Participant Orientation Webinar:
Climate Change Resilient Farming in Vermont Program

October 2014 – March 2015

Hosted by the University of Vermont
Vermont Farm Resilience in a Changing Climate Initiative

Photo by Sam Mayfield
Program Facilitators

- **UVM Agroecology & Rural Livelihoods Group**
  - V. Ernesto Mendez, PhD., Associate Professor
  - Kate Westdijk, M.S., Food Systems Research Specialist

- **UVM Center for Sustainable Agriculture**
  - Joshua Faulkner, PhD., Farming & Climate Change Coordinator
  - Jennifer Colby, M.S., Pasture Program Coordinator
  - Juan Alvez, PhD., Pasture Technical Coordinator
  - Ginger Nickerson, PhD., GAPS Program Coordinator
Program Orientation Webinar

- Participant Introductions
- Welcome, Program Overview and Background
- Observed and Projected Climate Impacts in VT
- Participant Perspectives on Farm Resilience:
  - What does it look like?
  - How do we assess it?
- CC Resilient Farming Program Components
- October 30th Field Day: Details and Preparation
Participant Introductions

♦ Name, affiliation, primary expertise

♦ What do you hope to get out of participating in this program?
Background

- USDA Climate Hubs: support agriculture and land managers with technical support, assessments, regional forecasts, and education.
- 2012 VT stakeholder survey: majority believe farmers lack information and support for responding to climate change
- High Meadows Fund interest and investment
Climate Change Resilient Farming in Vermont Program 2014-15

Our Goals for Participants

♦ Deepened relationships with peers

♦ Increased ability to:
  • conduct holistic farm climate change resilience assessment including recommendations for the farm and a tool kit of strategies
  • assess farmer knowledge and desire to learn about CC implications for their farm

♦ Increased understanding of climate change adaptation and/or mitigation strategies

♦ Increased number of farms they serve implementing recommended strategies
Our Goals

- Increased understanding of participant goals specifically what they need to be better able to serve farmers.
- Validate perceived outcomes that participants want based on past research with stakeholders.
- Broaden network of service-providers aware of our initiative and prepared to translate our findings to on-farm management decisions.
- Evaluate and improve program for future offering.
Our Goals for Vermont Farmers

Farmers served by program participants, not farm field day hosts

- Increased adoption of appropriate farm management practices by VT farmers to enhance climate change resilience (*requires understanding their farm context and which BMPs are a good fit*)

- Increased understanding of climate change adaptation and/or mitigation strategies
Climate Change Resilient Farming in Vermont Program 2014-15

- Webinar
- Farm Day (10/30)
- November- March: Attend self-identified professional development opportunities (mini-grants available)
- Workshop (TBD March 2015)
- Share with Farmers (Season 2015 and beyond)
The Vermont Farm Resilience in a Changing Climate Initiative
An action-oriented approach.
Working with farmers, extensionists and researchers to face the challenges of climate change.
How do we move from Disaster Relief to Agricultural Resilience?
Our Approach

- Research for Action
  - Validation/enhancement of existing VT farm practices
  - Policy change
  - Farmer to farmer outreach
Our Approach

- **Research for Action**
  - Validation/enhancement of existing VT farm practices
  - Policy change
  - Farmer to farmer outreach

- **Participatory**
  - Stakeholder involvement
  - Ensures:
    - Simultaneous & Shared Learning
    - Accuracy & Relevance
Initiative Collaborators

Agroecology & Rural Livelihoods Group (ARLG), Dept. of Plant & Soil Science Department (PSS)

- V. Ernesto Mendez, PhD
- Kate Westdijk, MS
- Martha Caswell, MPP
- Rachel Schattman, PhD student

UVM Research & Extension Departments

- Stephanie Hurley, DDes (PSS)
- Carol Adair, PhD (Rubenstein School of Environment & Natural Resources)
- Linda Berlin, PhD (Extension Center for Sustainable Ag & Nutrition and Food Sciences)
- David Conner, PhD (Community Development & Applied Economics-CDAE)
- Chris Koliba, PhD (CDAE)
- Asim Zia, PhD (CDAE)
- Heather Darby, PhD (UVM Extension- Crops & Soils)
- Including staff and students within each

