# What do Northern New England Farmers Need to Adapt to Climate Change?

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## A comparison of farmer and agricultural advisor perspectives and needs

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## Background

The Northeastern United States is projected to see some of the largest changes brought by climate change (CC) (Sweet et al., 2017). Since the mid-1990's, the frequency of extreme climate related events in the region increased by 71% (Wolfe et al., 2018). Climate models suggest that short-term summer droughts could increase in frequency, and the precipitation that does come will be in the form of heavy precipitation events, or more than 5-10 centimeters of rainfall daily (Sweet et al., 2017). Increased drought coupled with increased frequency of heavy precipitation has already and will continue to negatively impact crop and livestock production in the region. Further, one third of all crop losses reported to the USDA-FSA from 2013-2016 were associated with excessive precipitation in the Northeast region of the U.S. (Wolfe et al., 2018).

During the winter and spring of 2019, researchers from the University of Vermont (UVM) and the University of Maine (UMaine) interviewed farmers and researchers / agricultural advisors (n=50) within the two states about their experience with climate change. The purpose of these interviews was to examine the ways in which the farmers were being impacted by CC, and how they were adapting to such extreme and variable weather. Semi-structured interviews assessed what farmers wanted and needed to adapt, and what researchers and agricultural advisors perceived farmers wanted or needed. Mental modelling of farm systems examined agricultural priorities from the two groups. The subsequent analysis is the focus of this brief.

## Key Findings

1. Farmers and Agricultural Researchers / Advisors have different climate resource priorities. Among the 17 unique resources mentioned by farmers and the 10 by researchers and agricultural advisers, there were only 2 overlapping: climate / weather predictions and decision support tools.
2. Farmers and Agricultural Researchers see farm system priorities in different ways. 45% of farmers mentioned quality of life as a vital component of their farm system, and 55% mentioned community wellbeing. Respectively, only 25% and 19% of researchers and ag. advisers mentioned those concepts.
3. Lack of both time and money were seen as the main barriers in adapting to climate change. Both Farmers and Agricultural Researchers / Advisors agree on the main barriers to adapting to climate change.

## Farmer Desired Resources

The resources desired by farmers differed from those researchers and ag. advisors perceived them to desire in that they were more specifically geared towards the issues they face on their farm. Resources desired by farmers include:

- Climate predictions for NE region (incl. sea level rise calculator and pest monitoring)
- Decision support tool
- Agroforestry information / tools
- Financial planning and grant assistance (incl. tailored grants for CC adaptation)
- Farmer-centric info on how to help mitigate CC
- Information on drought resistant seed varieties
- CC adaptation training
- Helpful apps (including weather, greenhouse data logger, and managed grazing)

