

Agricultural Resiliency to Climate Change in the Northeast U.S.

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United States Department of Agriculture
Northeast Climate Hub

In 2015, the USDA Northeast Climate Hub, in partnership with Cornell University & Penn State, conducted three regional research projects to lay the groundwork for facilitating agricultural resiliency to climate change in the Northeast. We present & integrate findings from our Northeast climate change & agriculture vulnerability assessment, regional research & extension capacity survey, & literature review of agricultural stakeholder views to identify priority research & Extension needs.

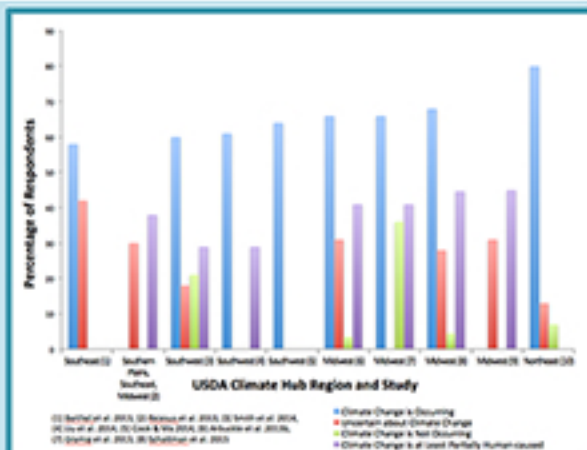
NORTHEAST U.S. CLIMATE CHANGE & AGRICULTURE BACKGROUND



Climate change is posing increasing risks & potential opportunities for agricultural production in the Northeast & other regions of the US. The Northeast US is home to about 175,000 farms, comprising 21% of the region's landmass, producing agricultural commodities worth more than \$21 billion per year.

Project	Research Question	Methods
U.S. AGRICULTURAL STAKEHOLDER VIEWS	What are US ag. stakeholder perceptions related to climate change?	Literature review of 75 journal articles
NE CLIMATE CHANGE VULNERABILITY ASSESSMENT	What are the major regional climate change vulnerabilities in agriculture & forestry?	Review & synthesis of studies on climate change & agriculture
NE RESEARCH & EXTENSION CLIMATE CHANGE CAPACITY	What is the capacity of NE land-grant universities to address climate change in ag., nat. resources, & forestry?	Online survey of NE land-grant researchers & Extension specialists. N=3,751

U.S. AGRICULTURAL STAKEHOLDER CLIMATE CHANGE VIEWS

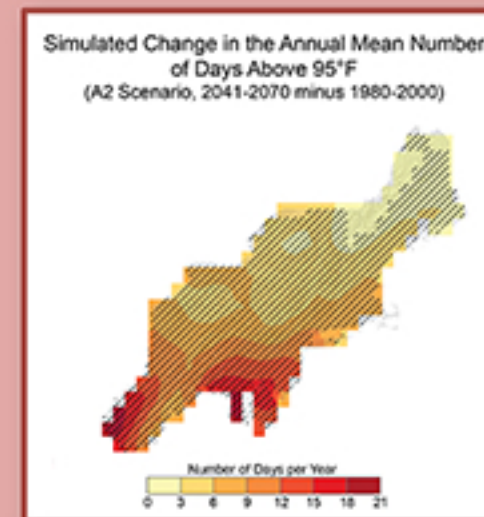


- Farmers notice changes in weather patterns & increase in extreme weather events yet many remain skeptical about climate change.
- A majority of farmers believe climate change is happening.
- Levels of climate change belief varies across regions.
- Fewer farmers believe climate change is human-caused.

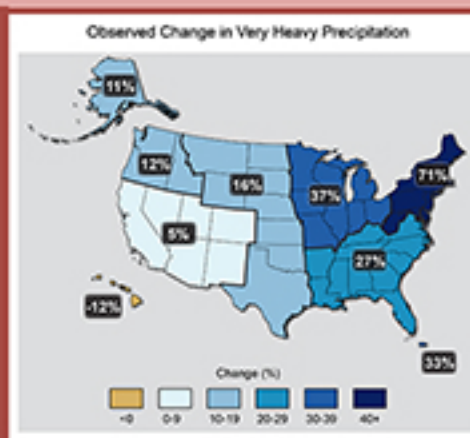
- Adaptation generally more accepted than mitigation measures. Affirmative belief in climate change & personal experience with extreme weather related to increased likelihood to support adaptation practices.
- Willingness to support mitigation practices seems to be related to belief in human causation of climate change, concern for negative impacts of climate change, & the presence of economic incentives.
- Extension professionals are one of the most trusted resources for farmers. Scientists are also generally trusted by the agricultural community.

