Nutrient Requirements of Goats for Quality Meat Production

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GOAT HERD

BOER

Kiko

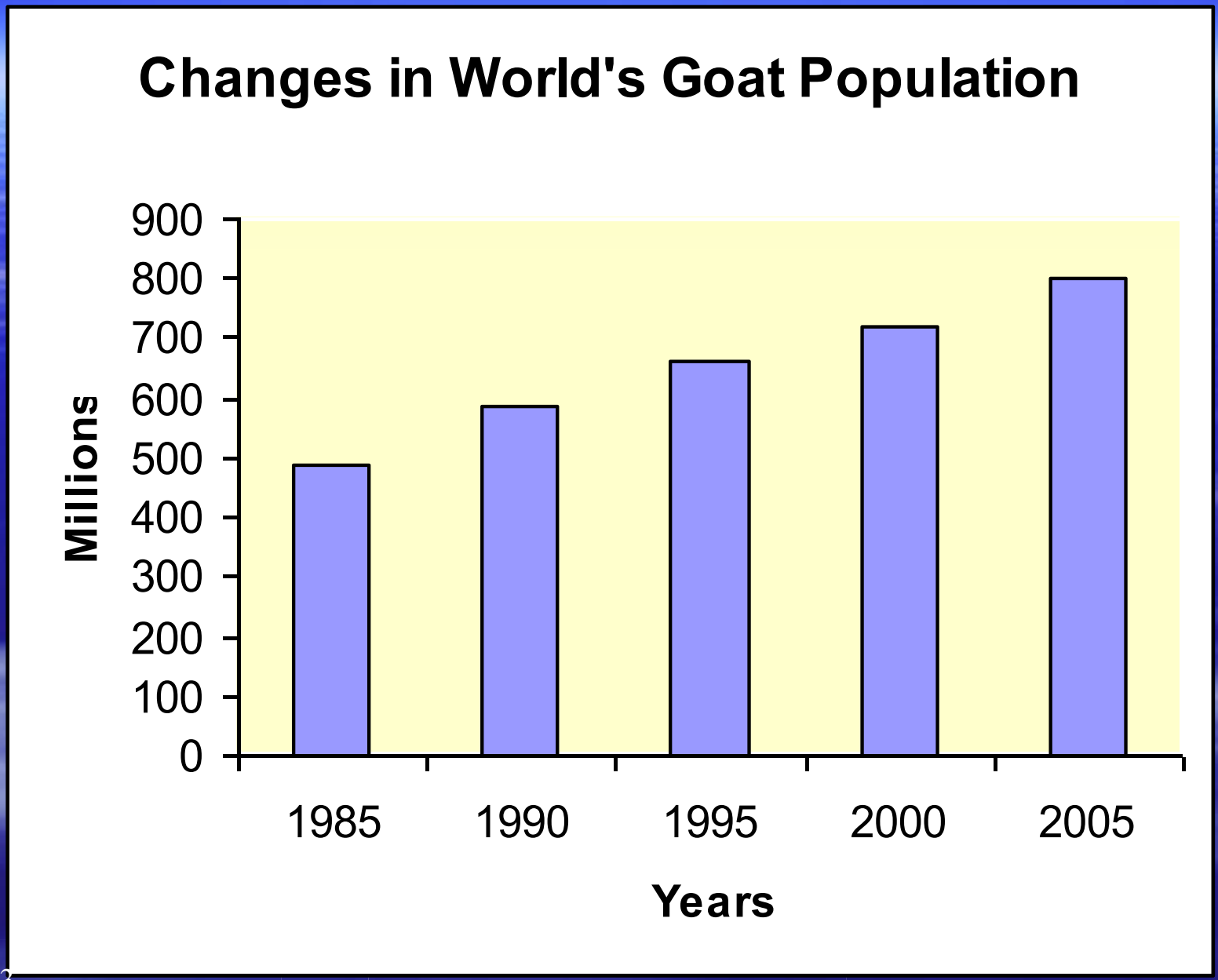
PASTURES

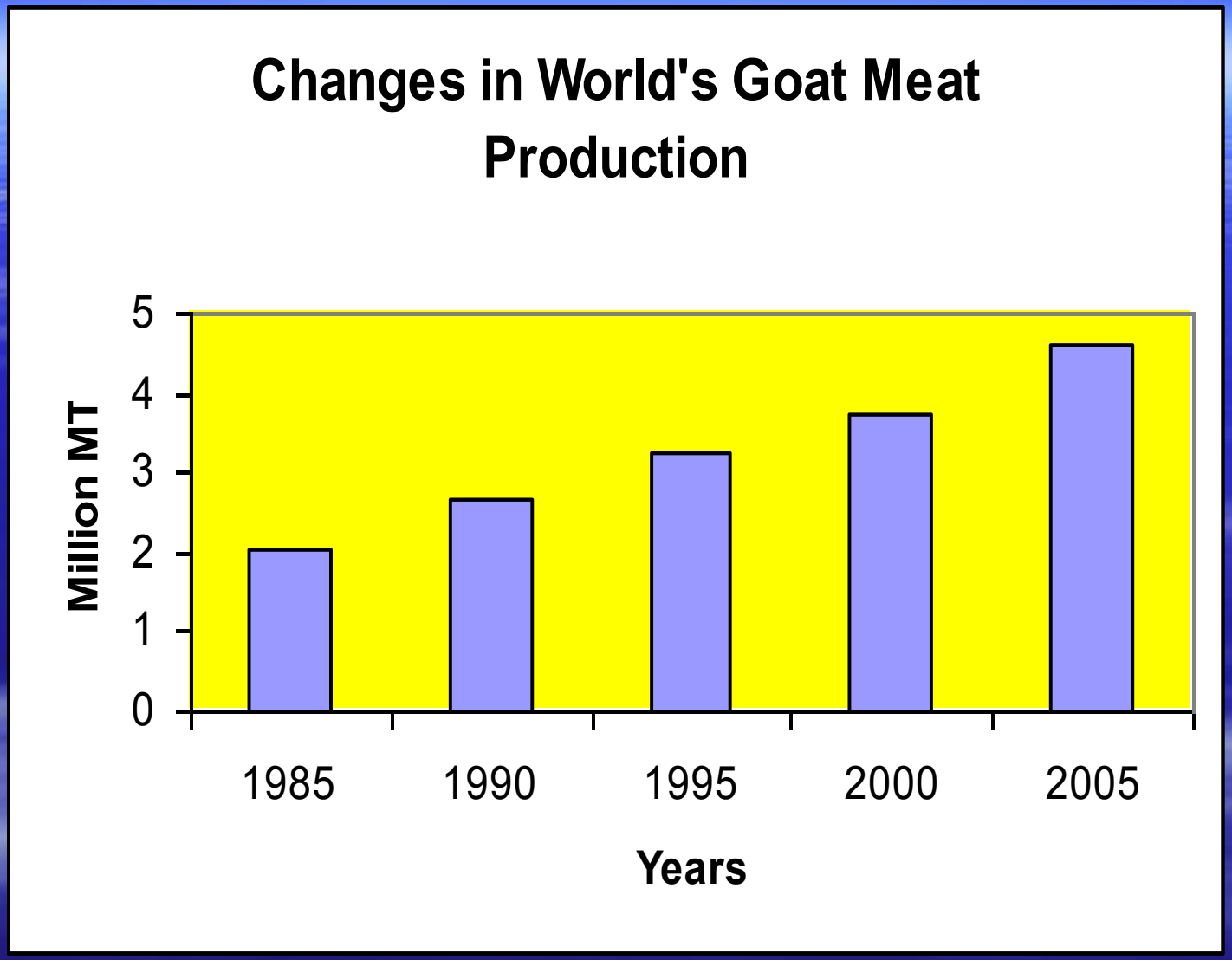
INDOORS FACILITIES

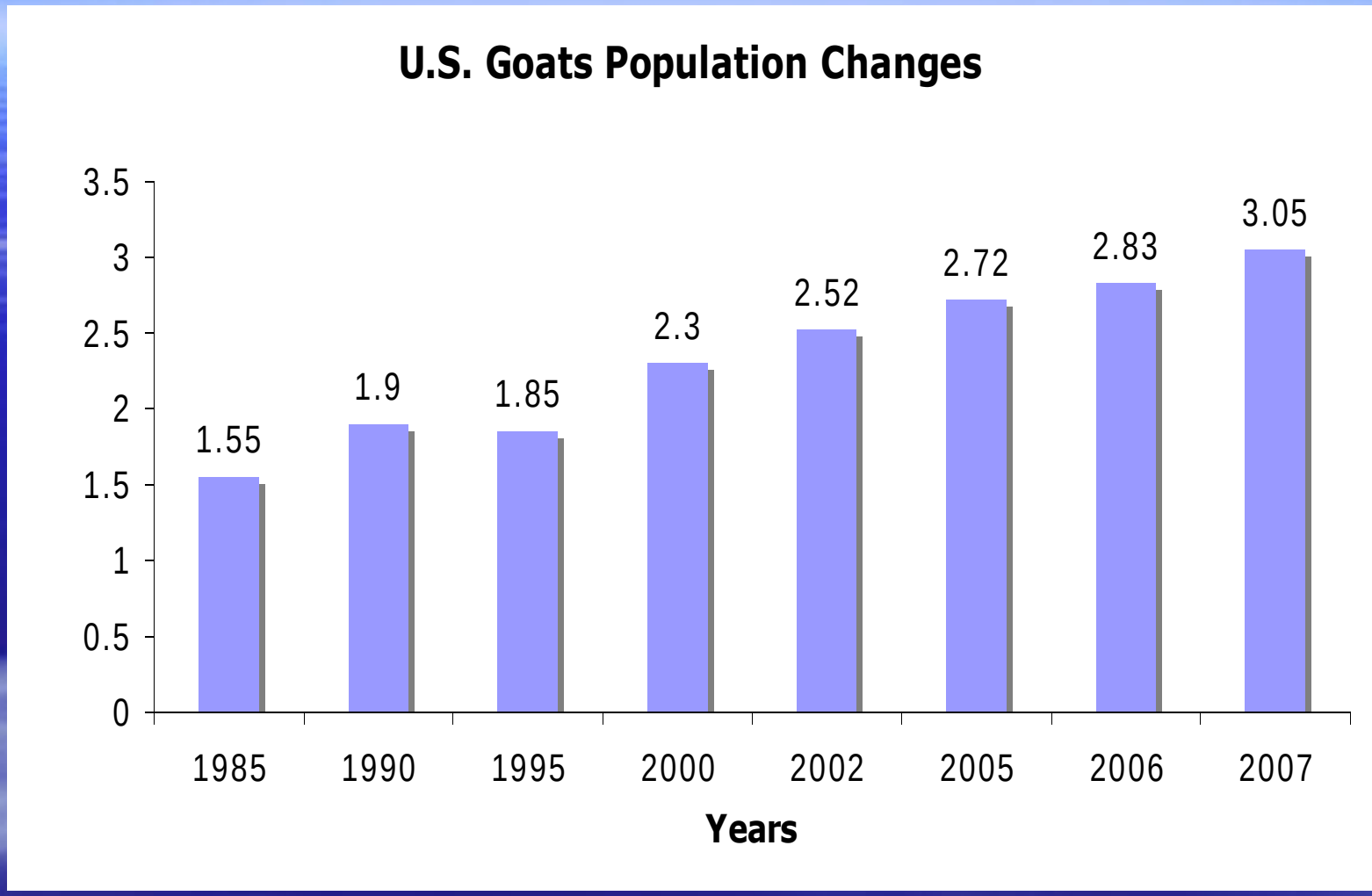
Metabolism Crates

MEAT GOAT INDUSTRY

World, U.S.


Changes in World's Goat Population
900
800
700
600
500
400
300
200
100
0
Millions
1985
1990
1995
2000
2005
Years


Changes in World's Goat Meat Production
Million MT
0
1
2
3
4
5
1985
1990
1995
2000
2005
Years


U.S. Goats Population Changes
3.5
3
2.5
2
1.5
1
0.5
0
1.55
1.9
1.85
2.3
2.52
2.72
2.83
3.05
1985
1990
1995
2000
2002
2005
2006
2007
Years

Goat Industry Profile in the U.S.

