Ration formulation for small ruminants

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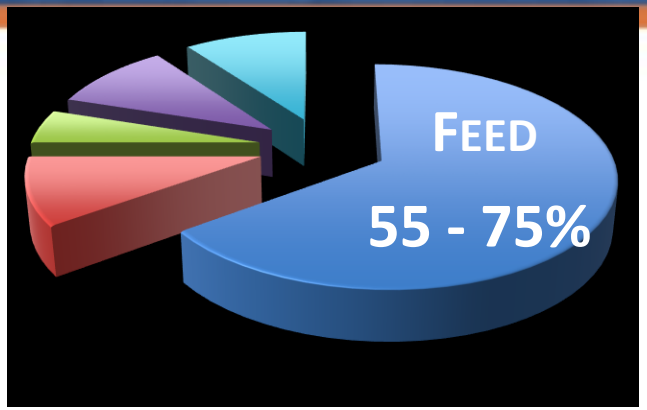
SOUTHERN EXTENSION RISK MANAGEMENT EDUCATION

UF IFAS UNIVERSITY of FLORIDA

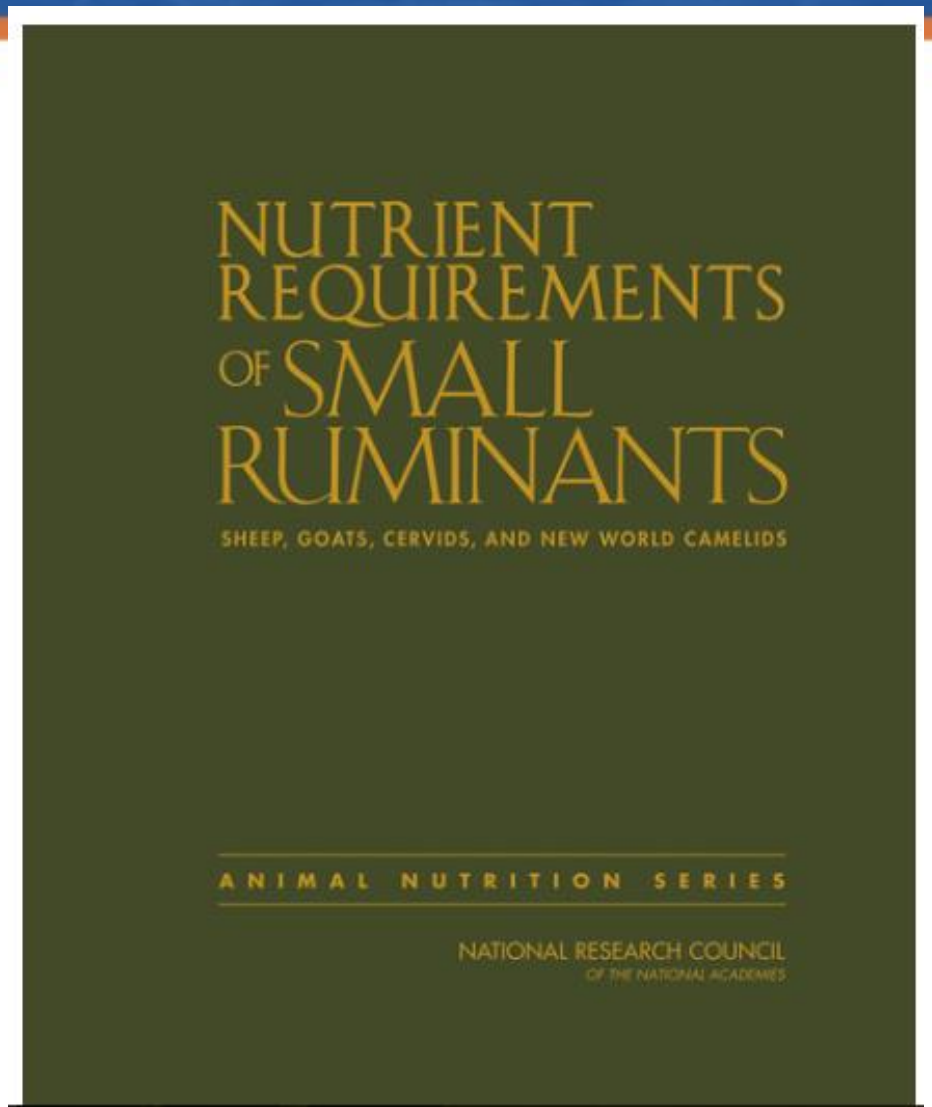
Formulating diets for an economic return



