

Composition of Feedstuffs and Animal Tissues

With Reference to

Nutritional Status of Cattle on Sauvie Island, Oregon

J. R. Haag

Department of Agricultural Chemistry
Agricultural Experiment Station
Oregon State College

Miscellaneous Paper 16

June 1955

The accompanying tables were compiled from data on file in the Department of Agricultural Chemistry. The copper and molybdenum analyses on liver were made by Washington State College. Mr. R. G. Sprowls and Mr. J. R. Stegmuller were most helpful in the preparation of the tabular material. This report covers over 700 entries.

The analytical data are assembled in four tables. Table 1 deals with the composition of pasture herbage, hays, grain mixtures, and miscellaneous feedstuffs. Table 2 deals with forage as it went into silos and with the finished silages. Table 3 deals with the composition of blood with special reference to the copper content of blood plasma. Table 4 is adapted from copper and molybdenum analyses of liver as reported by Washington State College. Copper values in Table 4 are reported as p.p.m. in dry liver.

The variations in the composition of feedstuffs are such as one might expect to encounter in almost any community. They reflect the kind of feedstuff, the influence of climatic and soil conditions, stage of maturity, and numerous management practices. The composition of forages is peculiarly susceptible to the variations just mentioned.

The protein, calcium, and phosphorus contents in Table 1 for the most part fall within normal limits. The protein contents in Table 2 very largely reflect stages of maturity. It is evident that silage is often made from forages which are too mature even for good hay.

If one considers 0.06 p.p.m. cobalt as marginal, it is evident that only scattered samples in Table 1 fall below this limit. Cobalt deficiency under practical conditions might be expected only in those instances where animals are confined for considerable periods to forages with these lower values.

The copper and molybdenum values in Table 1 (forages) very largely fall within normal limits. Since Table 3 (bloods) and Table 4 (livers) contain a considerable number of marginal to low copper values, it appears that some factor may be interfering with proper copper utilization. It is unfortunate that circumstances did not permit a more extensive study of beef cattle confined to limited areas on locally grown feedstuffs. It should be noted that a portion of the feedstuffs including minerals as supplements or in concentrate-grain mixes utilized by the commercial dairy herds were not locally-produced. In an operation in which only locally-produced feedstuffs are utilized, low copper could be a more important factor in animal health.

Addendum: A pertinent reference for a literature review (containing 828 references):

Marston, H. R. "Cobalt, Copper and Molybdenum in the Nutrition of Animals and Plants," *Physiological Reviews* 32, 66, 1952.

[Approved for publication as Miscellaneous paper no. 16 by the Director of the Oregon Agricultural Experiment Station.]

Table 1. Pasture Herbage, Hay, Grain, Concentrate and Miscellaneous Feedstuff Samples