- UVM student research assistants
- UVM Food Systems Research Spire
- UVM Gund Institute for Ecological Economics

Advisory Committee

- The Vermont Grass Farmers Association
- The Vermont Vegetable and Berry Association
- Vermont Agency of Agriculture
- SARE/Extension- Vern Grubinger
- Vermont NRCS
- Stone Environmental
- Vermont Farm to Plate Initiative
- Vermont State Climatologist
- UNH Assistant Professor of Agroecology (Richard Smith)
Outreach/Extension

Farmer to Farmer
Policy makers
Service Providers

Collaborative Reflection on Findings

Research
- Farming Practices
- Policies

Action
- Climate Change Resilient Farming Practices (CCBMPs)
- Policies that support Climate Change Resilience
- Education

Policy-makers
Ag. Serv. Providers
Funders

Extensionists

Researchers
Farmers
Students
Vermont Farm Resilience in a Changing Climate Initiative

General Objectives

1) Identifying existing farming practices that contribute to climate change mitigation and/or adaption (CCBMPs)

2) Assessing farmers’ interest in pursuing farm management strategies under different climate change and policy scenarios

3) Improving existing practices through agroecology, outreach and policy innovations

4) Providing decision support for policy makers and farmers- directly and through extension and outreach programs
Farm Practices Being Evaluated:

- **Focus for Farm Sampling:**
  1. Cover Crops
  2. No Till
  3. Stormwater runoff management
  4. Wetland conservation
  5. Rotational grazing

- **Considering broadly:**
  1. Hoop houses/high tunnels
  2. Green manure
  3. Timely manure incorporation
  4. Pest/disease management
  5. Invasive species management
  6. Irrigation
  7. Nutrient Management Plans
  8. Conservation buffer strips
  9. Drainage tile
  10. Animal diversity
  11. Animal feed management
  12. Agroforestry
  13. Alternative energy
  14. Insurance
Climate Change and Agriculture in Vermont

Joshua Faulkner, PhD
Farming and Climate Change Program Coordinator
UVM Center for Sustainable Agriculture

October 9, 2014

AP Photo: Toby Talbot
Northeast Annual Precip.: 
+4.15”/century 
(1895-2013)
Precipitation in Northeastern Vermont (1970-2013)

Northeastern VT: 9.5”
Western VT: 7”
Southeastern VT: 2”
Why Vermont Crops Fail (2001-10)

Since 1988, Crop Ins. provided $213 Bil. of Protection and Paid $15 Million in Loss Payments to VT Farmers

- Cold Wet, 1%
- Wind, 1%
- Frost, 2%
- Drought, 7%
- Hail, 26%
- All Other, 2%
- Excess Moisture, 60%
Northeast Extremes in 1-Day Precipitation (1910-2013)
‘In general, erosion increases at a rate 1.7 times annual rainfall increases’
(Nearing et al., 2004)
Erosion Predictions

(O’Neal et al., 2005)
Flooding and Downstream Impacts

- Flooding...
- Increased peak flows
- Increased streambank erosion
- Nutrient loss (including leaching)
- ‘Build-up and wash-off’
Sediment input to the Hudson R. due to Lee and Irene was 5 times long-term annual average (Ralston et al., 2013)
Modeled Total P: Six Climate Scenarios

![Graph showing TP Load across various climate scenarios for Lake Champlain.](image-url)

(Tetra Tech, 2013)
How does climate change impact farmers? (VT)

- Warming Temperatures:
  - Annual: 2°F
  - Winter: 4°F (in last 40 years)
  - Extremes...
Growing season increasing by 3.7 days/decade

(Galford et al., 2014. Vermont Climate Assessment)
### Projections in Vermont (LCB)

