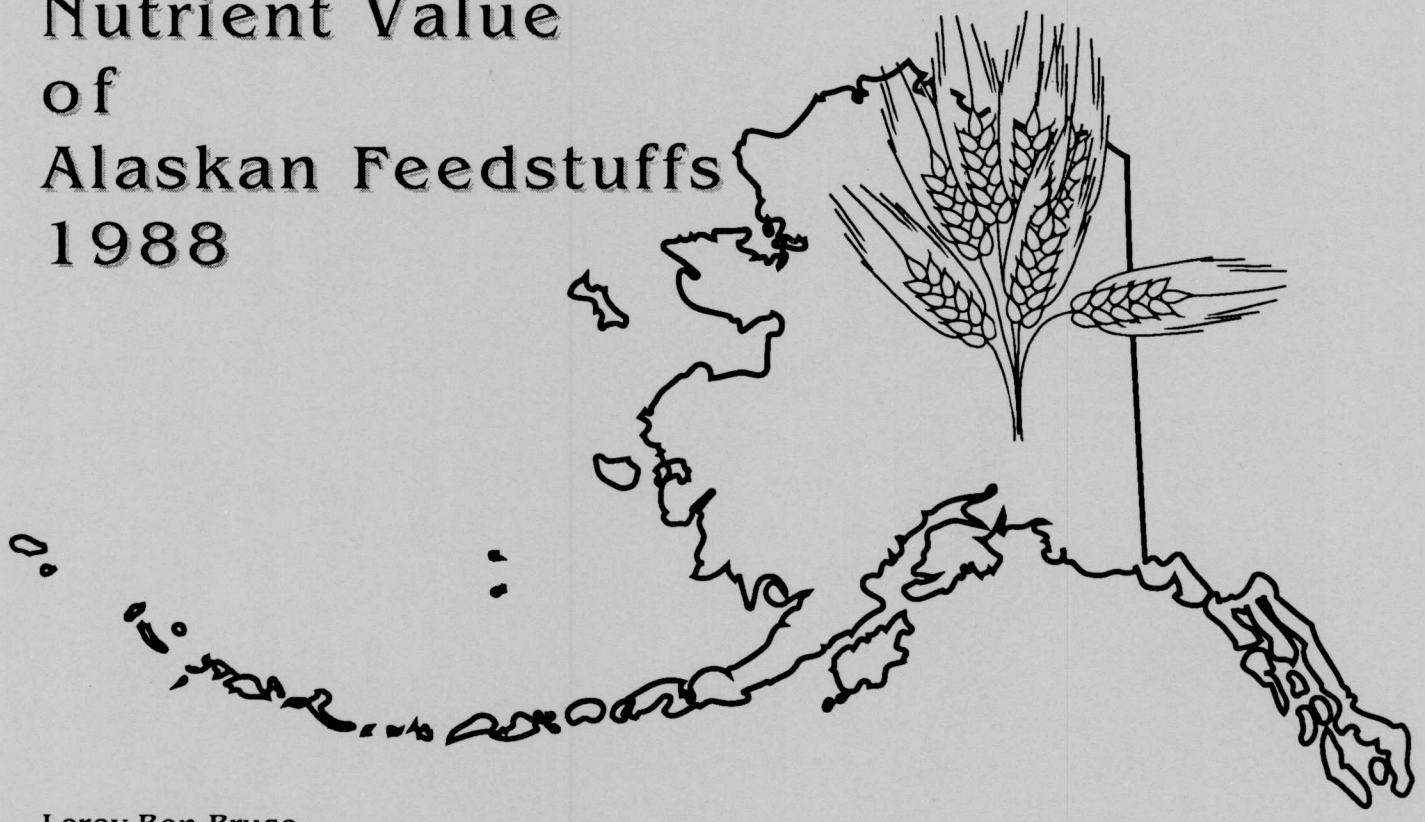
Nutrient Value of Alaskan Feedstuffs 1988



Leroy Ben Bruce
Assistant Professor of Animal Science

and

Mary Lou Herlugson
Research Associate in Animal Science

School of Agriculture and Land Resources Management
University of Alaska Fairbanks
James V. Drew, Dean and Director

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Introduction

Livestock rations should be balanced for many parameters including protein, and various minerals, and energy, to ensure that all required nutrients are present in the adequate amounts and proper relationships. Energy content is the primary consideration for balancing any farm animal's diet because it is often the most limiting factor in animal performance. In Alaska, it is extremely important to test for major nutrients and then to balance rations because:

1) Alaska has longer, colder and wetter winters than those in the lower 48 states and consequently Alaskan animals have different nutrient needs.
2) Alaskan feedstuffs tend to be more variable in nutrient content than feeds grown in other states.

