Managing pastures for organic goat & sheep production

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Collaborators

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The West Virginia University Organic Research Farm:

1999-2014
~150 acres certified
Silt-loam soils, Hilltop farm!

Why Do Growers Go Organic?

1. Concerned about sustainability and ecological impact
2. Chemically sensitive/health concerns
3. Improved food quality/nutrition
4. Price premiums
5. Build direct relationship with customers.
6. "Beliefs"

None of these involve yield comparisons with conventional production systems.

Key Elements of the WVU-ORF Project

- Whole Farm Is Organic (No Conventional Treatments)
- Integrate Livestock with Crop Production
- "Whole Systems" and "Component" Research
- Experiment Farm and "On-Farm" Grower Trials
- Grower Advisory Committee
- Student Involvement (Internships, Courses, etc.)

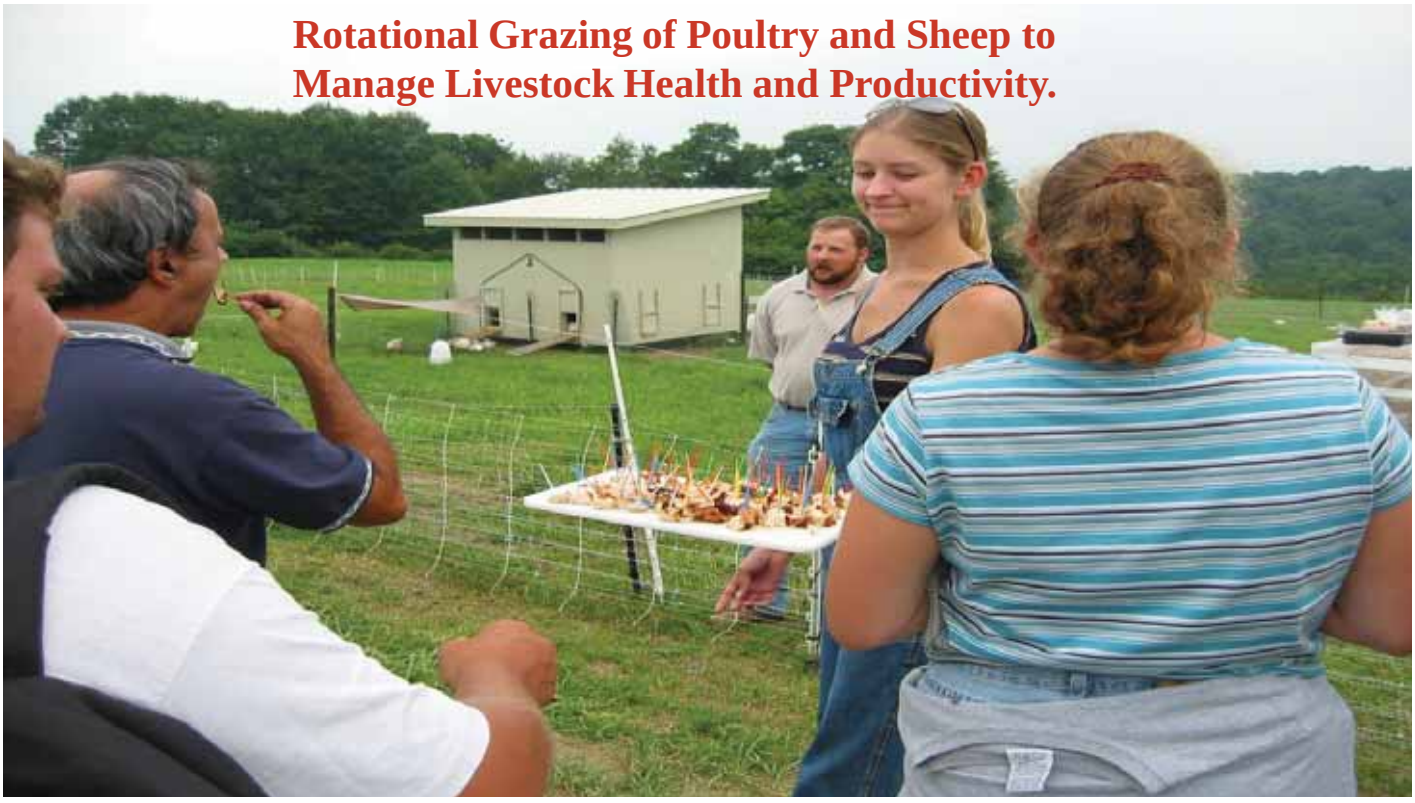

Garden-Scale Research Do Carrots Love Tomatoes?
Use of "Crop Circles" to Assess Plant Density
Effects in Vegetable Intercropping Trials Bomford et al.

