

### BACKGROUND

- Proper dry cow nutrition is essential for a smooth transition period and a productive lactation.
- Variability in measured mineral concentrations of the dry cow ration can pose a risk to the accuracy of ration formulation.
- Identifying sources of variation in mineral concentrations o dry cow rations could lead to strategies capable of improving the management of the dry cow nutrition program on a farm.

## **OBJECTIVES**

• The objective of this experiment was to quantify selected sources of variation in mineral concentrations of dry cow total mixed ration (TMR) samples from commercial dairy farms.

## **MATERIALS & METHODS**

- Duplicate TMR samples collected by dairy consultants from 14 farms in the US were sent to a commercial laboratory
- Technicians divided each sample into 2 subsamples using a mixing and quartering technique.
- Each subsample was then microwave oven-dried and ground to pass through a 1.0 mm screen.
- These samples were then divided into 3 subsamples, each of which (n = 167) were analyzed for nutrients using NIRS and macro- and micro-minerals using inductively coupled plasma-optical emission spectrometry.
- Total variance was partitioned into that associated with sampling at the farm, with the first subsampling at the laboratory, and with the second laboratory subsampling and subsequent analysis.
- Data were analyzed using PROC GLIMMIX in SAS. The model included farm as a fixed effect and farm sampling, first subsampling (within farm sampling), and second subsampling (within first subsampling) as random effects.
- Covariance estimates, compared on a relative basis for each mineral, were used to compare variance attributed to on-farm sampling versus subsampling at the laboratory

# Partitioning variation in mineral concentrations of dry cow total mixed rations on commercial dairy farms.

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			t composition of d	rv cow total	mixed rations co	llactad from 11	commercial d
Table	e 1. Descriptive statistic	cs for nutrier	it composition of a				
		n	Average	SD	Minimum	Maximum	CV, %
	DM, % as-fed	56	54.1	9.1	36.6	72.1	16.8
	CP, % DM	167	15.6	1.8	11.0	18.8	11.3
	NDF, % DM	167	36.8	6.3	19.2	48.7	17.1
	Starch, % DM	167	18.8	6.9	6.7	36.2	36.7
	Fat, % DM	167	2.8	0.6	1.6	8.3	22.9
	Ash, % DM	167	8.3	1.0	0.5	9.9	11.6
Table	e 2. Descriptive statisti	cs for minera	al concentrations of	of dry cow to	otal mixed rations	collected from	14 commercia
		n	Average	SD	Minimum	Maximum	CV, %
	Ca, % DM	167	1.2	0.2	0.6	1.9	19.3
	K, % DM	167	1.1	0.2	0.7	1.4	13.7
	Mg, % DM	167	0.4	0.1	0.2	0.6	26.4
	Na, % DM	167	0.2	0.1	0.1	0.3	46.6
	P, % DM	167	0.3	0.1	0.2	0.5	18.1
	S, % DM	167	0.3	0.1	0.2	0.5	26.3
			17 5	7 0	11 0	16 1	44.6
	Cu, mg/kg	167	17.3	6.1	11.0	40.4	
	Cu, mg/kg Fe, mg/kg	167 167	459.4	7.8 173.3	221.2	1053.0	37.7
	Cu, mg/kg Fe, mg/kg Mn, mg/kg	167 167 167	459.4 84.5	7.8 173.3 22.1	221.2 39.5	40.4 1053.0 136.0	37.7 26.1
Table	Cu, mg/kg Fe, mg/kg Mn, mg/kg Zn, mg/kg e 3. Comparison of var	167 167 167 167 riance in min	459.4 84.5 81.5 eral concentration	7.8 173.3 22.1 27.8 s of drv cow	221.2 39.5 30.8 V total mixed ratio	1053.0 136.0 143.5 ns attributed to	37.7 26.1 34.1 on-farm same
Table subs	Cu, mg/kg Fe, mg/kg Mn, mg/kg Zn, mg/kg e 3. Comparison of var ampling at the laborate	167 167 167 167 riance in min ory.	459.4 84.5 81.5 eral concentration	7.8 173.3 22.1 27.8 s of dry cow	221.2 39.5 30.8 V total mixed ratio	1053.0 136.0 143.5 ns attributed to	37.7 26.1 34.1 on-farm samp
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Tabl	Eu, mg/kg Fe, mg/kg Mn, mg/kg Zn, mg/kg e 3. Comparison of var ampling at the laborato Item Ca K Mg Na P S Cu Fe Mn Zn Macr Trace te 4. Average within-far SD 0.12	167 167 167 167 riance in minor ory. ro-mineral ave e-mineral ave mineral ave 0.04	459.4 84.5 81.5 eral concentration Farm Sa 55 40 23 24 21 9 10 39 10 10 10 10 10 10 10 10 10 10 10 10 10	7.8 173.3 22.1 27.8 s of dry cow % o ampling 5.7 9.9 5.3 2 .6 .1 .4 .1 .4 .1 .4 .1 .4 .1 .4 .1 .4 .1 .4 .1 .4 .1 .4 .1 .4 .1 .4 .1 .4 .1 .4 .1 .4 .1 .4 .1 .4 .1 .4 .1 .6 .1 .1 .6 .1 .1 .6 .1 .0 .1 .1 .6 .1 .0 .1 .1 .6 .1 .0 .1 .1 .6 .1 .1 .0 .1 .1 .6 .1 .0 .1 .1 .0 .1 .1 .6 .1 .0 .1 .0 .1 .0 .1 .0 .0 .1 .0 .0 .1 .0 .1 .0 .0 .1 .0 .0 .0 .0 .0 .0 .0 .0 .0 .0	11.0         221.2         39.5         30.8         v total mixed ratio         of Total Variance         Lab Subsamplin         0.9         1.5         0.7         1.2         2.7         3.1         0.0         0.4         5.6         0.8         1.7         1.7         1.7         1.7         1.7         1.7         0.03	1053.0 136.0 143.5 ns attributed to <b>g Residua</b> 43.4 57.6 76.1 96.7 75.7 87.8 89.6 60.5 82.3 90.6 72.9 80.7 trations. Femg/kg r 40.36	37.7 26.1 34.1 on-farm samp

