Agricultural Adaptation for Climate Resilience: Challenges & Opportunities

National Adaptation Forum
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Who are we?

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Roadmap for today

Goals:

Share our experiences of working with agricultural sector

Brainstorm together effective ways forward

Itinerary:

Part 1: Setting the stage: current situation, adaptation resources

Part 2: Delving deeper (small group discussions)

Part 3: What next? (whole group discussion)
Part 1 - Setting the stage

The “climate” of climate change communication

- Alarmed: 21% (March 2018, n=1,278)
- Concerned: 30%
- Cautious: 21%
- Disengaged: 7%
- Doubtful: 12%
- Dismissive: 9%

Highest Belief in Global Warming
- Most Concerned
- Most Motivated

Lowest Belief in Global Warming
- Least Concerned
- Least Motivated

Yale Program on Climate Change Communication
George Mason University Center for Climate Change Communication
“We really don’t hear some of the positive effects that agriculture has on the climate.”
~Michigan farmer, 2011
The “climate” of climate change communication

“I guess, if I could summarize, it doesn’t matter what the weather is going to be in twenty-thirty years from now. It only matters what it’s going to be next year, and nobody can predict that.”
~Michigan farmer, 2011

(Doll et al. 2017)
The “climate” of climate change communication

- 66% of Midwest farmers: climate change is occurring, 41% of those say humans play some role

- 55% Extension educators and 63% ag advisors think climate change occurring but NOT caused mostly by human activities

(Arbuckle et al. 2013; Prokopy et al. 2015)
Who are the trusted sources to communicate?

(CRED 2014; Prokopy et al. 2015)
Reports from the field: agribusiness

- Extreme weather
  - Logistical and capacity challenges for input suppliers
  - Consistent product quality to markets
- Weather = climate?
  - Human nature element in denying climate change
- Market forces as a driver for climate action
Reports from the field: SD State Climatologist

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Part 1 - Setting the stage

Climate-based decision cycle for corn

Takle et al., 2014
Reports from the field: SD State Climatologist

Part 1 - Setting the stage

Fig. 22.4: Reductions in Grassland Area in the Prairie Pothole Region

The figure shows the loss of grassland to corn/soy between 2006 and 2011 in the eastern states of the Northern Great Plains (Nebraska, South Dakota, and North Dakota), expressed as a percentage of 2006 grassland acres. Outlined in black is the boundary of the U.S. portion of the Prairie Pothole Region, a substantial portion of which was converted from grassland to corn/soy between 2006 and 2011. Source: adapted from Wright and Wimberly 2013.46

2012 USDA Census of Agriculture
Reports from the field: MI State Climatologist

Part 1 - Setting the stage
Changing climate and production risk

Part 1 - Setting the stage

**Date of Tart Cherry Side Green Stage**
Traverse City, MI, 1900-2018

**No. Freeze Events Following Side Green**
Traverse City, MI 1900-2016
Potential adaptive strategies

- Frost protection technology (e.g. forced convection)
- Development of better adapted cultivars
- Insurance, financial risk management
- Development of new carbon/nitrogen sequestering or neutral production management strategies
Reports from the field: Purdue Extension

Part 1 - Setting the stage
A bleak economic situation for farmers

- Living below break-even and above shut-down
- Farms going out of business (2 dairy farms/day in Wisconsin)
- Rates of farmer stress and suicide have risen
- “Doom and gloom” - hard to invest in long-term planning and changes
Living the reality of a changing climate
Reports from the field: MI State Univ. Extension
Changing management practices
Adaptation resources - resilience thinking

Response Capacity
Recovery Capacity
Transformation Capacity
Key Resilience Thinking Concepts

Balanced Portfolio of Resources

A Framework for Adaptability

Reduce Harm
Little Change to Existing System

Enhance Capacity
Moderate Change to Existing System

Transform System
Major Change to Existing System
Adaptation in Action: Is Sustainable Agriculture Climate Resilient?
Adaptation in action:
The Climate-Resilient Agriculture Initiative
FIGURE 1. A Strategic Way to Think About Climate Risk and Resilience

**CLIMATE RISK**
is determined by...

1. **EXPOSURE**
The weather patterns and events in your area, ...
2. **SENSITIVITY**
...how the weather affects your farm or ranch, and ...
3. **ADAPTIVE CAPACITY**
...the resilience of your farm or ranch. Resilience is determined by ...
4. **RESPONSE**
...your ability to adjust your production system in the face of changing weather patterns, ...
5. **RECOVERY**
...your ability to bounce back from weather-related damage, ...
6. **TRANSFORMATION**
...and your ability to make major changes to your production system to reduce costs and capture new opportunities associated with current and future changes in weather patterns.

