Cornell Climate Smart Farming:

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

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June 30, 2016

Cornell University

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.

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

CICCA

Cornell Institute for Climate Change & Agriculture

- 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

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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)
  - Multi-State Hatch Project: Food, Feed, Fuel, and Fiber: Security Under a Changing Climate: Enhance understanding of how ag stakeholders climate info and tools in their management decision processes (2017-2020).

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

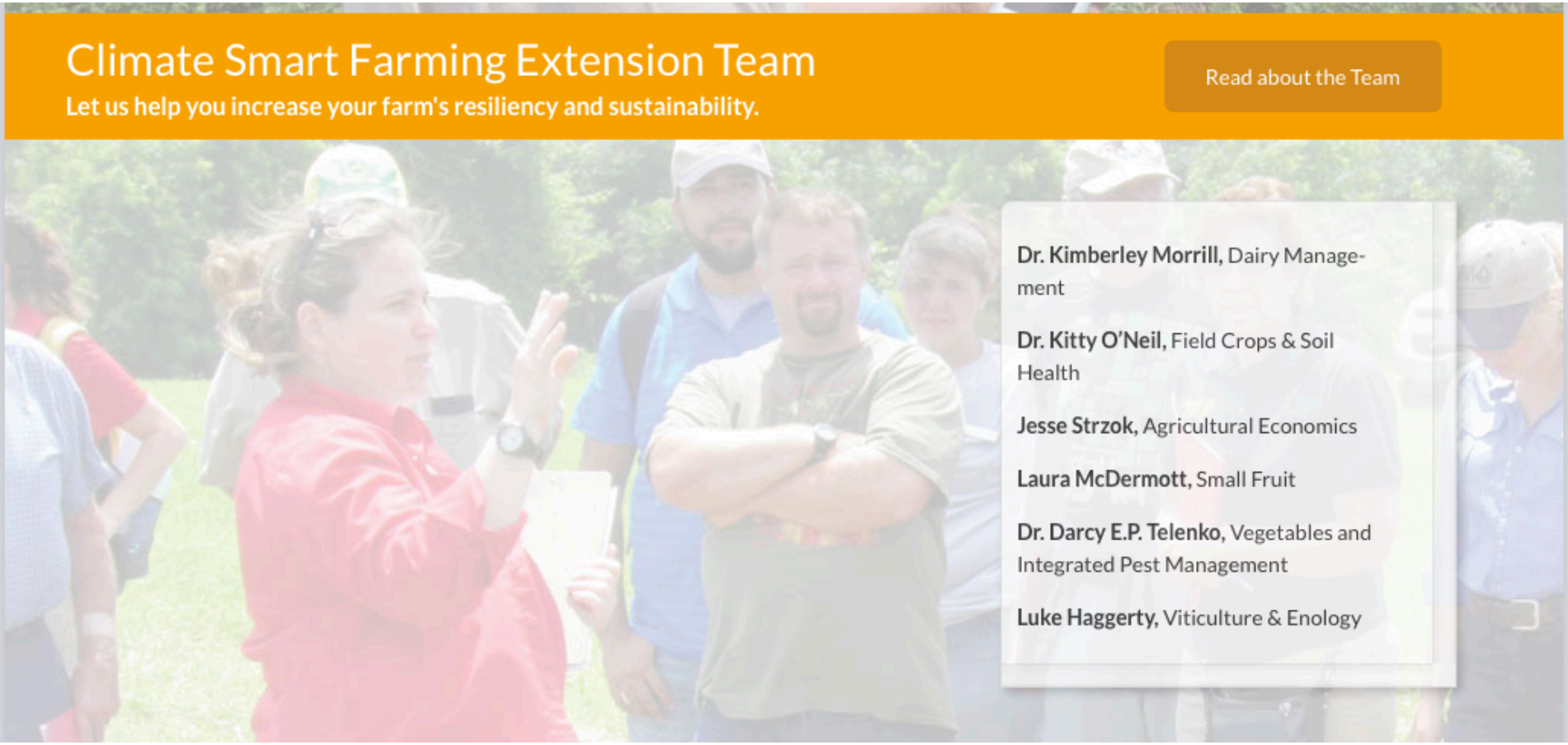
- Agriculture in the Northeast is characterized by a diversity of products and production systems, scales of operations, and landscapes.
- Farmers need a variety of specific practices and tools to help them with climate change adaptation and mitigation.

