ORGANIC DAIRY
COST OF PRODUCTION
PROJECT

Jen Miller
NOFA-VT Farmer Services Program
March 14, 2019
**Farms in the study**

2017 financial information collected from 34 farms

- 29 organic farms (used data from 28)
- 5 organic, 100% grass-fed farms

<table>
<thead>
<tr>
<th>VT Organic Dairy Participants (n = 28)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Average # of Cows</td>
<td>81.4</td>
</tr>
<tr>
<td>Lbs Shipped Total</td>
<td>1,294,173</td>
</tr>
<tr>
<td>Lbs shipped/cow</td>
<td>14,942</td>
</tr>
<tr>
<td>Milk price</td>
<td>$36.90</td>
</tr>
</tbody>
</table>
Farms in the study

BY HERD SIZE

<table>
<thead>
<tr>
<th>Cow Group</th>
<th>Cost of Production Study</th>
<th>VOF Farms</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>40</td>
<td>32</td>
</tr>
<tr>
<td>2</td>
<td>57</td>
<td>58</td>
</tr>
<tr>
<td>3</td>
<td>136</td>
<td>131</td>
</tr>
<tr>
<td>Average</td>
<td>78</td>
<td>74</td>
</tr>
</tbody>
</table>
Farms in the study

**BY MILK BUYER**

<table>
<thead>
<tr>
<th>Milk Buyer</th>
<th>Cost of Production Study</th>
<th>VOF Farms</th>
</tr>
</thead>
<tbody>
<tr>
<td>OV</td>
<td>65%</td>
<td>67%</td>
</tr>
<tr>
<td>Stonyfield</td>
<td>15%</td>
<td>11%</td>
</tr>
<tr>
<td>Horizon</td>
<td>21%</td>
<td>22%</td>
</tr>
</tbody>
</table>
## Average Milk Price vs. Cost of Production per CWT

<table>
<thead>
<tr>
<th>Year</th>
<th>Milk Price</th>
<th>Total Expenses</th>
<th>Cash Expenses</th>
</tr>
</thead>
<tbody>
<tr>
<td>2015</td>
<td>$37.81</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2016</td>
<td>$38.09</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2017</td>
<td>$36.90</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**2017 Dairy-Only Cash Expenses Per Cwt** $31.03

**2017 Dairy-Only Total Expense Per Cwt** $35.03
<table>
<thead>
<tr>
<th>By Profitability Group</th>
<th>Bottom Third</th>
<th>Middle Third</th>
<th>Top Third</th>
<th>All Farms</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N=10</td>
<td>N=9</td>
<td>N=9</td>
<td>N=28</td>
</tr>
<tr>
<td>Average # of cows</td>
<td>66.8</td>
<td>49.4</td>
<td>129.6</td>
<td>81.4</td>
</tr>
<tr>
<td>Lbs shipped total</td>
<td>946,543</td>
<td>713,462</td>
<td>2,261,140</td>
<td>1,294,173</td>
</tr>
<tr>
<td>Lbs shipped/cow</td>
<td>14,194</td>
<td>13,664</td>
<td>17,050</td>
<td>14,942</td>
</tr>
<tr>
<td>Milk price</td>
<td>$36.24</td>
<td>$37.10</td>
<td>$37.44</td>
<td>$36.90</td>
</tr>
<tr>
<td>Cash Expenses/CWT</td>
<td>$32.67</td>
<td>$29.86</td>
<td>$29.40</td>
<td>$30.72</td>
</tr>
</tbody>
</table>
Profit Trends 2015-2017

Net Cash Farm Income
Net Farm Income
EBITDA
<table>
<thead>
<tr>
<th></th>
<th>2015</th>
<th>2016</th>
<th>2017</th>
</tr>
</thead>
<tbody>
<tr>
<td>Debt/Cow</td>
<td>$3,389</td>
<td>$3,337</td>
<td>$3,215</td>
</tr>
<tr>
<td>Interest Expense/Cow</td>
<td>$115</td>
<td>$115</td>
<td>$112</td>
</tr>
<tr>
<td>Average Assets/Cow</td>
<td>$17,246</td>
<td>$18,235</td>
<td>$17,549</td>
</tr>
<tr>
<td>Average Equity/Cow</td>
<td>$13,856</td>
<td>$14,898</td>
<td>$14,334</td>
</tr>
<tr>
<td>Debt/Asset Ratio</td>
<td>6.0%</td>
<td>5.7%</td>
<td>5.8%</td>
</tr>
</tbody>
</table>
Average Production Expenses (Total = $348,963)

