Nebraska Lincoln EXTENSION

Know how. Know now.

CUSTOM MINERAL MIXES:

ARE THEY FEASIBLE?

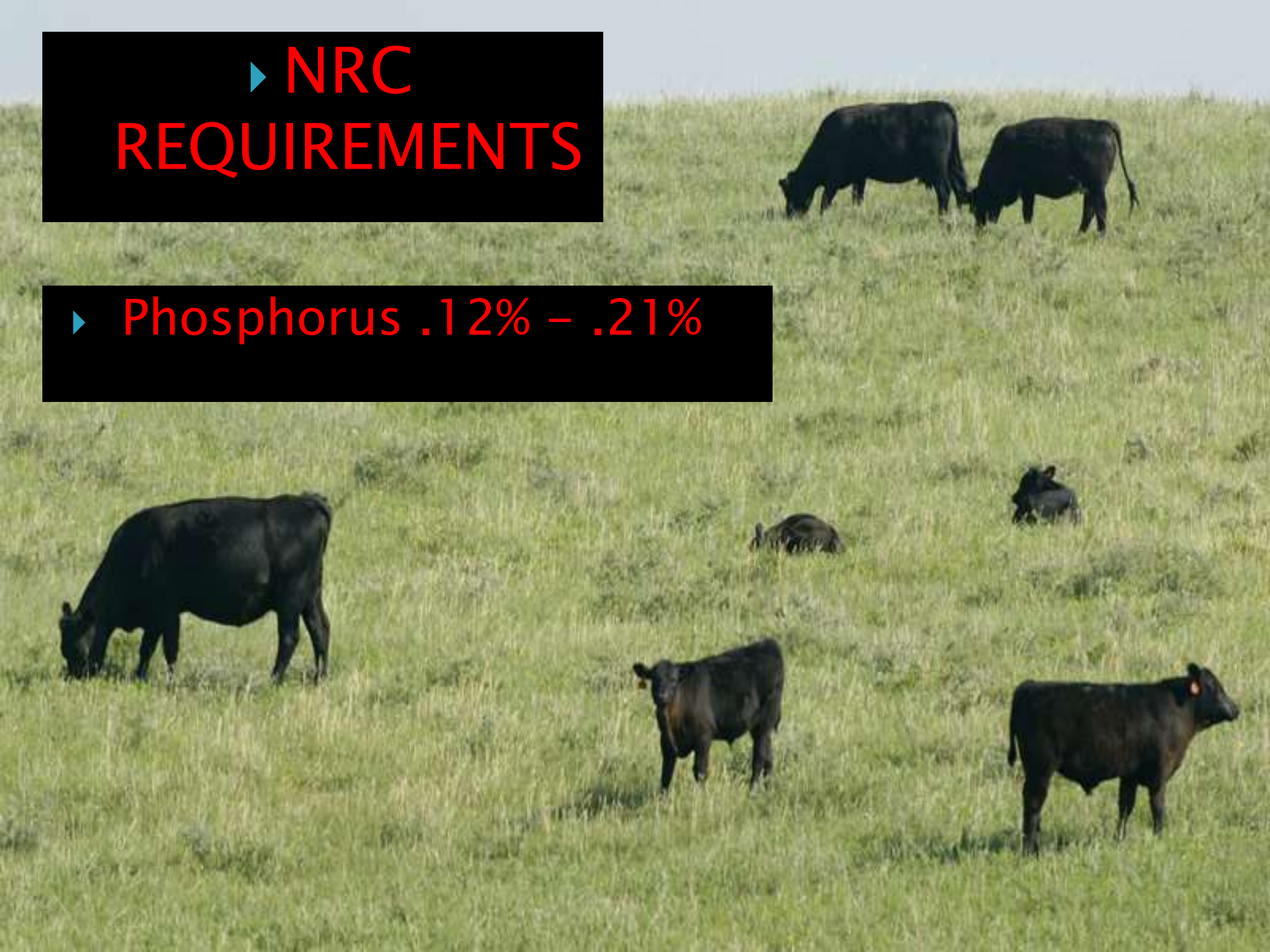
Dennis Bauer

UNL Extension Educator

in Brown, Keya Paha & Rock Counties

Cost of Mineral Programs

Dollars/Ton	2oz/day	3oz/day	4oz/day
$250.00	$5.62	$8.50	$11.24
$450.00	$10.12	$15.30	$20.24
$650.00	$14.62	$22.10	$29.24
$850.00	$19.13	$28.90	$38.29
$1,050.00	$23.62	$35.70	$47.24
$1,250.00	$28.62	$42.70	$56.94


NRC REQUIREMENTS
Phosphorus .12% – .21%

NRC REQUIREMENTS

(National Research Council)

