Farming and Climate Change: Working Toward a Resilient Agriculture

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Upper Valley Adaptation Workgroup
Northeast Annual Precip.: +4.15”/century (1895-2013)

Last 30 yrs:
Northeastern VT: 9”
Western VT: 7”
Southeastern VT: 5”
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%
Trend in 1-day Very Heavy Precipitation (1958-2010)
‘In general, erosion increases at a rate 1.7 times annual rainfall increases’
(Nearing et al., 2004)
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)
How does climate change impact NE crops?

- 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…
  - Increased irrigation demand
Building healthy, functioning, and productive soils

Three principles of resilient soils:

1. Soil cover (preferably living!)
2. Increasing organic matter
3. Reduced disturbance/soil structure

www.nrcs.usda.gov
Increased need for more, and efficient, irrigation

(McDonald and Girvetz, 2013)
Subsurface Drainage

Photo: Dwight Burdette.
Other Agricultural Adaptations

Diversification

- Crops
- Land
- Enterprises
- Markets
- Income Sources
- Social Networks

Photo: Debbie Roos, NC State Extension
Soil Management

- Climate Adaptation
- Water Quality Improvement
- Mitigation Opportunities

(Photo: Kirsten Workman)
How does agriculture impact climate change? (US)

U.S. agricultural greenhouse gas sources (Adapted from Archibeque et al., 2012)

8% of Total GHG Emissions
Elsewhere…

U.S. Drought Monitor
California

October 6, 2015
(Released Thursday, Oct. 8, 2015)
Valid 8 a.m. EDT

Drought Conditions (Percent Area)

<table>
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<th>None</th>
<th>D0-D2</th>
<th>D2-D4</th>
<th>D4-D6</th>
<th>D6-D8</th>
<th>D8-D10</th>
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<td>Current</td>
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<td>98.96</td>
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<td>Last Week</td>
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<td>67.33</td>
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<td>3 Months Ago</td>
<td>0.14</td>
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<td>67.33</td>
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<td>68.12</td>
<td>64.34</td>
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<td>67.33</td>
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<td>Start of</td>
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<td>68.12</td>
<td>64.34</td>
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<td>32.21</td>
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<tr>
<td>Water Year</td>
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<td>One Year Ago</td>
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</tr>
</tbody>
</table>

Intensity:
- D0: Abnormally Dry
- D1: Moderate Drought
- D2: Severe Drought
- D3: Extreme Drought
- D4: Exceptional Drought

The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.

Author:
David Miskus
NOAA/NWS/NCEP/CPC

http://droughtmonitor.unl.edu/
Summary: Adaptation Principles for NE Farms

1. Manage soil differently
2. Manage water differently
3. Variety/crop/breed/enterprise selection
4. Diversification in many ways (enterprises, crops, markets, income, networks, land base, etc.)
5. Investment in infrastructure (high tunnels, land, ventilation, equipment, structures)
6. Financial risk management tools (i.e., building financial cushion, crop insurance)