- Feed - purchased: 43%
- Labor: 18%
- Feed: 5%
- Repairs: 10%
- Pasture Management: 2%
- Milk Marketing: 2%
- Herd Health & Fertility: 3%
- Fuel and Oil: 4%
- Supplies: 6%
- Miscellaneous: 4%
- Bedding: 3%
- Custom hire: 5%
- Miscellaneous: 4%
<table>
<thead>
<tr>
<th>By Profitability Group</th>
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<td>13,664</td>
<td>17,050</td>
<td>14,942</td>
</tr>
<tr>
<td>Variable Expense/Cow</td>
<td>$4,126</td>
<td>$3,515</td>
<td>$4,313</td>
<td>$3,990</td>
</tr>
<tr>
<td>Fixed Expense/Cow</td>
<td>$541</td>
<td>$572</td>
<td>$703</td>
<td>$603</td>
</tr>
<tr>
<td>Grain Purchased/Cow</td>
<td>$1,503</td>
<td>$1,361</td>
<td>$1,810</td>
<td>$1,556</td>
</tr>
<tr>
<td>Forage Purchased/Cow</td>
<td>$169</td>
<td>$241</td>
<td>$52</td>
<td>$155</td>
</tr>
<tr>
<td>Paid Labor Expense/Cow</td>
<td>$714</td>
<td>$231</td>
<td>$866</td>
<td>$608</td>
</tr>
<tr>
<td>Paid Labor Expense/CWT</td>
<td>$5.03</td>
<td>$1.58</td>
<td>$5.07</td>
<td>$3.93</td>
</tr>
</tbody>
</table>
Thank you!

To all the farmers who participated

&

To our project supporters

- University of Vermont
- Stonyfield Farm
- Organic Valley/Cropp
- Whitewave/Horizon
- Vermont Agency of Agriculture
- Yankee Farm Credit
- NODPA
- Green Mountain Feeds
Energy Dense Legume-Grass Mixtures for High Forage Diets
Introduction

MML SILAGE, New York, October 2018

<table>
<thead>
<tr>
<th>Item</th>
<th>Samples</th>
<th>Average</th>
<th>Normal Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>% Dry Matter</td>
<td>118</td>
<td>40.807</td>
<td>30.429 - 51.184</td>
</tr>
<tr>
<td>% Crude Protein</td>
<td>118</td>
<td>20.841</td>
<td>18.084 - 23.598</td>
</tr>
</tbody>
</table>
The Study

Located at the UVM Horticultural Research Farm, Adams Sandy Loam Soil

Management:          Legumes:          Grasses:
3 Cut (Lax)            +
VS.                   +
4 Cut (Intense)        +

Tall Fescue
Meadow Fescue
Perennial Ryegrass
Timothy

30 Treatments
Four replications
120 plots

http://www.pfaf.org/user/Plant.aspx?LatinName=Lotus+corniculatus
The Study
Preliminary Results – Yield and Composition

DM Yield and Composition (T/A)
Lax Mgmt.

Cut-3L  Cut-3G  Cut-2L
Cut-2G  Cut-1L  Cut-1G

Pure  Timothy  Tall
Mead. Fesc.  Peren. Rye

Alfalfa  Birdsfoot Trefoil  Red Clover
Preliminary Results – Yield and Composition

DM Yield and Composition (T/A)

*Intensive Mgmt.*

- Cut-4
- Cut-3L
- Cut-3G
- Cut-2L
- Cut-2G
- Cut-1L
- Cut-1G

<table>
<thead>
<tr>
<th></th>
<th>Alfalfa</th>
<th>Birdsfoot Trefoil</th>
<th>Red Clover</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pure</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Timothy</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tall Fesc.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mead. Fesc.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Peren. Rye</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Preliminary Results - Fermentation