Copper 10 ppm

Range of 4 to 15 ppm

Sulfur/molybdenum

NRC REQUIREMENTS

Zinc 30 ppm

Range of 17-30 ppm

NRC REQUIREMENTS

Potassium	.60%
Magnesium	.10%
Manganese	40 ppm
Selenium	.10 ppm
Sulfur	.15%
Calcium	.13% – .22%

Reproduction of 2-year Old Cows on Trace Mineral Supplementation

	Treatment		
Year	Control	Organic	Inorganic
MINERAL TRT FED: FEB–MAY DICAL AND SALT FED: IN WINTER	DICAL + SALT	DICAL+SALT CU.125MG ZINC 360 MG	DICAL+SALT CU. 125MG ZINC 360MG
Pooled over years 1994–1995			
No. of cows (2 YEAR OLDS)	80	78	78
No. open	0[c]	11[f]	11[f]
Calf gain (April – May)	54 lb	53 lb	52 lb
Calf wt. at weaning	405 lb	405 lb	401 lb

Journal of Animal Science 2004

Effect of copper, zinc and manganese supplementation and source on reproduction, mineral status and performance in grazing beef cattle over a two-year period.

Cow Performance:
Mean BW & BCS did not differ among treatments
control no supplemental Cu, Zn or Mn.
Organic (50% org. 50% inorganic)
100% inorganic

Overall pregnancy rate 60 day breeding season with AI (2 years)

Control	**89%**
Organic	**93%**
Inorganic	**95%**

Calf performance over two years (actual weaning wts:)

Control	**451.0 #**
Organic	**423.0 #**
Inorganic	**426.0 #**

J. K. Ahola et al
Colorado State University)

UNL 2004 Beef Cattle Report

Phosphorus Requirement for Finishing Heifers

The break point of ADG suggests that the P requirement for finishing heifers is 0.115% P of diet DM within the range of 8.2 to 10.3 g P/day (0.104 and 0.127% P on a DM basis).

Bobbi Gene Geisert, Galen Erickson et al

UNL 2000 Beef Cattle Report

Copper Levels and Source in Pre- and Post-Calving Diets of First Calf cows

Calf health and cow pregnancy rates were not affected by Cu additions to diets fed pre-and post calvng to cows with liver concentrations of about 50 ppm 60 days prior to calving.

Dennis Brink, Gene Deutscher, Erick Muehlenbein

UNL 1999 Nebraska Beef Cattle Report

Trace Mineral Supplementation and Ovarian and Luteal Function in Pubertal Heifers

Cu, Co, Mn and supplemted at high levels do not affect blood progesterone or estradiol concentrations or luteal phase characteristics, but supplemented heifers have fewer large follicles.

Chuck Story, Rick Rasby, Dennis Brink et al

UNL 1998 Nebraska Beef Cattle Report

Phosphorus Requirement of Finishing Yearlings

The Phosphorus requirement for finishing yearlings is 0.14% of dietary DM or less, suggesting phosphorus supplementation in corn based diets fed to yearlings is unnecessary.

Galen Erickson et al

Analysis of Western Kansas-Nebraska Roughage Samples - 1994

Nutrient	Cane Hay Western Kansas	Grass Hay Western Kansas	Sandhills Nebraska Hay
Phosphorus %	.17	.12	.11
Copper, ppm	8.2	2.0	3.25
Zinc. ppm	26.7	16.2	10.4
Manganese, ppm	109.8	23.3	37.6

Mineral Analyses for Dry Land Spring Planted Cereal Annual Forages Grown in 1999

Forage name	Ca %	P %	K %	Mg %	S %	Mn ppm	Cu ppm	Zn ppm
Spring cereal Barley	.30	.20	2.3	.09	.13	45	5	10
Oat	.35	.24	3.5	.11	.19	110	6	15
Triticale	.27	.24	2.7	.09	.16	70	7	16
Pea	1.2	.33	2.8	.26	.19	105	8	23
Soybean	1.7	.24	1.9	.48	.21	45	5	20
Vetch	1.5	.31	2.9	.26				

*1999 University of Wyoming Cheyenne – High Plains Ag Lab Sidney

Mineral Analyses for Dry Land Summer Annual Forages in 1999

Forage Name	Ca %	P %	K %	Mg %	S %	Mn ppm	Cu ppm	Zn ppm
Dryland Forage Sorghum	.49	.13	2.7	.18	.11	50	7	15
Sorghum x Sudan	.43	.12	2.6	.15	.10	50	6	15
Sudangrass	.41	.10	2.5	.17	.06	40	6	13
Foxtail millet	.35	.12	3.2	.23	.14	60	6	13

