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Natural Resources Conservation Service

Nutritional Needs and Challenges of Animals Raised on Pasture




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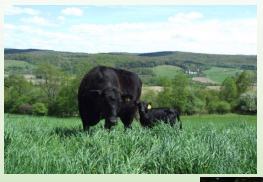

Cow-calf and ewe-lamb pairs usually on pasture

Pasture and woody browse important

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Grass-finished growing in popularity

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Challenges

- What are they eating?
- How much are they eating?
- What is the quality of what they are eating?
- Does it meet their needs?
- What else should I feed?
- How do I know???

Some of these are or will be answered by other presenters

Typical Forage Quality

Nutrient	Pasture	Hay	Haylage
Dry Matter %	20-25	88-92	35-40
Crude Protein %	20-30	8-14	14-20
TDN%	65-75	55-65	60-70
Net Energy$_G$, Mcal/lb	.50-.60	.40-.50	.40-.50
ADF%*	20-30	30-40	30-40
NDF%**	40-50	55-65	45-55

Also need to know mineral content – Ca, P, Mg, K, trace minerals – will vary with soil type, fertility, and soil health

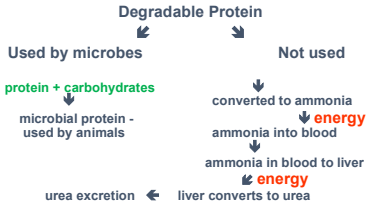
* Acid Detergent Fiber

**Neutral Detergent Fiber

Protein

- Protein from pasture > animal req'ts
  - 20 – 30% crude protein from pasture
  - Most livestock need 16-17% or less
- Protein from pasture > rumen bacteria req'ts
  - 70 – 80% degradability
- Ruminants will use energy to eliminate excess protein
- Results in high milk urea nitrogen (MUN) in dairy animals

How Excess Degradable Protein Wastes Energy



Non-Fiber Carbohydrates (NFC)

- Source of energy
- Sugars and starches from grain
  - Corn, barley, oats, etc.
- Rumen bugs match with protein
  - More microbial protein – feeds the animal

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Non-Fiber Carbohydrates (NFC)

- Dairy
  - Critical for high milk production
  - Caution – no grain not easy
- Beef
  - Only if gains are low
  - Sheep, goats
    - Breeding, lactating w/multiples, weaned lambs or kids

There may be some adaptation in the rumen of 100% grass-fed animals to utilize more N without added NFC's

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Non-Fiber Carbohydrates (NFC)

- Swine
  - Grain higher proportion of diet
- Poultry
  - 70-90% of diet with insects, grass, etc balance

Neither of these species needs NFC's for rumen or excess pasture protein issues

They are non-ruminants, so pasture is supplemental protein

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High Quality Forage

- How much forage can they eat?
  - Cattle – 2.5-3.5% of body weight
  - Sheep – 2.5-3.5% of BW
  - Goats – 3.5-5.5% of BW
  - Swine – 1.0-2.0% of BW
  - Poultry - ?? 5-20% of total intake

Depends on stage of production – growing vs lactating vs "dry"

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Nutritional Requirements and Rations

- National Research Council publications
  - https://www.nap.edu/collection/63/nutrient-requirements-of-animals
- Ration balancing programs
  - Some free, some cost $
  - Many universities have easy to use programs
  - Google "beef cattle/sheep/goat/poultry/swine ration formulation software"
    - Goats
      - Langston University - http://www.luresext.edu/?q=Training
  - Service provided by feed companies, consultants, veterinarians, Cooperative Extension, etc.

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Beef Requirements vs. Pasture Quality

Nutrient	Cow/Calf	Steer*	Pasture
CP%	8 - 12	11.7	20.0
NE_G, MCAL/LB		0.46	0.50
NE_M, MCAL/LB	0.55	0.74	0.70
TDN%	58	70	68

* 600 LB – 8 months age, 2.5 lb/day ADG

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Sheep Requirements vs. Pasture Quality

Nutrient	Ewe/Lambs*	Lamb#	Pasture
CP%	15.0	11.7	20.0
NE_G, Mcal/lb		0.31	0.50
NE_M, Mcal/lb		0.25	0.70
TDN%	65	77	68

* 154 lb w/twins – early lactation

Ram lamb – 88 lb finishing, 0.5 lb ADG

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Goat Requirements vs. Pasture Quality

Nutrient	Dairy*	Meat#	Pasture
CP%	12-17	15-17	20.0
TDN%	65	67	68

* Doe in lactation

55 lb Boer, 0.25 lb ADG

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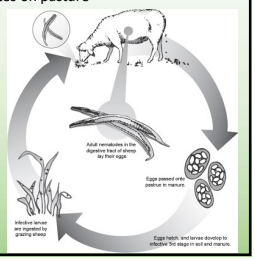
Parasites!