After energy requirements, crude protein, calcium, phosphorus, and potassium are considered – and with the energy estimate – are the basis of the standard feed analyses performed by the Agricultural and Forestry Experiment Station (AFES) Service Laboratory feed testing section. Because all of these nutrients can vary greatly in the same feed, the Palmer Animal Sciences beef unit of AFES tracks the nutrient values of feed samples submitted to the AFES Service Laboratory. A summary of these values provides an indication of the types and values of feed available in Alaska. It also shows the variability in nutrient content of feedstuffs. Hopefully, this will stimulate the use of individual nutrient analyses for feeding livestock in Alaska.

Procedures

The Palmer AFES Service Laboratory officially began accepting feed samples for testing in September 1982 in a cooperative program with the Cooperative Extension Service (CES). Originally, samples were analyzed for dry matter, calcium, phosphorus, crude protein, acid detergent fiber (ADF), and *in vitro* dry matter disappearance (IVDMD). Metabolizable energy (ME) was then calculated from the IVDMD value. In 1988, equations specific to Alaskan feeds were derived and are now used to calculate total digestible nutrients (TDN) as well as ME from ADF values. Recently, potassium analysis was added as part of the standard analyses. Data from the samples analyzed between 1982 and June 1988 were compiled and categorized by type. For this circular, energy values (TDN, ME, and NEL) were calculated from ADF. Other values were determined by procedures as outlined in the AFES Service Lab manual. Major categories are: alfalfa hay, barley grain, concentrates, grass hay, oat hay, silage (including grass and small grain), timothy hay, and other grains (including corn, oats, peas, wheat, and thual barley). These categories represent feedstuffs used in Alaska, which may or may not have been grown here.

Discussion and Conclusions

Because our Alaskan feeds database is now sufficiently large, we have developed equations to predict energy values as TDN, ME, and NEL from ADF. This new technique is used for the energy data in this circular. Since the mid-1970s, the detergent analysis procedures developed by Van Soest (1963), have largely replaced the IVDMD (Tilley and Terry, 1963) procedure which estimates digestibility that is positively correlated to energy. A survey by C. E. Coppock (1976) of land-grant universities of the United States and the corresponding universities of the Canadian provinces found that of 50 respondents, only two still offered IVDMD in their feed testing programs. The IVDMD analysis takes a minimum of one week. Van Soest's procedures measure chemical components of feedstuffs rather than their apparent digestibilitie and are rapid, relatively simple techniques. One of his procedures, ADF, measures the less digestible portions of feedstuffs. There is a very strong negative correlation between ADF and feedstuff energy values. Many researchers now believe that ADF is the most accurate chemical method for predicting quality (Bath, 1978). Acid detergent fiber is an officially accepted method of the Association of Official Analytical Chemists (1980), meaning that laboratories anywhere in the country could run an ADF on a set of samples and be expected to achieve the same value. Currently, at the AFES Service Lab, IVDMD is analyzed along with ADF to estimate energy. In the future, feed samples will be saved and IVDMD's run in batches to continually update the equations. Eventually, ADF will replace IVDMD.

Tables one through eight present data summarized by type and submittal location. All data are presented on a 100% dry matter, or moisture-free, basis. This is standard for reporting data, both in scientific literature and in feed tables. Storage methods, weather, and other factors cause feedstuff moisture content to vary even on a daily basis. When feeding livestock, moisture content should be measured and used to adjust the amount to be fed.

