Cornell Climate Smart Farming: Decision Tools for Climate Variability and Change - The Irrigation Scheduler and More

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Climate Smart Farming Program
Presentation for the NRCC Monthly Webinar
September 29th, 2016
• Cornell Institute: Formed 2013
• 140+ Cornell researchers working on climate change
• Vision: Working toward a future where agricultural, environmental, and social systems are resilient in the face of a rapidly changing climate and have reduced their impacts on the climate system.
• Climate Smart Farming Program and Extension Team: Launched 2015
• Research, Education/Outreach, and Partnerships

climateinstitute.cals.cornell.edu/
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 and Northeast Agriculture

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
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.

Grape Hardiness & Freeze Risk
Charts hardiness temperature vs. daily observed/forecast temperatures for several varieties of grapes.

CSF Irrigation Scheduler
Monitor current and forecasted soil water deficits 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.

http://climatesmartfarming.org/
http://climatesmartfarming.org/tools
Irrigation Scheduler

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

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

Soil Water Capacity
High (Clay, fine texture)

Crop Type
Grass Reference

Plant/Greenup Date
05/01/2016

Last Irrigation Date
NONE

Water Deficit since last recharge to field capacity

- No deficit for plant
- Deficit, no plant stress
- Deficit, plant stress likely
- Deficit, severe plant stress

Observed on: 09/28/2016 @ 8AM
Water Deficit: -1.36

Water Deficit Results
Next 30 days

Field Capacity
Plant Stress Begins
Wilting Danger Exists

09/28
Irrigation Scheduler

- Can “view entire season” by checking the box in the lower left-hand corner
Irrigation Scheduler

- Can determine probability of water deficit over a 30-day range
- Scroll with tool tip to interact with bar chart in bottom right

30-day water deficit outlook based on historical probabilities

- **Deficit, no plant stress**
- **Deficit, plant stress likely**
- **Deficit, severe plant stress**

**Valid Date:** 10/26/2016 @ 8AM

- **Probability:** 10% 25% 50% 25% 10%
- **Water Deficit:** -1.20" -0.79" -0.23" -0.03" 0.01"

**Field Capacity:**
- 25% 50% 75% 95% 100%

**Plant Stress Begins:**
- 10%

**Wilting Danger Exists:**
- 25%

**Probability of deficit category on 10/26**

- None: 18%
- Small Stress: 15%
- Moderate Stress: 0%
- Severe: 66%
Irrigation Scheduler

- Can be used to plan water applications to minimize plant stress and maximize water conservation.
- Assesses the probability of naturally reaching certain levels of soil water content over the next month.
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
Grape Hardiness Tool

- Spring frosts not receding as quickly as flowering is advancing
- Can be used to determine level of freeze injury to grapes as a product of weather conditions and stage of plant development
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/
Resources and Best Management Practices
Reduce emissions. Increase resiliency and profitability. Realize opportunities.

http://climatesmartfarming.org/resources/
Questions? Thank You!

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