flaked	82	20	38	<del>-</del>	38	06	102	20	3.1	0.04	0.28	0.40	0.14	2	15	18
Cottonseed, whole         91         47         100         23         62         95         108         76         17.8         0.16         0.62         1.22         0.26         8         12           Cottonseed Meal, 41%         90         25         23         48         58         77         84         55         1.8         0.22         1.25         1.70         0.44         17         57           Peanut Meal, solvent         91         27         23         50         73         77         84         55         3.6         0.24         0.58         1.00         0.34         17         57           Soybean Meal, 48%         91         9         23         54         64         87         98         67         1.2         0.28         0.71         2.0         0.47         23         41           Soybeans, whole         88         15         100         40         75         122         142         103         42         27         151         106         33         4         20         35           Surflower Seeds, high oil         90         23         26         80         60         68         42         2.9 </td <td></td> <td>High Protein Meals and Seed</td> <td>(n</td> <td></td>		High Protein Meals and Seed	(n															
Cottonseed Meal, 41%         90         25         23         48         58         77         84         55         1.8         0.22         1.25         1.70         0.44         17         57           Peanut Meal, solvent         91         27         23         50         73         77         84         55         3.6         0.24         0.58         1.00         0.30         16         29           Soybean Meal, 48%         91         9         23         54         64         87         98         67         1.2         0.28         0.71         2.0         0.47         23         41           Soybeans, whole         88         15         100         40         75         122         142         103         42         2.0         0.45         1.0         23         41         35           Sunflower Seeds, high oil         91         40         25         80         60         68         42         71         51         1.06         0.34         15         35           Sunflower Seed Meal with Hulls 91         40         23         26         80         60         68         42         2.9         0.45         1.02	69	Cottonseed, whole	91	47	100	23	62	92	108	9/	17.8	0.16	0.62	1.22	0.26	œ	12	38
Peanut Meal, solvent         91         27         23         50         73         77         84         55         3.6         0.24         0.58         1.00         0.30         16         29           Soybean Meal, 48%         91         9         23         54         64         87         98         67         1.2         0.28         0.71         2.0         0.47         23         41           Soybeans, whole         88         15         100         40         72         93         106         74         18.8         0.27         0.64         2.00         0.34         15         35           Sunflower Seeds, high oil         91         24         75         122         142         103         42         71         1.1         1.06         0.21         20         35           Sunflower Seed Meal with Hulls 91         40         23         26         80         60         68         42         2.7         1.27         0.33         4         20           Mung Beans         90         44         23         26         79         73         45         65         6.6         6.6         6.6         6.6         6.6	20	Cottonseed Meal, 41%	06	25	23	48	28	77	84	22	1.8	0.22	1.25	1.70	0.44	17	22	99
Soybean Meal, 48%       91       9       23       54       64       87       98       67       1.2       0.28       0.71       2.20       0.47       23       41         Soybeans, whole       88       15       100       40       72       93       106       74       18.8       0.27       0.64       2.00       0.34       15       35         Sunflower Seeds, high oil       91       24       80       122       142       103       42       77       51       1.06       0.21       20       35         Sunflower Seed Meal with Hulls 91       40       23       26       80       60       68       42       2.7       1.27       1.27       0.33       4       20       35         Mung Beans       90       23       25       79       87       58       1.19       0.68       7       1.85       14       12	71	Peanut Meal, solvent	91	27	23	20	73	27	84	22	3.6	0.24	0.58	1.00	0.30	16	29	38
Soybeans, whole 88 15 100 40 72 93 106 74 18.8 0.27 0.64 2.00 0.34 15 35 Sunflower Seeds, high oil 91 24 80 19 75 122 142 103 42 .71 .51 1.06 0.21 20 35 Sunflower Seed Meal with Hulls 91 40 23 26 80 60 68 42 2.9 0.45 1.02 1.27 0.33 4 20 .70 Mung Beans 90 23 25 79 87 58 1.19 0.68	72	Soybean Meal, 48%	91	6	23	54	64	87	86	29	1.2	0.28	0.71	2.20	0.47	23	41	61
Sunflower Seeds, high oil 91 24 80 19 75 122 142 103 42 .71 .51 1.06 0.21 20 35 Sunflower Seed Meal with Hulls 91 40 23 26 80 60 68 42 2.9 0.45 1.02 1.27 0.33 4 20 Mung Beans 90 23 25 79 87 58 1.19 0.68 Feather Meal 92 44 23 86 27 69 73 45 6.5 0.60 0.62 0.20 1.85 14 12	73	Soybeans, whole	88	15	100	40	72	93	106	74	18.8	0.27	0.64	2.00	0.34	15	35	29
Sunflower Seed Meal with Hulls 91       40       23       26       80       60       68       42       2.9       0.45       1.02       1.27       0.33       4       20         Mung Beans       90       23       25       79       87       58       1.19       0.68         Feather Meal       92       44       23       86       27       69       73       45       6.5       0.60       0.62       0.20       1.85       14       12	74	Sunflower Seeds, high oil	91	24	80	19	75	122	142	103	42	.71	.51	1.06	0.21	20	35	53
Mung Beans         90         23         25         79         87         58         1.19         0.68           Feather Meal         92         44         23         86         27         69         73         45         6.5         0.60         0.62         0.20         1.85         14         12	22	Sunflower Seed Meal with Hulls	91	40	23	56	80	09	89	42	5.9	0.45	1.02	1.27	0.33	4	20	105
92 44 23 86 27 69 73 45 6.5 0.60 0.62 0.20 1.85 14 12	92	Mung Beans	06			23	25	79	87	28		1.19	0.68					
	27	Feather Meal	92	44	23	98	27	69	73	45	6.5	09.0	0.62	0.20	1.85	14	12	95