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

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!

http://climatesmartfarming.org/



http://climatesmartfarming.org/climate-smart-farming-extension-team/

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http://climatesmartfarming.org/resources/

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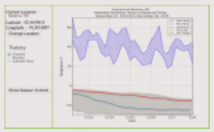
Climate Smart Farming Tools

Climate | Tools | Team | Resources | Forum | Videos

CSF Growing Degree Day Calculator

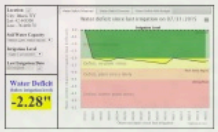
Growing Degree Days (GDD) are a measure heat accumulation used to predict plant development and pest/disease outbreaks.

CSF Freeze Risk Tools



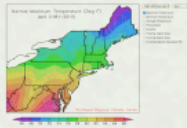
Graphs hardiness vs. observed temperature for several crop varieties over a specific date range to determine freeze risk.

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.

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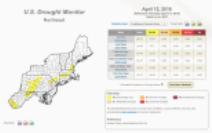
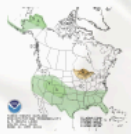
U.S. Drought Monitor



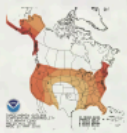
The map is based on measurements of climatic, hydrologic and soil conditions as well as reported impacts and observations from more than 350 contributors around the country.

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

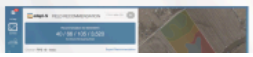


A seasonal forecast is the best available prediction of what our climate will be like in the next few months.

