Cornell Climate Smart Farming: Integrating Research, Stakeholder Engagement, Modeling and Outreach for Climate Resilient Farming and Rural Communities

Allison M. Chatrchyan, Ph.D.
Cornell Institute for Climate Change and Agriculture
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Climate Smart Farming in New York and the Northeastern US

The Northeast region is home to:

• @ 22% of US population
• 175,000 farms
• Comprising 21% of the region’s landmass
• Urban and rural, varied geography
• Producing agricultural commodities worth more than $21 billion/year
• Increasing risks & potential opportunities: need to help farmers prepare.
Challenges:

- Temperature: Increased frequency of high temperature causes heat stress for both livestock and crops
- Water: Too much or too little; lack of efficient water management
- Pest, Disease & Weed Pressure
- Climate change much more complicated than just “warming”: Uncertainty, Variability & Extremes

But also Opportunities:

- Heat stress challenges less severe than some other regions
- Relative to other regions: we have water!
- Longer growing seasons allow farmers to explore with different crop varieties and double-cropping
- Close proximity to many markets: 22% U.S. population
• Cornell Institute: Formed 2013
• 140+ Cornell researchers working on climate change
• Vision: Empower farmers and their communities to respond to increasing climate variability and change, take advantage of opportunities, and lessen their impacts on the climate.
• Climate Smart Farming Program and Extension Team: Launched 2015
• Partnerships, Research & Information Clearinghouse

climateinstitute.cals.cornell.edu/
STAKEHOLDER-DRIVEN RESEARCH AND OUTREACH

CUTTING-EDGE RESEARCH
- Climate Change Data and Impact Assessments
- Agroecological Research
- Stakeholder Surveys & Interviews

EXTENSION PROGRAM OUTREACH
- Climate Smart Farming Extension Team
- Training and Outreach
- Farmer Videos and Case Studies
- Farmer Forum to Share practices

DECISION SUPPORT TOOLS
- AgroClimate Models & Forecasts
- Web-based Tools
- Adaptation & Mitigation Practices

FARMER-COMMUNITY ENGAGEMENT
- Farmer Advisory Panel
- Pilot Testing Materials & Tools
- Partnerships with Agencies and NGOs

CLIMATE SMART FARMING
- Increased Agricultural Resiliency
- Reduced GHG Emissions
- Increased Sustainable Agricultural Productivity
Listening to Stakeholders

- Farmer Advisory Committee
- Climate Smart Farming Stories:
  - Multimedia Project: NYS Farmers in their Own Words
- Focus Groups & Surveys:
  - Focus Groups with Producers & Advisors: with Penn State and UW Madison (2016-17 with USDA NE Hub and Dairy CAP)
Program Goals
Cornell Climate Smart Farming

• Increase farm resiliency to extreme weather and climate variability through adoption of BMPS for climate change adaptation.

• Increase energy efficiency and renewable energy capacity to reduce operating costs and GHG emissions.

• Sustainably increase agricultural productivity, farming incomes, and food security.
CLIMATE CHANGE & AGRICULTURAL IMPACTS

- Agriculture in the Northeast is characterized by a diversity of products and production systems, scales of operations, and landscapes.
- Farmers need a variety of specific practices and tools to help them with climate change adaptation and mitigation.

<table>
<thead>
<tr>
<th>Agricultural Products</th>
<th>Climate Change Impacts</th>
<th>Toolkit of Adaptation &amp; Mitigation Practices</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dairy and Livestock</td>
<td>Heat stress, water impacts from heavy precipitation</td>
<td>Increased cooling, energy efficiency and renewables, water management</td>
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<tr>
<td>Vegetables and Field Crops</td>
<td>Disease, weed and pest pressure, flooding and short-term drought, longer growing seasons, heat stress</td>
<td>Integrated pest management, drainage or irrigation, soil health, cropping systems, shifting dates and new varieties</td>
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<tr>
<td>Tree Fruit, Berries, and Grapes</td>
<td>Unexpected freeze, short-term drought, reduced winter chill</td>
<td>Monitoring weather and protecting crops, siting, soil health and cropping systems, new varieties</td>
</tr>
<tr>
<td>Maple Syrup</td>
<td>Changing seasons, variable weather, contamination, tree health</td>
<td>Earlier tapping, new technologies, shifting production</td>
</tr>
</tbody>
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Infrastructure @ Cornell

- **Data & Models**: Northeast Regional Climate Center (NOAA)
- **Climate Change, Agriculture, Ecosystem, Community & Extension Expertise**: CALS Researchers, CSF Extension Team, Farmer Advisory Committee
- **Computer Programmers & Website Design**
- **Support**: Small, Short-Term Funds (USDA Federal Formula Hatch & Smith Lever Funds, and the New World Foundation funds): Need for long-term, core funding!
How is the changing climate affecting your farm?