Silage pH-Third Cut-Intensive

pH

- PureTIM
- TF
- MF
- PRG

- PureTIM
- TF
- MF
- PRG

- PureTIM
- TF
- MF
- PRG

- PureTIM
- TF
- MF
- PRG

ALF

BFT

RCL
THANK YOU!
USE OF NYLON BAG TECHNIQUE IN FISTULATED CATTLE TO ASSESS FORAGE NUTRIENT PROFILES

Miriam Snider
PhD Student – University of Vermont
NYLON BAG STUDY - FORAGE DIGESTION

- Orchard grass
  - Staple in forage-based systems in New England

- Other forages (individual or in combination) may provide a better nutrient profile while using the same land area.

- Forages analyzed in this study:
  - Orchard grass, sudan grass, millet, meadow fescue, white clover
Harvest:
Pre-heading (grasses) or
Pre-blooming (legumes)

Drying, Grinding, & Bagging

Rumen Insertion for up to 72 h

Drying & Weighing
Pooling, Grinding, & Analysis
CRUDE PROTEIN CONTENT AFTER 72 H

- White clover (red line)
  - Greater amounts of CP present until 72 h
  - Equivalent to meadow fescue (orange line) at 72 h

- Meadow fescue CP content was equivalent to that of millet and sudan grass at 72 h.

- Orchard grass (blue line)
  - Lowest CP content at 72 h
White clover (red line)
- Greatest amounts of WSC at h 2 and 7.5
- WSC content was equivalent to all other forages by 72 h
Next proposed step:
+ Continuous culture experiment

Parameters of interest:
- Fermentation rates & patterns
- Microbial nitrogen flows
- CH₄ production
- VFA production patterns
- Microbial profiles
- Enzyme patterns
NUTRITION ON PASTURE BASED DAIRIES

Ariel Ayers, M.S. Candidate
University of Vermont
16 organic dairy farms across the state of Vermont were surveyed during the grazing season of 2017.

Monthly sampling included:

- Animal level:
  - Milk production, body condition score.
- Plant level:
  - Pasture profile, mass.
- Farm level:
  - Grazing management, feeding strategies.

The results showed that milk urea nitrogen (MUN) numbers across all farms varied drastically, indicating protein intake as a limiting factor.
MATERIALS AND METHODS

- 6 organic dairy farms across the state of Vermont.
- Sampling occurred for 2 consecutive days once a week per farm.
- 6 week trial during summer 2018, with a 2 week baseline period and a 4 week experimental period.
- Farms were paired by 2017 MUN profile and assigned to groups by current crude protein (CP) content in supplement:
  - Control (CON, n=3 farms)
    - Continued with their regular supplements
  - Treatment (TRT, n=3 farms)
    - 16% CP content
    - Organic barley and roasted soybean mix
• Gather information from the farmer.
• Collect milk and feed samples.
• Body Condition Score.

Post-Graze Pasture:
• Plate Meter
• Quadrat Cuts
• Pasture Area

Pre-Graze Pasture:
• Botanical
• Plate Meter
• Quadrat Cuts
• Pasture
**Pasture Profiles**

- **Botanical Composition**
  - Grass average: 63.75%
  - Legume average: 16.40%
  - Weed average: 12.47%
  - Dead material average: 8.70%

- **NIR Analysis**
  - WSC average: $9.7 \pm 0.9$
  - Fat average: $2.8 \pm 0.2$
  - Protein average: $17.6 \pm 1.6$
  - aNDF average: $50.3 \pm 3.0$
  - ADF average: $28.9 \pm 1.8$
Milk yield averages of CON group and TRT group over the six week trial.
FAT PERCENT AND PROTEIN PERCENT OVER THE SIX WEEKS

Fat Percent in CON vs. TRT across the Six Weeks

Protein Percent in CON vs. TRT across the Six Weeks
MUN PROFILE AVERAGES OF CON GROUP AND TRT GROUP OVER THE SIX WEEK TRIAL
CONCLUSION