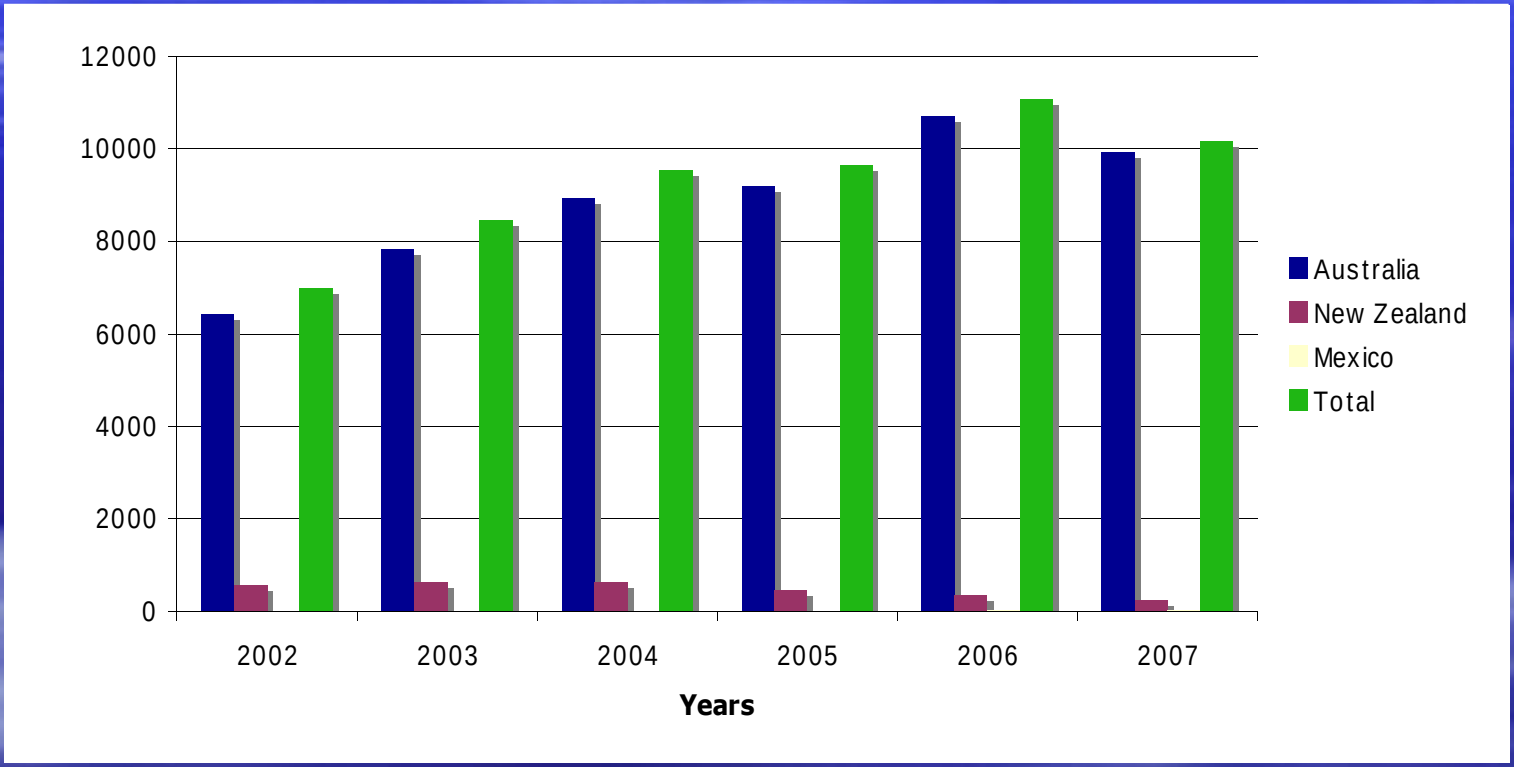
	Number	%2002	Number	%2008
All goats	2,530,466	100	3,015,000	100
Meat goats	1,938,924	76.6	2,500,000	83
Milk goats	290,789	11.5	305,000	10
Fiber goats	300,756	11.9	210,000	07

Goat meat imports (MT) and its value ($1000)

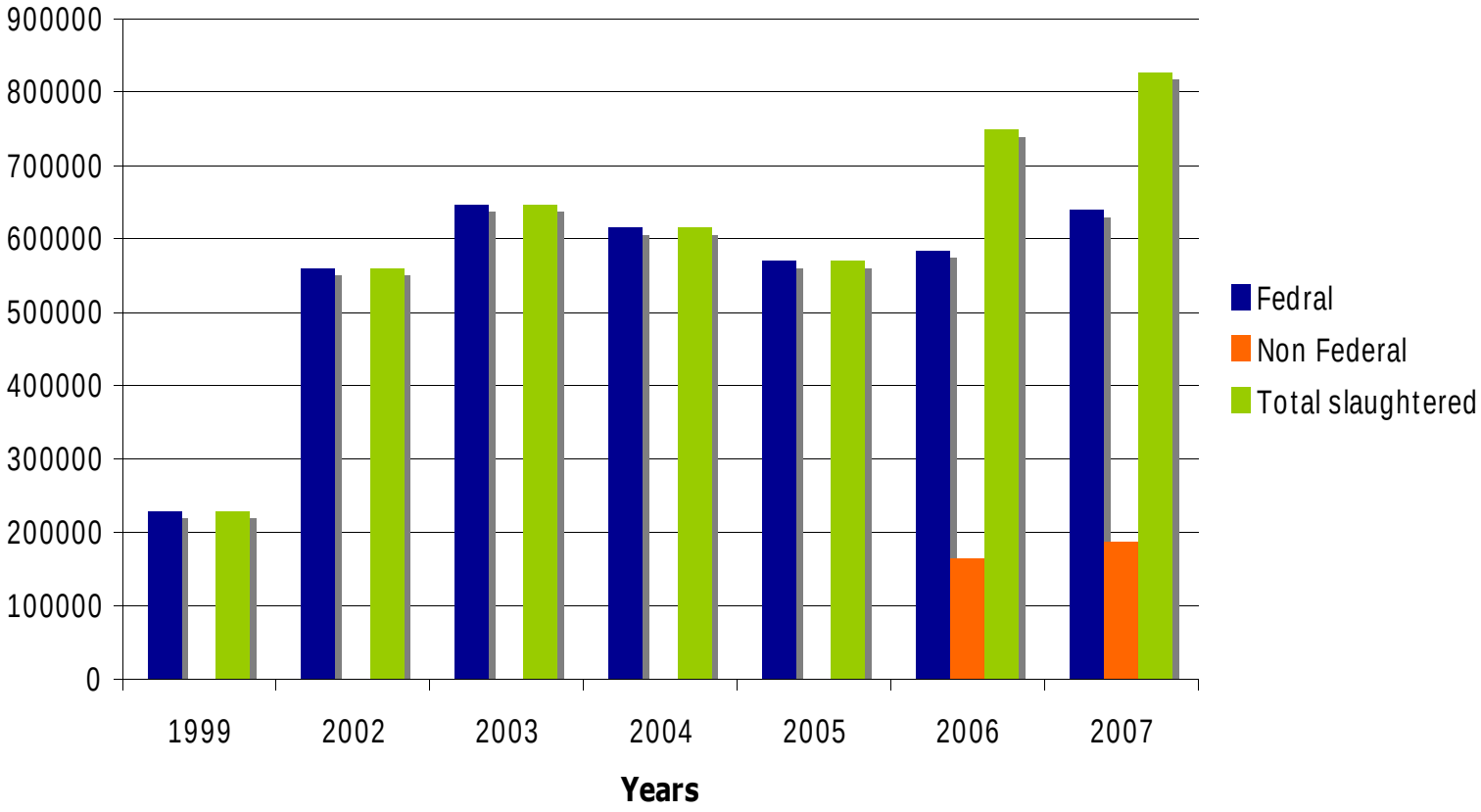
	1999	2003	2006	2007	% of 1999
Goat meat	3,360	8,462	11,070	10,166	302
Dollar Value	7,850	21,484	41,816	37,047	472
$/lb	1.06	1.15	1.72	1.65	155

USDA-NASS sample data.

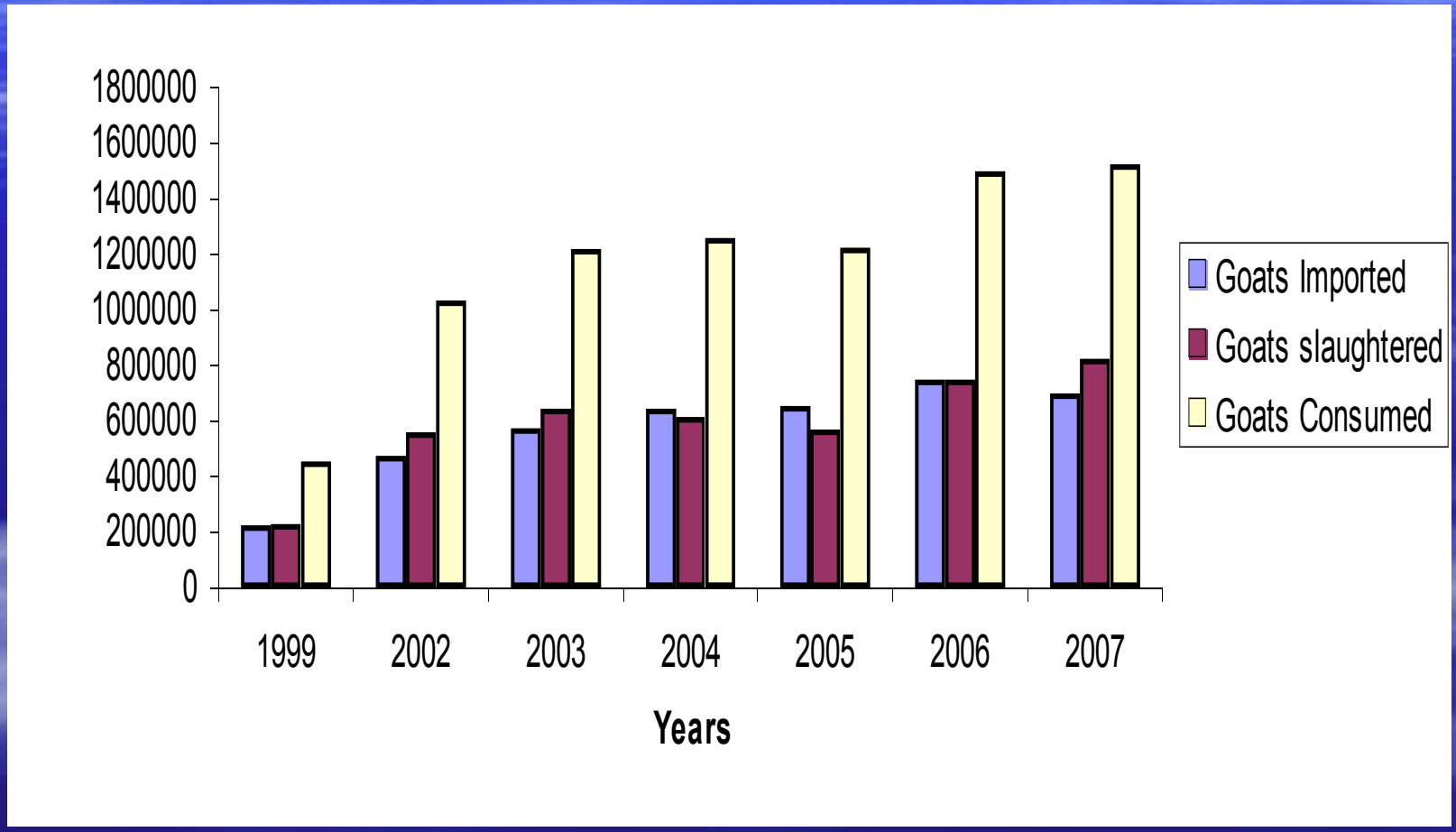
Changes in the goat meat imported to the U.S. from 2002 to 2007



Goats slaughtered in federally and state inspected plants in the U.S.



Changes in goat consumption in the U.S.