Growth (ADG)
Weaning wt
Reproductive performance
(# kids/lambs weaned)

The best source for goat nutrition

2007 Edition



Nutrient requirements

Luginbuhl and Poore, 1998. Nutrition of Meat Goats. NCSU

Table 1. Nutrient Requirements for Meat and Fiber Producing Goats [1,2]

Nutrient	Young Goats [3]		Does (80 lb)			Buck (80-120 lb)
	Weanling (30 lb)	Yearling (60 lb)	Dry (Pregnant)	Lactating		
				Avg Milk	High Milk	
Daily Feed, lb	2.0	3.0	4.5	4.5	5.0	5.0
TDN, %	68	65	60	60	65	60
Protein, %	14	12	10	11	14	11
Calcium, %	.6	.4	.4	.4	.6	.4
Phosphorus, %	.3	.2	.2	.2	.3	.2

[1] Nutrient Requirements of Goats. 1981. National Research Council

[2] Pinkerton, F. 1989. Feeding Programs for Angora Goats. Bulletin 605. Langston University, OK.

[3] Expected weight gain >.44 lb / day.

3 x 0.65 = 1.95 lb TDN/d required

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Nutrient Requirements of Sheep and Goats

Table 3. Nutrient Requirements Of Goats: Daily Nutrient Requirements Per Animal.

Body Wt. (lb.)	Dry Matter (lb./head[a])	% Body Weight	Total Protein (lb.)	TDN[b] (lb.)	Ca (lb.)	P (lb.)	Vitamin A (IU)	Vitamin D (IU)
Maintenance								
22	0.63	2.80	0.05	0.35	0.002	0.002	400	84
45	1.08	2.40	0.08	0.59	0.002	0.002	700	144
67	1.46	2.20	0.11	0.80	0.004	0.003	900	195
90	1.81	2.03	0.14	0.99	0.004	0.003	1200	243
112	2.13	1.90	0.17	1.17	0.007	0.005	1400	285
134	2.44	1.82	0.19	1.34	0.007	0.005	1600	327
157	2.76	1.80	0.21	1.50	0.009	0.006	1800	369
179	3.05	1.70	0.23	1.66	0.009	0.006	2000	408
202	3.32	1.64	0.26	1.81	0.009	0.006	2200	444
224	3.58	1.60	0.28	1.96	0.011	0.008	2400	480
Additional Requirements For Late Pregnancy (All Goats)[c]								
	1.56		0.18	0.87	0.004	0.003	1400	213
Additional Requirements For Growth: Weight Gain At 0.11 Lb. Per Day (All Goats)[c]								
	0.40		0.03	0.22	0.002	0.002	300	54
Additional Requirements For Growth: Weight Gain At 0.22 Lb. Per Day (All Goats)[c]								
	0.79		0.06	0.44	0.002	0.002	500	108
Additional Requirements For Growth: Weight Gain At 0.33 Lb. Per Day (All Goats)[c]								
	1.19		0.09	0.66	0.004	0.003	800	162
Additional Requirements For Milk Production Per Pound At Different Fat Percentages (% Fat)								
3			0.13	0.73	0.004	0.003	3800	760
3			0.14	0.74	0.004	0.003	3800	760
4			0.15	0.75	0.004	0.003	3800	760
4			0.16	0.76	0.007	0.005	3800	760