- The increase in milk yield in the TRT group indicates protein intake was a limiting factor in milk production.
- Further formulation should be done to determine impact on fat percent and protein percent.
- Dietary considerations should ensure MUN profile remaining in optimum range.
Highlights of kelp meal research at UNH

André F. Brito, Veterinarian, M.S., Ph.D.
Associate Professor of Dairy Cattle Nutrition and Management
Department of Agriculture, Nutrition, and Food Systems
University of New Hampshire
Email: andre.brito@unh.edu
Office phone: (603) 862-1341
Kelp meal studies objectives at UNH

- Investigate the impact of kelp meal supplementation on milk production, nutrient digestibility, animal health, and methane (CH$_4$) emissions during the grazing and winter seasons.

- Improving the understanding of iodine metabolism in dairy cows fed kelp meal year-round.
Use of kelp meal in organic dairy farms in the Northeast and Midwest US

- 59% of organic dairy farmers feed kelp meal in the Northeast (Antaya et al., 2015)
- 49% of organic dairy farmers feed kelp meal in Wisconsin (Hardie et al., 2014)
- 83% of organic dairy farmers feed kelp meal in Minnesota (Sorge et al., 2016)
Why organic dairy farmers feed kelp meal in the Northeast?

- It improves body condition and overall animal appearance
- It decreases milk somatic cell count, reproductive problems, and incidence of “pinkeye” (i.e., infectious bovine keratoconjunctivitis)
- It helps with control of nuisance flies during the grazing season

Source: Antaya et al. (2015)
### Pasture vs. kelp meal nutritional composition

<table>
<thead>
<tr>
<th>Item</th>
<th>Pasture</th>
<th>Kelp meal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crude protein</td>
<td>19.5</td>
<td>10.2</td>
</tr>
<tr>
<td>NDF</td>
<td>51.0</td>
<td>53.9</td>
</tr>
<tr>
<td>ADF</td>
<td>31.4</td>
<td>39.9</td>
</tr>
<tr>
<td>Ca</td>
<td>0.76</td>
<td>1.31</td>
</tr>
<tr>
<td>P</td>
<td>0.36</td>
<td>0.25</td>
</tr>
<tr>
<td>Mg</td>
<td>0.28</td>
<td>0.69</td>
</tr>
<tr>
<td>K</td>
<td>2.68</td>
<td>3.53</td>
</tr>
<tr>
<td>S</td>
<td>0.28</td>
<td>2.84</td>
</tr>
<tr>
<td>I, ppm</td>
<td>0.62</td>
<td>820</td>
</tr>
</tbody>
</table>

Sources: Antaya et al. 2015; Hafla et al. (2016); Brito et al. (unpublished)
Iodine intake with feeding 2 oz or 4 oz of kelp meal relative to iodine requirement of lactating dairy cows

Sources: NRC (2001); Antaya et al. 2015
Milk iodine increased linearly in organic dairy cows fed kelp meal during the winter season.

Source: Antaya et al. 2015
Serum cortisol in dairy cows fed kelp meal during the winter


P-values
Linear ($P = 0.08$)
Quadratic ($P = 0.60$)
Serum cortisol in conventional dairy cows fed kelp meal during the summer

Source: Brito et al. (unpublished)

P-values
Linear ($P = 0.01$)
Quadratic ($P = 0.94$)
Milk somatic cell count (SCC) in grazing cows fed kelp meal

Source: Brito et al. (unpublished)
Methane emission measurements
The portable GreenFeed gas emission monitoring system
Methane emissions in grazing dairy cows fed kelp meal

Source: Brito et al. (unpublished)

<table>
<thead>
<tr>
<th>Month</th>
<th>Control</th>
<th>4 oz kelp</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>July</td>
<td>500</td>
<td>400</td>
<td>0.04</td>
</tr>
<tr>
<td>August</td>
<td>300</td>
<td>300</td>
<td>0.40</td>
</tr>
<tr>
<td>September</td>
<td>200</td>
<td>200</td>
<td>0.48</td>
</tr>
</tbody>
</table>

P-values
Diet (P = 0.60)
Month (P < 0.01)
Interaction (P = 0.01)
Final considerations

- Kelp meal supplementation may provide farmers with opportunities to improve animal health, but further research is needed.