With the large nutrient content variation in all categories, it is important to emphasize that all feeds should be analyzed and that average values of feeds, from this report or any other, should be avoided when feeding individual animals. This type of averaged information is valuable in that it indicates, generally, what kinds of feeds are available in Alaska and their relative value. Data presented here is a compliation of the nutrient values of feed samples submitted for six years from various locations. The data is intended to be informative from that standpoint. The feed samples came from various locations from year to year and no inference can be or should be made on yearly fluctuations. *The most important conclusion is that the nutrient analyses vary considerably, and individual producers should feed livestock on the basis of their own nutrient analyses.* Specific problems may require specialized analyses or the help of a nutritionist or Cooperative Extension Agent in properly balancing the ration.

Literature Cited

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TABLE 1. Alfalfa Hay analytical values, by region, for number of samples (No.), Crude Protein (CP) %, Phosphorus (P) %, Calcium (Ca) %, Potassium (K) %, Total Digestible Nutrients (TDN) %, Metabolizable Energy (ME) Mcal/lb, and Net Energy for lactation (NEL) Mcal/lb.

		Alfalfa Hay							
Region	Value	No. of samples	CP	P	Ca	K	ADF	TDN	ME	NEL
Kenai										
	Average	10	18.6	.27	1.29	2.68	36.0	56	.93	.60
	Maximum		25.	.33	1.66	3.01	43.9	67	1.16	.79
	Minimum		15.4	.21	1.00	2.33	27.5	47	.76	.46
Mat-Su										
	Average	29	18.0	.24	1.40	2.59	36.5	55	.92	.59
	Maximum		25.1	.32	1.99	3.76	49.2	72	1.25	.86
	Minimum		12.8	.15	.91	1.83	24.0	41	.63	.35
STATE										
	Average	43	18.0	.25	1.43	2.50	36.1	56	.93	.60
	Maximum		25.1	.34	3.03	3.76	49.2	72	1.25	.86
	Minimum		12.0	.15	.91	1.83	24.0	41	.63	.35

TABLE 2. Barley grain analytical values, by region, for number of samples (No.), Crude Protein (CP) %, Phosphorus (P) %, Calcium (Ca) %, Potassium (K) %, Total Digestible Nutrients (TDN) %, Metabolizable Energy (ME) Mcal/lb, and Net Energy for lactation (NEL) Mcal/lb.

		Barley Grain							
Region	Value	No. of samples	CP	P	Ca	K	ADF	TDN	ME	NEL
Delta										
	Average	44	11.2	.32	.12	.61	10.2	80	1.29	.89
	Maximum		16.7	.68	1.21	1.03	22.4	87	1.42	1.00
	Minimum		7.6	.19	.03	.41	4.5	65	.99	.65
Fairbanks										
	Average	3	14.2	.36	.11	.67	8.3	82	1.33	.92
	Maximum		16.7	.38	.18	.67	11.4	84	1.37	.96
	Minimum		11.2	.34	.05	.67	6.5	78	1.26	.86
Kenai										
	Average	6	11.9	.19	.23	-	10.5	79	1.28	.88
	Maximum		13.7	.34	.33	-	13.1	82	1.34	.93
	Minimum		10.8	.06	.05	-	8.0	76	1.22	.83
Mat-Su										
	Average	30	11.4	.34	.11	.62	13.5	76	1.21	.82
	Maximum		13.8	.49	.31	.86	41.2	89	1.48	1.04
	Minimum		8.0	.14	.00	.40	2.1	43	.55	.29
STATE										
	Average	83	11.4	.32	.12	.62	11.3	78	1.26	.86
	Maximum		16.7	.68	1.21	1.03	41.2	89	1.48	1.04
	Minimum		7.6	.06	.00	.40	2.1	43	.55	.29

TABLE 3. Silage analytical values, by region, for number of samples (No.), Crude Protein (CP) %, Phosphorus (P) %, Calcium (Ca) %, Potassium (K) %, Total Digestible Nutrients (TDN) %, Metabolizable Energy (ME) Mcal/lb, and Net Energy for lactation (NEL) Mcal/lb.