Serial number	Farm number	Description	Dry M.	Crude	Ca	P	Co	Cu	Fe	Mn	Mo	Miscellaneous
				protein	per cent	per cent	per cent	ppm	ppm	ppm	ppm		ppm
March 6-7, 1952												
14000	5	Concentrate	...	16.19	0.869	0.712	1.0	8.9	227	...	...	3/6/52
01	6	Concentrate	...	13.30	0.380	0.617	0.13	6.3	221	...	...	3/6/52
02	1	Concentrate	...	16.43	0.627	0.644	0.72	5.9	265	...	...	3/6/52
03	1	Beet Pulp	...	8.92	0.738	0.070	0.42	12.6	836	...	...	3/6/52
04	2	Concentrate	...	16.62	0.885	0.757	0.32	11.8	482	...	...	-
14005	2	Beet Pulp	...	10.09	0.497	0.083	0.33	9.4	423	...	...	-
06	3	Concentrate	...	17.76	0.728	0.635	0.87	14.6	187	...	...	3/6/52
07	4	Concentrate	...	16.36	0.767	0.747	0.32	9.4	381	...	...	3/6/52
08	7	Barley	...	12.21	0.030	0.326	0.02	3.6	86	...	...	3/7/52
09	7	Oats	...	9.63	0.100	0.368	0.03	2.8	48	...	...	3/7/52
14010	7	Concentrate	...	18.29	0.611	0.682	0.26	15.5	223	...	...	3/7/52
11	5	Hay: Alfalfa	...	13.91	1.296	0.217	0.09	7.9	165	...	...	3/6/52
12	6	Hay: Grass and Clover	...	9.16	1.308	0.184	0.09	3.7	60	...	...	3/6/52
13	1	Hay: Oat	...	8.84	0.506	0.219	0.39	6.3	630	...	...	3/6/52
14	2	Hay: Grass	...	7.26	0.503	0.179	0.09	4.8	76	...	...	-
14015	3	Hay: Grass	...	4.38	0.195	0.164	0.09	3.1	57	...	...	3/6/52
16	4	Hay: Alfalfa	...	16.42	0.942	0.269	0.12	7.6	370	...	...	3/5/52
April 19, 1952												
14053	7	Pasture Herbage Composite	...	24.04	0.829	0.469	0.11	6.9	210	...	1.1	Composite of 5 samples, Past. #1
54	7	Pasture Herbage Composite	...	17.77	0.420	0.365	0.10	5.4	222	...	...	Composite of 5 samples, Past. #2
14055	6	Pasture Herbage Composite	...	17.33	0.335	0.339	0.12	7.3	209	...	1.0	Composite of 5 samples
56	2	Pasture Herbage Composite	...	19.26	0.77	0.35	0.14	7.6	270	...	2.4	Composite of 4 samples
57	3	Pasture Herbage Composite	...	17.00	0.36	0.33	0.14	6.9	263	...	1.8	Composite of 5 samples, Past. #1
14058	3	Pasture Herbage Composite	...	17.35	0.445	0.31	0.09	6.1	139	...	...	Composite of 5 samples, Past. #2
April 24, 1952												
14079	A	Pasture Herbage Composite	...	16.69	0.675	0.343	0.14	9.3	278	...	0.6	Composite of 5 samples
80	C	Pasture Herbage Composite	...	16.99	0.736	0.339	0.15	5.9	176	...	0.6	Composite of 5 samples
81	D	Pasture Herbage Composite	...	16.50	0.619	0.304	0.14	6.3	177	...	0.3	Composite of 5 samples
14082	B	Pasture Herbage Composite	...	15.91	0.570	0.340	0.07	8.4	138	...	0.4	Composite of 5 samples
May 22, 1952												
14138	A	Pasture Herbage Composite	...	22.56	0.92	0.39	0.10	6.3	183	...	...	Composite of 5 samples
39	5	Pasture Herbage Composite	...	11.34	0.43	0.29	0.04	6.5	130	...	...	Composite of 5 samples
14140	C	Pasture Herbage Composite	...	21.96	0.71	0.43	0.15	8.5	273	...	...	Composite of 5 samples
41	7	Pasture Herbage Composite	...	16.00	0.29	0.35	0.05	5.1	99	...	...	Composite of 5 samples
42	B	Pasture Herbage Composite	...	19.44	1.03	0.36	0.09	7.4	122	...	...	Composite of 5 samples
43	D	Pasture Herbage Composite	...	21.31	0.90	0.38	0.20	8.4	280	...	...	Composite of 5 samples
44	6	Pasture Herbage Composite	...	18.61	0.57	0.40	0.11	7.9	93	...	...	Composite of 5 samples
14145	2	Pasture Herbage Composite	...	17.49	0.97	0.34	0.11	5.9	105	...	...	Composite of 5 samples
46	3	Pasture Herbage Composite	...	15.67	0.67	0.29	0.09	5.6	93	...	...	Composite of 5 samples
47	4	Pasture Herbage Composite	...	15.12	0.79	0.29	0.09	7.0	119	...	...	Composite of 5 samples
June 19, 1952												
14229	A	Pasture Herbage Composite	...	16.04	0.73	0.36	0.13	6.6	205	...	...	Composite of 5 samples
14230	5	Pasture Herbage Composite	...	13.55	0.81	0.36	0.10	5.4	136	...	...	Composite of 5 samples
31	C	Pasture Herbage Composite	...	13.77	0.64	0.32	0.13	5.8	164	...	...	Composite of 5 samples
32	7	Pasture Herbage Composite	...	13.26	0.44	0.33	0.07	5.0	127	...	...	Composite of 5 samples
33	B	Pasture Herbage Composite	...	17.81	1.00	0.38	0.09	7.4	127	...	...	Composite of 5 samples
34	D	Pasture Herbage Composite	...	19.63	1.25	0.29	0.15	8.5	185	...	...	Composite of 2 samples
14235	6	Pasture Herbage Composite	...	13.46	0.79	0.43	0.10	8.1	120	...	...	Composite of 5 samples
36	1	Pasture Herbage Composite	...	11.24	0.47	0.26	0.16	5.1	107	...	...	Composite of 2 samples
37	2	Pasture Herbage Composite	...	16.14	0.93	0.39	0.20	6.9	99	...	...	Composite of 5 samples
38	3	Pasture Herbage Composite	...	11.98	0.69	0.31	0.11	5.0	186	...	...	Composite of 5 samples
14239	4	Pasture Herbage Composite	...	13.80	0.43	0.35	0.13	5.3	126	...	...	Composite of 5 samples
July 19, 1952												
14293	A	Pasture Herbage Composite	...	14.80	0.89	0.34	0.19	5.9	199	...	...	Composite of 4 samples
94	5	Pasture Herbage Composite	...	12.60	0.77	0.32	0.05	5.9	83	...	...	Composite of 5 samples
14295	7	Pasture Herbage Composite	...	13.01	0.50	0.41	0.11	4.6	356	...	...	Composite of 5 samples
96	B	Pasture Herbage Composite	...	14.52	1.06	0.35	0.01	6.0	111	...	...	Composite of 5 samples
97	6	Pasture Herbage Composite	...	19.00	0.61	0.34	0.15	9.8	145	...	...	Composite of 5 samples
98	6	Pasture Herbage Composite	...	17.77	0.87	0.43	0.11	7.1	211	...	...	Composite of 5 samples
99	1	Pasture Herbage Composite	...	13.70	0.42	0.30	0.09	7.8	127	...	...	Composite of 1 sample
14300	2	Pasture Herbage Composite	...	15.27	0.90	0.37	0.15	7.3	110	...	...	Composite of 5 samples
01	3	Pasture Herbage Composite	...	13.91	0.47	0.40	0.12	6.1	166	...	...	Composite of 5 samples
02	3	Pasture Herbage Composite	...	13.10	0.67	0.35	0.11	6.2	218	...	...	Composite of 5 samples
14303	4	Pasture Herbage Composite	...	14.23	0.87	0.28	0.07	6.5	90	...	...	Composite of 5 samples
August 12, 1952												
14354	A	Pasture Herbage Composite	...	17.30	0.89	0.41	0.31	7.2	327	...	...	Composite of 5 samples
14355	B	Pasture Herbage Composite	...	21.40	1.01	0.46	0.12	8.7	195	...	...	Composite of 5 samples
August 13, 1952												
14356	6	Pasture Herbage Composite	...	19.40	0.56	0.30	0.24	12.1	277	...	...	Composite of 5 samples
14357	6	Pasture Herbage Composite	...	18.89	0.82	0.40	0.15	7.6	175	...	...	Composite of 5 samples
August 12, 1952												
14361	D	Pasture Herbage Composite	...	20.22	1.28	0.35	0.15	8.5	204	...	...	Composite of 3 samples
September 12, 1952												
14396	A	Pasture Herbage Composite	...	19.95	0.95	0.42	0.25	9.8	314	...	...	Composite of 5 samples
97	C	Pasture Herbage Composite	...	16.03	0.71	0.41	0.14	6.7	333	...	...	Composite of 5 samples
98	6	Pasture Herbage Composite	...	22.07	0.55	0.31	0.11	13.2	163	...	...	Composite of 5 samples, Past. #1
99	6	Pasture Herbage Composite	...	19.52	0.53	0.50	0.18	9.2	181	...	...	Composite of 5 samples, Past. #2
14400	B	Pasture Herbage Composite	...	20.65	1.12	0.43	0.09	8.2	156	...	...	Composite of 5 samples
01	D	Pasture Herbage Composite	...	19.96	1.14	0.39	0.24	7.2	446	...	...	Composite of 3 samples
02	2	Pasture Herbage Composite	...	16.12	1.03	0.30	0.16	6.5	101	...	...	Composite of 3 samples
Date Unknown Approx. 9/20/52												
14425	7	Grain Feed	...	18.08	...	...	...	...	...	...	...	Sampled by O. C. Compton
October 10, 1952												
14431	C	Pasture Herbage Composite	...	22.18	0.74	0.45	0.15	8.3	500	...	...	Composite of 5 samples
October 11, 1952												
14437	6	Pasture Herbage Composite	...	21.73	0.53	0.48	0.12	9.4	191	...	...	Composite of 5 samples, Past. #2
November 11, 1952												
14444	6	Pasture Herbage Composite	...	20.88	0.64	0.26	0.21	11.1	237	...	...	Composite of 4 samples, Past. #1
14448	A	Pasture Herbage Composite	...	19.55	1.04	0.30	0.29	7.8	395	...	...	Composite of 3 samples
14454	C	Pasture Herbage Composite	...	19.75	0.50	0.40	0.17	7.9	330	...	...	Composite of 5 samples
14460	B	Pasture Herbage Composite	...	22.10	1.10	0.34	0.12	7.5	280	...	...	Composite of 5 samples
14464	D	Pasture Herbage Composite	...	20.95	0.97	0.34	0.21	7.3	332	...	...	Composite of 3 samples
14470	6	Pasture Herbage Composite	...	25.09	0.45	0.44	0.20	10.8	280	...	...	Composite of 5 samples
December 19, 1952												
14478	33	Hay: Mixed Grass Hay	...	16.08	1.17	0.23	0.19	8.3	117	...	...	14478 and 14479 combined
14479	33	Hay: Mixed Grass Hay	...	16.08	1.17	0.23	0.19	8.3	117	...	...