Extending the growing season

Biological Pest Control

Organic Extension and Grower Outreach

- Goal: Rapid Technology Transfer to Users
- Tools:
  - Field Days, **(Aug. 7, 2014)**
  - Extension Bulletins,
  - Diagnostics and Recommendations,
  - Grower meetings/Training Workshops,
  - On-Farm Trials.



What Do We Mean by "Farming Systems"?

- Northbourne (1949) looked at the farm as a "whole".
- Considers complexity of multiple factors and interactions among those factors.

Systems Thinking in Organic Agriculture

- Understanding components and their interactions.
- Managing whole systems to use complexity, rather than to simplify it.
- Selecting management practices for multiple functions, not "silver bullets".
- Emphasizing iterative monitoring and management, and site-specific applications to work with the ecosystem.

Adding Livestock to the System

Benefits

- High Value commodity
- Use legume and forage resources.
- Take advantage of perennial crops to use steep soils.
- Provide manure.

Drawbacks

- Labor Intensive.
- Additional risks.
- More pests and problems to manage.
- Costs for shelter, feed, etc.
- Manure management.
- Organic requirements?

Farming Systems Trials

- Long-Term Trials: On-going since 1999
- **Two Market Garden Vegetable Systems:** Four-year rotation of crop families (Cucurbitaceae, Solanaceae, Legumes, and Leafy Vegetables). Four replicates each, with versus without annual compost application.
- **Four Field Crops/Livestock Systems:** Factorial design: with versus without compost; and 4-year (without livestock) versus 7-year (with livestock) rotation. Three replicates each of potato, soybean, wheat, rape (followed by three years of orchard grass & red clover in the with-livestock systems).

The Importance of the Ley

- **Ley = Temporary pasture (2-3 years) used as part of a cultivated crop rotation.**
- Compared to annual legumes, perennial forages/legumes have:
  - **more nitrogen fixation,**
  - **better weed control,**
  - **Higher biodiversity,**
  - **tighter nutrient cycling,**
  - **reduced nitrogen leaching,**
  - **increased soil organic matter.**