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

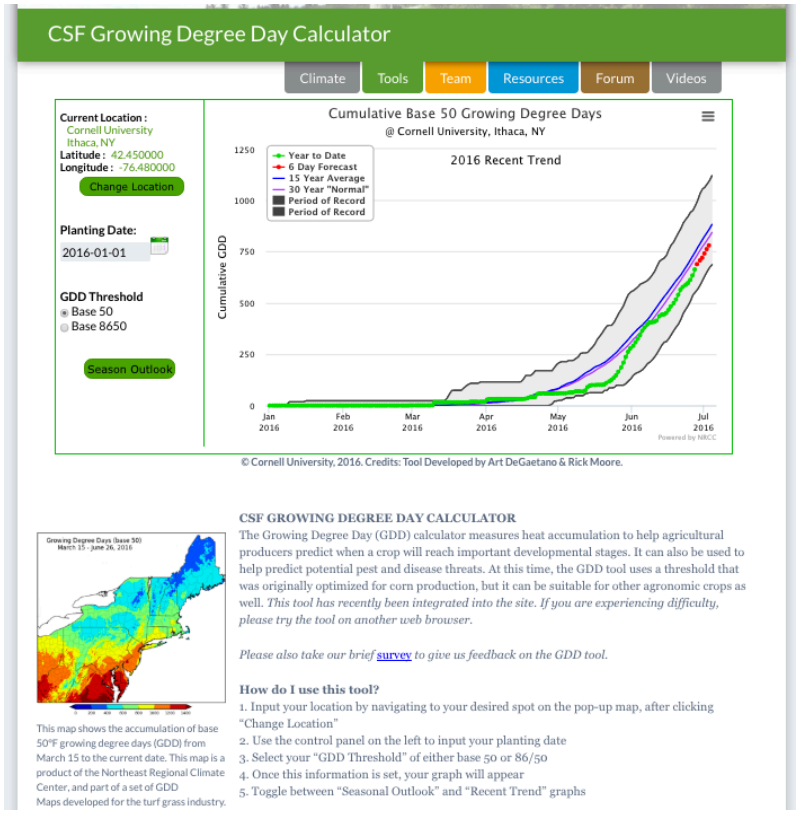
http://climatesmartfarming.org/tools/

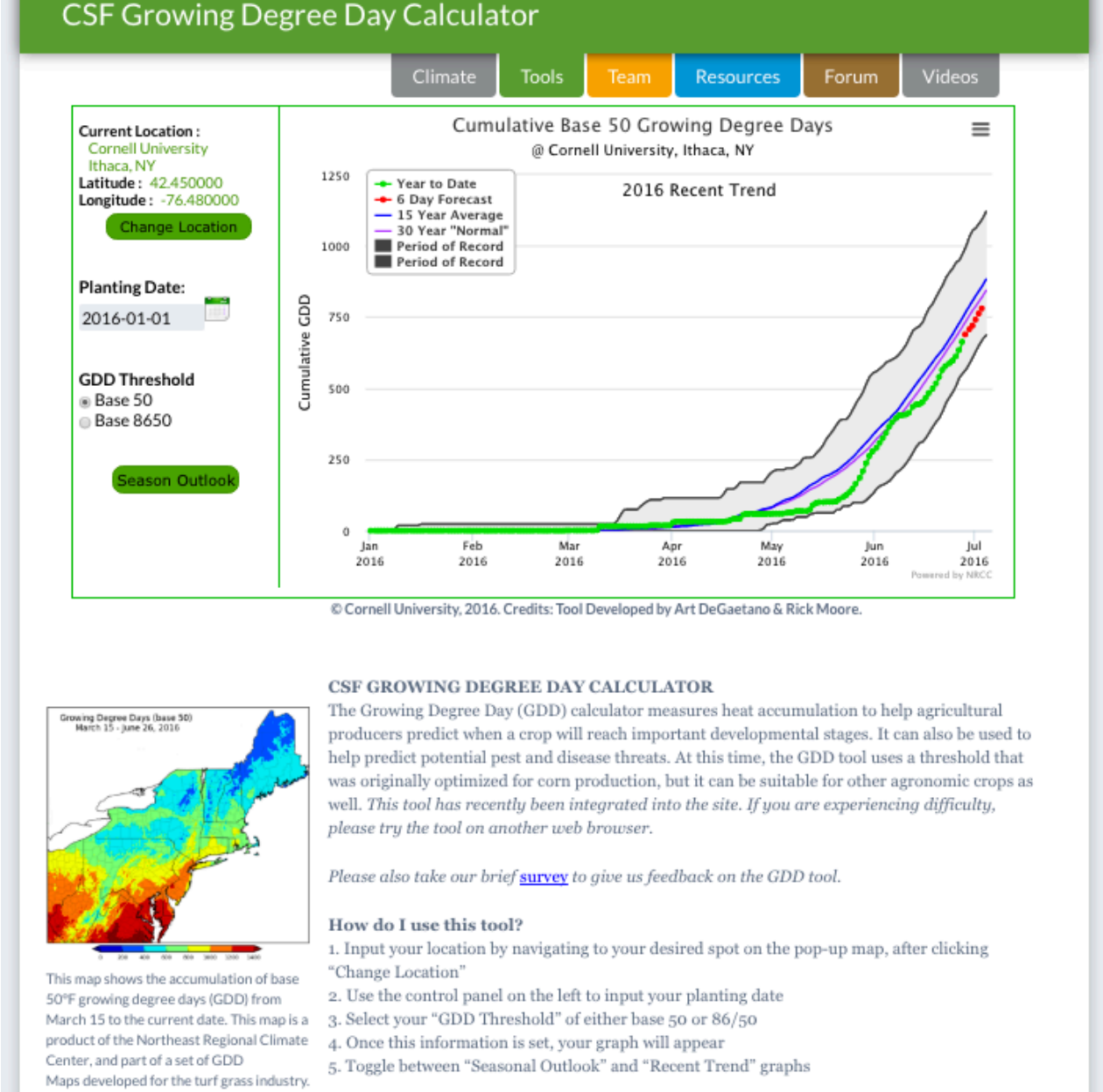
CSF Growing Degree Day (GDD) Tool

- 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

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Location

City: Ithaca, NY
Lat: 42.443300
Lon: -76.449170

Soil Water Capacity

High (Clay, fine texture)