Table 1. Pasture Herbage, Hay, Grain, Concentrate and Miscellaneous Feedstuff Samples (Continued)

Serial number	Farm number	Description	Dry	Crude	Ca	P	Co	Cu	Fe	Mn	Mo	Miscellaneous
			M. Per cent	protein Per cent								
14503	33	May 5, 1953 Pasture Herbage Composite ...	...	...	...	...	...	...	...	...	...	Composite of 5 samples
14509	5	Pasture Herbage Composite ...	16.62	1.08	0.36	0.11	6.6	193	...	3.6	...	Composite of 5 samples
14515	1	Pasture Herbage Composite ...	17.78	0.78	0.37	0.07	8.2	115	...	4.2	...	Composite of 5 samples
14521	6	May 6, 1953 Pasture Herbage Composite ...	18.90	0.44	0.41	0.07	7.4	82	...	2.2	...	Composite of 5 samples
14527	1	Pasture Herbage Composite ...	14.97	0.34	0.31	0.07	7.7	127	...	1.4	...	Composite of 5 samples
14533	33	Pasture Herbage Composite ...	12.30	0.45	0.34	0.11	5.3	108	...	2.6	...	Composite of 5 samples
14539	C	May 7, 1953 Pasture Herbage Composite ...	14.04	0.49	0.34	0.12	4.8	93	...	1.3	...	Composite of 5 samples
14545	5	June 5, 1953 Pasture Herbage Composite ...	15.55	0.96	0.35	0.10	6.8	96	...	4.8	...	Composite of 5 samples
14551	6	Pasture Herbage Composite ...	17.99	0.62	0.40	0.07	7.2	75	...	2.5	...	Composite of 5 samples
14557	20	Pasture Herbage Composite ...	7.91	0.51	0.25	0.15	3.2	126	...	1.6	...	Composite of 5 samples
14563	1	Pasture Herbage Composite ...	14.81	0.66	0.36	0.09	9.0	119	...	2.8	...	Composite of 5 samples
14569	33	Pasture Herbage Composite ...	12.43	0.63	0.36	0.14	5.4	107	...	4.1	...	Composite of 5 samples
14577	C	June 10, 1953 Pasture Herbage Composite ...	14.72	0.62	0.38	0.11	5.7	99	...	1.5	...	Composite of 5 samples
14583	20	July 3, 1953 Pasture Herbage Composite ...	17.42	0.90	0.42	0.09	6.5	92	...	3.3	...	Composite of 5 samples
14589	6	Pasture Herbage Composite ...	20.49	0.82	0.44	0.04	8.2	87	...	2.7	...	Composite of 5 samples
14595	33	Pasture Herbage Composite ...	12.97	0.81	-	0.13	4.8	104	...	4.7	...	Composite of 5 samples
14601	C	July 6, 1953 Pasture Herbage Composite ...	15.53	0.78	0.43	0.10	5.5	137	...	2.7	...	Composite of 5 samples
14635	33	February 19, 1954 Hay: ...	...	11.53	0.76	0.30	0.07	6.7	95	...	1.9	...
14637	14	February 20, 1954 Hay: ...	...	11.49	0.66	0.28	0.05	4.5	75	...	2.9	...
14661	5	March 6, 1954 Hay: Grass and Alfalfa ...	...	8.68	0.54	0.25	0.07	5.1	84	...	1.9	Taken by Bloods 14652-60
14663	2	March 23, 1954 Hay: Mature Oat ...	...	6.00	0.27	0.15	0.08	2.8	66	...	0.95	Heifers wintered on this feed
14664	33	Hay: Grass ...	...	8.90	0.75	0.26	0.12	5.0	109	...	1.72	Heifers wintered on this feed
14665	14	April 16 & 17, 1954 Pasture ...	...	21.57	0.51	0.32	0.09	6.7	90	...	2.05	...
66	5	Pasture ...	...	25.37	0.54	0.39	0.15	7.8	200	...	3.72	...
67	20	Pasture ...	...	25.02	0.65	0.36	0.18	8.7	234	...	3.63	Pasture #1
14668	20	Pasture ...	...	27.65	0.56	0.44	...	...	250	...	4.81	Pasture #2
14669	2	April 22, 1954 Pasture ...	...	25.06	0.47	0.39	...	...	237	...	4.63	...
14670	33	Pasture ...	...	19.90	0.54	0.35	...	...	...	...	2.95	...
14699	37	May 18, 1954 Hay: Grass and Clover ...	...	12.91	1.04	0.16	...	...	...	...	2.19	...
14700	37	Pasture Herbage ...	...	16.21	0.48	0.34	...	...	...	...	2.26	...
14702	15	Hay: Grass and Alfalfa ...	...	18.83	1.32	0.26	...	...	...	...	0.98	...
14703	15	Pasture Herbage ...	...	14.75	0.28	0.27	...	...	...	...	1.03	...