Guilbert et al., 2014: *Impacts of projected climate change over the Lake Champlain basin in VT*

<table>
<thead>
<tr>
<th>Metric</th>
<th>Season</th>
<th>Base Avg</th>
<th>2040–69</th>
<th>2070–99</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>2.5%</td>
<td>50%</td>
<td>97.5%</td>
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<tr>
<td>Freezing days (day)</td>
<td>Annual</td>
<td>117</td>
<td>83</td>
<td>85</td>
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<td></td>
<td>Nov–Dec</td>
<td>38</td>
<td>25</td>
<td>26</td>
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<td>Jan–Feb</td>
<td>53</td>
<td>43</td>
<td>45</td>
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<td>Mar–Apr</td>
<td>24</td>
<td>13</td>
<td>14</td>
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<tr>
<td>Snowfall (cm)</td>
<td>Annual</td>
<td>676</td>
<td>413</td>
<td>432</td>
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<td></td>
<td>Autumn</td>
<td>68</td>
<td>29</td>
<td>32</td>
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<td></td>
<td>Winter</td>
<td>477</td>
<td>305</td>
<td>328</td>
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<td></td>
<td>Spring</td>
<td>131</td>
<td>64</td>
<td>72</td>
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<tr>
<td>Above 32.2°C (day)</td>
<td>Annual</td>
<td>6</td>
<td>23</td>
<td>24</td>
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<tr>
<td>Heat index (°C day⁻¹)</td>
<td>Annual</td>
<td>130</td>
<td>449</td>
<td>475</td>
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<td></td>
<td>Summer</td>
<td>118</td>
<td>389</td>
<td>416</td>
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<tr>
<td>Growing season (day)</td>
<td>Annual</td>
<td>141</td>
<td>166</td>
<td>169</td>
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<td>Maple sap production (day)</td>
<td>Annual</td>
<td>60</td>
<td>52</td>
<td>53</td>
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<td></td>
<td>Autumn</td>
<td>19</td>
<td>12</td>
<td>12</td>
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<tr>
<td></td>
<td>Winter</td>
<td>14</td>
<td>20</td>
<td>21</td>
</tr>
<tr>
<td></td>
<td>Spring</td>
<td>27</td>
<td>18</td>
<td>19</td>
</tr>
<tr>
<td>Heating requirements (°C day⁻¹)</td>
<td>Annual</td>
<td>5294</td>
<td>4216</td>
<td>4307</td>
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<tr>
<td></td>
<td>Autumn</td>
<td>1153</td>
<td>897</td>
<td>916</td>
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<td></td>
<td>Winter</td>
<td>2527</td>
<td>2159</td>
<td>2197</td>
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<td></td>
<td>Spring</td>
<td>1395</td>
<td>1078</td>
<td>1106</td>
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<tr>
<td>Cooling requirements (°C day⁻¹)</td>
<td>Annual</td>
<td>0</td>
<td>11</td>
<td>13</td>
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<td></td>
<td>Spring</td>
<td>0</td>
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<td>Summer</td>
<td>0</td>
<td>10</td>
<td>12</td>
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<td>Autumn</td>
<td>0</td>
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<tr>
<td>rPPET (ratio)</td>
<td>Summer</td>
<td>1.14</td>
<td>1.10</td>
<td>1.15</td>
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</table>
How does climate change impact crops? (VT)

- Cool-season crops will be of lower yield or quality
  - Sweet corn
- Reduced grain yield (rapid maturation and moisture)
  - Field corn, nutrient content…
- Reduced vernalization lower some fruit yields; increased frost risk?
  - Apples
- New pests are able to over-winter, emerge early; increased pesticides
  - Flea beetle, SWD?
- Some warmer season crops will do better
  - Red wine grape, peaches, watermelon
- Water stress in crops…
Fig. 12. Projected rPPET for (a) 2040–69 and (b) 2070–99 for RCP 4.5 and 8.5 relative to the 1970–99 base period.

