Responding to Climate Change Impacts to Agriculture: The Cornell Climate Smart Farming

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Cornell University

MARRAKECH COP22 | CMP12 | CMA1
UN CLIMATE CHANGE CONFERENCE

Cornell Climate Change Capacity

Research, Teaching and Extension:

- New/Adapted Crops
- Pests and IPM
- Animal Agriculture
- Climate Modeling/Extreme Weather
- Communicating Climate Change
- Crop Yield Risks
- Carbon Sequestration & Policy
- Northeast Regional Climate Center
- Water Management
- Renewable/Bioenergy
- Nutrient Management
- Stakeholder Risks & Needs
- Teaching: Climate Change Minor and Courses

And Many Partnerships: NYS Ag and Markets, DEC, NRCS, SWCC, USDA Climate Hubs, NGOs and Foundations.

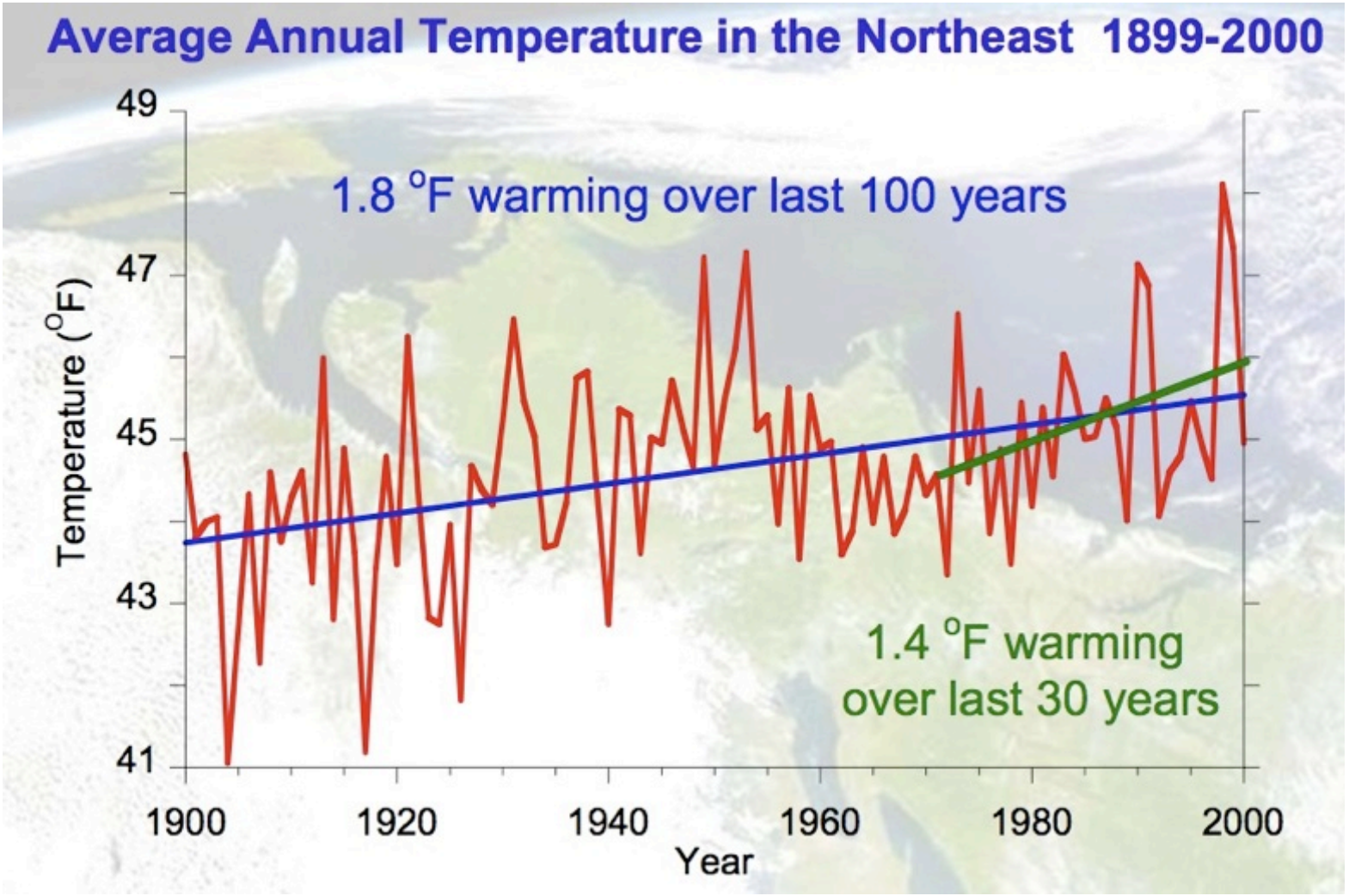
CICSS

Cornell Institute for Climate Smart Solutions

- Formed in 2013
- Working toward resilient and sustainable agricultural, ecological, and social systems in the face of a rapidly changing climate
- Research, Extension Outreach and Partnerships
- Launched Climate Smart Farming (CSF) Program and CSF Extension Team in 2015

