Adaptation and Resilience on Vegetable and Fruit Farms in the Northeastern US

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Objectives

- Identify adaptive management strategies for extreme weather risks in the northeastern region of the U.S that reflect the unique needs and challenges of diversified vegetable and berry farms.
- Capture the emergence of innovative ideas among agricultural information networks and geographic communities.
- Bridge the localized expertise of farmers with scientific research and regionalized outreach experts to identify information critical to supporting climate change adaptation and overcoming the climate information usability gap.
- Identify key leverage points to support agricultural resilience to climate change.

Background

Excessive moisture and drought are already leading sources of crop loss for farmers in the northeast. Projections for the region indicate that over the coming decades climate change will exacerbate the intensity and frequency of extreme precipitation patterns to a level which significantly threatens farm viability. Communication about climate change is characterized by politicization, complexity and uncertainty, making research and outreach on the topic challenging.

Approach

Our research draws on the expertise of extension professionals and farmers across the northeast to explore how farms are adapting to increasingly extreme weather patterns and what resources they need to support farm resilience to climate change. The iterative and collaborative approach of our project was designed to meet farmers at winter meetings and conferences, and invite them to participate in analysis. Progressive phases of the research were informed by previous research findings and input from collaborators.

Phase 1 — Extension Professional Interviews 2017-2018

Phase 2 — Regional Farmer Survey Winter 2017-2018

Phase 3 — Focus Groups & Farmer-to-Farmer Sessions Winter 2018-2019

Phase 1. Bridging the Climate Information Usability Gap

In the first phase of research, we asked extension professionals for advice about what kind of information farmers and outreach professionals need to best support vegetable and berry growers in adapting to the impacts of climate change.

Interviews with 17 Extension Professionals

- *One level down.* Information is more tangible and usable if it is tied to climate impacts, rather than climate change
- *Context specific.* Information is more useful when it is tailored to specific production contexts.

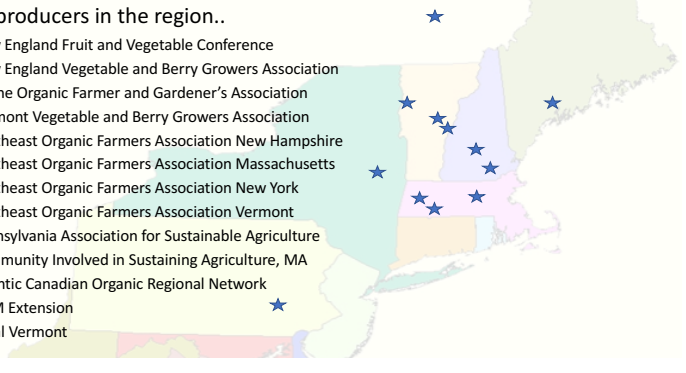
Phase 2. The New England Adaptation Survey

Our regional farmers survey was developed in collaboration with farmers to generate information about how vegetable and berry farmers across the northeastern US region are adapting to precipitation extremes, and what strategies they considered promising and innovative. 193 farmers completed the survey.

Phase 3. Resources for Resilience Listening Tour

We returned the following year to farmer network meetings to share results from the survey via collaborating organizations and hosted focus groups and farmer-to-farmer sessions. 9 conversations with 173 farmers asked growers to identify the resources they use and need to support resilience.

These boundary organizations facilitated the research and outreach interface with producers in the region..



- New England Fruit and Vegetable Conference
- New England Vegetable and Berry Growers Association
- Maine Organic Farmer and Gardener's Association
- Vermont Vegetable and Berry Growers Association
- Northeast Organic Farmers Association New Hampshire
- Northeast Organic Farmers Association Massachusetts
- Northeast Organic Farmers Association New York
- Northeast Organic Farmers Association Vermont
- Pennsylvania Association for Sustainable Agriculture
- Community Involved in Sustaining Agriculture, MA
- Atlantic Canadian Organic Regional Network
- UVM Extension
- Rural Vermont

How are farmers adapting to precipitation extremes?

A Summary of Results from The New England Adaptation Survey for Fruit and Vegetable Growers

Respondents from eastern Canada to Pennsylvania
n=193

Average Age	47
Gender	54% Male, 44% Female, 2% Other
Average total farm acreage in production	27.6 acres
Average years as a decision maker on a farm	13 years
% of participants who grow organic	45%

Results of Pearson's Chi Squared Test for goodness of fit between site specific characteristics and adaptive management strategies

Drought management strategies that differ by site characteristics	P-value	Heavy precipitation management strategies that differ by site characteristics	P-value
Conservation buffers	0.01361	Raised beds	0.04471
Permanent mulch	0.0258	Irrigation strategies	0.03491
Later planting dates	0.01495	Permanent mulch	0.0003844
Earlier planting dates	0.02852	Perennial plantings	0.000618
Perennial plantings	0.01287	Crop rotations	0.005714