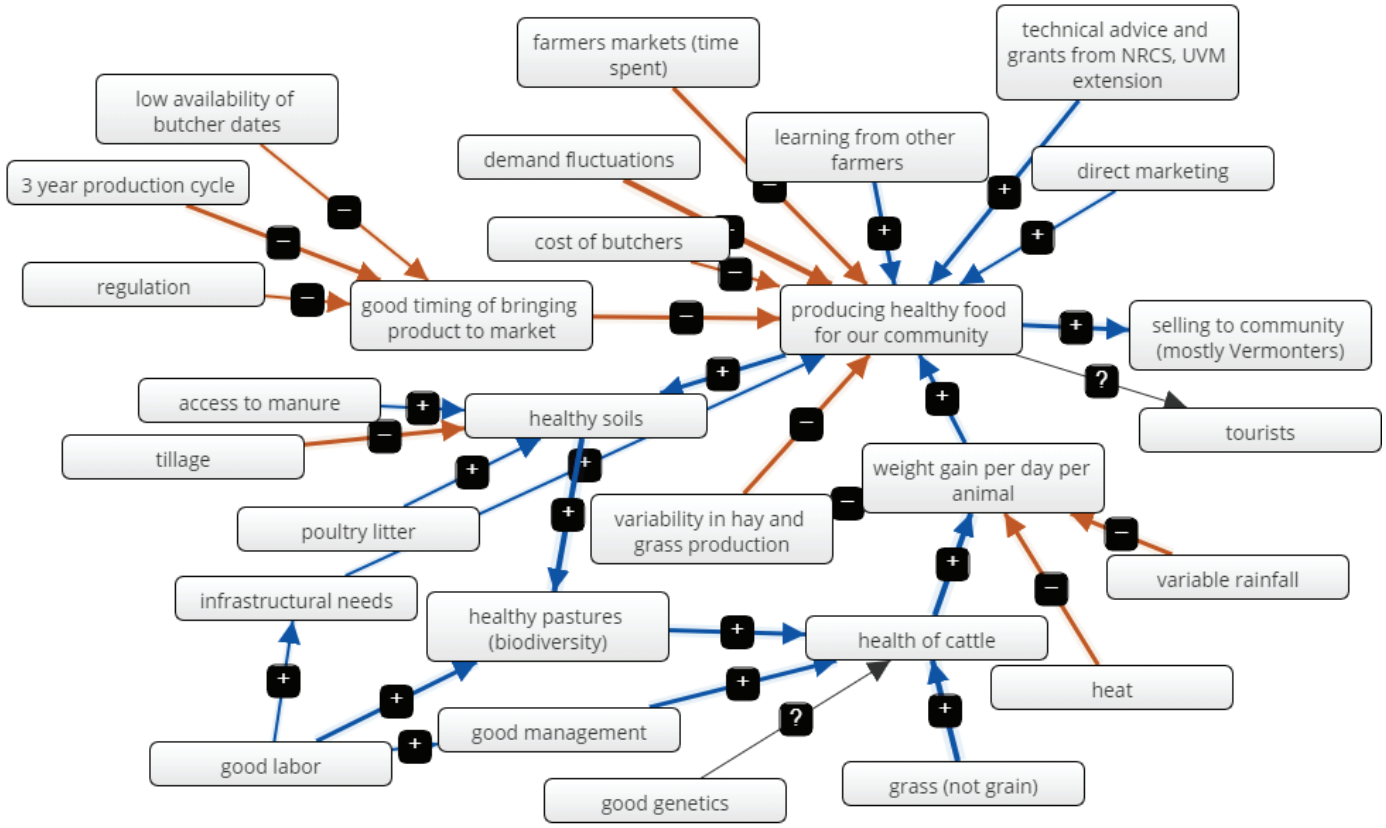


Figure 1. Mental model diagram constructed by a Vermont beef farmer.

## Perceived Farmer Resource Needs by Researchers and Agricultural Advisors

Given the urgency and severity of climate change, especially in the Northeastern region, ensuring that farmers and their agricultural advisors have common perspectives is important for adaptation (Halbrednt et al., 2014). We find that agricultural advisors largely perceive different resources necessary for climate change adaptation as compared to farmers:

- Climate predictions for NE region
- Decision support tools
- Best management strategies
- Web-based tutorials & webinars
- Carbon credits
- Long-term research on climate conditions
- Short-term weather forecasts

We find that only two resources were commonly mentioned by both farmers and researchers / agricultural advisors (underlined above). This suggests there may be opportunities to better connect researchers and agricultural advisors with farmers and to commonly share their perceived challenges and needed resources.

## Agricultural Mental Models

As part of the interview process, researchers conducted mental model exercises, as seen in Figure 1 and Figure 2. Here, respondents were asked to map out how they viewed their farm system (farmers) or a farm system they may be familiar with (researchers and ag. advisers). The same prompt questions, examples, and explanations were given to each group.

A mental model is based in "fuzzy-logic cognitive mapping", and is used to define the important components of a system, define the relationships between the components, and create a visual representation of how an individual thinks of something. The researchers used MentalModeler.org to generate and subsequentially analyze the data from the maps. In these images, blue lines represent positive connections between concepts, and the orange lines represent negative connections. Thicker lines denote a stronger connection, whereas thinner lines denote weaker connections. For example, Figure 1 shows a strong positive connection from healthy soils to healthy pastures, meaning healthy soils have a strong positive influence on healthy pastures.