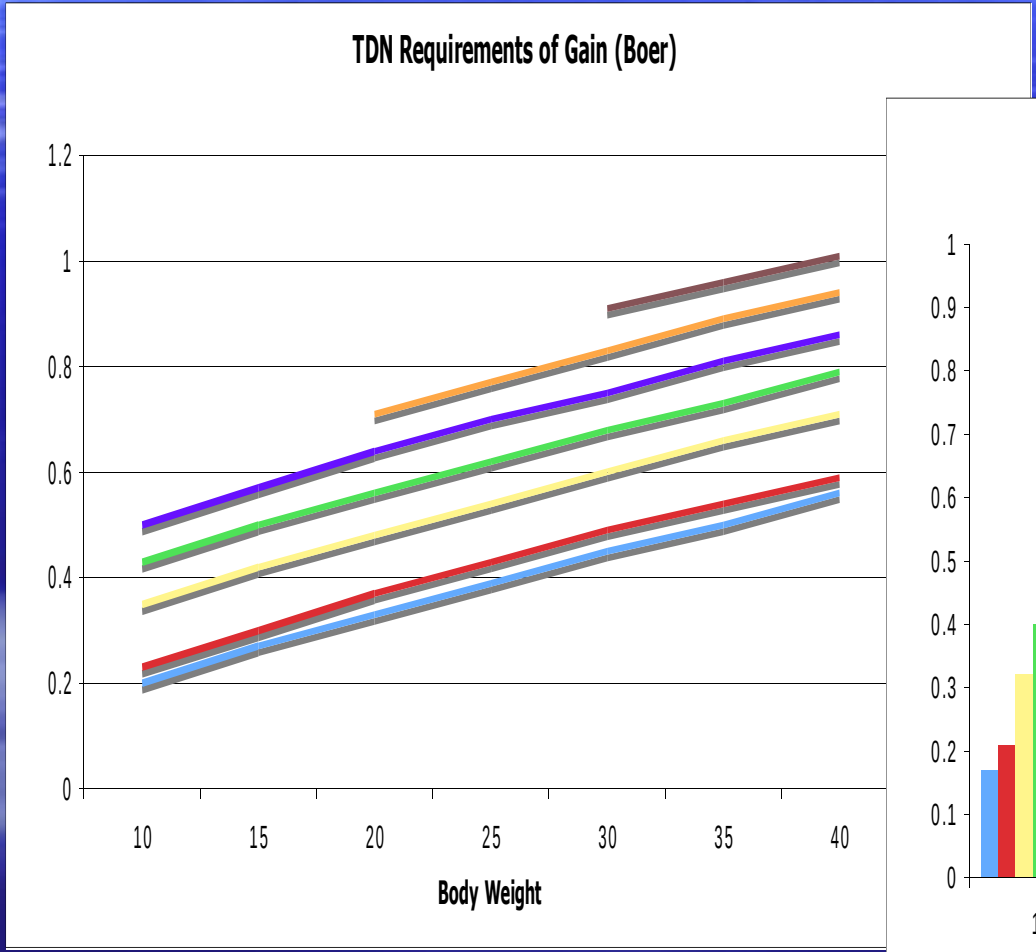


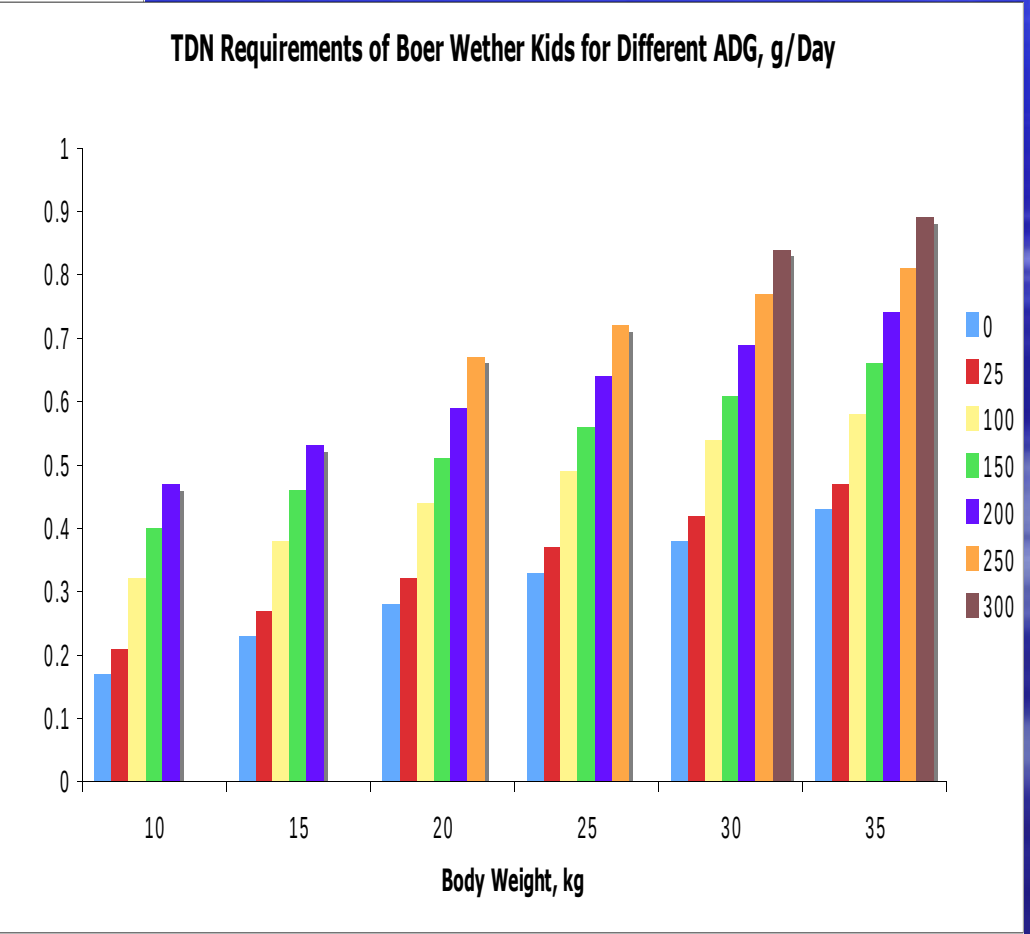
Feeding Meat Goats

Required Nutrients

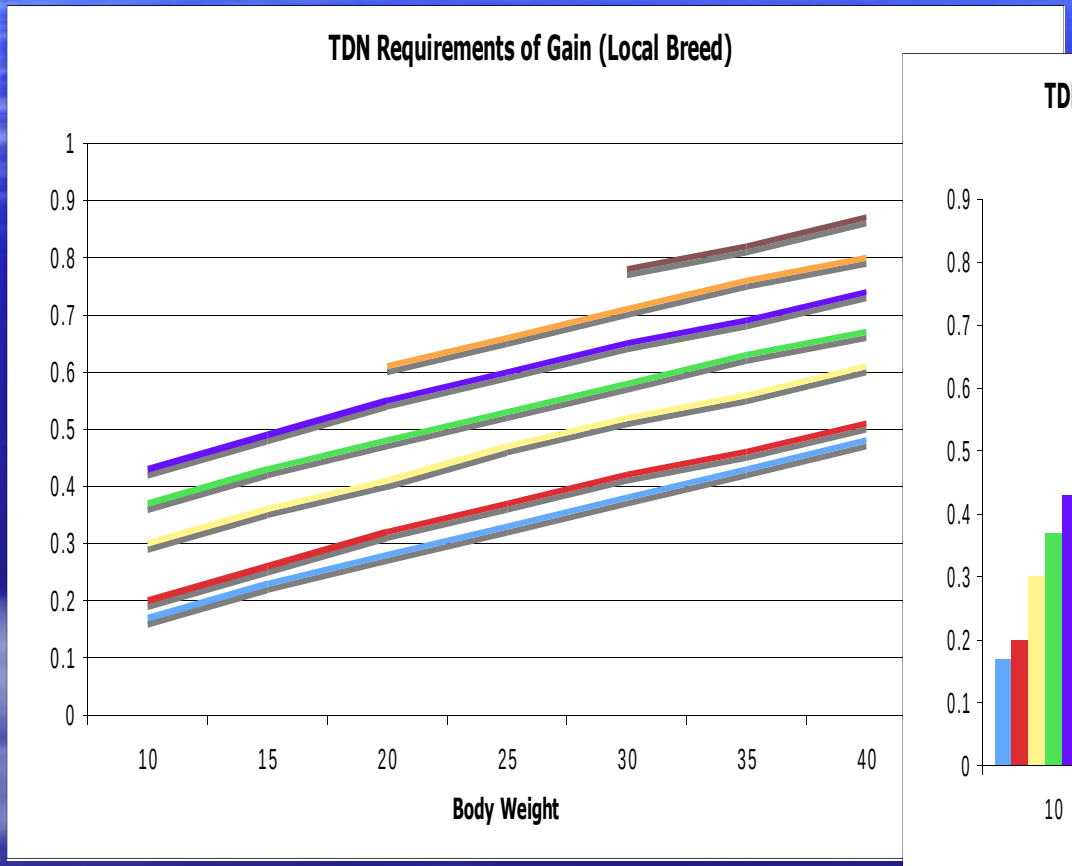
- Energy
  - TDN, kg/d
  - ME, Mcal/d
- Protein
  - CP @ 20% UIP g/d
  - CP @ 40% UIP g/d
  - CP @ 60% UIP g/d
  - MP g/d
  - DIP g/d
- Vitamins, A, E
- Minerals, major minerals and trace minerals
- Water, 1.5 to 2 gallons