Measuring intake in goats

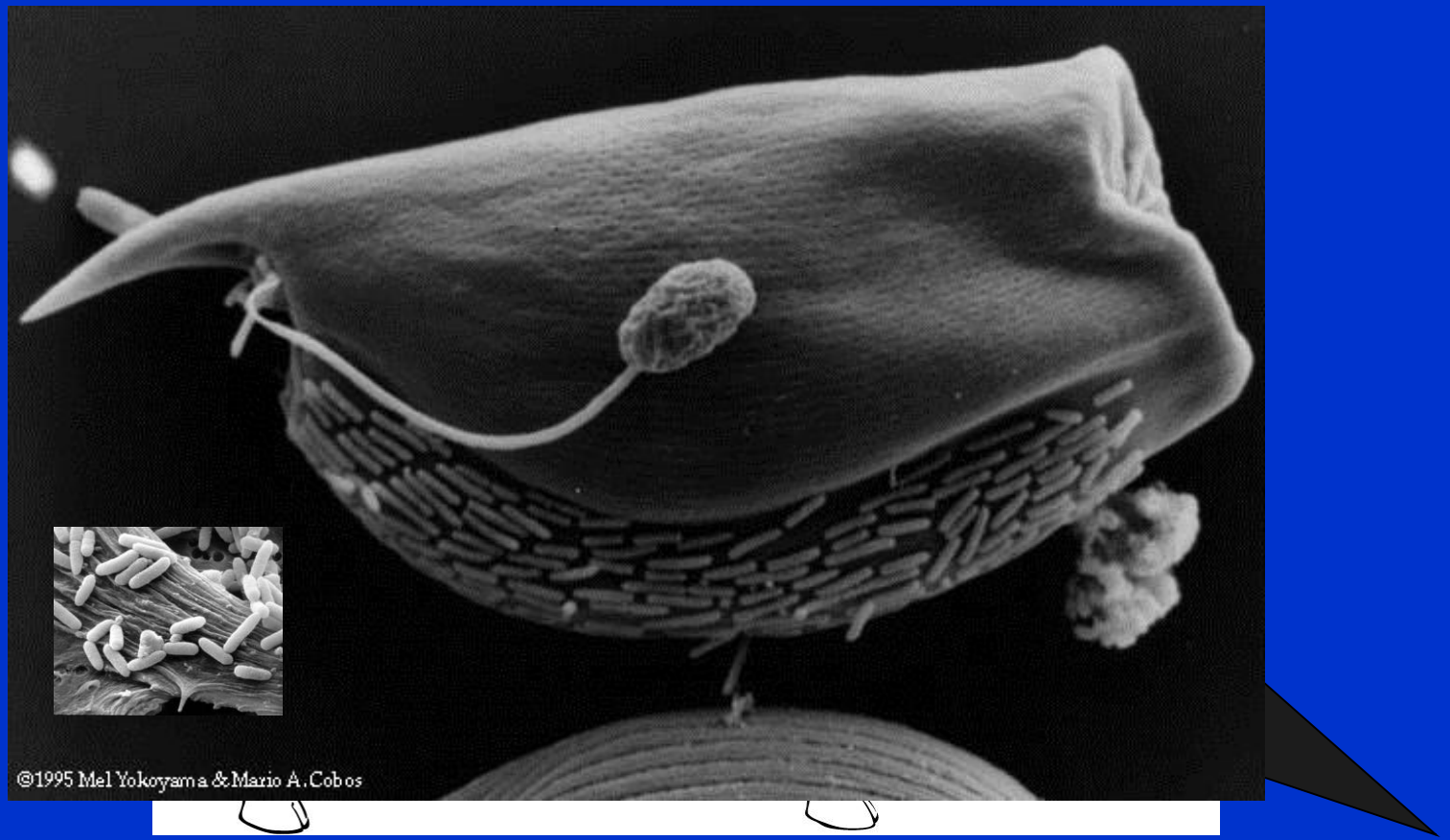
The biggest challenge

Intake in goats

The starting point to balance a diet

Study	Diet	Dry matter intake (DMI), lb/d	Goat BW, lb	Intake as % of goat BW
Zao et al., 2011	45% conc. suppl. 55% ground alfalfa	2.05	88.2	2.3%
Moore et al., 2002	Orch. hay ad lib + 5.7 % SBM	2 lb (1.86 lb hay + 0.14 lb SMB)	62.5	3.2%
Moore et al., 2002	Orch. hay ad lib + 1 % soy hulls	2.1 lb (1.50 lb hay + 0.6 lb soy hulls)	65.6	3.2%
Arias et al., 2014	Alfalfa hay ad lib	3.43 lb/d	86.4	3.97%