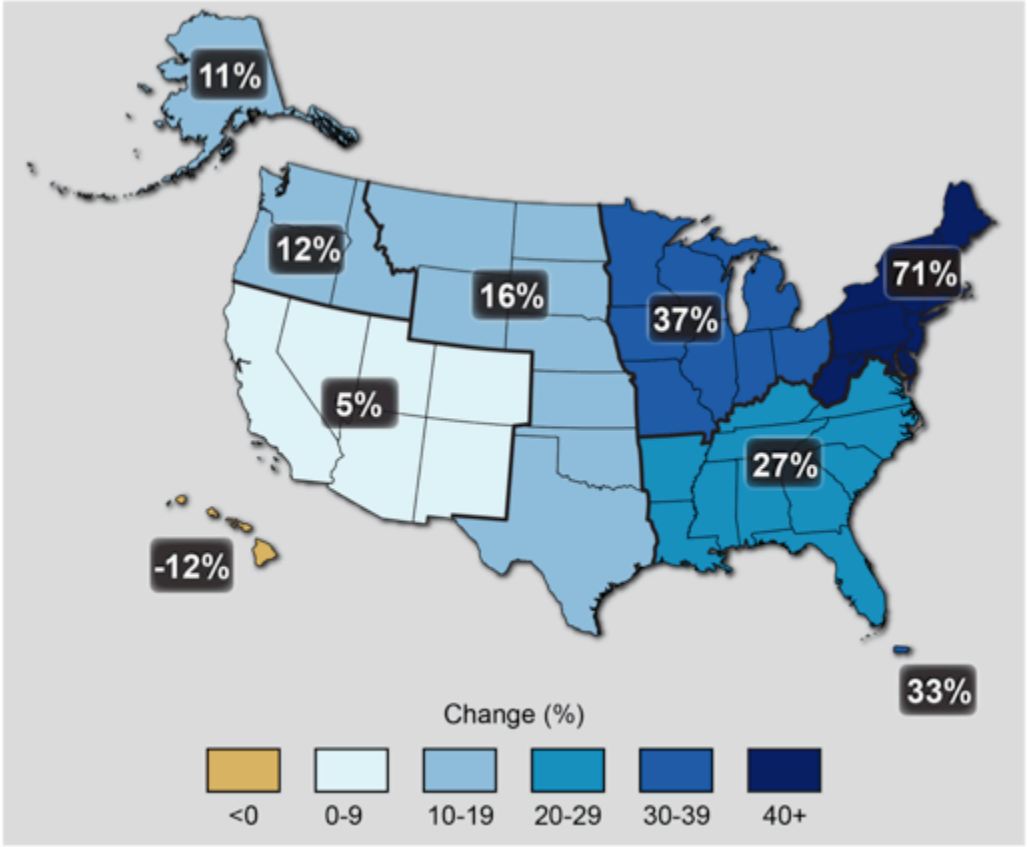
climateinstitute.cals.cornell.edu/

Temperature

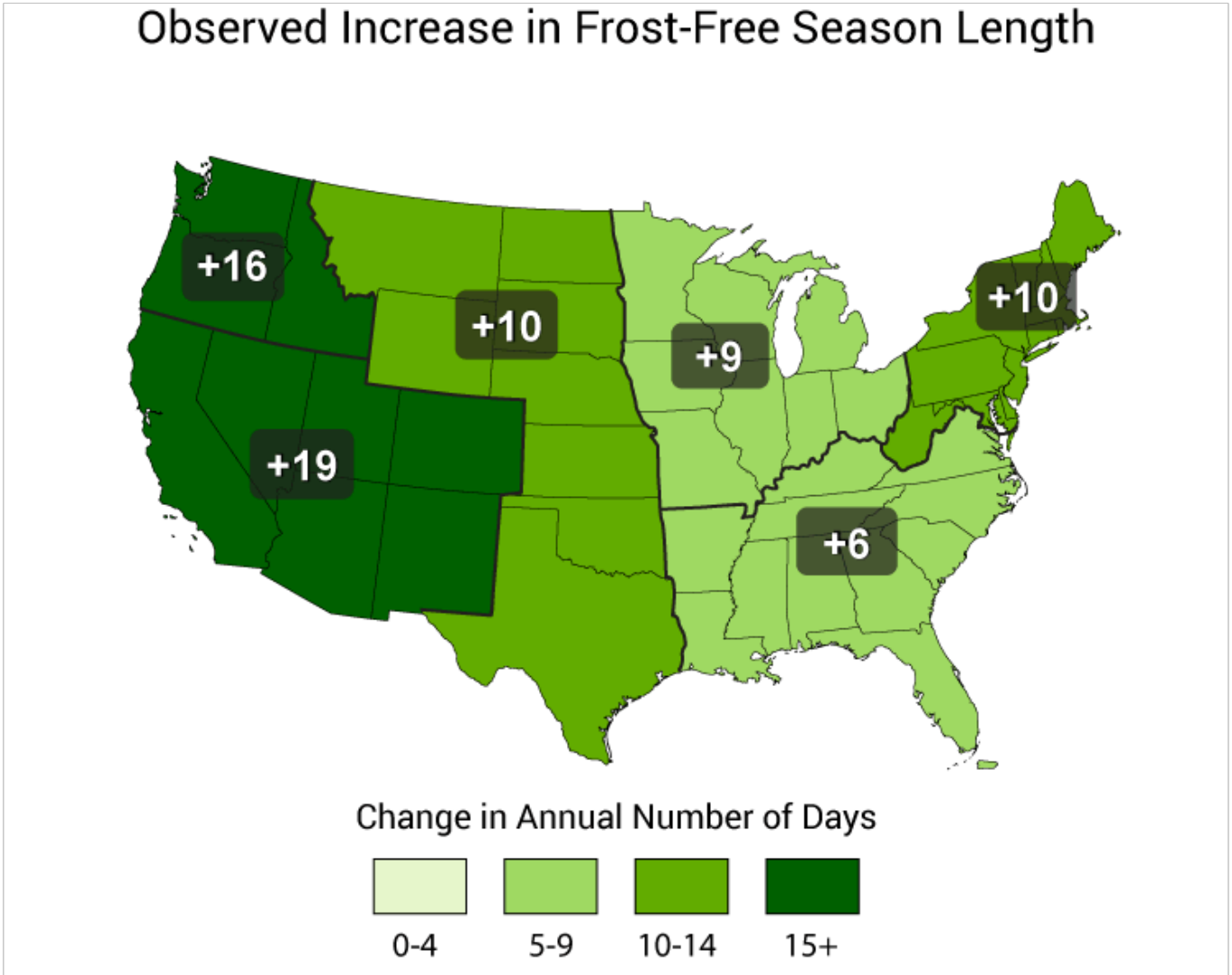


Extreme Precipitation

- Observed Trends in 1-day Very Heavy Precipitation (1958 to 2012)
- The Northeast has had the greatest increase in heavy precipitation in the United States.