Region	Value	No. of samples	CP	P	Ca	K	ADF	TDN	ME	NEL
Silage										
Grass Silage										
Delta										
	Average	4	12.7	.22	.46	2.16	34.7	59	.96	.62
	Maximum		15.3	.27	.58	2.26	36.2	60	.97	.63
	Minimum		9.0	.15	.38	2.08	32.7	58	.93	.60
Mat-Su										
	Average	12	14.0	.26	.46	2.80	38.7	55	.88	.56
	Maximum		19.8	.39	.63	3.43	44.9	60	.97	.63
	Minimum		9.7	.12	.29	2.20	32.9	47	.72	.43
STATE										
	Average	16	13.7	.25	.46	2.56	37.7	56	.90	.58
	Maximum		19.8	.39	.63	3.43	44.9	60	.97	.63
	Minimum		9.0	.12	.29	2.08	32.7	47	.72	.43
Small Grain Silage										
Delta										
	Average	15	11.7	.20	.45	2.06	37.9	56	.90	.57
	Maximum		16.4	.27	.67	3.10	44.8	60	.97	.63
	Minimum		7.6	.14	.23	1.34	32.1	48	.72	.43
Mat-Su										
	Average	88	9.5	.20	.29	1.62	40.6	53	.83	.52
	Maximum		18.6	.57	.85	4.63	52.1	59	.95	.61
	Minimum		5.7	.10	.08	.31	29.4	42	.62	.34
STATE										
	Average	112	9.8	.20	.30	1.70	40.1	54	.84	.53
	Maximum		18.6	.57	.85	4.63	52.1	60	.97	.63
	Minimum		5.7	.10	.08	.31	29.4	42	.62	.34

TABLE 4. Timothy Hay analytical values, by region, for number of samples (No.), Crude Protein (CP) %, Phosphorus (P) %, Calcium (Ca) %, Potassium (K) %, Total Digestible Nutrients (TDN) %, Metabolizable Energy (ME) Mcal/lb, and Net Energy for lactation (NEL) Mcal/lb.

		Timothy Hay							
Region	Value	No. of samples	CP	P	Ca	K	ADF	TDN	ME	NEL
Delta										
	Average	3	12.9	.15	.30	-	32.1	61	1.03	.68
	Maximum		15.2	.18	.31	-	35.5	67	1.15	.77
	Minimum		10.3	.10	.27	-	28.1	57	.95	.61
Kenai										
	Average	40	10.4	.21	.36	1.84	39.0	52	.86	.54
	Maximum		20.9	.33	1.24	3.09	48.2	64	1.09	.73
	Minimum		5.2	.09	.14	0.89	30.0	42	.66	.38
Mat-Su										
	Average	21	9.4	.20	.33	1.72	37.6	54	.89	.57
	Maximum		14.5	.33	.76	2.80	46.5	64	1.09	.73
	Minimum		3.8	.08	.19	1.05	30.0	44	.70	.41
STATE										
	Average	68	10.1	.20	.35	1.77	38.0	54	.89	.56
	Maximum		20.9	.33	1.24	3.09	48.2	67	1.15	.77
	Minimum		3.8	.08	.14	.89	28.1	42	.66	.38

TABLE 5. Oat Hay analytical values, by region, for number of samples (No.), Crude Protein (CP) %, Phosphorus (P) %, Calcium (Ca) %, Potassium (K) %, Total Digestible Nutrients (TDN) %, Metabolizable Energy (ME) Mcal/lb, and Net Energy for lactation (NEL) Mcal/lb.

		Oat Hay							
Region	Value	No. of samples	CP	P	Ca	K	ADF	TDN	ME	NEL
Delta										
	Average	10	11.1	.23	.32	2.41	38.1	53	.88	.56
	Maximum		17.7	.39	.55	4.07	47.0	68	1.17	.79
	Minimum		6.2	.14	.17	1.29	27.2	44	.69	.40
Fairbanks										
	Average	26	9.5	.25	.35	.54	39.9	51	.84	.53
	Maximum		13.0	1.02	.59	.87	51.7	60	1.01	.66
	Minimum		7.1	.13	.18	.20	33.0	37	.55	.29
Kenai										
	Average	12	9.6	.18	.27	2.09	39.6	52	.85	.53
	Maximum		14.3	.57	.45	2.68	49.4	67	1.16	.78
	Minimum		6.7	.08	.17	1.49	27.6	40	.62	.35
Mat-Su										
	Average	8	7.1	.17	.18	1.38	34.8	57	.96	.62
	Maximum		12.4	.37	.31	1.84	49.1	73	1.27	.87
	Minimum		4.4	.05	.07	.92	13.0	41	.63	.36
STATE										
	Average	47	9.4	.21	.29	1.76	38.5	53	.87	.55
	Maximum		17.7	1.02	.59	4.07	51.7	73	1.27	.87
	Minimum		4.4	.05	.07	.20	13.0	37	.55	.29

TABLE 6. Grass Hay analytical values, by region, for number of samples (No.), Crude Protein (CP) %, Phosphorus (P) %, Calcium (Ca) %, Potassium (K) %, Total Digestible Nutrients (TDN) %, Metabolizable Energy (ME) Mcal/lb, and Net Energy for lactation (NEL) Mcal/lb.