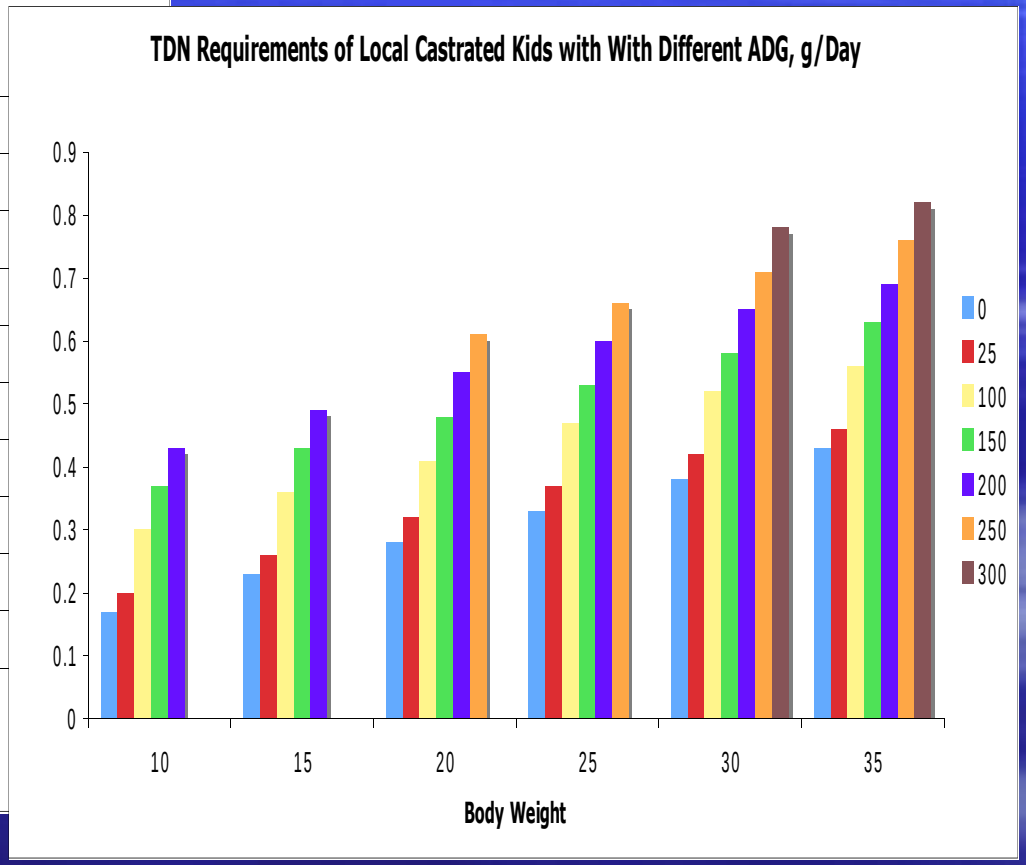
TDN Requirement of Gain Boer Kids





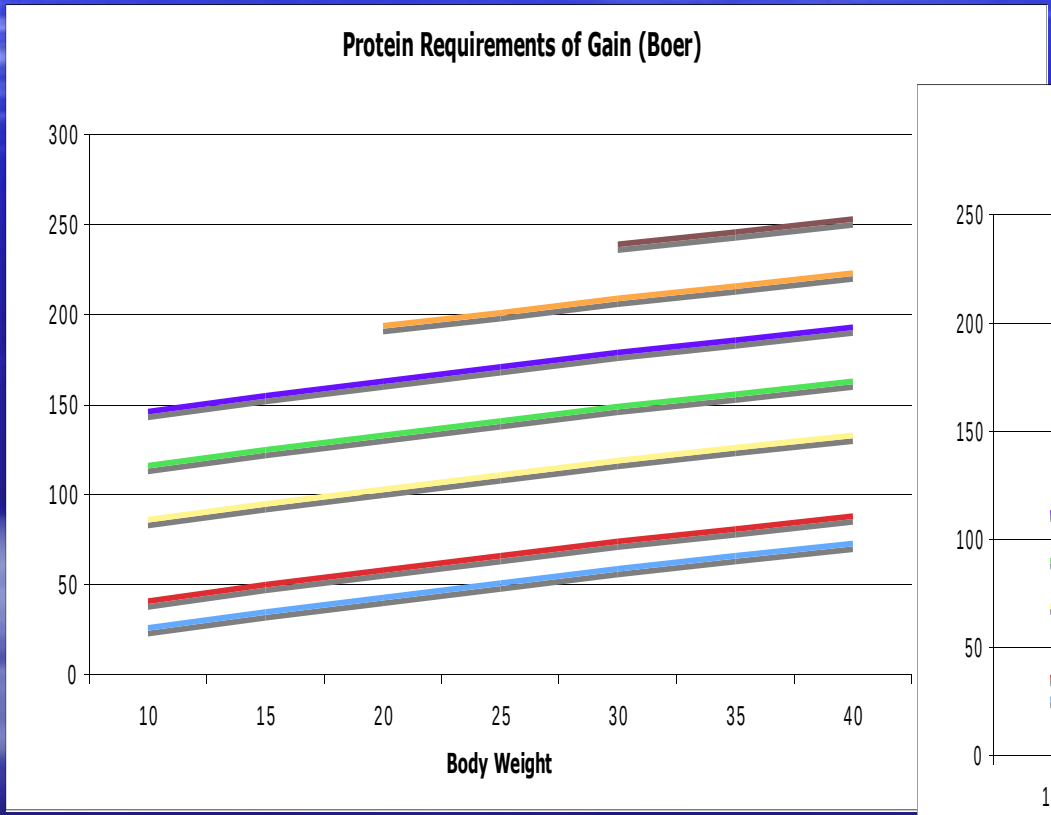
TDN Requirement of Gain Indigenous Kids

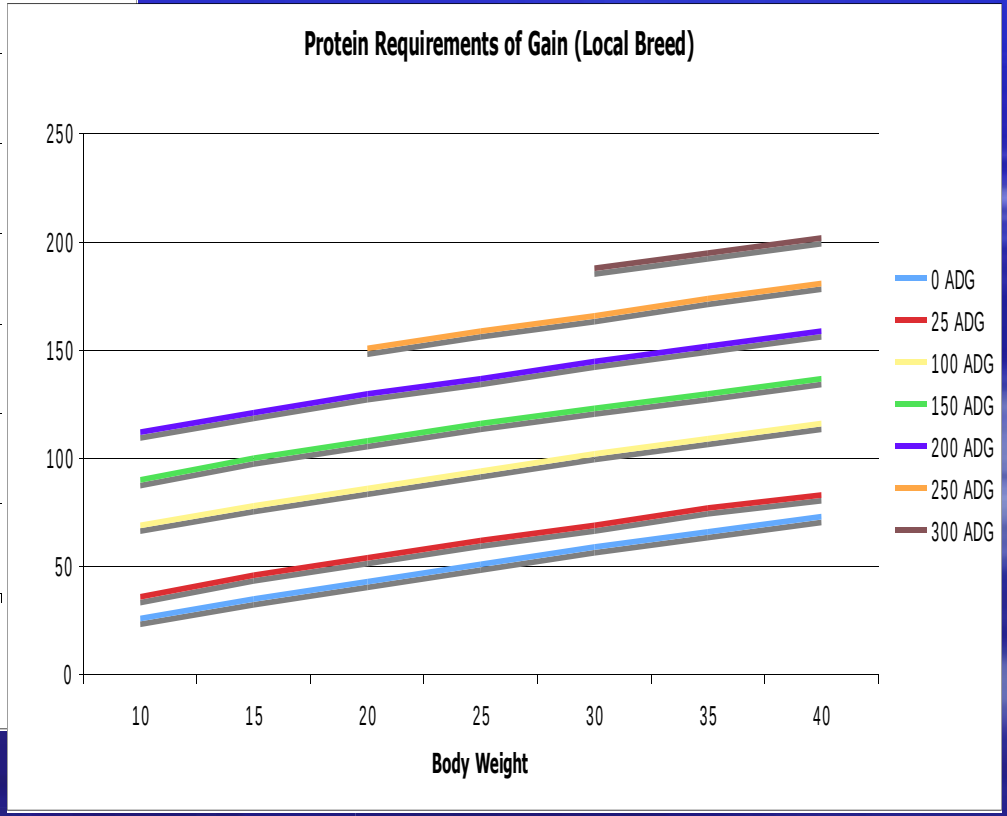




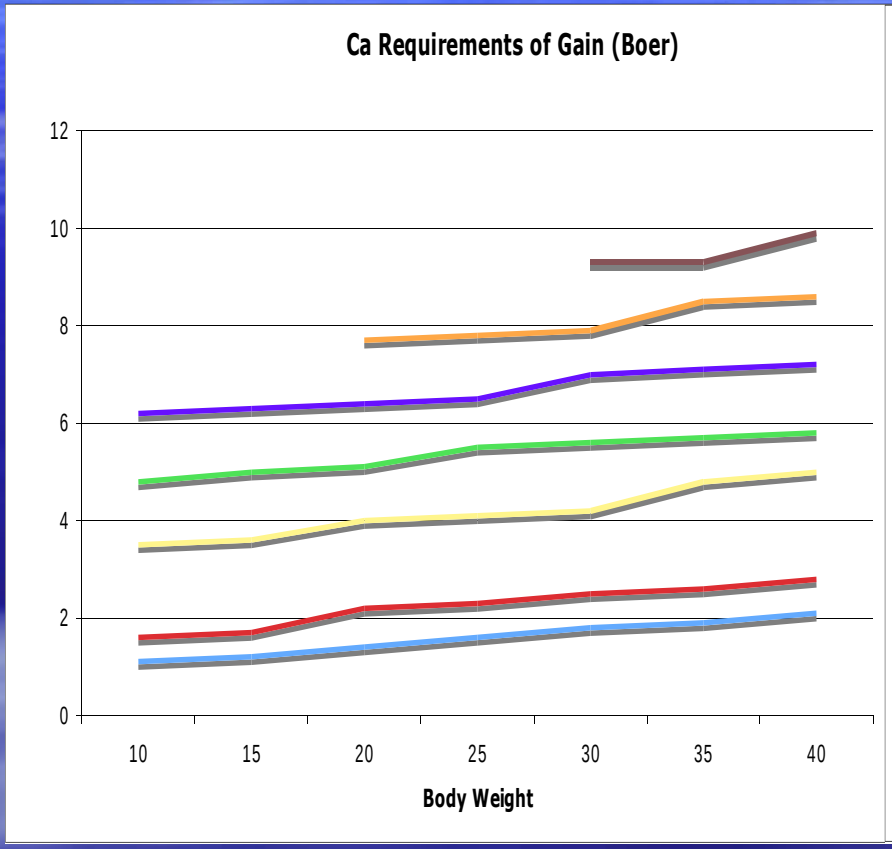
Protein Requirements of Gain @ 20% UIP

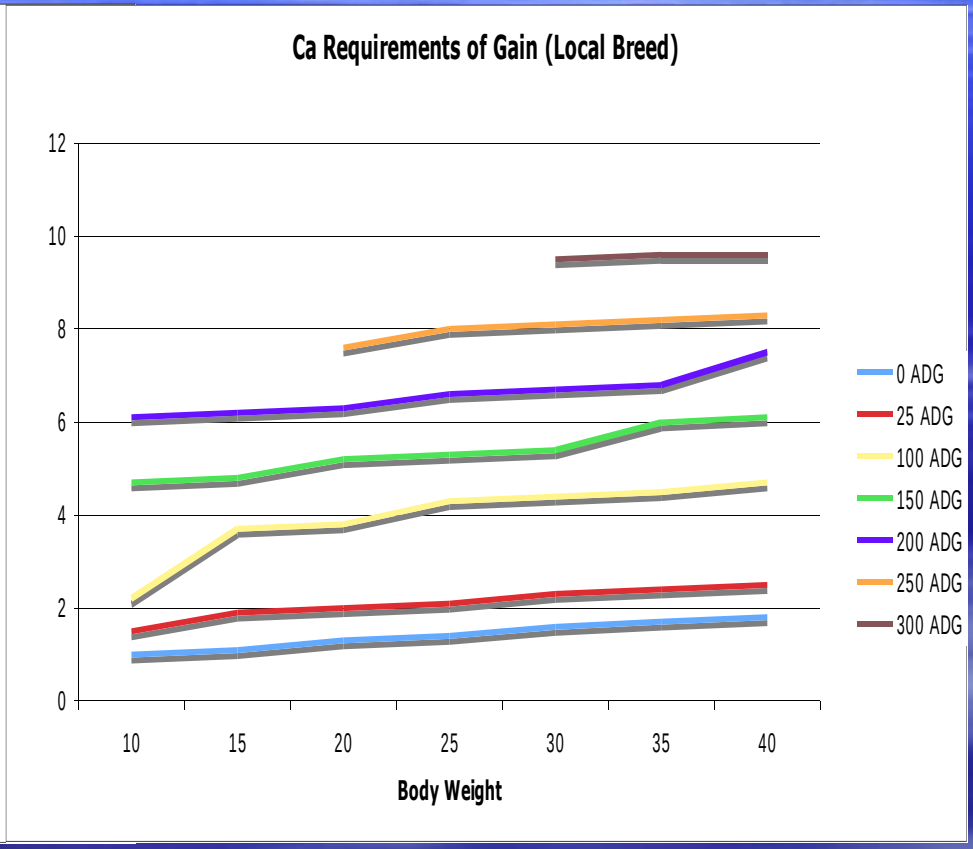
KIDS



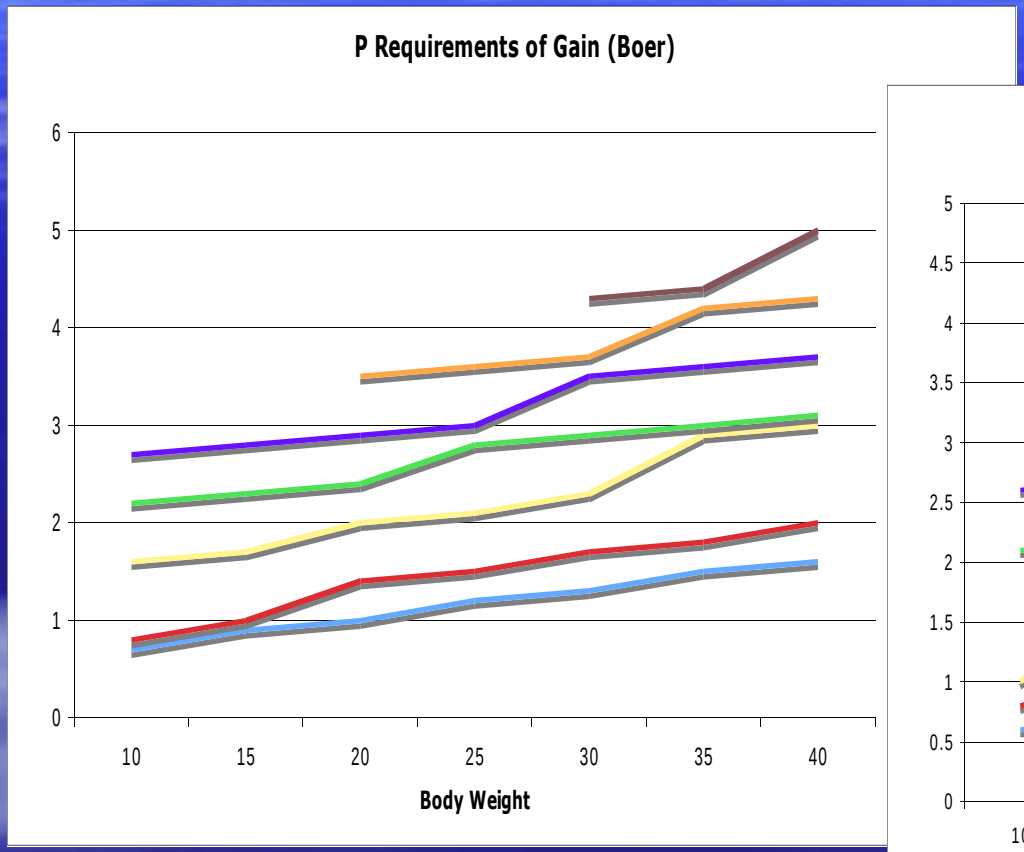


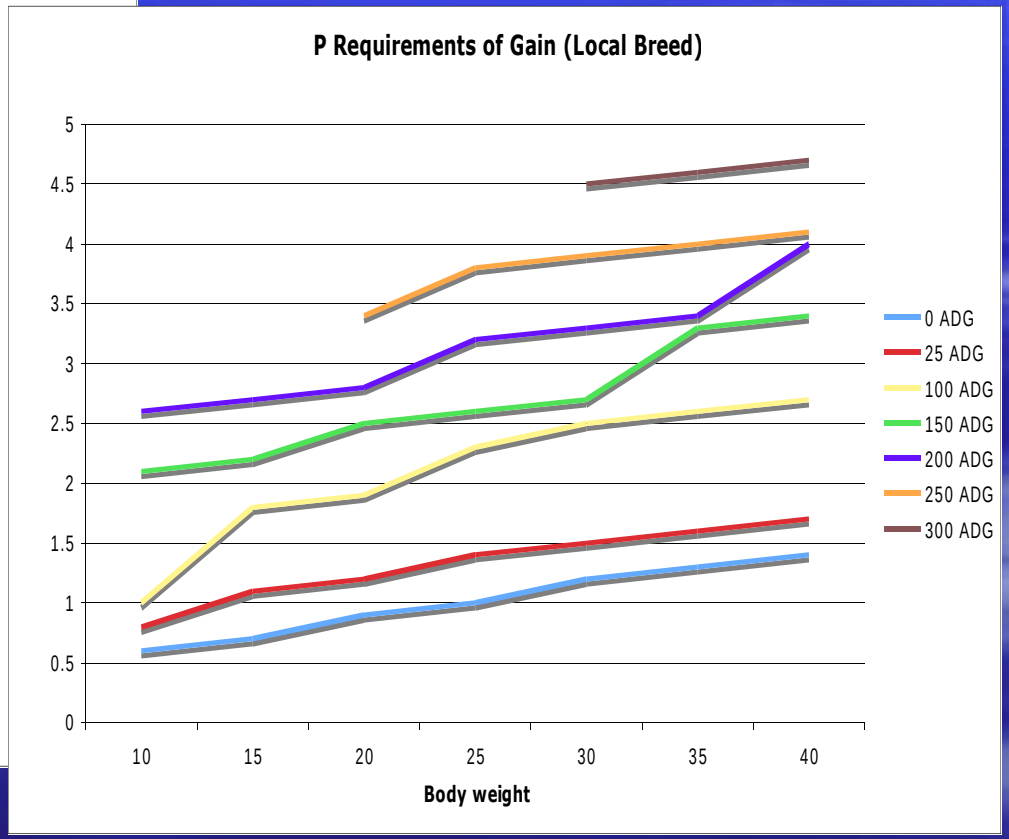
Ca Requirements of Gain Kids





P Requirements of Gain Kids