(Guilbert et al., 2014)
Water Management for Production

(McDonald and Girvetz, 2013)
Climate change and potential impact on VT ag

- Increased CO\textsubscript{2} in air
  - Crops can have higher yields but optimum conditions are rare
- Weeds!

Image: www.climateandfarming.org
How does climate change impact livestock?

- Warming Temperatures
  - Livestock
    - Heat stress in dairy cattle
  - Higher body temperatures
  - Increased respiration rates
  - Less activity
  - Increased water intake

- Performance
  - Dry matter intake down by 10-20%
  - Milk production down by 10-25%
  - Reproductive processes decrease
Questions?

Joshua.faulkner@uvm.edu

Additional Resources:
http://www.uvm.edu/~susagctr/
Participant Generated Key Words: Farm Resilience
1. Given these weather and climate projections, what does resilience look like for you in your work?

Please take a few moments to consider, then raise your hand to speak (look for icon) or type your response into the chat box.
Vermont Farm Resilience in a Changing Climate

1. Given these weather and climate projections, what does resilience look like for you in your work?

2. How would you measure it on a farm?

Please take a few moments to consider, then raise your hand to speak (look for icon) or type your response into the chat box.
Climate Change Resilient Farming in Vermont Program 2014-15

- Webinar
- Farm Day (10/30)
- November- March: Attend self-identified professional development opportunities (mini-grants available)
- Workshop (TBD March 2015)
- Share with Farmers (Season 2015 and beyond)
Reading the Farm: On-Farm Resilience Assessment

Goals

- Look at farms with a new eye (resilience)
- Connect trainees with University researchers
- Structured discussion, work as a team
- Shared learning
- Useful product for the farmer
October 30th Farm Visits

Day long: 9:30 to 4:00 pm, South Hero

Farm 1  9:30-11:30
- Welcome & intros
- Assessment orientation
- Farm tour
- Team data collection
- Regroup to discuss recommendations

Farm 2  11:30-4:00
- Working lunch, complete SWOT for Farm 1
- Farm tour
- Data collection
- Regroup to discuss and prep recommendations
- Complete SWOT for Farm 2
1. SWOT Analysis of Farm's Climate Change Resilience

Farm Name: ______________________________
Type of farm: __________________________

<table>
<thead>
<tr>
<th>Strengths</th>
<th>Weaknesses</th>
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<tr>
<th>Opportunities</th>
<th>Threats</th>
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### 2. Assessing Strategies to Build Your Climate Change Resilience

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<tr>
<th>Impact on...</th>
<th>Infrastructure Resilience</th>
<th>Natural Resource Resilience</th>
<th>Your (and Crew/Family's) Resilience</th>
<th>Production Resilience</th>
<th>Finances</th>
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<tbody>
<tr>
<td></td>
<td>(Land, buildings, equipment, etc.)</td>
<td>(Croppland, forests, wetlands, rivers, etc.)</td>
<td>(Skills, labor, communication, quality of life)</td>
<td>(Types of enterprises, timing, markets)</td>
<td>Costs</td>
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<td>Strategy 1:</td>
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<td>Strategy 2:</td>
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<td>Strategy 3:</td>
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### 3. Climate Change Resilience Action Plan

**Strategy 1:**

<table>
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<tr>
<th>To Do</th>
<th>Who will do this?</th>
<th>When will this happen?</th>
<th>Resources needed</th>
<th>Sources of funding, information, etc.</th>
<th>Barriers</th>
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**Comments:**
Logistics

- Lunch choices
  - A: Meat
  - B: Vegetarian
  - C: Gluten free meat
  - D: GF vegetarian

- File sharing preferences?
  - A: Email
  - B: Shared website (Dropbox or Google docs)
  - Other?
Reading:
- Farm 1 Packet
- Farm 2 Packet
- Agriculture section of Vermont Climate Assessment
  - All documents will be e-mailed to participants soon

Optional Reading:
- Research Brief of 2012 VT Stakeholder Survey