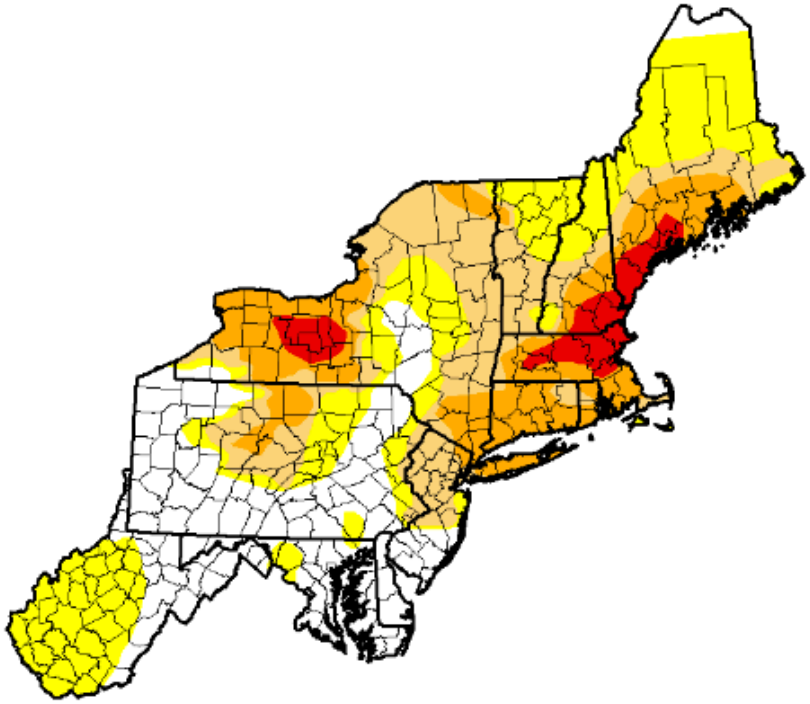


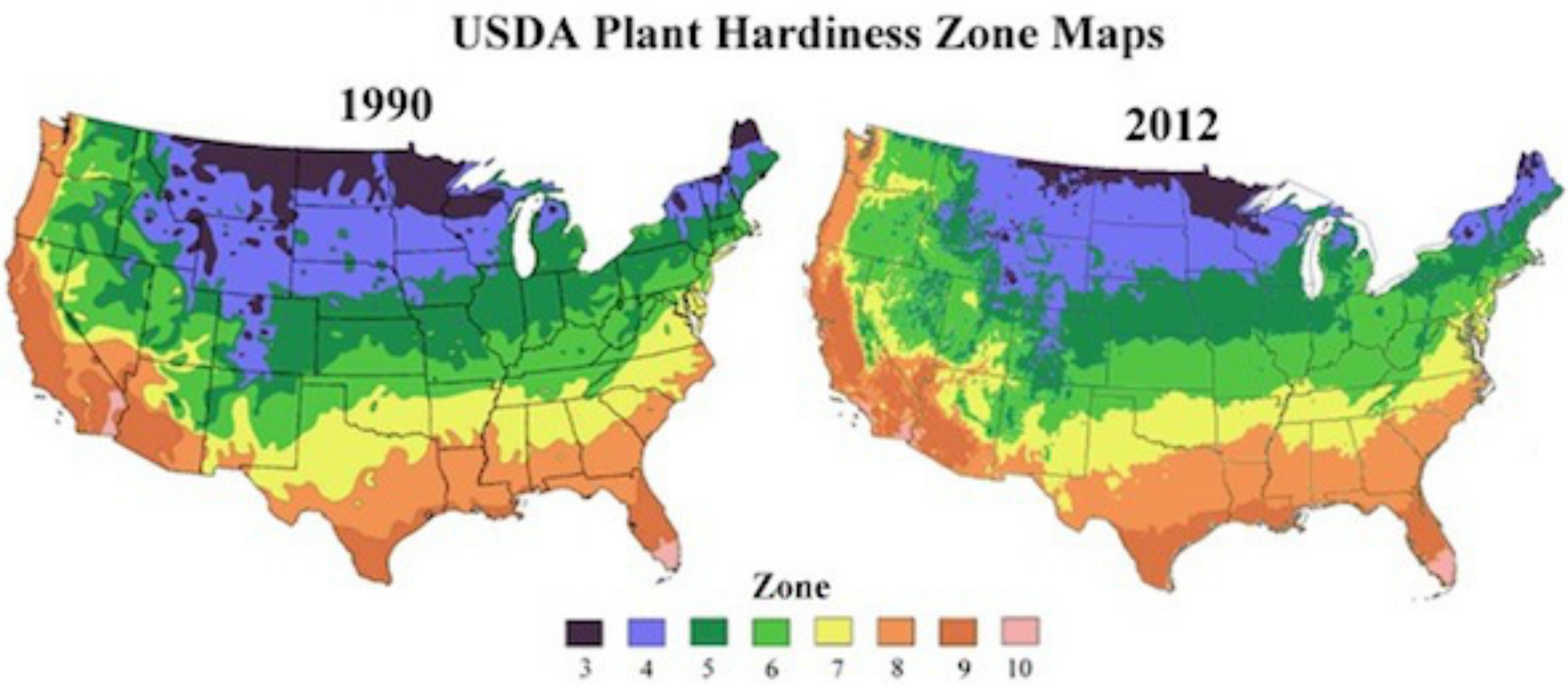
Changes in Seasons



Short Term Drought

- As of Oct 11th, 72% of the NE is abnormally dry
- 5% is in extreme drought(Including Tompkins County)
- Short-term drought is a part of climate variability we must be prepared for





Red River Valley, Manitoba

2005-8:, 20,000 acres grain

Today: 1.1 million & expanding

Phenological Responses:

Grapes are blooming 6 days earlier

Apples are blooming 8 days earlier than they were in the 1960s

Lilacs are blooming 4 days earlier

Spring arrival dates of 103 migrant birds in NY and MA arriving 4 to 13 days earlier 1951-1993 compared to 1903-1950 (Butler 2003)

[Source: Wolfe DW et al. 2005. Internat J Biometeor 49:303-309.]
National Phenology Network: http://www.usanpn.org

Climate Change and Northeast Agriculture

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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

Reducing GHG Emissions: Mitigation in Agriculture

- GHG Accounting and Reductions
- Energy Conservation and Fuel efficiency
- Renewable Energy
  - Biomass
  - Solar and wind power
  - Anaerobic Digestion
- Nutrient management
- Reduced tillage, cover crops
- Carbon Sequestration: Forest and Soils

CLIMATE CHANGE & AGRICULTURAL IMPACTS

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- 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.

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

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Climate Smart Farming Program Goals

- Sustainably increase agricultural productivity, farming incomes, and food security
- Increase energy efficiency and renewable energy capacity to reduce operating costs and GHG emissions
- Increase farm resiliency to extreme weather and climate variability through adoption of BMPs for climate change adaptation.

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US Farmer CC Perceptions

- US Ag Producers: Belief in CC ranged between 58% and 80% (VT study); on average 65%. Only 31% farmers believed that CC is mostly or entirely human-caused.
- US General Public: 73% of Americans believe CC is occurring, and 33% agree it is mostly or entirely human caused.
- Of ten studies in sample, farmer belief in CC appears to be lowest to highest from the Southeast, Southwest, Midwest, Northeast (Caveat: small sample sizes, not regionally representative studies)
- Farmers still high degree of uncertainty about CC; human causation.
- Need for further research – regionally representative studies with larger sample size!!