## **RFSUITS**

ry farr

SD	Minimum	Maximum	CV, %
9.1	36.6	72.1	16.8
1.8	11.0	18.8	11.3
6.3	19.2	48.7	17.1
6.9	6.7	36.2	36.7
0.6	1.6	8.3	22.9
1.0	0.5	9.9	11.6

dairy

ng vei

## Abstract #P394

	SUMMARY
ns.	<ul> <li>Across all 14 farms, concentrations of DM, CP, NDF, and starch averaged 54.1, 15.6, 36.8, and 18.8% of DM, respectively (Table 1).</li> </ul>
	<ul> <li>Variation in nutrient composition was greatest for starch (CV = 36.7%) and lowest for CP (CV = 11.3%; Table 1).</li> </ul>
farms.	<ul> <li>Variation in mineral concentrations was greatest for Na (CV = 46.6%) and lowest for K (CV = 13.7%; Table 2).</li> </ul>
	<ul> <li>Concentrations of Ca averaged 1.2 ± 0.2% (mean ± SD) of DM, ranging from 0.6 to 1.9% of DM (CV = 19.3%; Table 2).</li> </ul>
	<ul> <li>Concentrations of K averaged 1.1 ± 0.2% of DM, ranging from 0.7 to 1.4% of DM (CV = 13.7%; Table 2).</li> </ul>
rsus	<ul> <li>More than 25% of the variance in macro- mineral concentrations could be attributed to farm sampling, compared to 1.7% attributed to the first laboratory subsampling (Table 3).</li> </ul>
	<ul> <li>More than 17% of the variance in trace- mineral concentrations could be attributed to farm sampling, compared to 1.7% attributed to the first laboratory subsampling.</li> </ul>
	<ul> <li>Coefficients of variation for dietary mineral concentrations within a farm ranged from 3.7% to 9.5% (Table 4)</li> </ul>
	CONCLUSIONS
	<ul> <li>Results indicate that the majority of the variation in the TMR can be attributed to sampling at the farm level</li> </ul>
	<ul> <li>Careful collection of representative TMR samples can aid in the reduction of variation in measured mineral concentrations and should be a key</li> </ul>

component of any successful dry cow nutrition program.