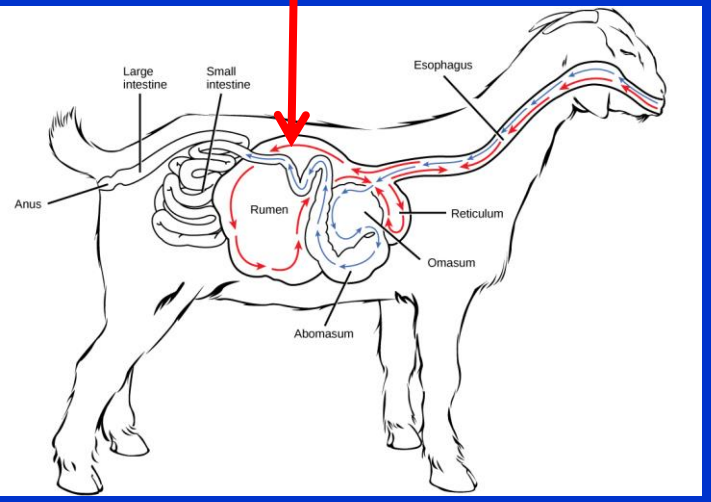
Ruminal microbes: the key to digestion in small ruminants… do not upset them!



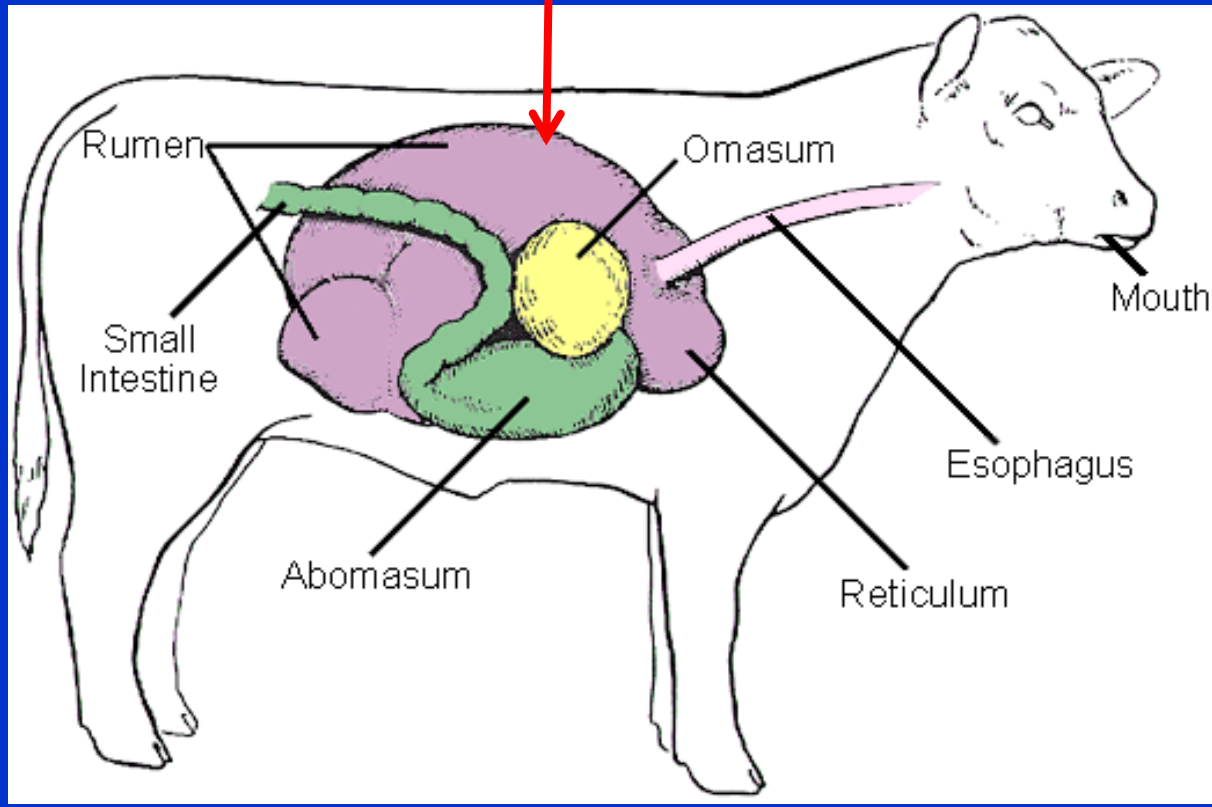
Cow vs. goat

size matters…

1 to 4 gallons (3 to 15 L)



23 to 47 gallons (90 to 180 L)



Cow vs. goat/sheep

- **Goats cannot digest poor quality forages as efficiently as cows do. Why?**
  - ✓ **Smaller rumen = less time in contact with bacteria**
  - ✓ **They need to "push through" faster**
  - ✓ **They eat more on a % of BW basis than a cow**