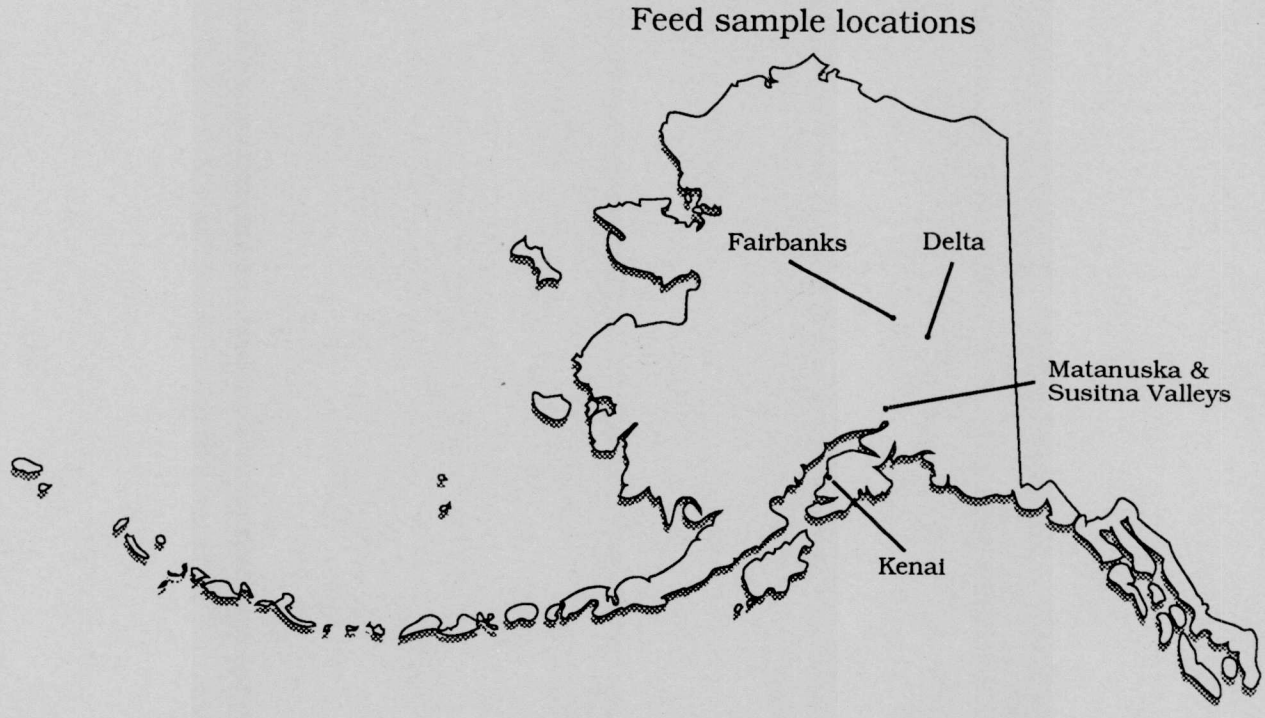
		Grass Hay							
Region	Value	No. of samples	CP	P	Ca	K	ADF	TDN	ME	NEL
Delta										
	Average	94	12.1	.24	.33	2.21	35.2	57	.95	.62
	Maximum		19.4	.36	.59	3.02	47.3	73	1.28	.88
	Minimum		6.7	.09	.12	.56	22.8	43	.68	.39
Fairbanks										
	Average	34	9.7	.21	.37	1.63	37.6	54	.89	.57
	Maximum		16.2	.37	1.06	2.53	55.9	69	1.20	.82
	Minimum		2.1	.04	.14	.86	26.1	27	.35	.13
Kenai										
	Average	38	10.7	.20	.41	1.45	40.1	51	.84	.52
	Maximum		16.9	.37	.93	2.45	53.7	64	1.08	.72
	Minimum		5.6	.11	.16	.49	30.3	32	.46	.22
Mat-Su										
	Average	88	11.7	.22	.39	1.71	37.5	54	.90	.57
	Maximum		28.2	.431	.36	3.17	56.3	71	1.24	.85
	Minimum		5.0	.07	.13	.69	24.5	25	.32	.11
STATE										
	Average	258	11.3	.22	.37	1.87	37.3	54	.90	.57
	Maximum		28.2	.43	1.36	3.17	56.3	73	1.28	.88
	Minimum		2.1	.04	.12	.49	22.8	25	.32	.11