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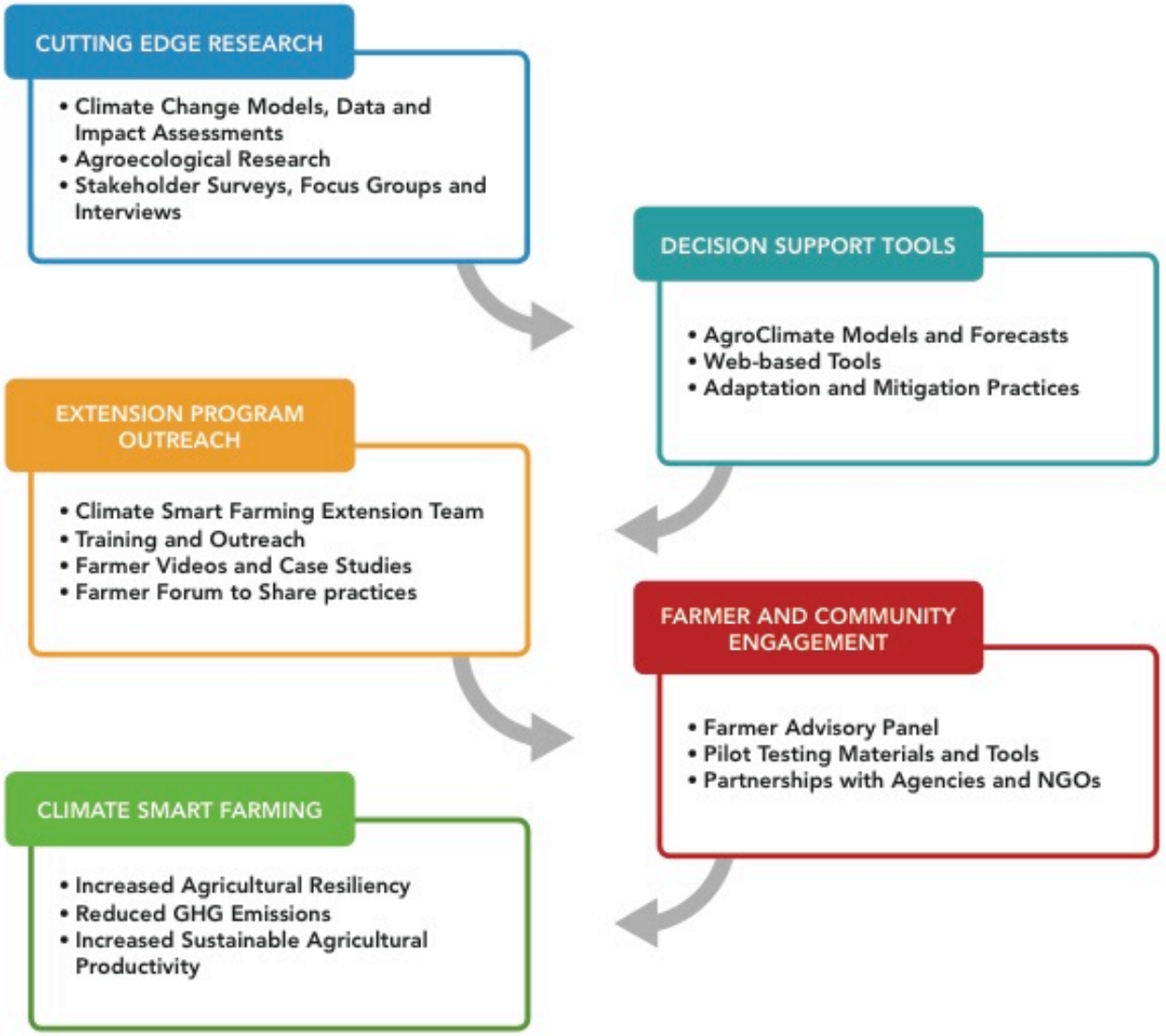
Stakeholder-Driven Research & Extension



www.climatesmartfarming.org

Extension Team

Dr. Kitty O'Neil, Field Crops & Soil Health

Dr. Kim Morrill, Dairy Management

Luke Haggerty, Viticulture

Laura McDermott, Small Fruit

Dr. Darcy Telenko, Vegetables & IPM

Jesse Strzok, Ag Economics

Cornell Cooperative Extension System: 1000s Educators/Every County:
http://climatesmartfarming.org/climate-smart-farming-extension-team/