- **Energy is typically more limiting than protein**
  - ✓ **8% CP and 50% TDN bahiagrass barely meets CP requirements but not enough energy for growth**

Intake behavior

Not even close to that of a cow

Browsing allows goats to separate stems from leaves and selectively enrich the diet choosing the most nutritious parts

Research to determine effects of grain supplements on forage digestion

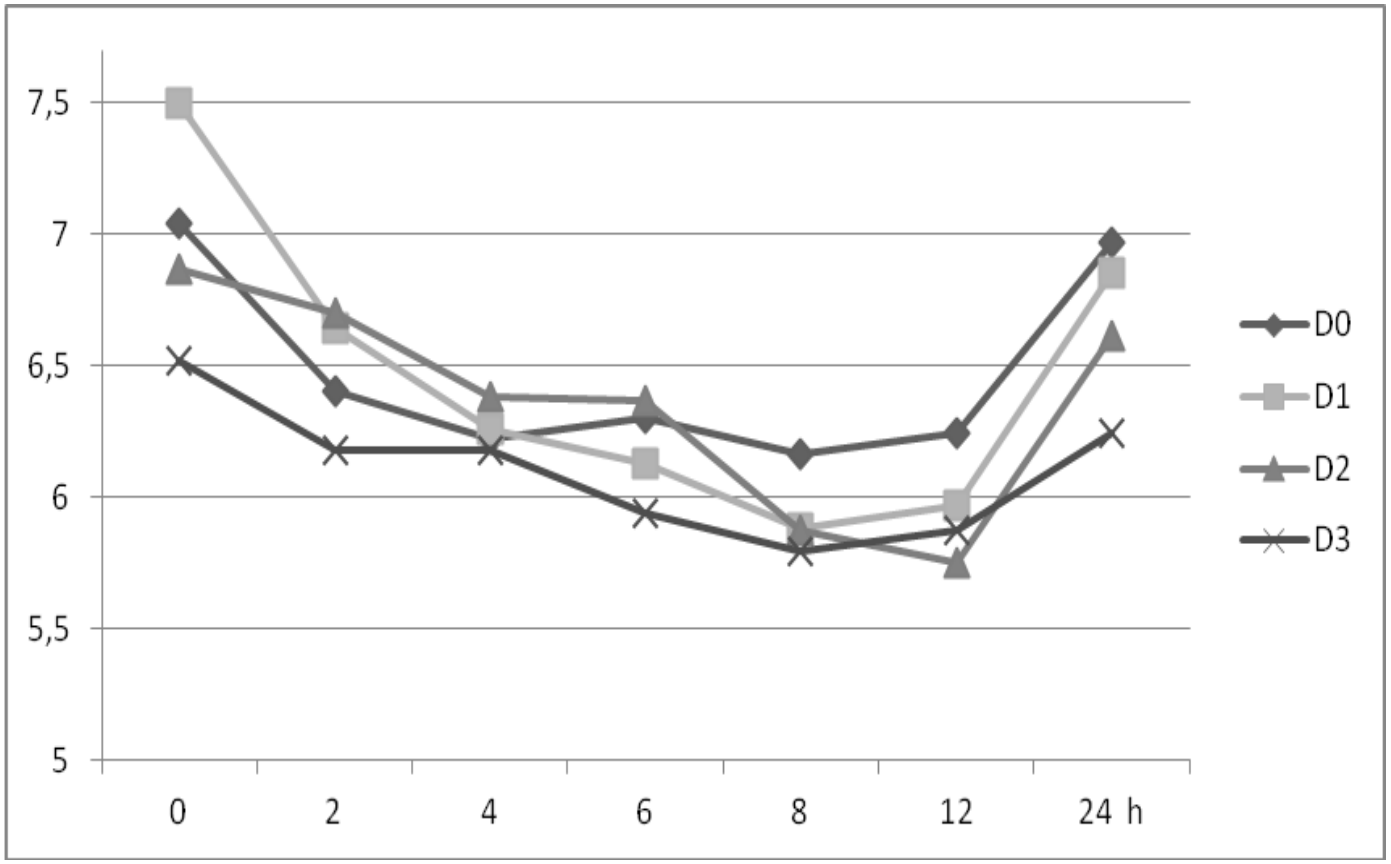
⬆ grain = ⬇ ruminal pH and ⬇ fiber digestion