Climate Smart Farming Decision Tools
Cutting-edge tools to help farmers manage climate risk.

CSF Growing Degree Day Calculator
Growing Degree Days (GDD) are a measure of heat accumulation used to predict plant development and pest/disease outbreaks.

CSF Freeze Risk Tools
Graphs hardness vs. observed temperature for several crop varieties over a specific date range to determine freeze risk.

CSF Irrigation Scheduler
Monitor current and forecasted soil water deficit at your location to allow smart scheduling of irrigation.

Climate Normals - Northeast Regional Climate Center
Climate normals are an arithmetic average of a variable such as temperature over a prescribed 30-year period.
Climate Smart Farming Extension Team
Let us help you increase your farm's resiliency and sustainability.

Dr. Kimberley Morrill, Dairy Management
Dr. Kitty O'Neil, Field Crops & Soil Health
Jesse Strzok, Agricultural Economics
Laura McDermott, Small Fruit
Dr. Darcy E.P. Telenko, Vegetables and Integrated Pest Management
Luke Haggerty, Viticulture & Enology

http://climatesmartfarming.org/climate-smart-farming-extension-team/
http://climatesmartfarming.org/resources/
Climate Smart Farming Tools

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U.S. Drought Monitor
The map is based on measurements of climatic, hydrologic and soil conditions as well as reported impacts and observations from more than 350 contributors around the country.

NOAA Seasonal Outlook - Precipitation
A seasonal forecast is the best available prediction of what our climate will be like in the next few months.

NOAA Seasonal Outlook - Temperature
A seasonal forecast is the best available prediction of what our climate will be like in the next few months.

USDA Plant Hardiness Map
The USDA Plant Hardiness Zone Map is the standard by which gardeners and growers can determine which plants are most likely to thrive at a location.

Adapt-N Nitrogen Management Tool

COMET-Farm GHG Accounting Tool

http://climatesmartfarming.org/tools/
CSF Growing Degree Day (GDD) Tool

• GDD:
  – Measures heat accumulation (development in plants is temperature-dependent)

• GDD Calculation:
  – (Average of Daily Min and Max Temp) – (Base Temp)

• You can use this tool:
  – To predict important stages in plant growth
  – To predict pest and disease outbreaks
  – In planning for and response to seasonal variability
CSF GDD Tool

• Using the Tool:
  1. Input location, planting date, and GDD threshold
  2. Toggle between graphs of observed data and seasonal outlooks
If you use the GDD tool, please fill out the survey to give us your feedback:
https://cornell.qualtrics.com/jfe/form/SV_3y15GKX1SEzJAS9
CSF Irrigation Scheduler

Irrigation scheduling is used by farmers and irrigation system managers to determine the optimum frequency and duration of watering that is necessary to avoid plant stress. The Cornell Irrigation Scheduler estimates soil water content within a crop’s effective root zone to inform decision makers about current and forecasted water deficits. An initial prototype of this tool has recently been integrated into the site for the 2016 growing season. Additional features and enhancements are planned while advancing this tool out of the prototype stage. Your feedback is appreciated as the tool versions progress.

How do I use this tool?
1. Input your location by entering your address or geographical coordinates.
2. Use the control panel on the left to input your soil type.
3. Use the control panel on the left to input your crop type.
4. Use the control panel on the left to provide your planting date (for annuals) or ‘greenup’ date (for perennials, when initiation of new leaves occurs).
5. Use the control panel on the left to provide your last irrigation date.
6. Once this information is set, your water deficit charts will appear.
7. Toggle between the tabs of “water deficit results” and “next 30 days” to view charts.
Create a Free Account: Get Answers, Share Information!
climatesmartfarming.org/forum/
CSF Farmer Videos and Video Tutorials for Tools & the Site:
http://climatesmartfarming.org/videos/
Questions? Thank You!

Allison M. Chatrchyan, Ph.D.
Director, Cornell Institute for Climate Change and Agriculture
Cornell University, Ithaca, NY
Tel: 607-254-8808
Email: amc256@cornell.edu
www.climatesmartfarming.org