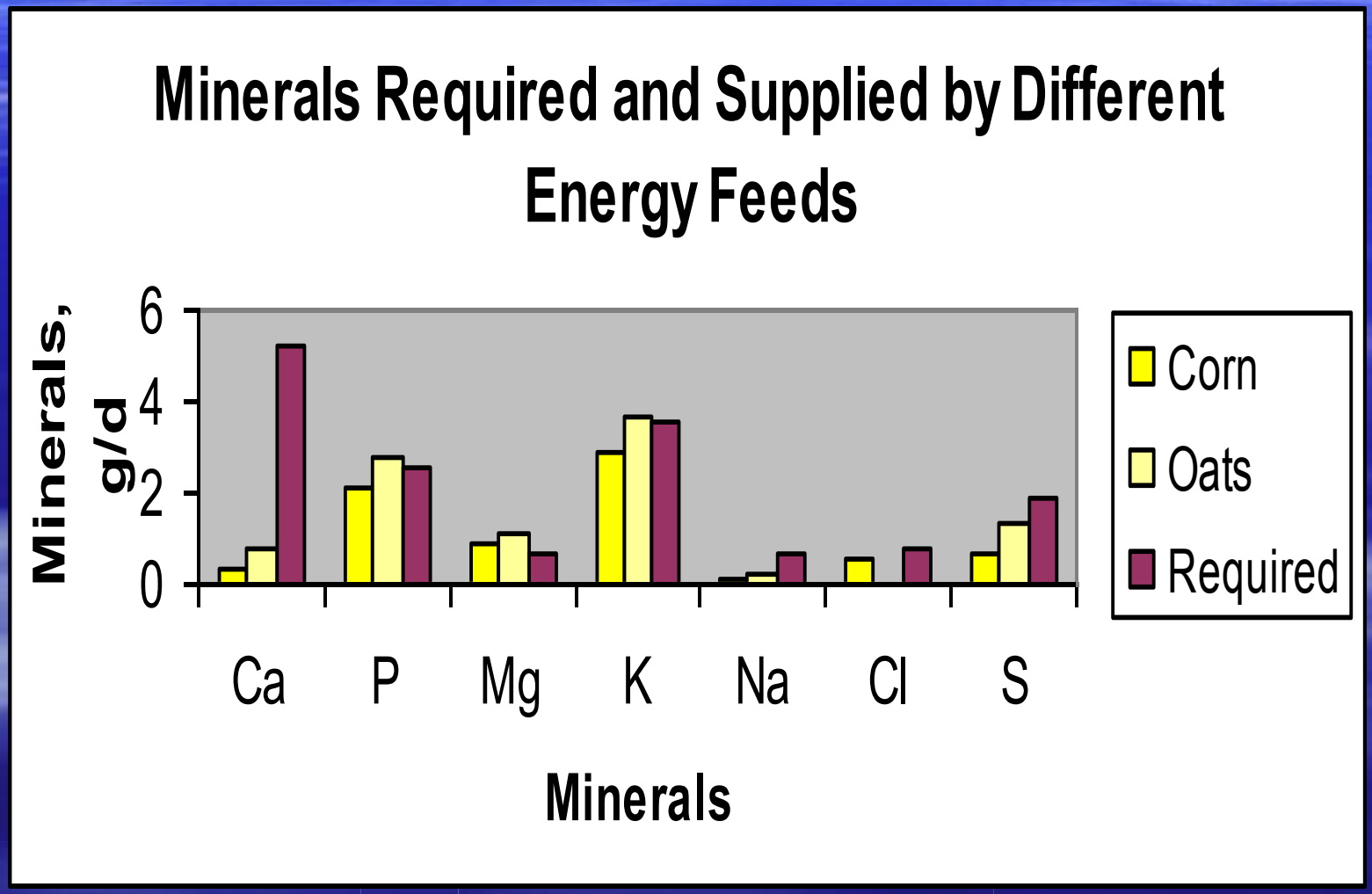


Mineral Requirements

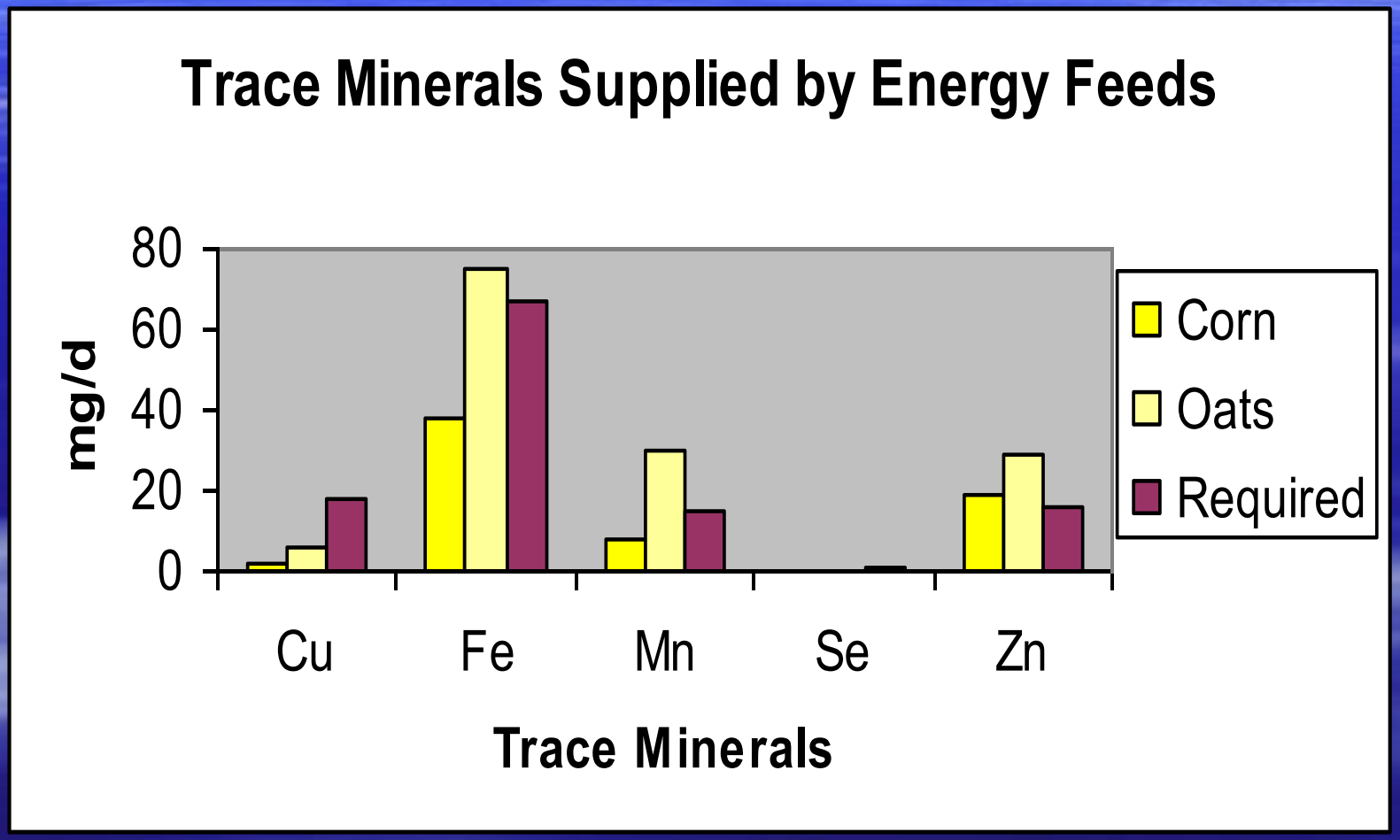
40-45 lbs. goat kid
1.5-2 lbs. DMI
100-150 g ADG

Feeds: Legume hay,
Cool season grass
Warm season grass
Alfalfa meal
Soybean meal
Whole cottonseed
Soy hulls
Corn
Oats

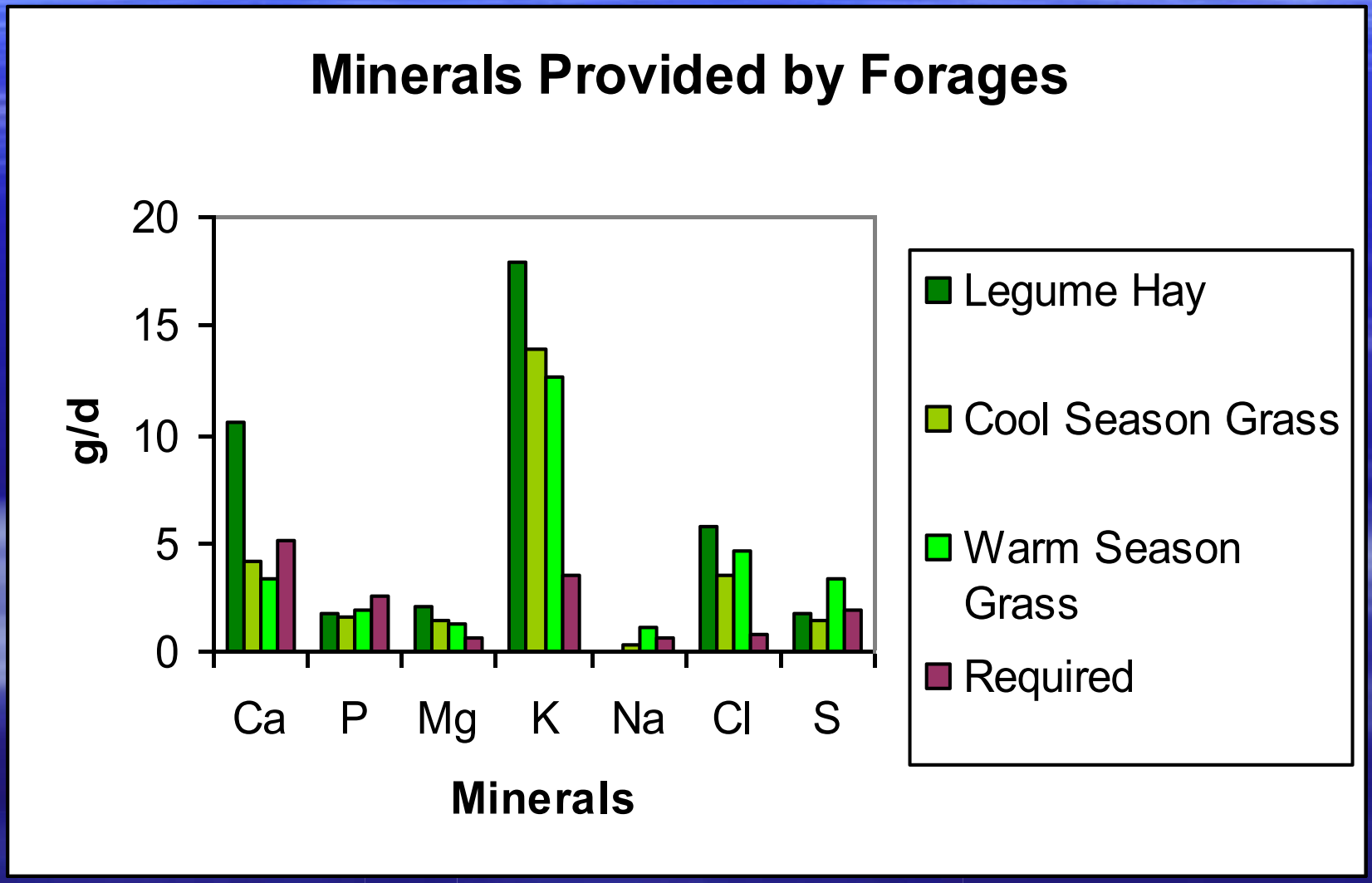
Macro Minerals in Cereal Grains vs. Requirements



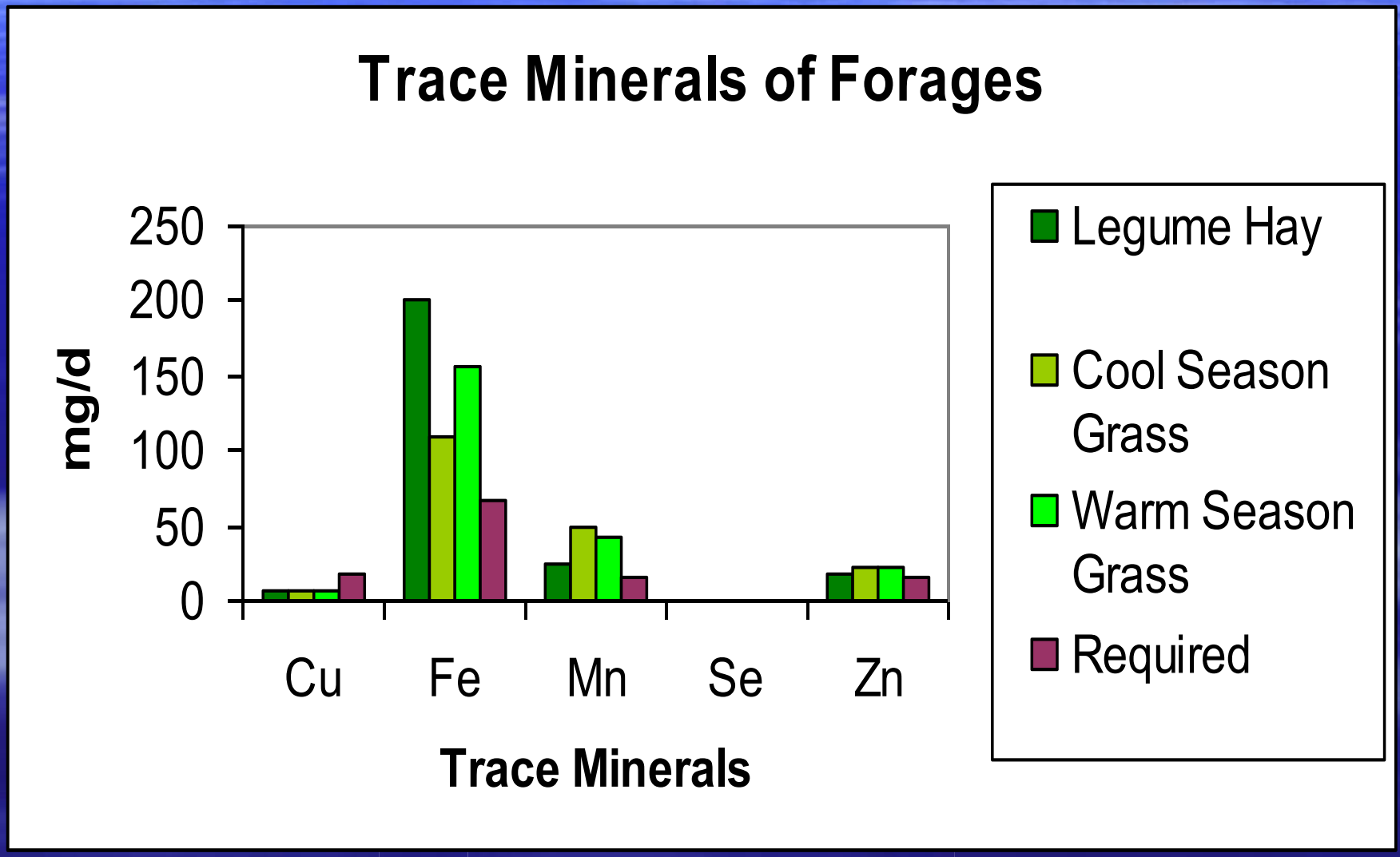
Trace Minerals in Cereal Grains vs. Requirements