Crop Type

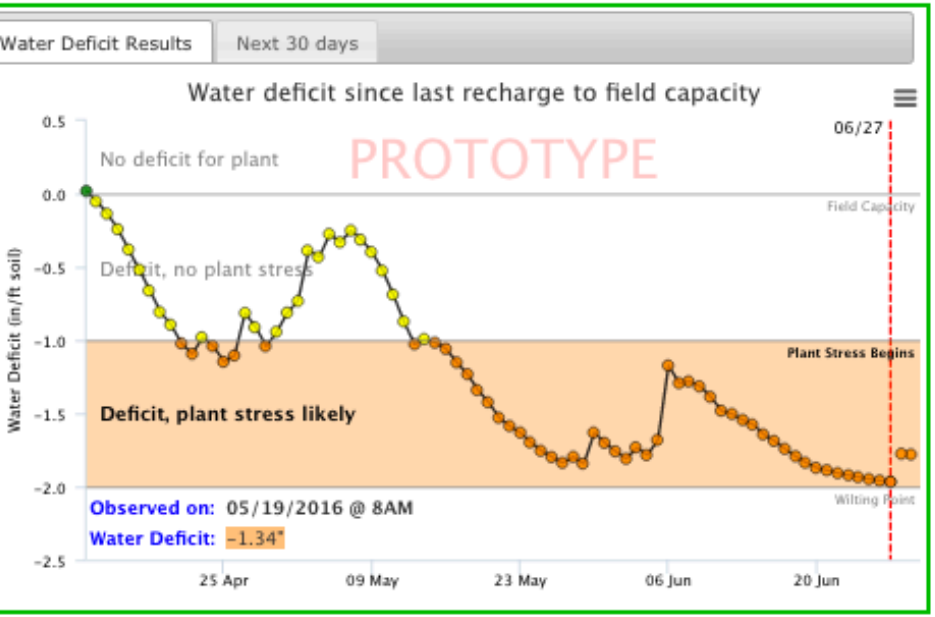
Grass Reference

Plant/Greenup Date

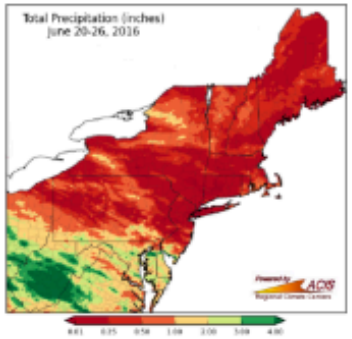
05/10/2016

Last Irrigation Date

03/01/2016



© Cornell University, 2016. Credits: Tool Developer (Art DeGaetano), Programmer (Brian Belcher).



The above map is produced using approximately 700 rain gauge sites to show the total rainfall (inches) observed over the last 7 days in the Northeastern US. This map is a product of the Northeast Regional Climate Center, and part of a set of Moisture Maps developed for the turf grass industry.