- Kelp meal is a high cost supplement ($50-60 per 50-lb bag).

- There is a critical need for developing a comprehensive evaluation of iodine concentration of retail organic milk.
Acknowledgments
Advancing Grass-Fed Dairy: A Whole Systems Approach to Enhancing Productivity, Quality, & Farm Viability in the U.S.

(Project no. 2018-02802)
Project Collaborators

Dr. Heather Darby, Agronomist and Nutrient Management Specialist, University of Vermont Extension

Brent Beidler, Grass-fed dairy farmer, VT

Dr. Sidney Bosworth, Professor and Agronomist, University of Vermont Extension

Dr. André F. Brito, Associate Professor Organic Dairy, University of New Hampshire

Roy Desrochers, Sensory Practice Leader, Tufts University Sensory and Science Center

Sarah Flack, Grazing Livestock Specialist, Sarah Flack Consulting, VT

Dr. Sabrina Greenwood, Associate Professor of Animal Science, University of Vermont

Dr. Jana Kraft, Associate Professor of Animal Science, University of Vermont

Dr. Meredith Niles, Associate Professor of Food Systems, University of Vermont

Albert Robbat, Jr., Director, Tufts University Sensory and Science Center

Dr. Kathy Soder, Animal Scientist, USDA-ARS-Pasture Systems and Watershed Management Research Unit, PA

Sara Ziegler, Crop and Soil Coordinator, University of Vermont Extension
2016 Northeast SARE grant created the Grass-fed Monitor, a monthly preliminary benchmarking program in the Northeast

2017 FAFO provided support for additional outreach materials and forage variety trials

2018 NERME grant to add DHIA milk testing and herd record information to the Grass-fed Monitor
The new OREI project will include:

- **Objective 1**: Understand the economic and production metrics for grass-fed dairy systems through implementing benchmarking on farms throughout the U.S.

- **Objective 2**: Understand nutrient cycling dynamics and the subsequent impacts on crop, soil, and animal production and health

- **Objective 3**: Investigate the impacts of soil and forage management on nutrient cycling, forage production, forage quality, and farm economics

- **Objective 4**: Develop an understanding of market demands and potential for grass-fed market growth and expansion

- **Objective 5**: Strengthen knowledge, skills, and networks among farmers, processors, and technical service providers
A survey has just been sent to all 100% grass-fed dairies in the U.S.

If you are a 100% grass-fed dairy interested in receiving the survey that processes milk on-farm or sells directly to an end user please send your contact information to:

mtniles@uvm.edu or mail it to:

Meredith Niles
University of Vermont
Department of Nutrition & Food Sciences, 350 Carrigan Wing
109 Carrigan Drive
Burlington, VT 05405
Grass-Fed Benchmark Program

• Will continue for the next 4 years.
• Will be expanded in Northeast & beyond
• For farmers in the Northeast:
  – Will have opportunity to continue on DHIA;
  – Will have opportunity to participate in cost of production;
  – Will have opportunity to participate in other research.
Other Research

MUN research in PA/NY
Forage quality research in VT
Nutrient cycling research NY/VT
Consumer preference studies
BEDDING STRATEGIES THAT PROMOTE UDDER HEALTH AND MILK QUALITY BY FOSTERING A BENEFICIAL MICROBIOME ON ORGANIC DAIRY FARMS

A research and extension project funded by the USDA Organic Research and Extension Initiative

Investigators: John Barlow
Deborah Neher
Jennifer Colby
Juan Alvez

Tucker Andrews
Caitlin Jeffreys
Despite living on a giant pile of organic material mixed with their own manure and urine, cows on bedded pack do not necessarily experience more mastitis.

In fact, some research reports a decrease in mastitis after switching to bedded pack.
Microbes!
Manure, ground, milking, humans, bedding, cows

Infection!

Intramammary Tissue

Teat Cistern

Teat Canal

Teat Skin

Bedding
• How does bedding management influence mastitis and milk quality on organic farms?
• What bacteria and fungi are living in bedding, milk, and cow mammary skin on organic farms?
• Do these organisms have an effect on mammary health?
• Does bedding management change this community?