Effects of grain supplements on forage digestion

Item	Treatments			
	Alfalfa hay ad lib	0.5% corn	1.0% corn	1.5% corn
DMI, % of BW	2.81	3.16	3.05	3.00
Forage /Conc.	-----	82/18 [a]	64/36 [b]	45/55 [c]

- Corn and corn byproducts (corn gluten feed, DDGS) are high in P, beware of urinary calculi
- Minimum 2:1 Ca:P ratio is needed, ideal 4:1 or 5:1

Effects of grain supplements on forage digestion



Alfalfa hay ad lib
Hay + 0.5% of BW corn
Hay + 1.0% of BW corn
Hay + 1.5% of BW corn

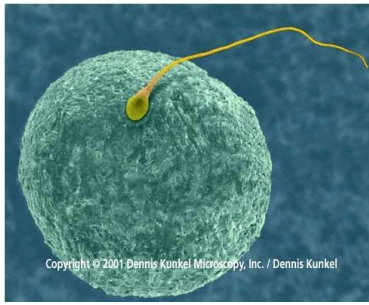
Balancing the diet

- **22 lb weanling needs (maintenance only):**
  - ✓ **2.8% of BW in dry matter intake (0.63 lb/d)**
  - ✓ **0.05 lb CP/d**
  - ✓ **0.35 lb TDN/d**

- **Bahiagrass can provide:**
  - ✓ **Enough intake = 0.63 lb/d**
  - ✓ **0.63 x 0.08 = 0.05 lb/d CP enough protein**
  - ✓ **0.63 x 0.50 = 0.31 lb/d of TD not enough energy**
- **Supplementing 0.75 lb/d of corn gluten feed or soy hulls allows for an extra CP and TDN to get ADG ~ 0.3-0.4 lbs**

Flushing

- **Temporary increasing in dietary energy ~ 1 month before the breeding season**
- **May increase conception rate and twining rate**
- **Does not work if does are fat**
- **Nutrition level must go back to normal approx. 30 days after breeding**
- **Increase in weaning rates typically outweigh extra cost of feed**



Conclusions

- **Goats need to process more feed through their digestive tract to compensate for lower gut residence times**
- **Be careful with grain supplements: do not upset the rumen microbes**
- **Effect of supplementation on reproductive performance**
  - ✓ **Flushing 30 days before breeding season**
- **Watch Ca:P ratio – 2:1 minimum, ideal 4:1**
- **Supplementation with grain byproducts when needed**
  - ✓ **Usually in the range of 0.5 to 0.75 lb/d does the trick**

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Adapting to new challenges

Smooth transition is key!

Thanks!