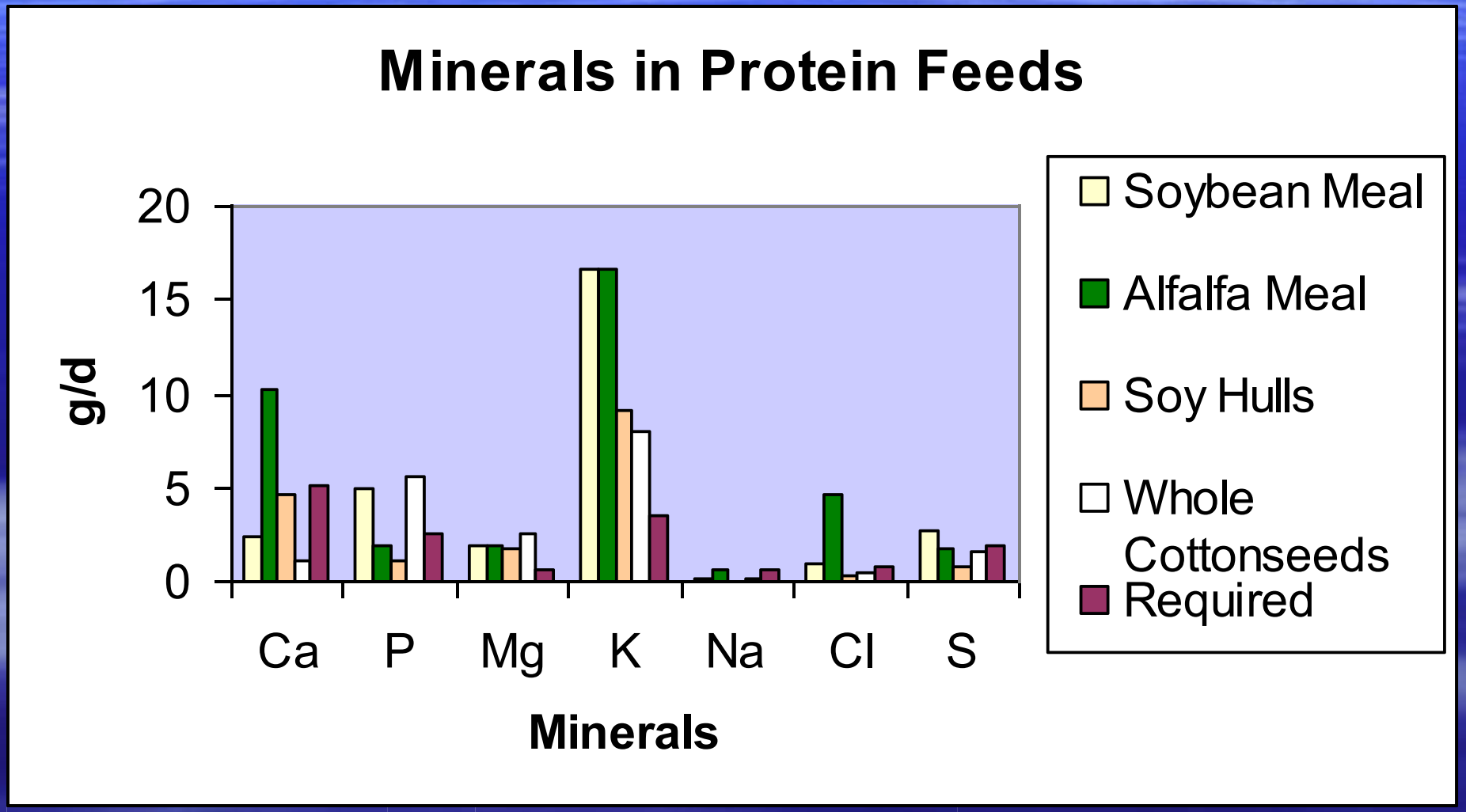
Forage Macro Minerals vs. Requirements



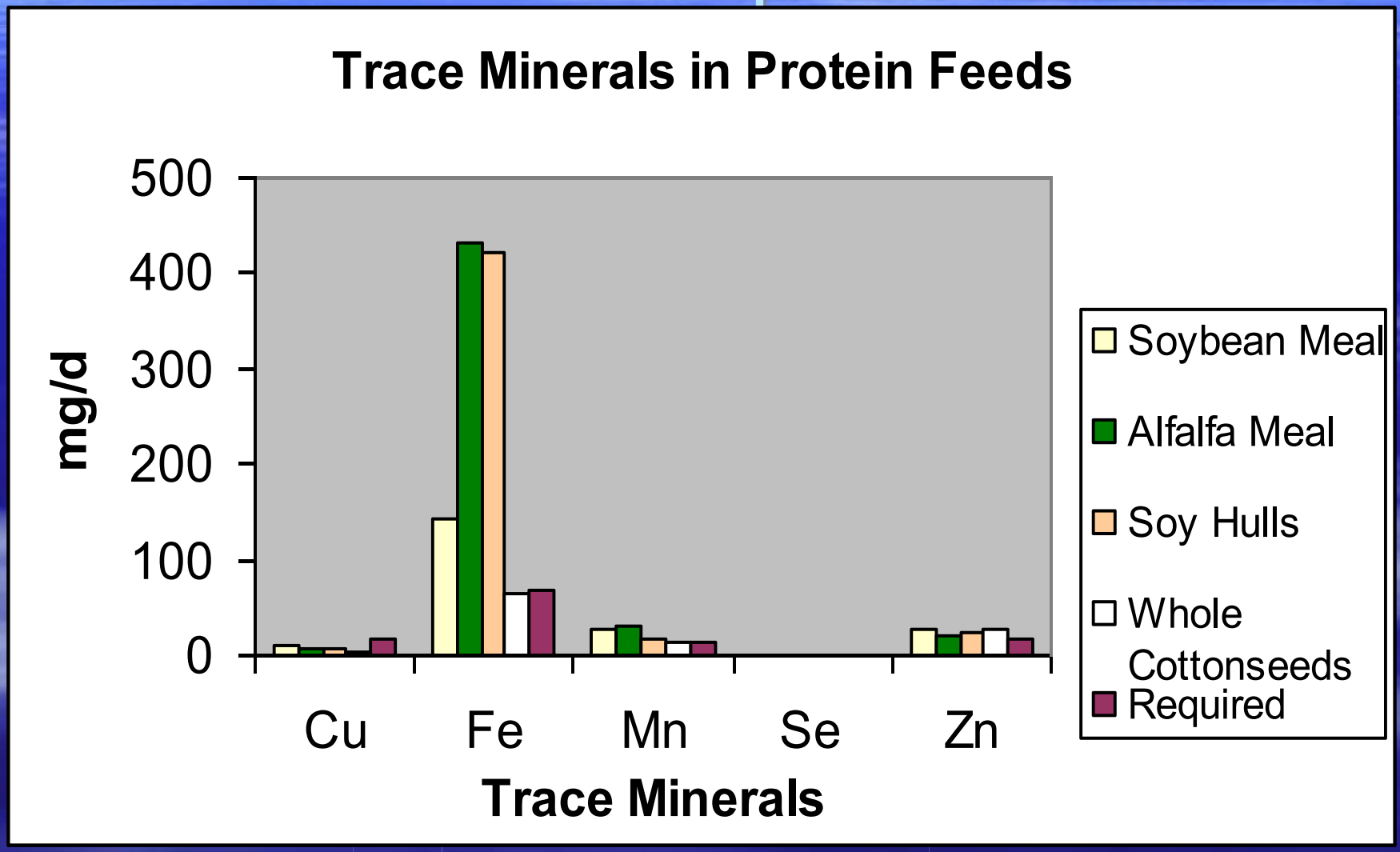
Trace Minerals Provided by Forages vs. Requirements



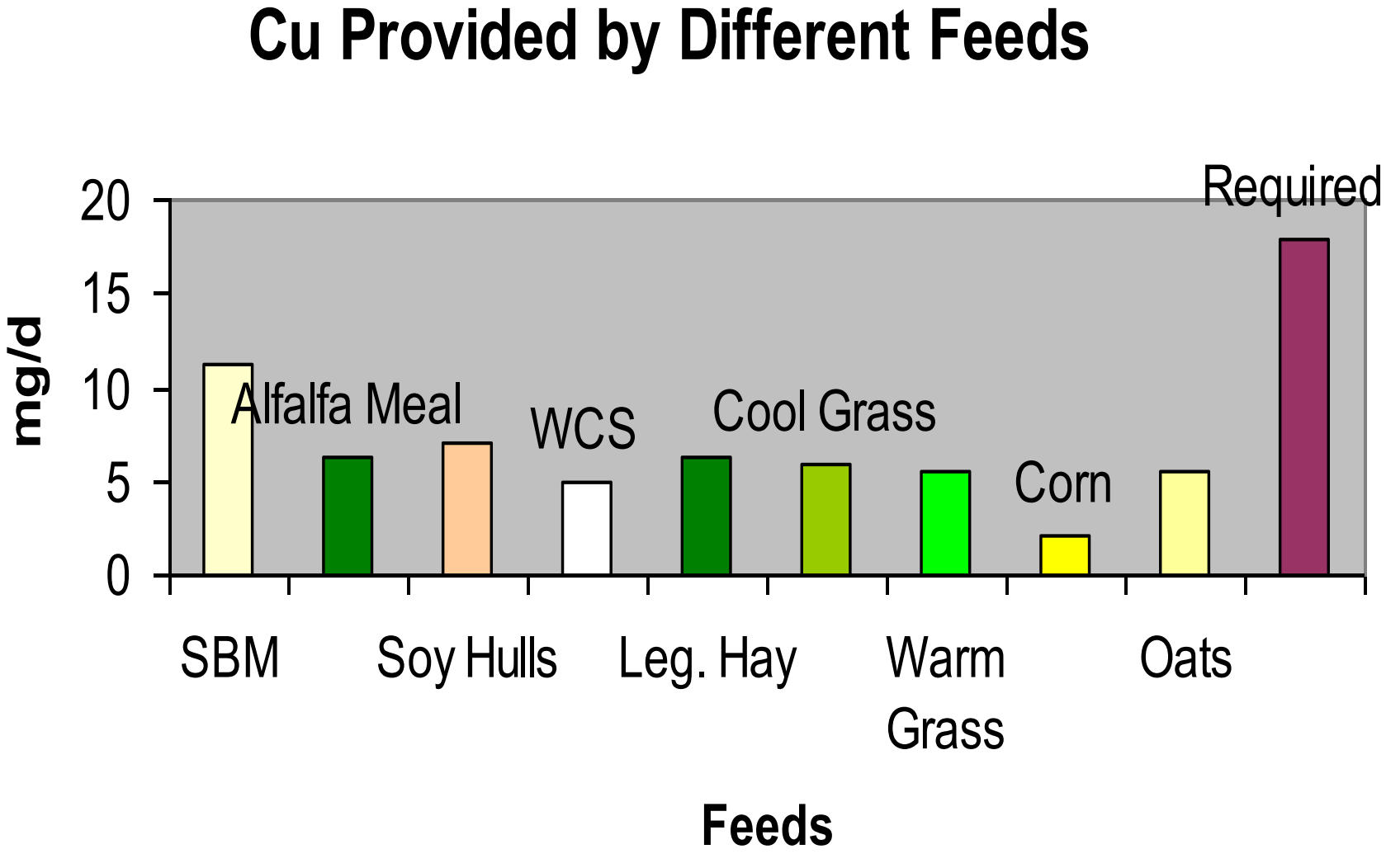
Macro Minerals Provided in Protein Feeds vs. Requirements



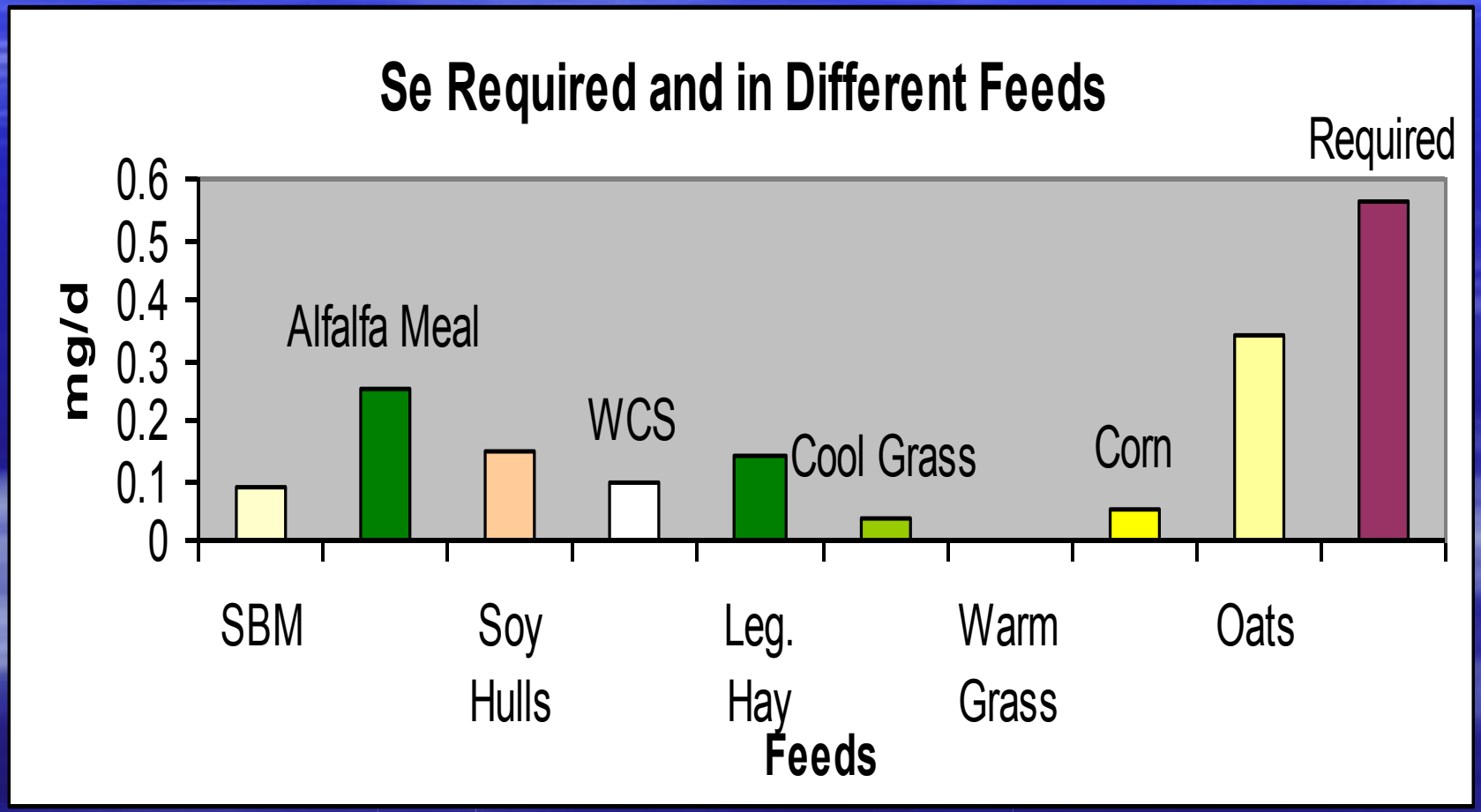
Trace Minerals Provided in Protein Feeds vs. Requirements