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

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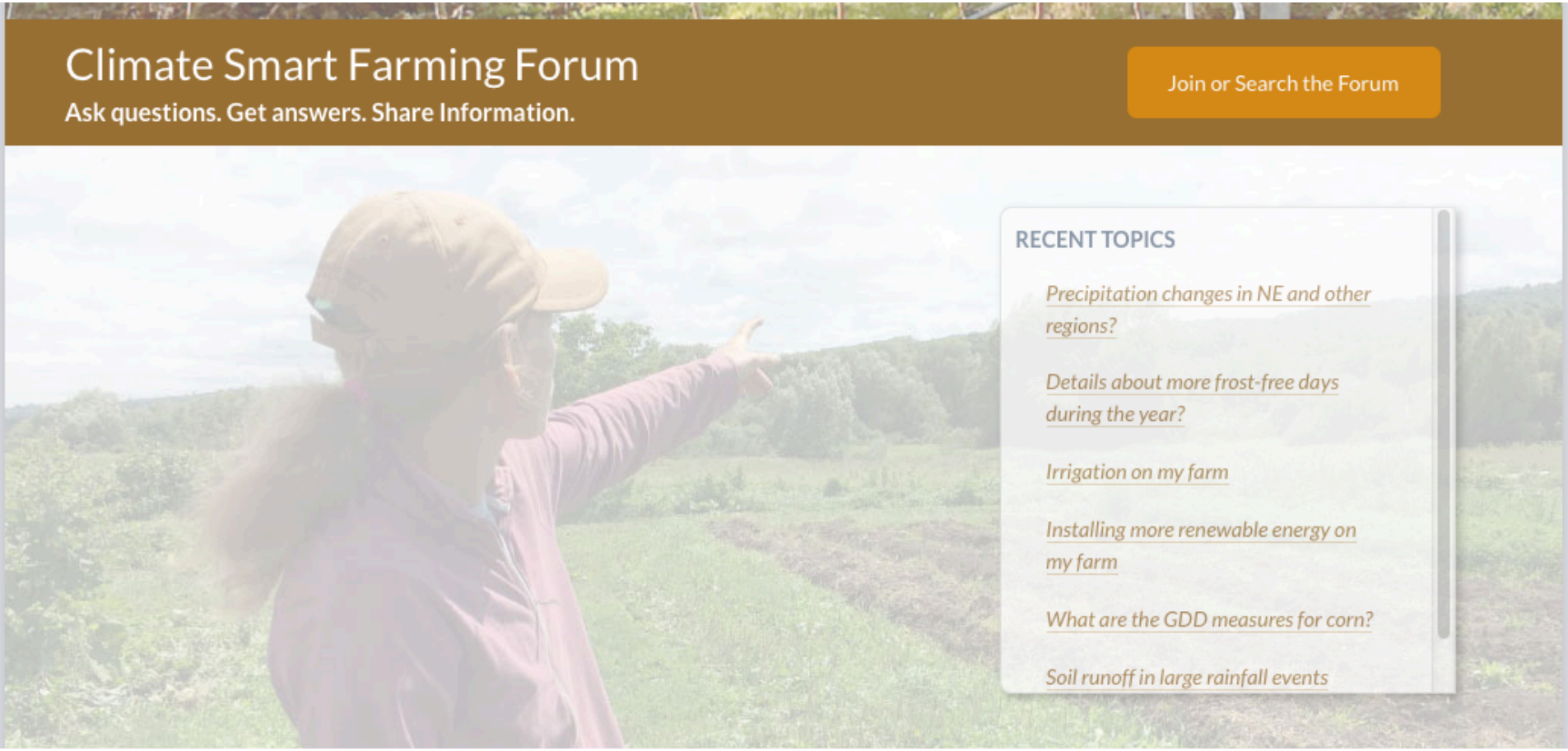
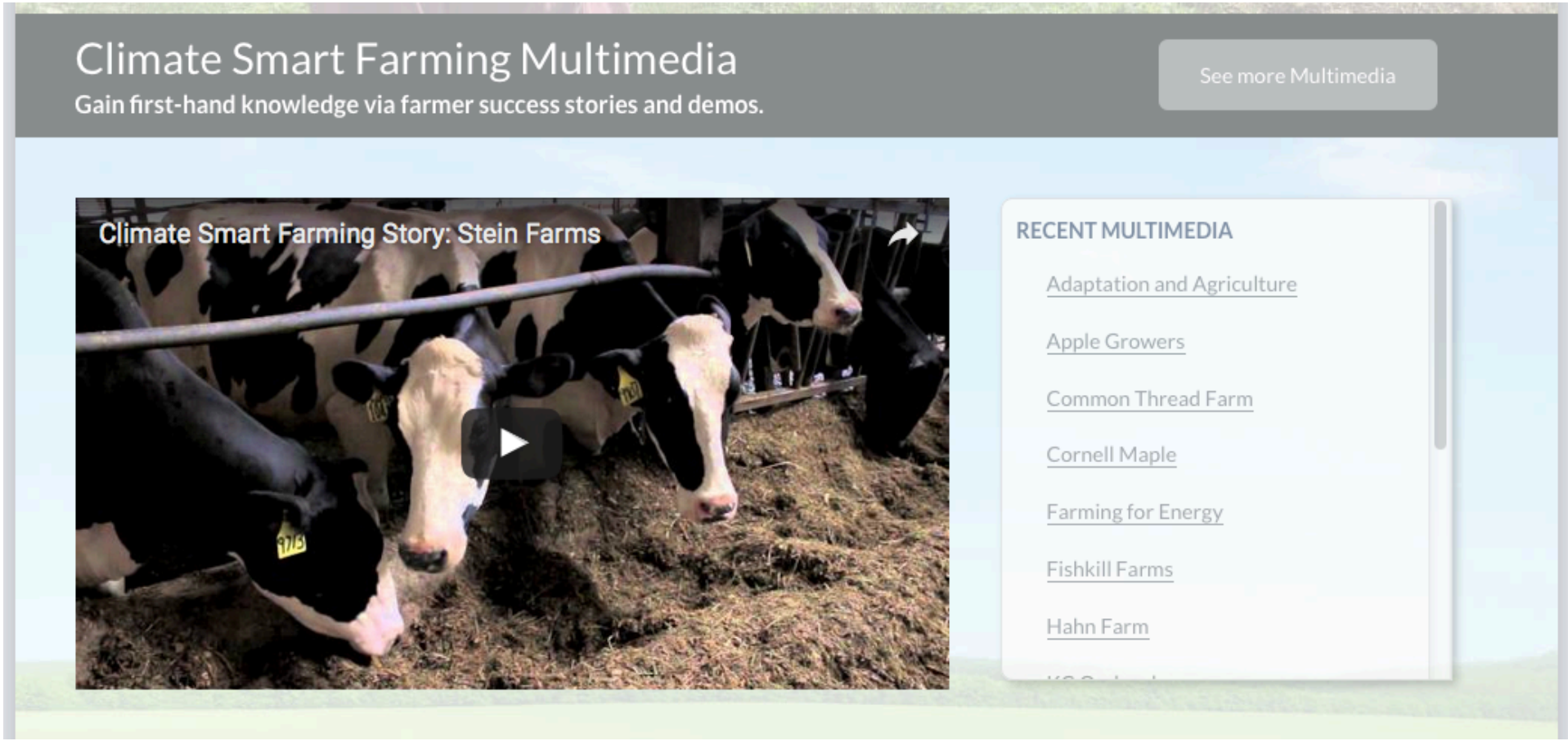


Create a Free Account: Get Answers, Share Information!
climatesmartfarming.org/forum/



CSF Farmer Videos and Video Tutorials for Tools & the Site:
http://climatesmartfarming.org/videos/

Questions? Thank You!

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