~100 ewes

Suffolk-Dorset cross

Year-round pasture, April lambing

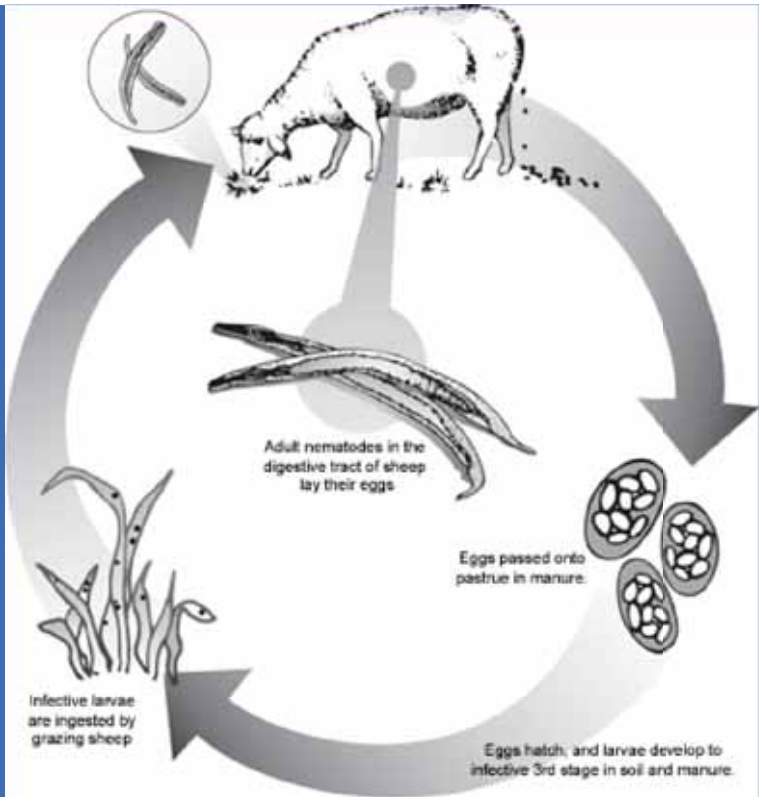
Haemonchus contortus

- Barberpole worm, Bankrupt worm
- Intestinal parasites of sheep and goats, related species attack other grazing animals.
- Limiting factor in organic production for small ruminants.

http://www.noonfamilysheepfarm.com/thenoonfamilysheepfarm_files/contortus.jpg

Life Cycle of *Haemonchus contortus*

http://www.pubs.ext.vt.edu/410/410-027/410-027.html



Life Cycle

- Eggs deposited in feces, hatch as J1, feed on bacteria, and molt to J2.
- Mature to Infective J3 in ~ 4 Days under optimum conditions. J3 is "filariform".
- J3 climbs grass blades in film of moisture, has "sheath.
- J3 ingested by sheep, molt in stomach to J4, then adult.
- Attaches to lining of abomasum (fourth stomach), ingests blood causing severe anemia, stunted growth, diarrhea, swelling of lymph glands, and death.
- Life cycle tied to sheep, egg-laying maximal just before lambing.

Symptoms

- Weakness and anemia
  - Paleness of gums and under eyelids
- Poor weight gain, weight loss, unthriftiness.
- Brittle wool
- Bottle jaw
- Death
- Diarrhea is rare and usually associated with other parasites, not Haemonchus.

Diagnosis

- Weight loss, poor performance, weakness
- Bottle Jaw
- FAMACHA
- Fecal Egg Counts
- Autopsy

Collecting fecal samples to assay for Intestinal parasites.

Conventional Management Options

- Antihelminthics
  - Ivermectins, Levamisole, Thiabendazole.
  - Anthelminthic resistance
  - Managed with selective treatment - FAMACHA
- Confinement feeding

Organic Management of *Haemonchus*

- Emphasis on Prevention – Dewormers are prohibited
- Emphasis on Herd Health and Nutrition
- Deworming is Required if Organic methods fail, sheep must then be sold as "Conventional". Loss of Organic Premium.

Organic Management of *Haemonchus*

- Avoidance. Rotational grazing for prevention.
- Anthelminthics (Copper Oxide Wire Particles, medicinal plants)
- Breeding Programs - Select for genetic resistance. Use resistant breeds (hair sheep)
- Sheep resistance to intestinal parasites also determined by antibodies, diet, age.
  - Maintain low levels of parasitism.
  - High protein diets,
  - High condensed tannins.
  - Lambs most susceptible, need most intensive management.

"Safe Pastures" program

- Includes Pastures that are:
  - Pastures previously harvested for hay or silage.
  - Mixed species rotational grazing.
  - Pastures not grazed for at least one year.

Avoidance Grazing

- Avoid exposure to infective larvae
- Rotate paddocks every three days in optimum weather (temp above 50 F with free moisture).
- Return no sooner than 60 days.
- Minimize excessively close grazing.

Drawbacks to Avoidance Grazing

- Labor intensive,
- Poor forage quality, sheep prefer younger forage.
- Is 60 days enough? May need longer rest period.

High Tannin Forages For Parasite Management

- Many reports suggest plants with high levels of condensed tannins are associated with reduced parasite problems.
- Condensed tannins are also called "Proanthocyanidins", polymers of flavans (AKA Polyflavonoids, non-hydrolyzable tannins)
- Sericea lespedeza, wormwood, chicory, grape seeds, cranberry, pine and spruce bark.
- Helps prevent bloat, increases protein absorption.

Birdsfoot Trefoil.