Table 2. Silage Forage and Silage Samples

Serial number	Other number	Description	Date	Dry	Crude	Ca	P	Co	Cu	Fe	Mn	Mo	Miscellaneous
				M. Per cent	protein Per cent								
14017	5	Silage	3/6/52	...	9.78	1.26	0.24	0.12	8.5	275	...	1.2	...
18	7	Silage	3/7/52	...	6.78	0.30	0.10	0.15	18.0	392	...	0.6	...
19	6	Silage	3/6/52	...	5.66	0.36	0.12	0.29	5.2	693	...	0.9	...
14020	3	Silage	3/6/52	...	10.02	0.37	0.30	0.19	7.2	229	...	1.4	...
14021	4	Silage	3/6/52	...	10.42	1.75	0.33	0.26	9.5	591	...	2.2	...
14166	35	Silage Forage: Alfalfa, Barley Grass	6/4/52	32.7	6.93	...	...	...	...	...	...	...	...
67	6	Silage Forage: A. Fescue, Sub Clover	6/4/52	25.7	8.82	...	...	...	...	...	...	...	...
68	3	Silage Forage: A. Fescue, Sub Clover	6/4/52	32.4	6.62	...	...	...	...	...	...	...	...
69	3	Silage Forage: A. Fescue	6/4/52	37.3	6.95	...	...	...	...	...	...	...	...
14170	37	Silage Forage: R. Grass, Alf. Clover	6/4/52	32.8	6.95	...	...	...	...	...	...	...	...
14172	...	Silage Forage: Alfalfa, Rye Grass	6/6/52	21.7	11.77	...	...	...	...	...	...	...	Tegart
73	...	Silage Forage: Red Clover, R. Grass	6/6/52	12.5	16.51	...	...	...	...	...	...	...	Townsend, Troutdale
74	...	Silage Forage: Alfalfa, Grass	6/7/52	20.3	9.70	...	...	...	...	...	...	...	Kruckmann, Latourell
14175	37	Silage Forage: Red Clover, Grasses	6/7/52	20.3	13.79	...	...	...	...	...	...	...	...
76	...	Silage Forage: Red Clover	6/7/52	22.1	14.47	...	...	...	...	...	...	...	Altman, Gresham
77	3	Silage Forage: Alta Fescue	6/18/52	65.8	5.77	...	...	...	...	...	...	...	...
78	33	Silage Forage: Alta Fescue, R. Grass, Clover	6/18/52	33.6	7.27	...	...	...	...	...	...	...	...
14179	6	Silage Forage: Grass, Alfalfa	6/18/52	27.6	8.93	...	...	...	...	...	...	...	Townsend, Troutdale
14240	...	Silage Forage: Alfalfa, Grass	7/3/52	29.2	10.00	...	...	...	...	...	...	...	Altman, Gresham
41	...	Silage Forage: Oats, Vetch	7/8/52	32.7	9.75	...	...	...	...	...	...	...	Fairview Farms, Troutdale
14242	...	Silage Forage: Clover Grasses Weeds	7/8/52	31.4	8.96	...	...	...	...	...	...	...	A. Cox Refer sample no 14083
14362	...	Silage: Vetch and Rye Grass	8/29/52	20.49	9.00	...	...	...	...	...	...	...	A. Johnson
14363	...	Silage: Vetch and Rye Grass	9/10/52	22.53	8.84	...	...	...	...	...	...	...	J. Altman
14364	...	Silage: Red Clover	9/10/52	26.31	11.43	...	...	...	...	...	...	...	W. Vockert, Corbett
14424	...	Silage: Red Clover	9/26/52	24.32	16.02	...	...	...	...	...	...	...	Refer Sample 14152
14438	14	Silage: Alfalfa	10/29/52	27.48	12.57	...	...	...	...	...	...	...	Country Farm
14439	...	Silage: Grasses and Clover	10/23/52	27.64	9.54	...	...	...	...	...	...	...	Refer Sample 14153
14471	33	Silage: Alfalfa and Grass	12/3/52	23.26	13.62	...	...	...	...	...	...	...	Refer Sample 14174, Kruckman
14472	...	Silage: Alfalfa and Grass	12/5/52	28.80	8.92	...	...	...	...	...	...	...	Refer Sample 14172, Tegart
14473	...	Silage: Alfalfa and Grass	12/15/52	24.53	9.98	...	...	...	...	...	...	...	Refer Sample 14150 & 55
14474	6	Silage: Alta Fescue	12/15/52	28.80	9.94	...	...	...	...	...	...	...	Refer Sample 14175
14475	37	Silage: Clover and Grass	12/15/52	22.52	12.27	...	...	...	...	...	...	...	Refer Sample 14152
14476	3	Silage: Alta Fescue	12/15/52	32.42	7.46	...	...	...	...	...	...	...	Refer Sample 14164
14477	29	Silage: Ladino Clover & Grass	12/15/52	32.90	13.39	...	...	...	...	...	...	...	...
14480	20	Silage:	12/19/52	32.58	7.79	...	...	...	...	...	...	...	...
14481	...	Silage: Corn	12/18/52	21.22	4.49	...	...	...	...	...	...	...	Tegart
82	...	Silage: Alfalfa & Grass	1/9/53	33.29	10.12	...	...	...	...	...	...	...	Refer Sample 14158 Schnleneggar
83	...	Silage: Alfalfa	1/9/53	23.34	12.80	...	...	...	...	...	...	...	Refer Sample 14160 S.B. Hall
84	...	Silage: Velvet Grass & other	1/22/53	10.49	10.16	...	...	...	...	...	...	...	Refer Sample 14163
14485	...	Silage: Clover	1/31/53	24.50	13.66	...	...	...	...	...	...	...	Refer Sample 14157 Biunc & Windust
86	33	Silage: Composite	2/13/52	31.21	10.30	0.59	0.22	0.19	6.1	34.1	...	...	...
87	29	Silage: Alsike Clover & Rye Grass	2/20/53	25.45	20.59	...	...	...	...	...	...	...	Refer Sample 14084
88	28	Silage: Alta Fescue	2/20/53	20.86	7.59	...	...	...	...	...	...	...	Refer Sample 14085