Each respondent was asked to list concepts that were vital to the function and success of the farm. Once the respondent had a collection of concepts, they were asked to associate a strength of correlation between the concepts in order to create a web-like map. The purpose of this exercise was to determine the discrepancy between how farmers and researchers / agricultural advisers view a successful farm system.

We found that, similar to resource desires for climate change adaptation, farmers versus researchers and agricultural advisors have differing perceptions of farm system priorities. Figure 3 shows that there was a certain level of agreement on topics such as climate. However, it is evident that farmer respondents mentioned quality of life and community wellbeing at a much higher frequency than did researchers and agricultural advisors. The difference in mention scores for community wellbeing was statistically significant, demonstrating a disagreement among priorities between farmers and agricultural advisors. This suggests that outreach to farmers from researchers and agricultural advisors may not be addressing key goals and outcomes for farmers.

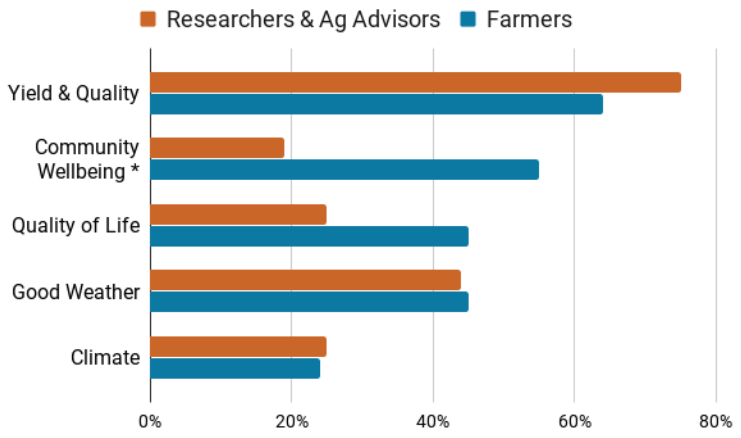


Figure 3 Graph showing the percent of respondents who mentioned a concept or outcome for a given farm during mental model exercise, separated by occupation. Statistically significant mention scores are noted with an asterisk (*). (X squared =4.27, p=0.039).

## Conclusions and Recommendations

The results from this study suggest that there is a discrepancy between what farmers want and need in order to adapt to climate change, and what researchers and agricultural advisers perceive them to want and need. When asked about desired adaptation