1999 University of Nebraska High Plains Ag Lab – Sidney
University of Nebraska Panhandle R & E Center - Scottsbluff

Mineral Analyses for Irrigated Summer Annual Forages in 1999

Forage Name	Ca %	P %	K %	Mg %	S %	Mn ppm	Cu ppm	Zn ppm
Forage Sorghum	.44	.22	2.6	.29	.14	90	7	25
Sorghum x sudan	.43	.20	2.5	.29	.13	100	8	26
Sudangrass	.47	.19	2.8	.31	.15	90	7	24
Pearl Millet	.51	.24	4.3	.33	.23	80	8	25.4
Foxtail Millet	.48	.22	4.7	.31	.21	106	9	35

1999 University of Nebraska High Plains Ag Lab – Sidney
University of Nebraska Panhandle R & E Center - Scottsbluff

Colorado, Kansas, Nebraska & Wyoming

Forage	Phosphorous %	Copper ppm	Manganese ppm	Zinc ppm
Colorado				
Alfalfa	.21	6.8	41.8	18.1
Native/Grass	.24	7.6	51.7	16.5
Kansas				
Sudan	.22	4.9	46.6	16.2
Native	.2	5.6	83.8	19.4
Grass	.21	6	41.5	15.9
Silage	.2	4.5	38.5	15.1
Nebraska				
Alfalfa	.26	8	54.5	20.3
Sudan	.28	6.1	50	38.6
Grass	.18	5.1	64.1	17.9
Wyoming				
Alfalfa	.2	6.1	35.5	15.9
Native	.14	5	97.2	15.1
Grass	.15	4.8	53.6	14.4

Mineral Concentrations of Sandhills Meadow Hay Samples from Three Nebraska Counties.

Mineral	Cherry	Rock	Holt
Cu (ppm)	9.4[b]	6.7[c]	6.5[c]
Zn (ppm)	26.1[b]	25.5[b]	27.5[b]
Mn (ppm)	85.9[b]	111.9[c]	131.5[c]
Mo (ppm)			
P (%)	.25[b]	.29[b]	.15[c]
Mg (%)			
K (%)	1.1[b]	1.6[c]	1.3[b]

[a] Adapted from Hickock et al. (1996).

Mineral Concentrations of Tissue Samples in the Northern Great Plains

Mineral	Western wheatgrass	Warm-season grasses	Annual brome
Ca	.25	.34	.35
P	.16	.20	.32
Mg	.12	.16	.23
K	1.6	1.0	2.7
Zn	20	30	24
Cu	2	5	6
Mn	47	51	97

Cody Wright SDSU

University of Nebraska-Lincoln

IANR

Nebraska Ranch Practicum 2006

Mineral	June 20th Harvest, Sept 20th regrowth		July 12th Harvest, Sept. 20th regrowth		mineral req.
Calcium	0.52%	0.79%	0.64%	0.89%	**0.13-0.22%**
Phosphorus	0.15%	0.22%	0.15%	0.23%	**0.12-0.21%**
Potassium	1.94%	1.75%	1.92%	2.39%	**0.60%**
Sulfur	0.21%	0.30%	0.19%	0.34%	**0.15%**
Magnesium	0.14%	0.20%	0.19%	0.18%	**0.12%**
Manganese	24 ppm	33 ppm	21 ppm	28 ppm	**40 ppm**
Zinc	13 ppm	17 ppm	13 ppm	18 ppm	**30 ppm**
Copper	5 ppm	5 ppm	5 ppm	6 ppm	**10 ppm**
Iron	123 ppm	119 ppm	127 ppm	94 ppm	**50 ppm**
Sodium	0.01%	0.01%	0.01%	0.01%	**0.07%**

Jerry Volesky UNL

Forage Testing Results

- 2001-2003
- 1,000 Samples Analyzed
- 11 Counties Northeast Nebraska

EXTENSION EDUCATOR TEAM INVOLVED

Dennis Bauer, BKR Counties

Troy Walz, Custer County

Brent Plugge, Central Sandhills Counties

Ralph Kulm, Holt County

Bud Stolzenburg, Cherry County

Forage Samples

Total samples 784

# Samples	Forage	Mineral–NRC requirement				
		.13–.22%	.60%	.10%	40 PPM	.15%
		Ca	K	Mg	Mn	S
223	Alfalfa	100%	100%	100%	99%	98%
320	Meadow Hay	99%	98%	93%	91%	83%
72	Oat Hay	87%	100%	100%	97%	90%
78	Millet	95%	100%	100%	92%	79%
91	Alf/grass	97%	100%	96%	93%	86%

% of samples exceeding NRC requirements

IANR

Forage Samples

Total samples 784

# Samples	Forage	Mineral–NRC REQUIREMENT		
		.12–.21 %	30 PPM	10 PPM
		P	Zn	Cu
223	Alfalfa	99.9%	15%	5%
320	Meadow Hay	34%	2%	0%
72	Oat Hay	97%	14%	0%
78	Millet	91%	53%	0%
91	Alf/grass	96%	5%	0%

% of samples exceeding NRC requirements

IANR

- Data from several states over the last 20 years is conclusive:
- **Phosphorous** levels in most forages are adequate for the dry cow.
- **Copper** concentrations in most forages are not high enough to meet a beef cows requirement. Only about 50% of the cows requirements is supplied by the forage.
- On average 50% to 65% of the cows requirement for **Zinc** is supplied by the forage.