Table 2. Silage Forage and Silage Samples (Continued)

Serial number	Other number	Description	Date	Dry	Crude	Ca	P	Co	Cu	Fe	Mn	Mo	Miscellaneous
				M. Per cent	protein Per cent								
89	...	Silage:	2/20/53	28.74	6.89	...	...	...	...	...	...	...	Refer Sample 14087
14490	...	Silage: A. Fescue, Rye Grass Clover	2/20/53	26.33	16.03	...	...	...	...	...	...	...	Refer Sample 14149
91	...	Silage: Clover and Grass	2/20/53	26.77	14.79	...	...	...	...	...	...	...	Refer Sample 14173
92	35	Silage: Alfalfa, Barley, Grass	2/20/53	32.83	8.15	...	...	...	...	...	...	...	Refer Sample 14166
93	37	Silage: Alfalfa, Clover, R. Grass	2/20/53	26.76	15.21	...	...	...	...	...	...	...	Refer Sample 14170
94	...	Silage: Corn	3/4/53	24.22	5.69	...	...	...	...	...	...	...
14495	20	Silage: N. Silo	3/12/53	41.83	6.62	...	...	...	...	...	...	...
96	1	Silage:	3/12/53	22.62	12.47	...	...	...	...	...	...	...
14497	33	Silage: Concrete Stave Silo	3/12/53	33.09	8.55	...	...	...	...	...	...	...
14570	...	Silage Forage: Red Clover	6/9/53	15.45	18.92	...	...	...	...	...	...	...	Blanc and Windust 100#33 1/2 % N
14571	...	Silage Forage: Red Clover	6/9/53	15.86	22.36	...	...	...	...	...	...	...	Blanc and Windust Check above
14602	29	Silage: Ladino C., M. Foxtail, Rye Grass	7/8/53	29.79	8.89	...	...	...	...	...	...	...
14603	...	Silage Forage: Red Clover	7/23/53	16.62	20.01	...	...	...	...	...	...	...	Blanc and Windust
14604	14	Silage: 1st Cut Alfalfa and Molasses	12/29/53	17.38	11.68	...	...	...	...	...	...	...
14605	14	Silage: 3d Cut Alfalfa, Grass, Barley	12/29/53	23.18	10.02	...	...	...	...	...	...	...
14606	2	Silage:	...	20.81	10.56	...	...	...	...	...	...	...
14634	33	Silage:	2/19/54	...	10.97	.74	.24	0.14	6.6	320	...	...	2.5
14636	14	Silage:	2/20/54	...	10.03	.62	.12	.18	9.0	410	...	...	2.4
14638	6	Silage:	2/19/54	...	8.48	.65	.28	0.12	7.7	171	...	...	2.5
14639	2	Silage:	2/20/54	...	11.29	.56	.25	0.17	6.9	209	...	...	2.2
14662	5	Silage:	3/6/54	...	...	1.20	.27	0.21	10.0	545	...	...	3.8
14701	37	Silage:	5/18/54	...	10.99	1.02	0.15	...	...	...	...	...	1.32
14704	15	Silage:	5/18/54	...	11.61	0.57	0.17	...	...	...	...	...	2.47

Serial number	Other number	Description	Date	Dry	Crude	pH	Miscellaneous
				M. Per cent	protein Per cent		
14022	4	Silage, 1st cutting Alfalfa	3/21/52	27.7	...	9.5	Sampled 3/21/52 by request. Silage was not palatable to dairy cattle.
14083	...	Silage Forage: Vetch and Rye G	5/16/52	18.7	12.29	...	A. Cox, Gresham
14084	29	Silage Forage: A. Clover and Rye G	5/16/52	21.9	21.70	...	
85	28	Silage Forage: Alta fescue	5/16/52	23.1	7.59	...	
86	...	Silage Forage: Vetch and Rice	5/21/52	23.7	8.50	...	A. Cox, Gresham
14087	...	Silage Forage: Fescue, Orchard, Clover	5/21/52	13.5	13.82	...	Multnomah County Farm
14148	...	Silage Forage: Alf-Clover-Grass	5/23/52	15.5	11.87	...	S. B. Hall, Troutdale
149	...	Silage Forage: Alta-Orchard-R.Grass	5/23/52	20.8	7.05	...	Vockert, Corbett
14150	6	Silage Forage: A. fescue-S. Clover	5/23/52	19.9	8.74	...	
51	14	Silage Forage: Alf-R.Grass	5/23/52	23.3	12.00	...	
52	3	Silage Forage: Alta fescue	5/23/52	26.1	10.20	...	
53	33	Silage Forage: Alf. and Grass	5/28/52	26.5	18.54	...	
54	33	Silage Forage: A. Fescue, R. Grass, Orchard	5/28/52	29.9	8.63	...	
14155	6	Silage Forage: A. fescue, S. clover	5/28/52	22.2	10.02	...	
56	...	Silage Forage: R.Grass, Clover	5/28/52	21.9	7.90	...	County Farm, Troutdale
57	...	Silage Forage: Clover	5/29/52	15.2	16.10	...	Blanc and Windust, Corbett
58	...	Silage Forage: R.Grass, Alfalfa	5/29/52	25.7	8.17	...	Schlueneggan, Portland
59	...	Silage Forage: Clover, Grass	5/29/52	21.5	13.40	...	S. B. Hall, Troutdale
14160	...	Silage Forage: Rye and Vetch	5/29/52	20.5	12.35	...	S. B. Hall, Troutdale
61	...	Silage Forage: Rye and Vetch	6/2/52	19.2	9.27	...	Johnson, Corbett
62	...	Silage Forage: Red Clover	6/2/52	18.3	17.54	...	Vockert, Troutdale
63	...	Silage Forage: Velvet G. et.al.vetch	6/2/52	24.2	11.68	...	Mullenhoff, Gresham
64	29	Silage Forage: L.Clover, M.Fox, R.Grass	6/4/52	40.4	11.22	...	
14165	7	Silage Forage: Rye Grass	6/4/52	44.9	6.44	...	