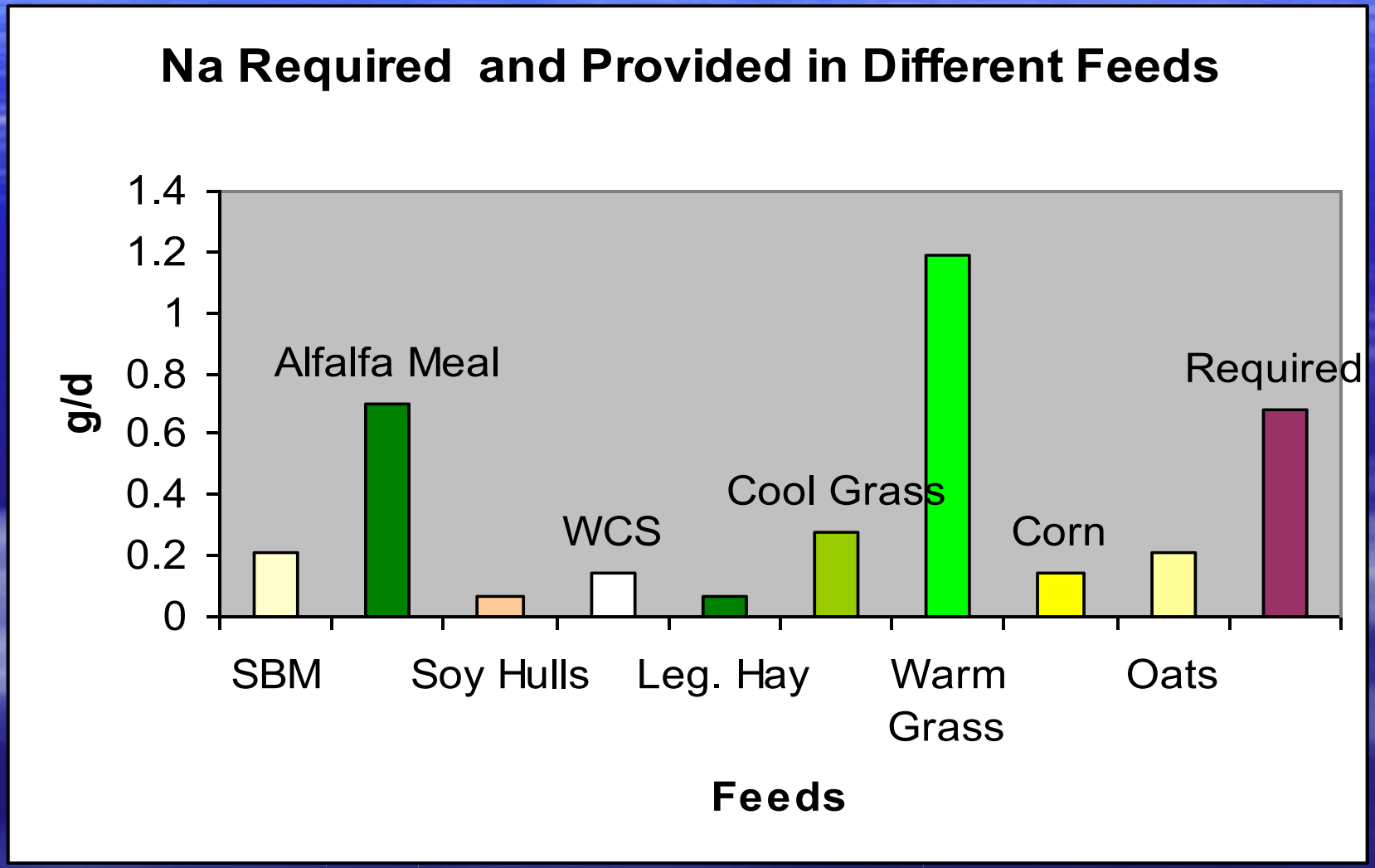
Cu Provided in Different Feeds vs. Requirements



Se Provided in Different Feeds vs. Requirements



Na Provided in Different Feeds vs. Requirements



Selection Criteria vs. Body Condition Score

- Institutional Meat Purchase Specifications (IMPS, 2001)
  - SC # 1
  - SC # 2
  - SC # 3
- Conducted on Live Goat or Carcass
- Ideal Weight 65 to 70 lbs
- BCS for Management

FEEDING STRATEGIES

Growth Performance and
Carcass Characteristics

Population means, standard deviation and minimum and maximum values of carcass traits and composition in goat kids (n = 89)

Variable	Mean	SD	Min.	Max.
Moisture % 9-10-11th rib	64.72	5.83	48.39	73.79
Ash % 9-10-11th rib	0.94	0.12	0.67	1.33
Protein % 9-10-11th rib	20.44	2.24	14.62	25.51
Fat % 9-10-11th rib	13.91	7.58	2.23	36.08
Moisture % carcass	67.57	3.83	56.31	74.15
Ash % carcass	0.88	0.08	0.61	1.10
Protein % carcass	20.13	2.02	14.14	23.50
Fat % carcass	11.42	4.48	4.56	25.52
Live weight, kg	30.20	6.30	18.00	43.76
Dressing %	45.72	7.28	32.84	70.12
Hot carcass weight, kg	14.02	4.38	7.26	25.06
Cold carcass weight, kg	13.36	4.14	6.80	23.00
Carcass shrink, %	5.07	3.61	0.00	13.84
Kidney and pelvic fat, kg	0.29	0.28	0.01	1.40
Back fat, cm	0.08	0.15	0.00	1.27
Body wall fat, cm	0.36	0.27	0.00	1.27
Longissimus muscle area, cm^2	7.40	2.46	3.05	13.21
Bone % carcass	27.64	6.59	14.91	45.56
Lean % carcass	69.34	5.55	54.44	86.21

C. E. Shoemaker, C. R. Kerth, W. R. Jones, S. G. Solaiman, K. R. Willian, and D. I. Bransby

Ryegrass Study

Cool Season Grass Pasture
Two-year data

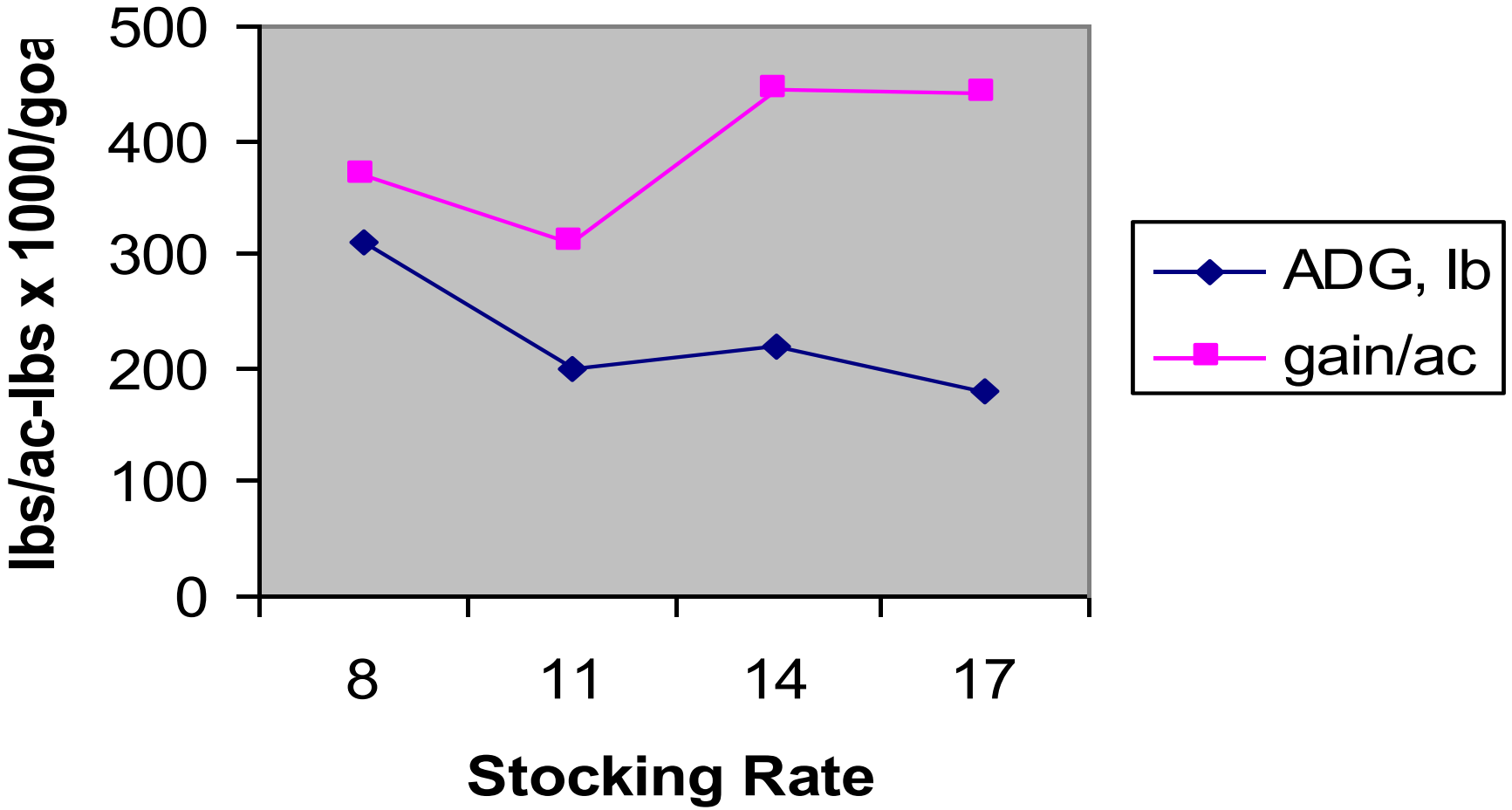
Methods

- Study 1, for 2 years
  - 50 young bucks per year
  - Stocking rates, 8, 11, 14, 17 goats/ac
  - 4 1-acre plots
  - Continuous Grazing
- Study 2, 1 year
  - 36 wethers, bucks
  - Continuous grazing 4 ac

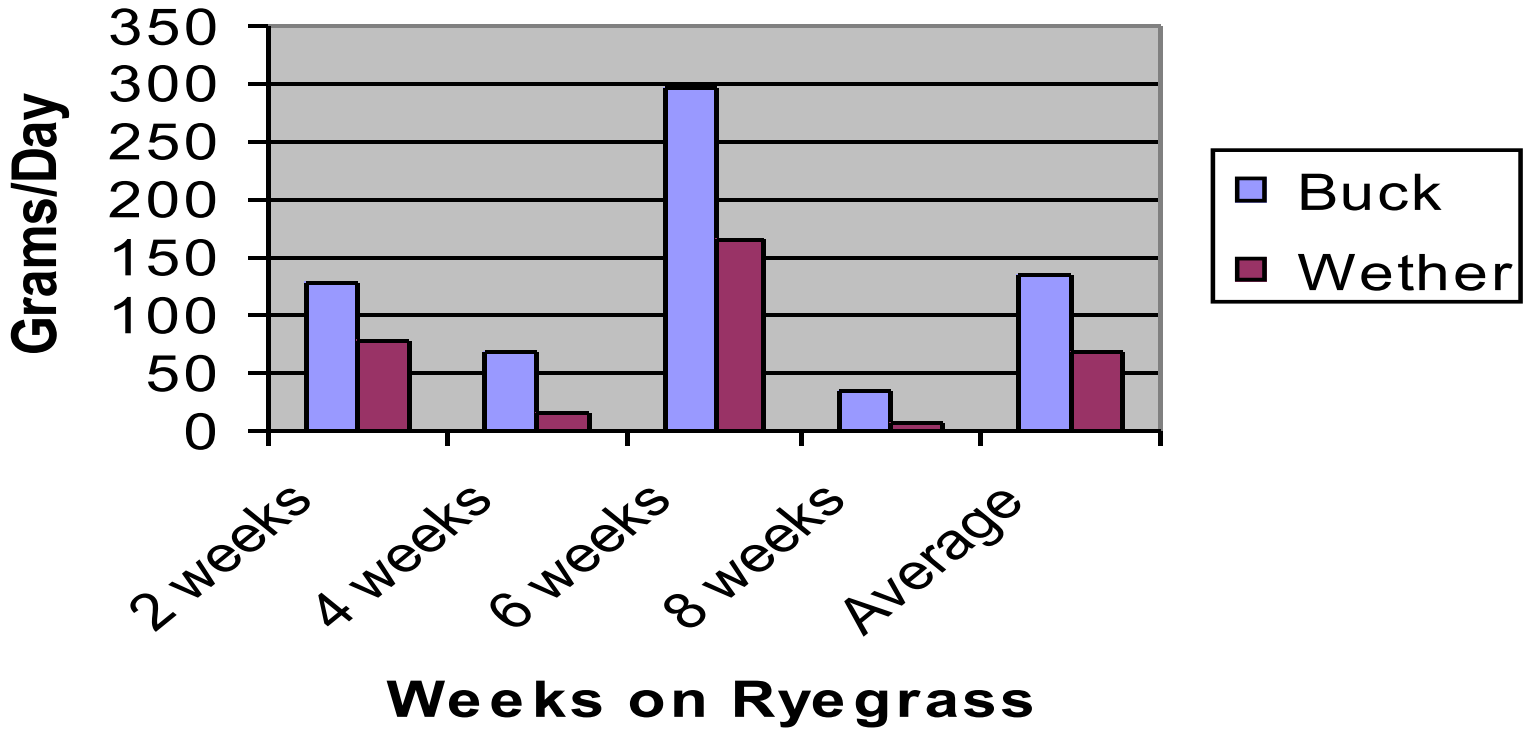
Annual Ryegrass Pastures

Stocking rate (n/acre)	8.0	10.4	13.6	16.4
Total weight/acre (lb)	430	558	730	881
ADG (lb)	0.31	0.20	0.22	0.18
Total gain/acre (lb)	370	310	446	440

Goat Performance



WETHER vs. BUCK



Carcass traits of buck and wether goats

	Means at 8 Weeks Body Weight		
Item[a,b]	Buck	Wether	SE ±
HCW, kg	21.8	19.5	0.86
CCW, kg	21.0	18.6	0.81
Dressing %	50.0	48.0	1.01
12 rib fat, cm	0.05	0.03	0.02
BWF, cm	0.2[a]	0.41[b]	0.06
KPF %	0.23[a]	0.51[b]	0.07
LMA, cm	20.36	17.8	0.58

[a] HCW= Hot carcass weight, CCW= Cold carcass weight, BWF= Body wall fat, KPF= Kidney pelvic fat, LMA= Longissimus muscle area.