- Sheep and goats are very susceptible to parasites on pasture
- Barber pole worm (H. contortus), stomach worms (many types), meningeal/deer worm (P. tenuis), etc.
- Management can minimize
  - Taller grazing height – parasites on plants up to 4" above ground
  - Longer pasture rotations
  - Multi-species grazing
  - Selection for resistance
- Resistance to dewormers
- www.ansci.cornell.edu/sheep for more info



Parasite Issues

- Cattle – minor issue
  - Roundworm, flukes, tapeworms
  - Same lifecycle as sheep parasites, but species specific
  - Dewormers typically used twice in spring – resistance issue
  - Young animals most susceptible – cattle become more resistant with age
  - Pasture management
    - Young animals on "clean" pasture
    - Don't overgraze

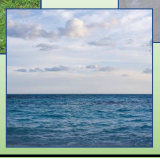
Poultry and swine

- Neither of these species are true "grazers"
  - Grain, insects, food waste, etc.
- Do benefit from being on pasture
  - Poultry – eat small amounts of grass & clover
  - Swine – root in soil for grubs and insects, some grass, weeds – "pigness"

Supplementation

- Dilute the pasture protein
  - Feed a little dry hay
    - Lower protein than pasture
    - Substitutes for pasture intake
- Use the pasture protein
  - Feed a little ground corn
    - Provides non-fiber carbs (NFC)
    - Rumen bugs use to make more bugs

Minerals



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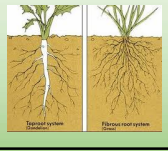
Plant Minerals

- Most available form for animals
  - Fresh forage vs. fermented
  - Depends on soil fertility
  - Depends on soil health
  - Depends on plant and root structure



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Force-Feed or Free-Choice?

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Supplemental Minerals

- Conventional nutrition
  - Major minerals
  - Supplement w/pre-mix or complex mixtures
  - Forages not tested for all trace minerals, vitamins
- Organics
  - Reliance on plants
  - Look to soil mineralization, pH, and OM
    - Long-term

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Free-choice

- Mix minerals with salt to limit intake
- May either encourage or limit intake of other minerals
- Minerals all taste like salt
  - Animals can't associate feedback with flavor

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Supplementation

- Salt
  - Supply free-choice
    - Loose vs. blocks
    - Self-limiting
  - Mix in with grain
    - Limits intake
- Minerals
  - Can be in trace mineral salt block
  - Specially formulated based on forage tests
  - Mix in with grain or free choice

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Immune System & Minerals

- Major minerals
  - Ca, P, Mg, K, Na, Cl, S
  - Acid-base balance, osmotic pressure, membrane electrical potential and nervous transmission
- Trace minerals
  - Co, Cu, I, Fe, Mn, Mo, Se,Zn
  - Components of enzymes and enzyme co-factors, hormones

These systems are inter-related in support of the immune system – need to consider holistic viewpoint

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Grass tetany

- Also known as “grass staggers”
- Caused by low Mg in spring pasture
  - Cool, wet weather
- Animals have difficulty standing, walking
  - Mg needed for muscles to contract
- Preventable by increasing Mg in diet
  - Magnesium oxide or sulfate

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White muscle disease

- Caused by low Se in diet
- Northeast soils deficient in Se = forages low
  - Need to supplement at correct level
  - Can be toxic
  - FDA sets limit of 0.3 mg/kg (ppm) in feed
- Calves, lambs, and kids can be born with disease
  - Lesions in skeletal and/or heart muscle
  - Can cause death if not diagnosed and treated
  - Make sure Mama is getting enough
    - Can inject a Se/Vitamin E product in late pregnancy to boost

Vitamins

- A, D, E
- Function in metabolic pathways, immune cell function, gene regulation
- Grazing Season
  - Vitamin A – precursor is ß-carotene
  - Vitamin D – sunlight & grass
  - May decrease slightly in diet

Sodium Bicarbonate

- Helps to buffer the rumen
- Fermented forages
  - Wet
  - Finely chopped
  - Intake limited
    - High grain
- Pasture?