Table 3. Blood Plasma

Serial number	Other number	Sample	Sample number	Animal number	Dry	Crude	Ca	P	Co	Cu	Fe	Mn	Mo	Miscellaneous
					M. Per cent	protein Per cent								
August 5, 1952														
14304	14	Blood	S-1	...	...	...	...	...	...	0.50	...	...	...
14305	14	Blood	S-2	...	...	...	...	...	...	0.64	...	...	...
06	14	Blood	S-3	...	...	...	...	...	...	0.41	...	...	...
07	14	Blood	S-4	...	...	...	...	...	...	0.75	...	...	...
08	14	Blood	S-5	...	...	...	...	...	...	0.97	...	...	...
09	14	Blood	S-6	...	...	...	...	...	...	0.19	...	...	...
14310	14	Blood	S-7	...	...	...	...	...	...	0.69	...	...	...
11	14	Blood	S-8	...	...	...	...	...	...	0.74	...	...	...
12	14	Blood	S-9	...	...	...	...	...	...	0.89	...	...	...
14313	14	Blood	S-10	...	...	...	...	...	...	0.50	...	...	...
August 6, 1952														
14314	33	Blood	S-11	...	...	...	...	...	...	0.56	...	...	...
14315	33	Blood	S-12	...	...	...	...	...	...	0.38	...	...	...
16	33	Blood	S-13	...	...	...	...	...	...	0.64	...	...	...
17	33	Blood	S-14	...	...	...	...	...	...	0.32	...	...	...
18	33	Blood	S-15	...	...	...	...	...	...	0.33	...	...	...
19	33	Blood	S-16	...	...	...	...	...	...	0.41	...	...	...
14320	33	Blood	S-17	...	...	...	...	...	...	0.21	...	...	...
21	33	Blood	S-18	...	...	...	...	...	...	0.27	...	...	...
22	33	Blood	S-19	...	...	...	...	...	...	0.33	...	...	...
23	33	Blood	S-20	...	...	...	...	...	...	0.61	...	...	...
24	33	Blood	S-21	...	...	...	...	...	...	0.46	...	...	...
14325	33	Blood	S-22	...	...	...	...	...	...	0.52	...	...	...
14326	33	Blood	S-23	...	...	...	...	...	...	0.46	...	...	...

Table 3. Blood Plasma (Continued)