Qualitative data about adaptation

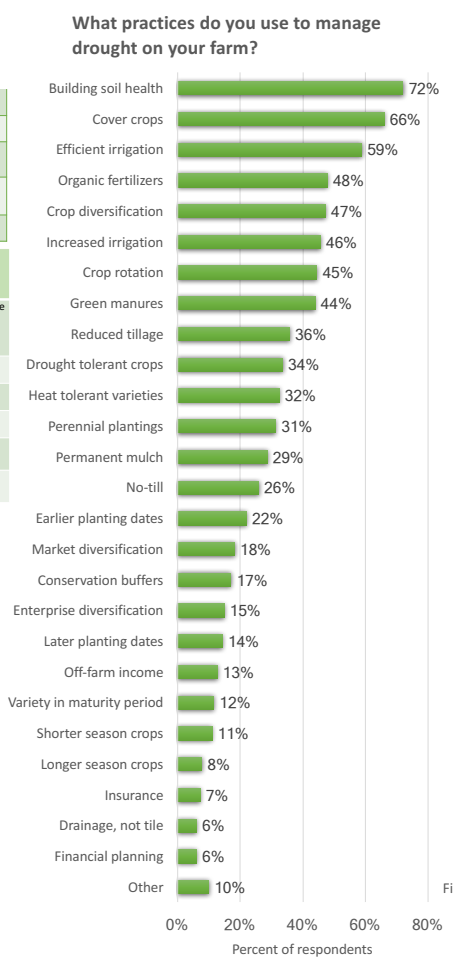
Farmers were asked open-ended questions about changes they made in response to and in anticipation of precipitation extremes. They were then asked open-ended questions about what they thought the most innovative and promising strategies for adaptation were. The responses to these questions were analyzed by our research team and then grouped into themes.

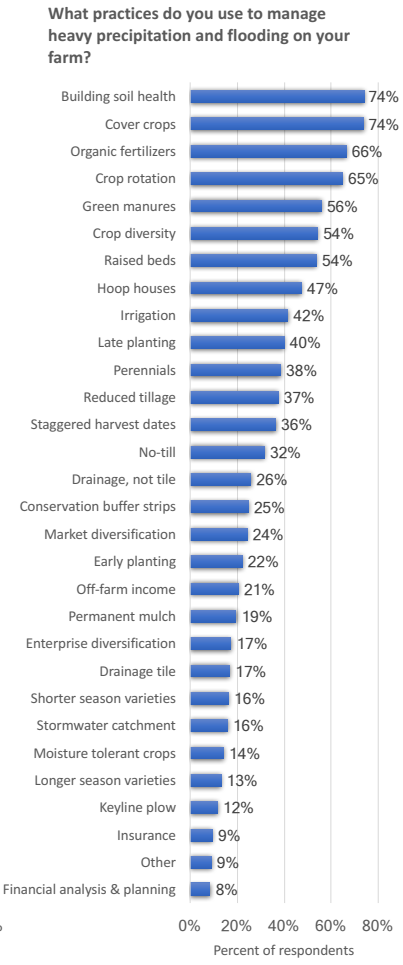
What do farmers consider to be the most promising and innovative strategies?

Primarily ideas that are already in the adaptation toolbox of most farmers:
- Soil building
- Raised beds
- Mulch
- Irrigation
- Water collection
- Cover crops
- Crop planning

New and emerging ideas included:
- Site-level water planning
- No till
- Education
- Mitigation
- Agroforestry
- Keyline
- Hugelkulture
- Agroforestry
- Intercropping

Quantitative data about adaptation





66% of participants **have made changes** on their farm because of an experience with, or concern about, drought.

39% of participants **are planning to make changes** that will help manage for risk of drought.

72% of participants **have made changes** on their farm because of an experience with, or concern about, heavy precipitation or flooding.

61% of participants **are planning to make changes** that will help manage for the risk of heavy precipitation or flooding.

Vulnerability & adaptive capacity

Survey data indicates that most farmers understand the vulnerability of their farmland to extreme weather, but often **lack the capacity to invest in adaptation and resilience.**

76% of survey respondents agree or strongly agree that they understand their vulnerability to weather-related risks. crop insurance.

37% of respondents agree or strongly agree that they have the knowledge or technical skill to respond.

Only **18%** of respondents agree or strongly agree that they have the financial capacity to deal with weather-related threats to the viability their farm operation, including crop insurance.

Resources for resilience

During farmer-to-farmers sessions and focus groups conducted in collaboration with farmers groups from Prince Edward Island to Pennsylvania we asked **173 farmers**:

- **What kinds of resources do you use to support the climate resilience of your farm and manage for the increased incidence of extreme weather?**
- **What additional resources do you need to support the climate resilience of your farm?**

Our thematic analysis of these conversations revealed the many types of resources farmers rely on to support their capacity to prepare for, respond to and recover from climate impacts:

Summary:

Farmers primarily invest in the natural capital and built infrastructure of their agroecosystem to resist, respond to and prepare for extreme weather risks. When extreme weather impacts are big enough to cause severe loss and damage, farmers turn to **financial safety-nets** and **community relationships** to help them recover. To support their resilience, farmers asked for more **on-farm technical assistance to help plan for excessive water issues, peer-to-peer learning opportunities, reliable local markets and financial** support for catastrophic losses. Farmers highly value **NRCS establishment cost-share programs**, and would like to see similarly structured programs that support climate adaptation. **Farmers cited collaborative problem-solving opportunities as one of the most important ways they address emerging challenges like climate change.**

Farmer's perspective:

"networks are by far the most important way that I get information because I'm capable of understanding scientific research, but I don't have the time to go through and sift through it all. ***I really depend on people I trust who done it and have succeeded or failed*** *but that I can identify with, who can tell me the short cut, 'here's what we did, here's what worked. Or here's a tool that exists.' ...* ***I'm going to use the tools that exist right now because I don't have the time or the resources to invent something new.*** *And so to be able to connect to those as quickly as possible and to find something that works in my neighborhood is going to be much more effective for me. So that's why I like this kind of peer-to-peer, it's just so important."*

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