#### **Effective NDF**

The effective NDF (eNDF) value shown in Table 1 is a measure of the feed NDF that is effective in stimulating rumen motility or churning. The table expresses eNDF as a percentage of NDF. The layman term for eNDF is the "scratch" value of the feed. If the rumen stops churning, acidic gasses build up causing the pH to drop. The result is bloat, acidosis, and/or founder, as well as reduced diet digestibility. This value is determined by several factors including particle size, density, hydration, and degree of lignification. In order to maintain optimal forage digestion, the diet should contain a minimum of 20% eNDF on a dry matter basis.

#### **Protein**

Requirements for metabolizable, degradable, and crude protein (CP) were discussed in F-3010. Protein values in the table reflect CP, which is simply nitrogen concentration multiplied by 6.25. The degradable intake protein (DIP) column is an estimate of the proportion of the crude protein that is actually degradable in the rumen and is expressed as a percentage of CP. Undegradable protein (% of CP) can be calculated by subtracting the DIP value from one.

## **Feed Energy Values**

Feed energy values are expressed on a dry matter basis as percent total digestible nutrients (TDN), net energy for maintenance (NEm), and net energy for gain (NEg) units (mega calories per 100 lb of feed). TDN is determined by carrying out a digestion trial and summing the digestible protein and carbohydrates plus 2.25 times digestible ether extract. Ether extract (EE) is the fat or lipid portion of the feed. The net energy system is generally thought to be more precise in estimating the energy value of feeds, particularly roughages. The net energy of feed is the portion that is available to the animal for maintenance or various productive purposes. The portion used for maintenance (NEm) is used for muscular work, maintenance and repair of tissues, maintaining a stable body temperature, and other body functions. Most of this energy will leave the animal's body as heat. The energy that

is used for productive purposes (NEg) may be recovered as retained energy in the tissues or in some product, such as milk.

## **Minerals**

Minerals that are needed by animals in larger quantities are referred to as macro minerals. These minerals are shown in Table 1 and feed concentration is expressed on a percent of DM basis. Minerals that are needed by animals in much smaller quantities are referred to as micro minerals and feed concentration is expressed in parts per million (ppm) in the table. To convert ppm to percent, simply move the decimal place four places to the left. For example, if a feed contained 12 ppm copper, the copper concentration expressed as a percentage would be 0.0012%.

#### Conclusion

Producers have to ensure that their animals' diets include the proper balance of the six essential nutrients in a physical form that maintains digestive system health and function. To accomplish this, producers must have good knowledge of available feed nutrient composition, physical and digestive characteristics, and the animal's nutrient requirements.

Nutrient concentration and digestibility data can be determined by using digestion trials or measuring chemical composition and applying this information to estimate digestibility. It is imperative that producers recognize that values published in any table are merely averages and that variation among feed commodities, oilseeds, and particularly forages and roughages can be extreme. For this reason, producers are advised to have their feeds and forages tested for nutrient composition by commercial laboratories.

### References

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