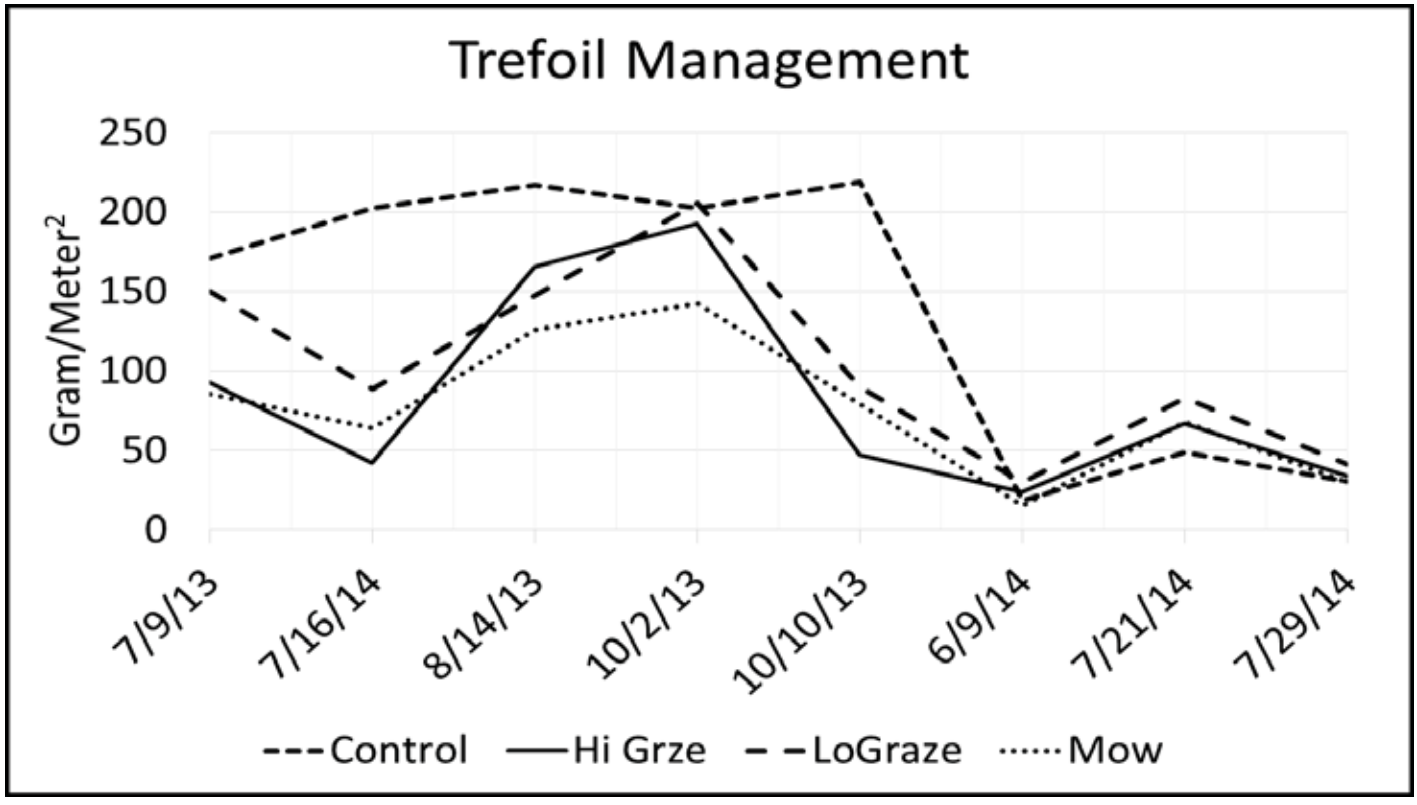
-Well-adapted to Northeast US
-Weed competition is a problem until well established.
-Does well on low to moderate fertility soils.

Establishing Birdsfoot Trefoil

- Use inoculated seed, 6-12 lbs/A
- Well-prepared seedbed
- Plant ¼ inch deep
- Manage weeds early
- Re-growth is from stem buds, not a tap root, therefore, avoid over-grazing (leave 4-inch stubble).
- Allow to grow to maturity to produce seed (~2-3 Years).