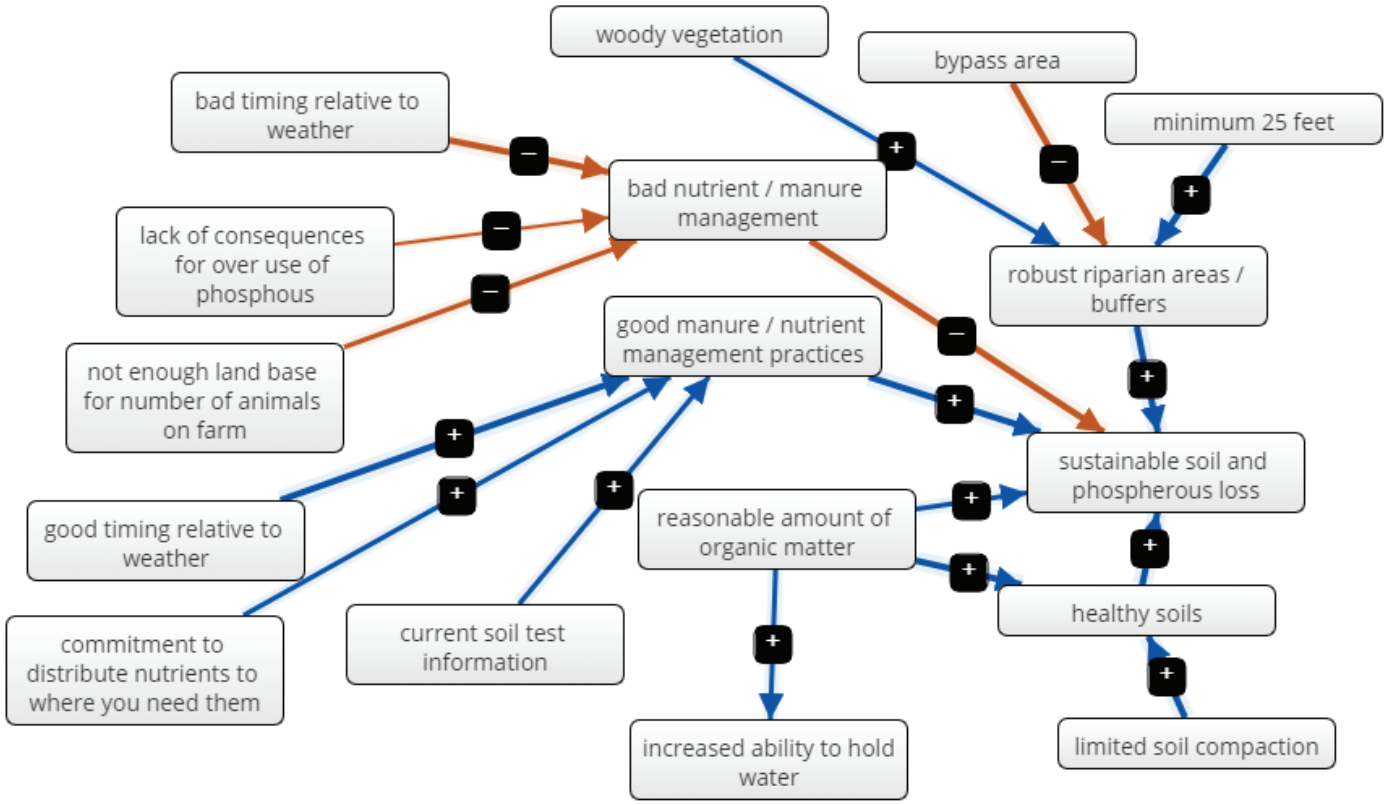


Figure 2. Mental model diagram constructed by Vermont researcher/agricultural advisor.

resources, farmers mentioned concepts such as climate projections for the Northeast region, decision support tools, financial planning and grant assistance, and farmer-centric information on how to adapt to climate change. Researchers and agricultural advisors perceived farmers to also desire resources such as climate predictions for the Northeast region and decision support tools but also best management strategies, and web-based tutorials and webinars. Furthermore, mental model analysis shows a higher percentage of farmer respondents mentioned concepts relating to quality of life and community wellbeing than did research and agricultural advisor respondents. While both groups found climate, good weather, and yield/quality to be of importance to the farm system, we found a sizable gap in relation to how respondents perceive their farm system to interact with their outside life.

These findings pertain to the ways in which researchers and agricultural advisers help farmers adapt to climate change in that they help them understand farmer's priorities. Researchers and agricultural advisors are urged to consider that a farmer may not be willing to implement a climate change adaptation practice on their farm if it will interfere with their quality of life or their community's wellbeing.

"I would like to see more of a focus on how farmers can help with climate change, not just how it's affecting us, but what we can do about it to solve- to help mitigate the problem."

- Maine farmer

Based on these findings, we recommend researchers and agricultural advisers take the following steps to better aid Northern New England farmers in adapting to climate change:

- Consider how a given practice, strategy, or tool will impact a farmer's quality of life, including time with family and work-life balance
- Consider how a given practice, strategy, or tool will impact a farmer's community wellbeing, including food security status, overall health, aesthetic value, and sound / water / air pollution
- Ask farmers how they would like to receive climate adaptation resources
- Develop and provide farmers with the types of resources listed on page one of this document

"So, life would be a lot easier if we just didn't farm. But I wouldn't be very happy… this is a lifestyle choice and a way that we want to raise our child. And so, it's like I want [my child] to know where his food comes from and I want to eat good food… at least make good food available to Franklin County and our neighbors…"

- Vermont farmer

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For more information about the Climate Adaptation Resources for Small and Medium Northeast Farms project, please contact Meredith Niles at mtniles@uvm.edu.