Serial number	Other number	Sample	Sample number	Animal number	Dry M.	Crude protein	Ca	P	Co	Cu	Fe	Mn	Mo	Miscellaneous
					Per cent	Per cent	Per cent	Per cent	ppm	ppm	ppm	ppm	ppm	
August 6, 1952														
14327	6	Blood	S-24		...	...	...	...	...	1.15				
August 6, 1952														
14328	20	Blood	S-25		...	...	...	...	...	0.70				
29	20	Blood	S-26		...	...	...	...	...	0.82				
14330	20	Blood	S-27		...	...	...	...	...	0.64				
31	20	Blood	S-28		...	...	...	...	...	0.74				
32	20	Blood	S-29		...	...	...	...	...	0.71				
14333	20	Blood	S-30		...	...	...	...	...	0.77				
September 16, 1952														
14403	33	Blood	S-31		...	...	...	...	...	0.46				
04	33	Blood	S-32		...	...	...	...	...	0.59				
14405	33	Blood	S-33		...	...	...	...	...	0.60				
06	33	Blood	S-34		...	...	...	...	...	0.40				
07	33	Blood	S-35		...	...	...	...	...	0.45				
08	33	Blood	S-36		...	...	...	...	...	0.54				
09	33	Blood	S-37		...	...	...	...	...	0.48				
14410	33	Blood	S-38		...	...	...	...	...	0.65				
11	33	Blood	S-39		...	...	...	...	...	0.42				
12	33	Blood	S-40		...	...	...	...	...	0.29				
13	33	Blood	S-41		...	...	...	...	...	0.40				
14	33	Blood	S-42		...	...	...	...	...	0.40				
14415	33	Blood	S-43		...	...	...	...	...	0.91				
14416	33	Blood	S-44		...	...	...	...	...	0.83				
September 16, 1953														
14417	20	Blood	S-45		...	...	...	...	...	0.66				
18	20	Blood	S-46		...	...	...	...	...	0.72				
19	20	Blood	S-47		...	...	...	...	...	0.56				
14420	20	Blood	S-48		...	...	...	...	...	0.83				
21	20	Blood	S-49		...	...	...	...	...	0.82				
22	20	Blood	S-50		...	...	...	...	...	0.73				
14423	20	Blood	S-51		...	...	...	...	...	0.85				
February 18, 1954														
14607	33	Blood	S-100		...	...	...	...	...	0.93				
08	33	Blood	S-101		...	...	...	...	...	0.91				
09	33	Blood	S-102		...	...	...	...	...	0.84				
14610	33	Blood	S-103		...	...	...	...	...	1.00				
11	33	Blood	S-104		...	...	...	...	...	1.01				
12	33	Blood	S-105		...	...	...	...	...	1.12				
13	33	Blood	S-106		...	...	...	...	...	0.85				
14	33	Blood	S-107		...	...	...	...	...	0.91				
14615	33	Blood	S-108		...	...	...	...	...	0.91				
16	33	Blood	S-109		...	...	...	...	...	0.90				
17	33	Blood	S-110		...	...	...	...	...	...
18	33	Blood	S-111		...	...	...	...	...	0.79				
19	33	Blood	S-112		...	...	...	...	...	0.88				
14620	33	Blood	S-113		...	...	...	...	...	0.89				
21	33	Blood	S-114		...	...	...	...	...	0.80				
22	33	Blood	S-115		...	...	...	...	...	0.91				
23	33	Blood	S-116		...	...	...	...	...	0.92				
14624	33	Blood	S-117		...	...	...	...	...	0.82				
February 20, 1954														
14625	14	Blood	S-118		...	...	...	...	...	0.98				
26	14	Blood	S-119		...	...	...	...	...	0.85				
27	14	Blood	S-120		...	...	...	...	...	0.91				
28	14	Blood	S-121		...	...	...	...	...	1.03				
29	14	Blood	S-122		...	...	...	...	...	1.58				
14630	14	Blood	S-123		...	...	...	...	...	1.03				
31	14	Blood	S-124		...	...	...	...	...	1.09				
32	14	Blood	S-125		...	...	...	...	...	1.30				
14633	14	Blood	S-126		...	...	...	...	...	1.04				
March 5, 1954														
14640	2	Blood	S-127		...	...	...	...	...	0.37				
41	2	Blood	S-128		...	...	...	...	...	0.41				
42	2	Blood	S-129		...	...	...	...	...	0.39				
43	2	Blood	S-130		...	...	...	...	...	0.56				
44	2	Blood	S-131		...	...	...	...	...	0.68				
14645	2	Blood	S-132		...	...	...	...	...	0.54				
46	2	Blood	S-133		...	...	...	...	...	0.48				
47	2	Blood	S-134		...	...	...	...	...	1.03				
48	2	Blood	S-135		...	...	...	...	...	0.41				
49	2	Blood	S-136		...	...	...	...	...	0.31				
14650	2	Blood	S-137		...	...	...	...	...	0.85				
14651	2	Blood	S-138		...	...	...	...	...	0.57				
March 6, 1954														
14652	5	Blood	S-139		...	...	...	...	...	0.75				
53	5	Blood	S-140		...	...	...	...	...	0.90				
54	5	Blood	S-141		...	...	...	...	...	0.90				
14655	5	Blood	S-142		...	...	...	...	...	1.00				
56	5	Blood	S-143		...	...	...	...	...	0.88				
57	5	Blood	S-144		...	...	...	...	...	1.03				
58	5	Blood	S-145		...	...	...	...	...	0.87				
59	5	Blood	S-146		...	...	...	...	...	0.78				
14660	5	Blood	S-147		...	...	...	...	...	0.84				
May 12, 1954														
14671	15	Blood	.....		...	...	...	...	...	1.10				
72	15	Liver	.....		...	...	...	...	...	161.3	222.	...	...	"Dead Cow" #272
14673	15	Kidney	
		A. Cortex								36.2	94.0			
		B. Medulla								25.3	136.3			

Table 3. Blood Plasma (Continued)

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Serial number	Other number	Sample	Sample number	Animal number	Dry M. Per cent	Crude protein Per cent	Ca Per cent	P Per cent	Co ppm	Cu ppm	Fe ppm	Mn ppm	Mo ppm	Miscellaneous
May 19, 1954														
14674	15	Blood	None	92B9755	...	...	...	...	...	.93				
14675	15	Blood	None	92B9756	...	...	...	...	...	.69				
76	15	Blood	None	92B9757	...	...	...	...	...	.71				
77	15	Blood	None	92B9758	...	...	...	...	...	.47				
78	15	Blood	None	92B9761	...	...	...	...	...	.71				
79	15	Blood	None	92B9762	...	...	...	...	...	1.01				
14680	15	Blood	None	92B9763	...	...	...	...	...	1.48				
81	15	Blood	None	92B9764	...	...	...	...	...	.80				
82	15	Blood	None	92B9769	...	...	...	...	...	.64				
83	15	Blood	None	K500103	...	...	...	...	...	1.13				
84	15	Blood	None	K500289	...	...	...	...	...	.88				
14685	15	Blood	None	B254637	...	...	...	...	...	.98				
86	15	Blood	None	B254629	...	...	...	...	...	1.07				
87	15	Blood	None	B254632	...	...	...	...	...	1.18				
14688	15	Blood	None	B61416	...	...	...	...	...	.79				
May 19, 1954														
14688	37	Blood	None	K447890	...	...	...	...	...	1.17				
89	37	Blood	None	K462994	...	...	...	...	...	1.17				
14690	37	Blood	None	K490239	...	...	...	...	...	.88				
91	37	Blood	None	K490243	...	...	...	...	...	1.21				
92	37	Blood	None	K490248	...	...	...	...	...	1.04				
93	37	Blood	None	K490249	...	...	...	...	...	1.13				
94	37	Blood	None	K979348	...	...	...	...	...	.85				
14695	37	Blood	None	C979347	...	...	...	...	...	.88				
96	37	Blood	None	C980850	...	...	...	...	...	.84				
97	37	Blood	None	T462994	...	...	...	...	...	1.17				
14698	37	Blood	None	T561653	...	...	...	...	...	1.26				
24146	37	Blood	None	K490241	...	...	...	...	...	1.36				
47	37	Blood	None	K490246	...	...	...	...	...	1.41				
48	37	Blood	None	C980852	...	...	...	...	...	.89				
49	37	Blood	None	C980853	...	...	...	...	...	1.15				
21450	37	Blood	None	4029	...	...	...	...	...	0.87				
51	37	Blood	None	4030	...	...	...	...	...	.85				
21452	37	Blood	None	4031	...	...	...	...	...	.75				