TABLE 7. Other Grains analytical values, by region, for number of samples (No.), Crude Protein (CP) %, Phosphorus (P) %, Calcium (Ca) %, Potassium (K) %, Total Digestible Nutrients (TDN) %, Metabolizable Energy (ME) Mcal/lb, and Net Energy for lactation (NEL) Mcal/lb.

Other Grains										
Region	Value	No. of samples	CP	P	Ca	K	ADF	TDN	ME	NEL
Corn										
STATE										
	Average	3	9.5	.18	.14	.31	3.9	97	1.63	1.17
	Maximum		10.0	.30	.20	.33	4.2	97	1.63	1.17
	Minimum		8.8	.02	.10	.29	3.7	97	1.63	1.17
Peas										
STATE										
	Average	4	17.9	.37	.16	1.19	17.0	77	1.24	.85
	Maximum		21.6	.50	.27	1.35	20.8	84	1.36	.95
	Minimum		14.9	.14	.09	1.08	9.5	75	1.19	.81
Wheat										
STATE										
	Average	4	15.9	.44	.06	.50	4.2	97	1.63	1.16
	Maximum		21.8	.52	.10	.71	6.0	97	1.63	1.17
	Minimum		12.0	.28	.01	.37	2.8	95	1.59	1.13
Oats										
STATE										
	Average	6	12.0	.35	.13	.66	15.0	79	1.27	.87
	Maximum		13.7	.42	.23	.80	18.7	82	1.33	.92
	Minimum		10.7	.29	.07	.51	11.2	76	1.22	.83
Thual Barley										
STATE										
	Average	11	12.8	.39	.07	.59	3.6	88	1.44	1.01
	Maximum		14.9	.52	.16	.76	6.8	90	1.49	1.05
	Minimum		9.7	.28	.01	.49	1.6	84	1.37	.95

TABLE 8. Concentrates analytical values, by region, for number of samples (No.), Crude Protein (CP) %, Phosphorus (P) %, Calcium (Ca) %, Potassium (K) %, Total Digestible Nutrients (TDN) %, Metabolizable Energy (ME) Mcal/lb, and Net Energy for lactation (NEL) Mcal/lb.

		Concentrates							
Region	Value	No. of samples	CP	P	Ca	K	ADF	TDN	ME	NEL
Delta										
	Average	3	37.6	1.00	2.98	1.23	7.8	92	1.54	1.09
	Maximum		48.9	1.10	4.96	1.23	9.1	94	1.57	1.12
	Minimum		32.6	.88	1.68	1.23	6.8	90	1.49	1.05
Kenai										
	Average	23	16.2	.52	.49	.01	14.1	82	1.33	.92
	Maximum		24.2	.90	1.00	.01	28.2	96	1.60	1.14
	Minimum		11.3	.07	.30	.01	5.6	75	1.19	.81
Mat-Su										
	Average	34	21.7	.72	1.30	1.09	11.5	86	1.40	.98
	Maximum		47.3	2.04	6.74	2.51	34.6	97	1.63	1.16
	Minimum		10.3	.14	.04	.40	2.2	42	.53	.28
STATE										
	Average	63	20.9	.66	1.07	1.05	12.1	85	1.39	.97
	Maximum		48.9	2.04	6.74	2.81	34.6	97	1.63	1.16
	Minimum		10.3	.07	.04	.01	2.2	42	.53	.28



Agricultural and Forestry Experiment Station
School of Agriculture and Land Resources Management
University of Alaska Fairbanks
James V. Drew, Dean and Director