NORTHEAST U.S. CLIMATE CHANGE VULNERABILITY ASSESSMENT

Agricultural Commodities	Climate Vulnerabilities	Climate Effects
<ul style="list-style-type: none"> Field crops Tree & vine fruits, berries Vegetables Greenhouse/nursery/sod Dairy, poultry, eggs Aquaculture 	<ul style="list-style-type: none"> Extreme precipitation Short-term drought Warmer winters Heat stress Disease, pest, & weeds Sea level rise 	<ul style="list-style-type: none"> Reduced production Flooding Crop damage Disease Shifting production zones Higher energy costs Soil erosion & run-off



From 1958 to 2012, heavy precipitation events (the heaviest 1% of daily events) has increased by 71% in the NE U.S.



[Fig. adapted from Karl et al. 2009]

NARCCAP models indicate increased hot days throughout the NE. Largest increases in southern & western areas. Freezing days to decrease by 20-23 days across most of NE.

[Fig. from Kunkel et al. 2013]



Figure 6: Mitigation Potential in the Northeast by Sector

Opportunities for reducing net GHG emissions include increasing C storage & mitigating emissions

- Land retirement offers largest opportunity by increasing C stock
- Manure management offers highest emissions reductions

NORTHEAST U.S. CLIMATE CHANGE RESEARCH & EXTENSION CAPACITY

- Current research & Extension work reflects climate impacts identified in vulnerability assessment (e.g. pests & disease, extreme precipitation, crop production, water management)

	Faculty w/o Extension appt (N=243)	Extension faculty & educators (N=270)	All respondents (N=554)
1	Securing funding for applied research	Training extension educators	Securing funding for applied research
2	Securing funding for basic research	Developing decision-support tools & websites	Training extension educators
3	Developing decision-support tools & websites	Securing funding for applied research	Developing decision support tools & websites
4	Better understanding land managers' need & attitudes	Conducting cost-benefit analyses	Better understanding land managers' needs & attitudes
5	Tie: Training extension educators & Conducting cost-benefit analyses	Better understanding land managers' needs & attitudes	Conducting cost-benefit analyses

- Researchers & Extension staff identify similar future priorities.

- Highest interest in collaborating on regional research & programming initiatives, attending workshops & conferences, & developing & implementing educational programs.



Means calculated based on scale of 1=Not at all willing to 5=Very willing.

Information Barriers to Addressing Climate Change



Means calculated based on a scale of 1= Not at all a Barrier to 5= A

- Primary barriers related to conducting climate change work were the lack of climate change options adapted to local conditions, attitudes of target audiences, & the lack of time & funding.

CONCLUSIONS & RECOMMENDATIONS

- The three research projects summarized here provide the foundation & context for research and Extension work in the NE U.S. moving forward. The U.S. Ag. Stakeholder Climate Change Views Literature Review provides the social-psychological context, the NE U.S. Vulnerability Assessment provides the physical, natural sciences, & agricultural policy programs context, & the NE U.S. Research & Extension Climate Change Capacity Survey provides the academic and institutional context for research, education, & outreach.
- USDA NE Hub activities must focus on adapting climate information to local conditions & improving communication mechanisms with farmers & other ag. stakeholders to encourage adaptation & mitigation actions. There is potential to build networks & collaborations among researchers & Extension within universities as well as across the NE.
- There is limited research on ag. stakeholder views and actions related to climate change in the NE. To build on research presented here, & develop a working model for understanding farmer decision-making around climate change, there is a need for in-depth qualitative research to explore & assess NE farmers & agricultural advisors experiences, priorities, & needs related to climate change.
- There is a need to catalogue & develop educational materials on adaptation & mitigation strategies & share approaches through decision support tools & resources, as well as demonstration sites.