Climate Smart Farming Resources

Cornell Institute for Climate Smart Solutions

http://climatesmartfarming.org/resources/

CSF Decision Support Tools

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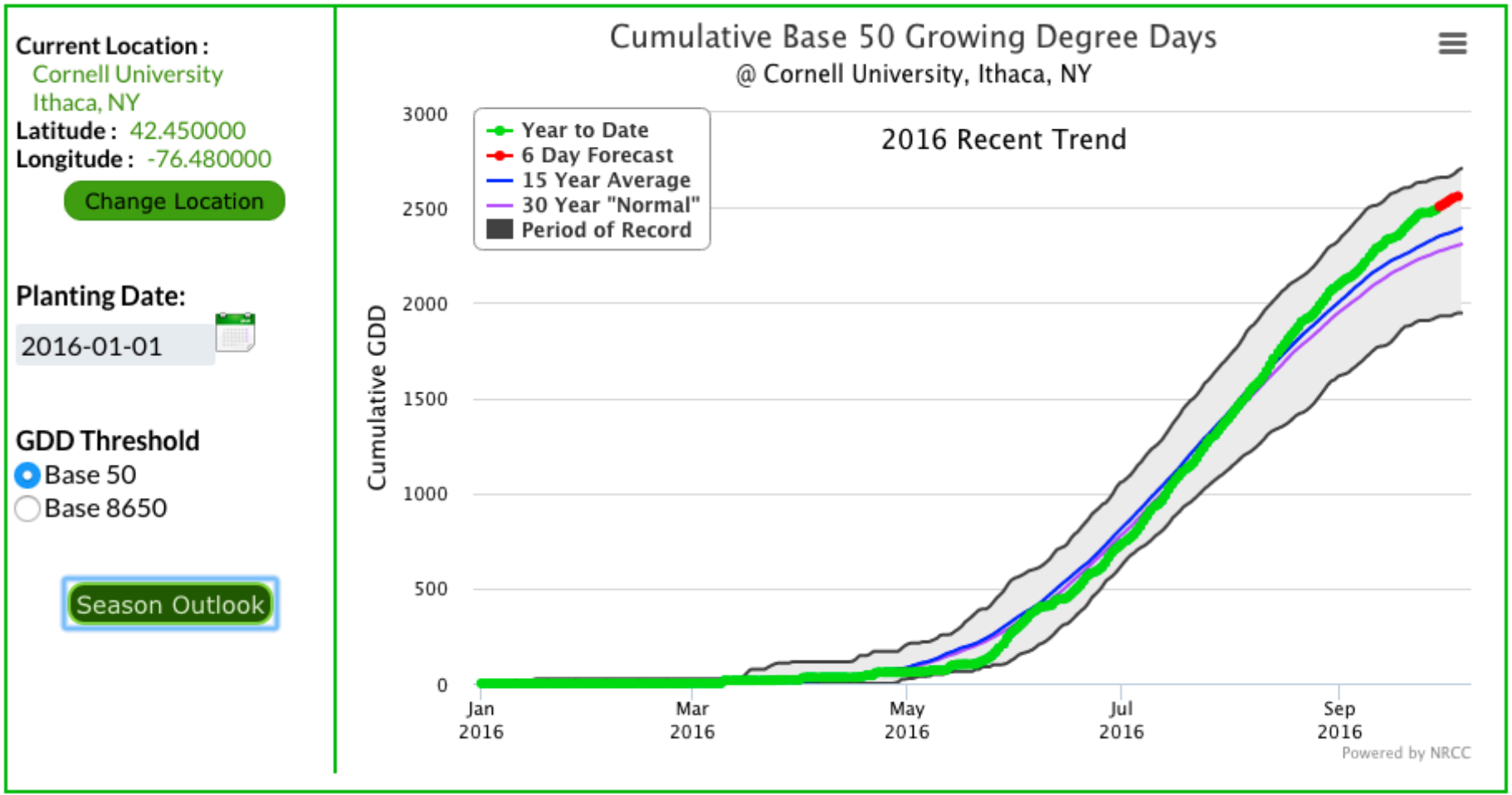
http://climatesmartfarming.org/tools/