Table 4. Copper and Molybdenum Analyses of Livers
p.p.m. of Cu and Mo in Dry Liver

These analyses are made available through the efforts of
Dr. R. L. Albrook, Dr. G. R. Spencer, and D. F. Adams of Washington State College

Serial number	Herd number	Other number	Description	Dry M. Per cent	Crude protein Per cent	Ca Per cent	P Per cent	Co ppm	Cu ppm	Fe ppm	Mn ppm	Mo ppm	Miscellaneous
F13	Salem, Oregon	...	...	...	...	...	37	...	...	2.8	
F14	Salem, Oregon	...	...	...	...	...	220	...	...	6.1	
F20	Coulee City, Washington	...	...	...	...	...	81	...	...	2.3	
F21	Wenatchee, Washington	...	...	...	...	...	109	...	...	3.6	
F22	Wenatchee, Washington	...	...	...	...	...	107	...	...	3.4	
F23	Ellensburg, Washington	...	...	...	...	...	169	...	...	3.1	
F24	Ellensburg, Washington	...	...	...	...	...	112	...	...	2.8	
F25	Ellensburg, Washington	...	...	...	...	...	27	...	...	3.5	
F26	Corvallis, Oregon	...	...	...	...	...	48	...	...	2.7	
F27	Corvallis, Oregon	...	...	...	...	...	132	...	...	3.4	
F30	Yakima, Washington	...	...	...	...	...	116	...	...	6.1	
F31	Yakima, Washington	...	...	...	...	...	44	...	...	6.8	
F33	Mt. Vernon, Washington	...	...	...	...	...	31	...	...	6.1	
F34	Mt. Vernon, Washington	...	...	...	...	...	185	...	...	3.0	
F35	Lynden, Washington	...	...	...	...	...	105	...	...	6.0	
F36	Lynden, Washington	...	...	...	...	...	31	...	...	5.8	
E1586	17	...	Sauvie Island, Oregon	...	...	...	...	...	134	...	...	9.1	
F62	8	...	Sauvie Island, Oregon	...	...	...	...	...	25	...	...	5.5	
F63	8	...	Sauvie Island, Oregon	...	...	...	...	...	57	...	...	6.7	
F64	8	...	Sauvie Island, Oregon	...	...	...	...	...	80	...	...	5.2	
F65	8	...	Sauvie Island, Oregon	...	...	...	...	...	18	...	...	5.4	
F72	Tillamook, Oregon	...	...	...	...	...	169	...	...	5.8	
F73	Tillamook, Oregon	...	...	...	...	...	48	...	...	2.6	
F91	Goldendale, Washington	...	...	...	...	...	104	...	...	6.1	
F92	Goldendale, Washington	...	...	...	...	...	18	...	...	1.9	
F111	Renton, Washington	...	...	...	...	...	40	...	...	4.7	
F112	Renton, Washington	...	...	...	...	...	259	...	...	2.7	
F229	Vancouver, Washington; Schevuple Sheep	...	...	...	...	...	404	...	...	3.8	
F248	...	1	Sauvie Island, Oregon	...	...	...	...	...	424	...	...	1.7	
F284	...	1	Genessee, Idaho	...	...	...	...	...	620	...	...	7.6	
F407	...	20	Sauvie Island, Oregon	...	...	...	...	...	103	...	...	12.9	
F408	...	20	Sauvie Island, Oregon	...	...	...	...	...	54	...	...	8.0	
F409	...	20	Sauvie Island, Oregon	...	...	...	...	...	142	...	...	18.6	
F410	...	20	Sauvie Island, Oregon	...	...	...	...	...	56	...	...	12.9	
F411	...	9	Sauvie Island, Oregon	...	...	...	...	...	73	...	...	5.8	
F437	...	1	Sauvie Island, Oregon	...	...	...	...	...	35	...	...	6.2	
F182	...	33	Sauvie Island, Oregon	...	...	...	...	...	279	...	...	5.6	
F514	...	20	Sauvie Island, Oregon	...	...	...	...	...	35	...	...	6.2	
F515	...	20	Sauvie Island, Oregon	...	...	...	...	...	19	...	...	7.6	
F568	...	9	Sauvie Island, Oregon Sheep	...	...	...	...	...	71	...	...	7.3	
F569	...	9	Sauvie Island, Oregon Sheep	...	...	...	...	...	207	...	...	7.0	
F582	...	6	Sauvie Island, Oregon	...	...	...	...	...	103	...	...	5.6	
F589	...	30	Sauvie Island, Oregon	...	...	...	...	...	14	...	...	2.4	
F590	...	9	Sauvie Island, Oregon Sheep	...	...	...	...	...	414	...	...	6.7	
F682	...	39	Sauvie Island, Oregon	...	...	...	...	...	380	...	...	2.5	
F843	...	33	Sauvie Island, Oregon	...	...	...	...	...	131	...	...	4.2	
F844	...	6	Sauvie Island, Oregon	...	...	...	...	...	781	...	...	3.1	
F845	...	1	Sauvie Island, Oregon	...	...	...	...	...	987	...	...	3.9	
F858	...	20	Sauvie Island, Oregon	...	...	...	...	...	27	...	...	2.2	
F939	...	33	Sauvie Island, Oregon	...	...	...	...	...	10	...	...	1.1	
F940	...	33	Sauvie Island, Oregon	...	...	...	...	...	2	...	...	0.9	
F941	...	33	Sauvie Island, Oregon	...	...	...	...	...	9	...	...	1.0	
F942	...	33	Sauvie Island, Oregon	...	...	...	...	...	8	...	...	0.9	
F943	...	1	Sauvie Island, Oregon	...	...	...	...	...	163	...	...	0.9	
F944	...	1	Sauvie Island, Oregon	...	...	...	...	...	148	...	...	1.1	