Animals on ryegrass pasture

Comparing Different Production Systems

Warm Season Pasture

Browse

Feedlot

Methods

- 45 bucks, 15 each
- Three production systems
  - Bahiagrass pasture,
    - 2, 2-acre rotated
    - Supplemented, 150-200 g, 16
  - Browse, mimosa,
    - 4, 1-acre, rotated
    - Supplemented with 100 g corn
  - Feedlot, 40% grain mix, 40% soy hulls, 20% hay

Growth performance (lsmean ± SE) from pasture-fed, browse-fed and concentrate-fed goat kids

Trait	BG	MB	CONC
No. of animals	15	15	15
	Performance phase (98 d)		
Body weight, kg			
Initial weight	21.2 ± 0.91	21.2 ± 0.91	22.8 ± 0.91
Final weight	25.9 ± 0.93^{c}	29.4 ± 0.93^{b}	35.1 ± 0.93^{a}
ADG, g/day	46.2 ± 4.57^{c}	82.4 ± 4.45^{b}	124.1 ± 4.77^{a}

^{abc} Means within the same row with different letters differ $P < 0.05$.

BG= Bahiagrass pasture; MB= Mimosa;
CONC= 40:40:20 Grain mix: soy hulls:grass hay

Carcass traits from pasture-fed (BG), browse-fed (MB) and concentrate-fed (CONC) goat kids

Trait	Dietary Treatments		
	BG	MB	CON
No. of animals	15	15	15
Final weight, kg	27.1[c] ± 0.97	31.8[b] ± 0.97	35.1[a] ± 0.9
Hot carcass, kg	11.8[c] ± 0.23	13.6[b] ± 0.21	16.2[a] ± 0.3
Cold carcass, kg	11.7[c] ± 0.23	13.4[b] ± 0.21	15.2[a] ± 0.3
Dressing %	36.8[c] ± 0.71	43.4[b] ± 0.65	49.0[a] ± 0.9
Shrink %	0.64 ± 0.63	1.09 ± 0.57	0 .72 ± 0.87
KP fat, kg	0.17 ± 0.02	0.22 ± 0.02	0.17 ± 0.03
Back fat, cm	0.06 ± 0.02	0.09 ± 0.02	0.05 ± 0.03
Body wall fat, cm	0.10[b] ± 0.07	0.21[b] ± 0.06	0.67[a] ± 0.0
Adjusted fat, cm	0.06 ± 0.02	0.04 ± 0.02	0.03 ± 0.03
LMA[d], cm^2	12.4[b] ± 0.33	15.1[a] ± 0.30	15.2[a] ± 0.45
Live grade[e]	2.29 ± 0.14	2.34 ± 0.13	2.21 ± 0.19
Carcass grade[d]	2.40 ± 0.20	2.22 ± 0.18	2.43 ± 0.28

Feeding High Concentrate Diets

80% Grain Mix

20% grass Hay

Methods
Copper Study

- 15 animals
- Fed indoors ad lib
- 90 days
- 80% grain mix 16% protein
- 20% Bermudagrass hay

Effects of dietary copper on performance of goat kids.

	Added Cu mg/d				P-value	
Item	0	100	200	SE	Linear	Quadratic
BW, kg						
Initial	22.4	22.4	22.3	1.79	0.99	0.98
Final	31.6	32.7	30.5	1.85	0.69	0.48
ADG, g	131	147	117	6.09	0.11	0.01
ADFI, Kg of DM	1.21	1.11	1.03	0.06	0.05	0.90
Gain:Feed	0.11	0.13	0.11	0.01	0.67	0.02

Animals on 80:20 grain mix: hay

Effects of high levels of supplemental copper on carcass merit of goat kids

Item	Added Cu mg/d				*P*-value	
	0	100	200	SEM	Linear	Quadratic
Chilled carcass wt, kg	17.4	18.3	16.9	0.92	0.71	0.33
Shrink, kg	1.76	2.22	1.44	0.32	0.48	0.13
Dressing, %	59.9	59.3	56.5	1.30	0.08	0.48
12th rib backfat, cm	0.24	0.13	0.08	0.04	0.01	0.56
Adjusted fat, cm	0.37	0.22	0.17	0.06	0.03	0.46
Body wall fat, cm	0.81	0.36	0.48	0.12	0.08	0.07
Kidney-pelvic fat, %	5.36	4.45	4.50	0.47	0.22	0.40
LM area, cm^2	20.4	20.4	21.2	0.59	0.68	0.81
BCTRC, %	49.5	49.7	50.7	0.35	0.04	0.38

Animals on 80:20 grain mix: hay

Feeding High Concentrate Diets

50% grain mix

50% hay

Methods
Cu-Mo Study

- 18 animals
- Housed indoors
- Fed 50:50
  - 20% protein mix
  - Bermudagrass hay
- 90 days

Effects of increasing levels of molybdenum on growth performance

Item 92 day performance period (Sept. 11 - Dec. 12, 2006)	Added Mo			*P*-value[1]		
	0 ppm	5 ppm	10 ppm	±SE	Linear	Quadratic
BW, kg						
Initial	26.0	25.9	25.1	1.04	0.572	0.810
Final	36.6	37.0	37.3	1.25	0.694	0.968
ADG, g	115	121	132	14.7	0.427	0.882
ADFI (g)	1006	997	1017	51.2	0.872	0.821
PDMG	53.1	53.1	53.7	0.423	0.317	0.570
Gain:Feed, g/kg	113	121	129	12.1	0.362	0.980

Animals on 50:50 grain mix: hay

PDMG = Percent Dry Matter Grain

Effects of increasing levels of molybdenum on carcass characteristics

	Added Mo			*P*-value[1]		
ITEM	**0 ppm**	**5 ppm**	**10 ppm**	**±SE**	**Linear**	**Quadratic**
Live wt., kg	36.6	37.0	37.3	1.25	0.694	0.968
HCW (kg)	17.0	17.0	17.5	0.714	0.609	0.765
CCW (kg)	16.5	16.4	16.9	0.657	0.690	0.679
Shrink (%)	2.70	3.50	3.40	0.335	0.162	0.293
Dressing, %	46.4	45.8	46.9	1.06	0.717	0.543
ADF (cm)	0.174	0.182	0.229	0.030	0.211	0.609
BF (cm)	0.169	0.169	0.148	0.025	0.559	0.735
BOF (cm)	0.510	0.742	0.532	0.089	0.865	0.061
LM area (cm^2)	18.0	16.3	16.8	0.747	0.287	0.255
Selection Criteria	2.14	1.89	2.05	0.331	0.847	0.622

ADF = Adjusted Fat; BF = Back Fat; BOF = Body Fat

Animals on 50:50 grain mix: hay

Feeding High Roughage Diet

70% Roughage

30% Concentrate

Methods

- 24 animals
- Housed indoors
- Four groups of 6 each
- Fed 30:70 Grain:hay
  - 0, 10, 20, or 30% Alfalfa/Lespedeza
  - 30% Bermudagrass
  - 10% Soyhulls
  - 30% Concentrate

Growth performance of goats consuming various levels of sericea lespedeza

	Sericea Lespede za %					*P-value* [a]		
Item	0	10	20	30	SE ±	Lin.	Quad.	Cubic
BW, kg								
Initial	27.9	27.4	28.7	27.5	2.2	0.99	0.82	0.54
Final	36.1	32.2	34.7	35.6	1.9	0.89	0.24	0.4
ADG, g	129.6	77	94.9	129.9	14.1	0.77	0.01	0.45
ADFI, g	1064.8	1082.4	1195.4	1414.5	111.5	0.03	0.4	0.98
Gain: Feed	0.12	0.07	0.07	0.09	0.009	0.09	0.002	0.32
Body Measure								
SC, in	10.3	8.95	9.62	9.48	0.3	0.21	0.07	0.96
Height, in	26.1	24.3	24.6	25.5	0.5	0.05	0.01	0.53
Girth, in	38.9	36.7	38.7	37.6	0.91	0.68	0.57	0.11

[a] Based on orthogonal contrast for equally spaced treatments.

Animals on 30:70 grain mix: hay

Carcass characteristics of goats consuming various levels of sericea lespedeza

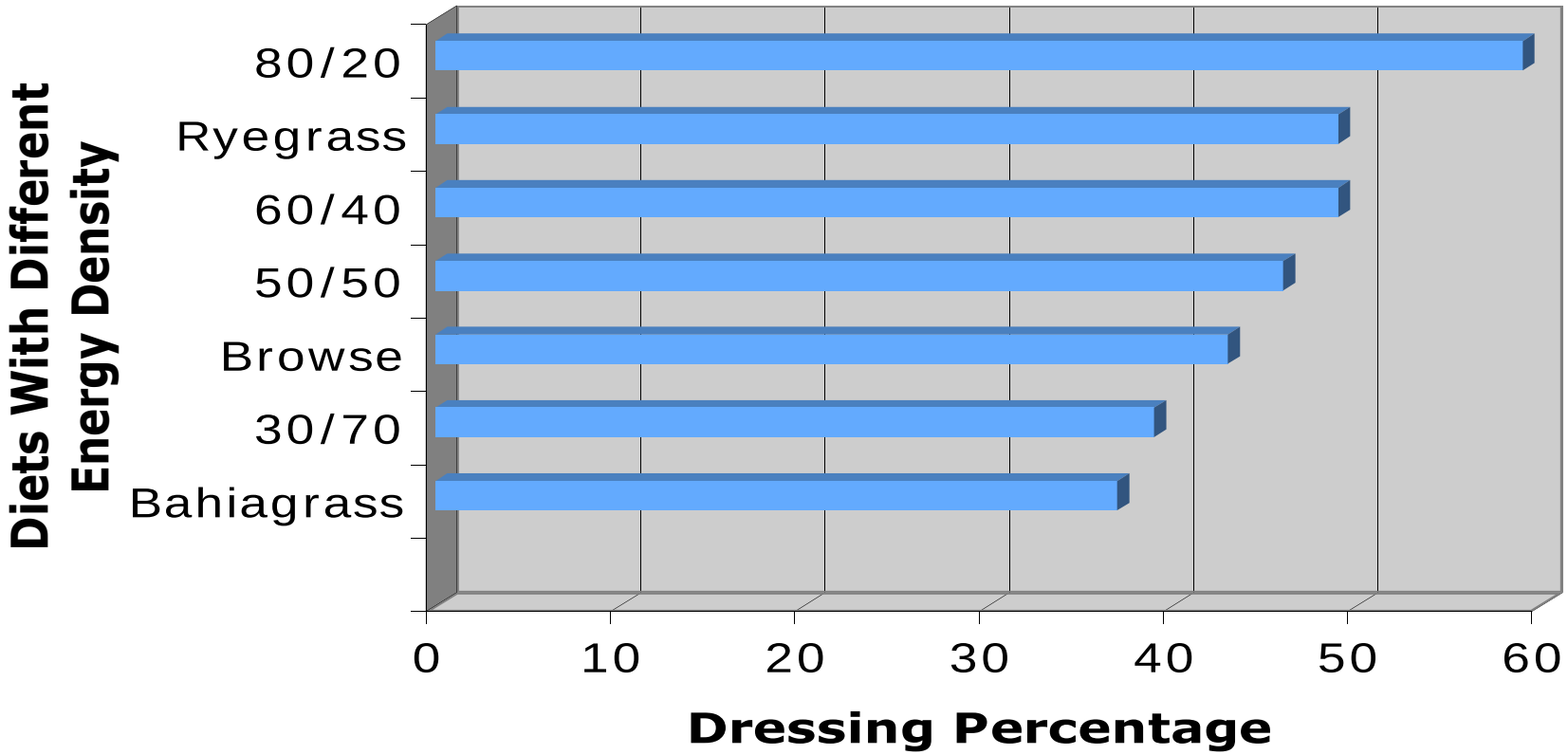
Items [a]	Sericea Lespede za %					*P*-value [b]		
	0	10	20	30	SEM	Lin.	Quad.	Cubic
Live wt., kg	38	33.5	33.9	35.9	1.98	0.52	0.13	0.73
HCW (kg)	14.3	13.2	13	13.8	0.99	0.73	0.35	0.98
CCW, kg	14.2	12.9	12.6	13.6	0.95	0.67	0.27	0.95
Shrink, %	1.18	1.74	2.89	1.51	0.89	0.6	0.31	0.47
Dressing, %	37.6	39.1	38.4	38.6	1.5	0.72	0.67	0.65
ADF, cm	0.085	0.09	0.07	0.062	0.007	0.02	0.53	0.38
BF, cm	0.03	0.02	0.02	0.017	0.005	0.09	0.92	0.99
LM area, cm^2	16.8	14.6	15.9	15.8	0.9	0.69	0.25	0.26
BCS	4.41	4.5	4.6	4.08	0.17	0.25	0.1	0.45

[a] HCW, hot carcass weight; CCW, cold carcass weight; ADF, Adjusted Fat; BF, body fat; LM, longissimus muscle.

[b] Based on orthogonal contrast for equally spaced treatments.

Animals on 30:70 Grain mix: hay

Dressing Percentages of Goats Fed Different Diets



Conclusions

- Feed according to requirements
- Improved breeds require higher input
- Higher ADG is associated with:
  - Intact kids
  - Improved cool season pastures
  - High concentrate diets

Conclusions

- Low DP is associated with:
  - Higher than 50% roughage diets
  - Browse
  - Warm season pastures
- High DP is associated with:
  - Improved cool season pastures
  - Higher than 50% concentrate diets

THANK YOU
QUESTIONS????