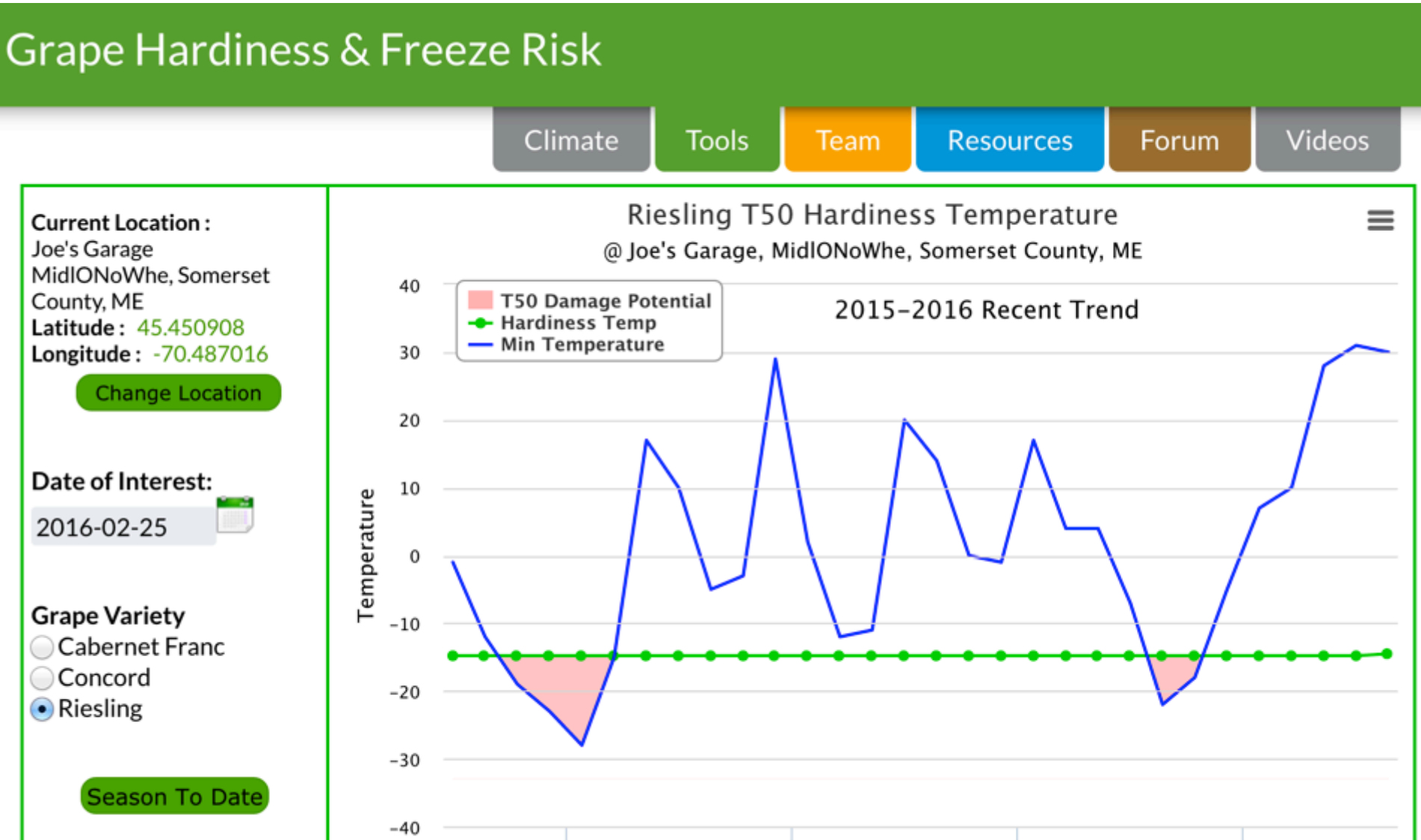
Growing Degree Day Tool

- GDD Measures heat accumulation over the season
- Tool can be used to predict important stages in plant growth and predict pest and disease outbreaks



Freeze Risk Tools

- Grape and Apple



Water Deficit Calculator