Birdsfoot Trefoil Varieties Stand Establishment and Grazing Preference

- Cv. Bull, Empire, Leo, Norcen established in 2012
- Four Weed Management treatments applied in 2013
  - Untreated Control
  - Mow at 15 cm
  - Low grazing Intensity (6 sheep/1000 ft^2 for one day)
  - High Grazing Intensity (6 sheep/1000 ft^2 for two days)



Results from Birdsfoot Trefoil Management Trial

- Sheep grazed 50-75 % of BFT.
- Plots not mowed or grazed had more BFT in Year 1, but the least in Year 2.
- Weed management is critical to sustaining BFT stands.

Current Research: Forage-based Parasite Control

- Compare lamb performance on pastures with:
  - High-tannin BFT (cv. Pardee)
  - Low-tannin BFT (cv. Norcen)
  - Orchard Grass & Red Clover (control)
- Compare "Avoidance" grazing vs "Challenge" grazing.
  - Avoidance = 3-day grazing, 57 days rest before return.
  - Challenge = 7-day grazing, 21 days rest.

Current Research: Forage-based Parasite Control

- Parameters Measured:
  - pasture composition,
  - tannin levels,
  - Lamb FEC,
  - FAMACHA,
  - weight gain
  - organic status.

Pastures Planted April 2013
1 acre each

Grazed lightly in May,
Grazing Trial in June, 2014,
2 ewes + 4 lambs/plot

Grazing Trial repeated
with 4 lambs
Aug-4 to Sept. 30, 2014

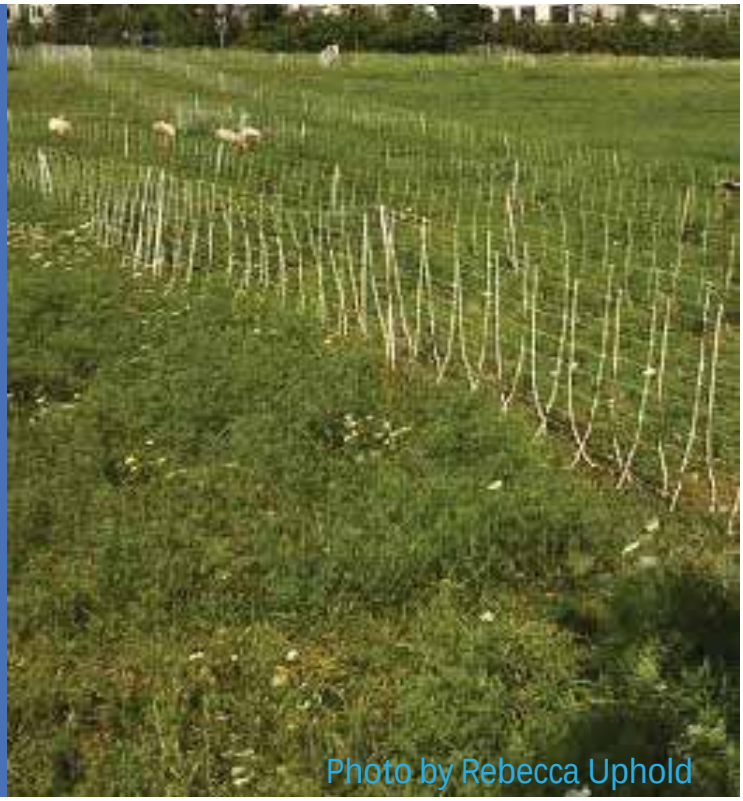


Photo by Rebecca Uphold

Results from 2014 Grazing Trial

- Few statistically significant differences
- Weight gain was higher in blocks with best trefoil stand
- Fecal Egg Counts highest on Orchard Grass+Red Clover, lowest on Pardee (High Tannin cv.)

Organic Lambs at Harvest (9-29-14)

•Orchard Grass & Red Clover	4/8
•Norcen BFT (Low Tannin)	6/8
•Pardee BFT (High Tannin)	8/8

Trials to be repeated in 2015 & 2016

Other Management Options:

- Feed BFT hay?
- Medicine plots for infected animals?
- Effects proportional to concentration of condensed tannins in diet; Will grasses, weeds or feed supplements dilute the benefits?


Questions?