Mineral requirements for **Calcium, Potassium, Sulfur, Iron & Manganese** are met 90% to 100% of the time, based on the forages that have been tested.

The requirement for **Selenium** supplementation is dependent on the region of the country. In some cases there is a problem with **Selenium** toxicity. In North Central Nebraska **Selenium** levels were found to be adequate in the forages tested.

Corn By Products for the Beef Cow

- Excellent source of protein, energy and phosphorus
  - Compliments most wintering programs
  - Excellent for growing cattle
- No negative associative effects on forage digestibility

Excellent Supplement for Cows

- Base forage of 6% Protein, 50% TDN
- 1200 lb dry cow:

	Intake	CP	TDN	Phos, g
Requirement		1.8	13	19
Base forage	23	1.4	11.5	15
DDG	2	.6	2	8
Total	25	2.0	13.5	23

No negative effects on forage digestibility

Mineral Content of Distiller's Grains

	% Ca	% P	% Mg	% K	Cu ppm	Mn ppm	S ppm	Zn ppm
DG	.32	.83	.33	1.07	10	27	.40	67
Corn Stalks	.62	.10	.17	1.63	3.0	56	.12	17
Grass Hay	.26	.13	.16	1.7	3.7	77	.15	18

BEEF COW MINERAL SUPPLEMENTATION WHEN FEEDING DDG

NRC requirements – phosphorus 19 grams hd/day

Forage Base -- .13% x 25 lbs. DM = 14.6 grams

DDG -- .83% x 2 lbs DM = 3.7 grams

TOTAL 18.3 grams

1250# Dry Cow
200 Days Pregnant

- Feed on a 100% Dry matter basis
- 23.8 # corn stalks
- 2.0 # DDG

Mineral	P grams	Cu ppm	Zn ppm
Required	19	258	773
Supplied	18.5	92	545
+ or -	-.5	-166 ppm	-226 ppm

Mineral in Pellet or Cube?
How Much?

- $CuSo_4$ – .66#/Ton
- ZnO_2 – .33#/Ton

- Approximate cost $1.70/Ton
- Free Choice Salt

Mineral Mix

- 0% P
- 1,500 ppm Cu
- 2,000 ppm Zn

MINERAL MIX

12# $CuSo_4$

25% Cu

6# ZnO_2

68% Zn

1982# Salt

Cost	
$CuSo_4$ $1.70 / LB.	$20.40
ZnO_2 $1.70/LB.	$10.20
Salt $86.00/TON	$85.00
Total	**$115.60**
Bag & Mix	$40.00
Total	**$155.60/Ton**

IANR

Daily Intake/cow

- 2.0 oz/head/day
- LESS THAN A PENNY/DAY

FORAGE MANAGEMENT

- Does fertilizing increase mineral content?
- Does stage of growth at harvest effect mineral content?
- What about the availability of minerals from forages?

1200# Dry Cow .12-.16% Phosphorous or in Lactation (20# milk) .16-.21% Phosphorous

% Phos	22# Forage	2# DDG .83%	4# DDG .83%	18# Forage	6# Alfalfa Hay .32%
Base Forage %P	Grams of Phos.	Grams of Phos. (%P)	Grams of Phos. (%P)	Grams of Phos.	Grams of Phos. (%P)
.10	9.9	17.4 .16%	24.9 .23%	8.2	16.8 .15%
.13	12.9	20.4 .19%	27.9 .25%	10.6	19.3 .18%
.15	14.9	22.4 .21%	29.9 .27%	12.2	20.9 .19%
.17	16.9	24.4 .22%	31.9 .29%	13.9	22.6 .20%
.20	19.9	27.4 .25%	34.9 .32%	16.3	25.0 .23%

IANR

Tips To Minimize Mineral Costs

1. Test feeds, custom mix mineral.
2. Take bids on mineral needs.
3. Eliminate over consumption.
4. Feed mineral only when needed.

- Late summer through winter months

SUMMARY

- It is possible to custom mix a mineral to meet your cow herds requirements.

- Mineral cost on a per cow basis per year can be as low as $**5.00** per head.

- **If you are spending over $15.00 - $20.00 per head per year on mineral you might want to get a second opinion.**

- **Bottom line: test your feed supply for mineral content; including protein supplements etc.**

Dennis Bauer
UNL Extension Educator
Brown, Keya Paha, & Rock Counties
Email – dbauer1@unl.edu

Phone 1-402-387-2213 or 1-800-634-8951
Cell phone 1-402-760-1549