Sodium Bicarbonate on Pasture

- Pasture is a neutral pH feed
- Pasture has a long particle length
- Rapid rate of digestion
  - Low fiber
  - Wet

Kelp

- Approved for organics
- Source of minerals, vitamins, anti-oxidants
- High iodine content
  - Not problematic
- Limited research
  - Boosts immune system
  - Reduces pinkeye

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Kelp

Major Elements		
Ca	Calcium	2.1%
Cl	Chlorine	6.5%
K	Potassium	2.7%
Mg	Magnesium	0.85%
N	Nitrogen	1.4%
Na	Sodium	4.0%
P	Phosphorus	0.3%
S	Sulphur	2.8%

From www.thorvin.com
Not intended as a product endorsement

Minor Elements (parts per million – ppm)		
Al	Aluminum	289
As	Arsenic (FCC)	<3
B	Boron	98
Cd	Cadmium	1
Co	Cobalt	4
Cr	Chromium	0.8
Cu	Copper	4
Fe	Iron	622
Hg	Mercury	0.4
I	Iodine	780
Mn	Manganese	60
Mo	Molybdenum	2
Pb	Lead	<5
Se	Selenium	0.3
Sn	Tin	6.5
Zn	Zinc	12

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Kelp

Vitamins			
A	Retinol	390	ppb
B2	Riboflavine	4.9	ppm
B3	Niacin	182.6	ppm
C	Ascorbic Acid	375	ppm
D	Cholcalciferol	150	ppb
E	Alphatocopherol	110	ppm

Amino Acids (% of total Amino Acids)			
Alanine	5.52	Lysine	4.24
Arginine	5.47	Methionine	1.07
Aspartic Acid	9.88	Phenylalanine	3.54
Cystine	1.49	Proline	3.71
Glycine	5.70	Serine	4.92
Glutamic Acid	12.03	Threonine	4.60
Histidine	1.29	Tryptophan	1.68
Isoleucine	3.26	Tyrosine	3.52
Leucine	5.63	Valine	3.51

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Multi-species Grazing

- Benefits
  - More uniform grazing
    - Different preferences for plants
    - Avoid own manure, but not of other species
  - Better animal performance
  - Manage parasites
  - Predator protection
- Options
  - Different species grazing together
  - Leader-follower system
- Which is better?
  - Depends on your goals and livestock types

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Species Together

- Beef and sheep or goats
  - Challenge with minerals – copper
  - Tend to have species "cliques"
  - Bovine malignant catarrhal fever
    - Uncommon, but vets may have concerns
    - Spread from sheep to cattle during lambing in fluids
    - Important to separate
- Beef/sheep/goats and poultry
  - Poultry can free-range days, confined at night
  - Break up manure – eat fly larvae, slugs
  - Reduced poultry grain consumption

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Species Together

- Sheep and goats
  - Same mineral
  - Goats can work on woody plants, sheep on grasses and forbs
  - "Personality conflicts" may occur

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Leader-follower species

- Which comes first?

  Beef then sheep/goats
  or
  Sheep/goats then beef?

- Anything can be followed by poultry
- Pigs can follow where you want disturbance

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Who's First?

- Advantages to leader grazing
  - Better quality forage and availability – can select preferred species
  - May have better animal performance
  - Sheep eat tallest forage – reduce parasite intake in bottom 4"
  - Beef "vacuum" parasites, reducing larvae concentration
- Disadvantages to follower grazing
  - Lower quality forage, availability, selection

Regardless of any system you choose, pastures will be utilized better

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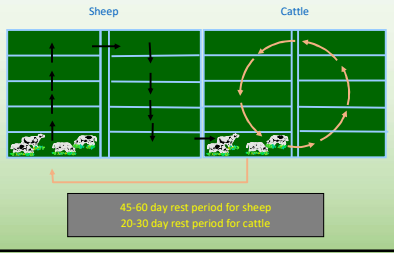
"Strategic Rotational" Stocking Method



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Thanks – any questions?

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