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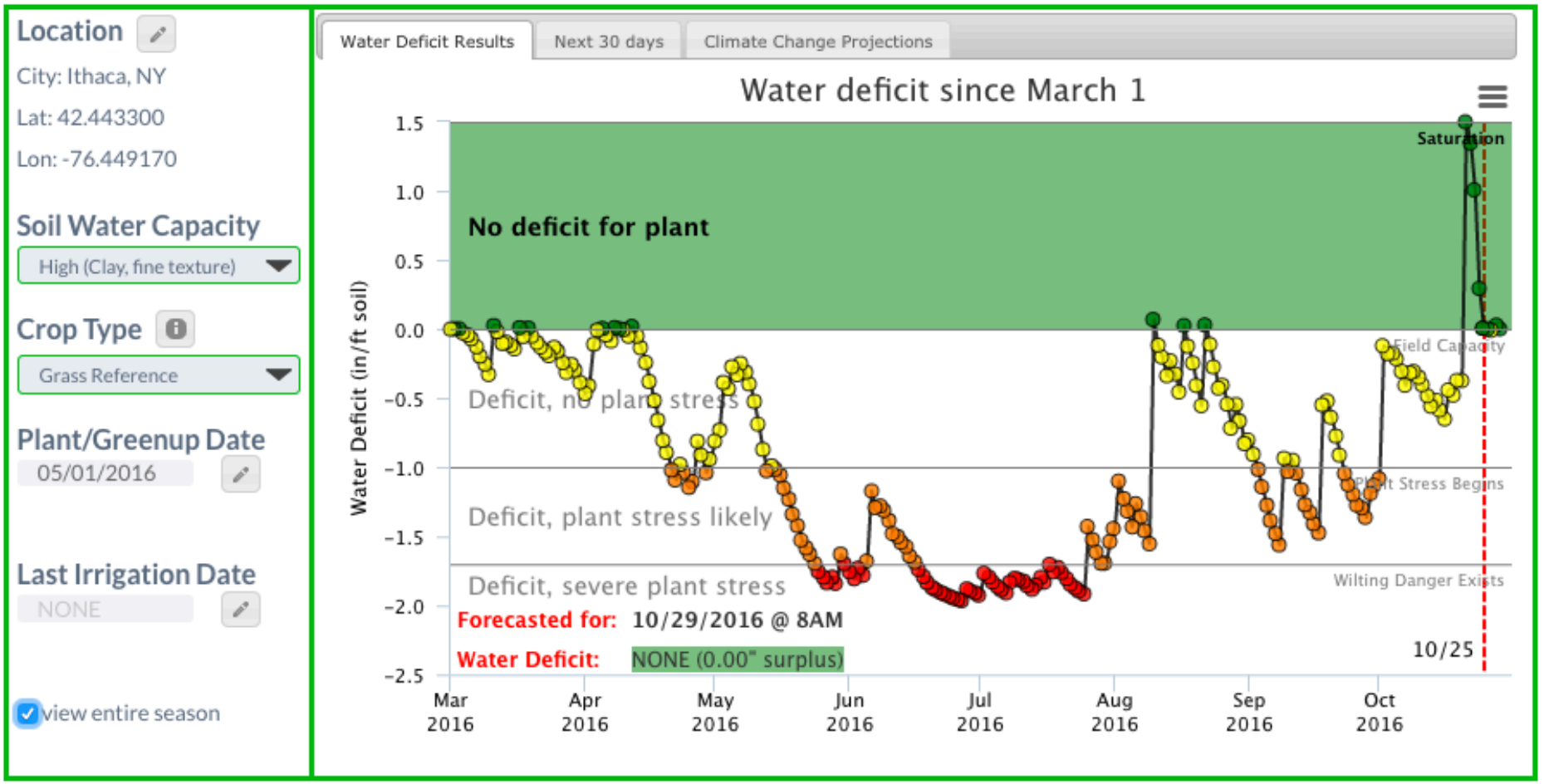
- Estimates effective root zone soil water content to inform decision makers about current and forecasted water deficits
- Uses precipitation, evapotranspiration, drainage, and runoff



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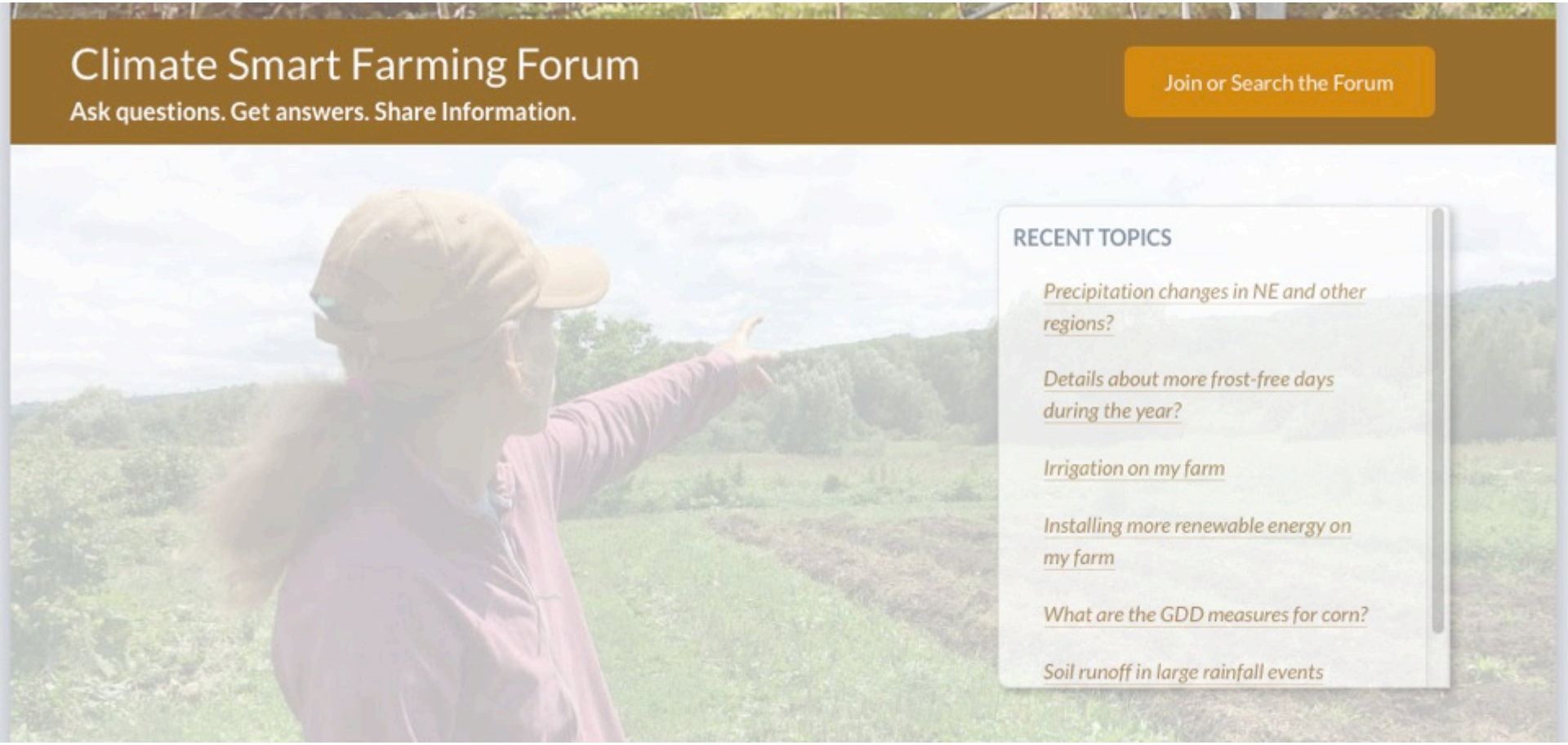

Create a Free Account: Get Answers, Share Information!

climatesmartfarming.org/forum/

Resources

- Cornell Institute for Climate Smart Solutions: http://climateinstitute.cals.cornell.edu
- Cornell Climate Smart Farming Program: www.climatesmartfarming.org
- Cornell Climate Change Resources: www.climatechange.cornell.edu
- US National Climate Assessment: http://nca2014.globalchange.gov/

Questions? Thank You!

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