**YOUR CLIMATE RESILIENCE TOOLBOX**

- **Whole-Farm Planning**
  (e.g., monitor, evaluate, adapt)
- **Human Resources**
  (e.g., skills, experience, motivation)
- **Physical Resources**
  (e.g., irrigation, livestock shelter)
- **Natural Resources**
  (e.g., soil health, crop diversity)
- **Social Resources**
  (e.g., networks, customers, community)
- **Financial Resources**
  (e.g., income, assets, insurance)
Adaptation in action: whole-farm planning

United States Department of Agriculture
Midwest Climate Hub

Adaptation Resources for Agriculture
A Case Study: Organic Dairy in Wisconsin
Adam Dowling, NRCS Liaison to USDA Midwest Climate Hub

The Adaptation Resources for Agriculture Workbook was jointly developed by USDA Climate Hubs and NRCS to support producers, service providers, and educators in the Midwest and Northeast Regions to manage climate change. The workbook helps producers consider both short-term adaptive management actions (<5 years) and long-range strategic plans (5 to ~20 years, subject to farm type). This workbook promotes adaptation through multiple resources including a “menu” of many adaptation strategies/approaches and example tactics for row cropping and forages, confined livestock, grazing, orchards and small fruit and vegetable production systems. Recent efforts by USDA Climate Hub NRCS Liaisons work to increase the number of examples, and have been documented as Case Studies. These Case Studies are of agricultural producers utilizing the workbook to document their management choices to ameliorate climate change impacts to their operations.
Part 1 - Setting the stage

Midwest Climate Hub

Step 3: EVALUATE Management Objectives; Given Projected Impacts and Vulnerabilities

<table>
<thead>
<tr>
<th>Land Unit</th>
<th>Objective</th>
<th>Challenges to Meeting Management Objective with Climate Change</th>
<th>Opportunities for Meeting Management Objective with Climate Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cropland</td>
<td>Utilize targeted fertilization and management systems to maximize variable rate technology to increase yields</td>
<td>Heavy/mid/wet spring conditions—more difficult to get into fields in spring; ponding make it harder to plant, hailorraine in spring/fall; Ponding reduces yields; Drought decreases yields</td>
<td>Crops will benefit from longer growing seasons as long as there’s enough moisture; Seed companies are keeping up with some changes (e.g., drought-tolerant corn) and more options are available; Plant some crops (Winter triticale &amp; wheat) during fall and could do more of that for forage or grain (would reduce corn acres)</td>
</tr>
<tr>
<td>Pasture</td>
<td>Maintain productive cow herd while maintaining good vegetation; Continue to increase acres of pasture interseeded; Maintain and increase plant/pasture productivity</td>
<td>Wet spring conditions—more difficult to get cows out (access in lanes, muddy/greasy with all the traffic); Potential for more disease with prolonged wet conditions; Diseases do reduce productivity of plants (sear grass); Drought decreases yields; Grasses shut down and increases need to feed</td>
<td>Pasture will benefit from longer growing seasons as long as there’s enough moisture</td>
</tr>
<tr>
<td>Farmstead</td>
<td>Improve/increase energy efficiency of milking and housing facilities</td>
<td>More intense heat would require greater cooling within buildings (current design is mostly natural ventilation w/o misters); Increased spring precipitation or longer events causes manure storage lagoon to fill faster; too much precip at once means hauling at inopportune times, risking compaction, rotting, etc.</td>
<td>N/A</td>
</tr>
</tbody>
</table>

**IDENTIFY:** The fourth step of the process is brainstorming tactics that farmers can implement to enhance the farm’s ecosystem’s ability to adapt to climate change and meet management goals.

Through workbook exercises, R & G Miller & Sons discovered numerous tactics that they are or could implement: plant fall crops for a forage or grain the following spring; increase cover crop usage; reduced tillage regime; increase interseeding efforts in pastures; shift pasture planting varieties and increase rehab; and upgrade cow lanes to pastures.

**MONITOR:** Throughout the workbook exercise it was clear that R & G Miller & Sons continually look for avenues to improve the land that provides for their organic dairy herd. Via their vision, they are able to simultaneously consider how to mitigate their direct affects on the changing climate and adapt to the current/anticipated changes in climate to become a local leader in environmental stewardship (e.g. monitor and evaluate effectiveness of implemented tactics).

### The Take-Away

The *Adaptation Resources for Agriculture Workbook* can be a valuable process for any agricultural producer to undertake as long as one is willing to think outside the box and look beyond next year’s cropping or grazing season. Take action now to improve your operation and production resiliency.

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For more information on the Midwest Climate Hub, please visit: https://www.climatehub.oea.usda.gov/hubs/midwest
Part 2: Delving deeper - small group discussions

1. Effective outreach and coaching strategies you use/see?

2. Useful (and unhelpful) agricultural adaptation resources?

3. What gaps are there in resources, programming, and networks that limit agricultural adaptation efforts?
Part 2: Delving deeper

1. Effective outreach and coaching strategies you use/see?

   ~With US agriculture increasing in productivity every year, how do we communicate to farmers there IS a need to address climate change?

   ~How do we engage resilience/adaptation planners and experts in non-ag fields?
Part 2: Delving deeper

2. Useful (and unhelpful) agricultural adaptation resources?

~Who do you/your ag stakeholders trust, listen to, and go to information for?

~Why, what qualities make them a trusted source?
Part 2: Delving deeper

3. What gaps are there in resources, programming, and networks that limit agricultural adaptation efforts?

   ~What do we really need to do to move adaptation forward?

   ~Have you seen successful examples of these gaps being addressed in other sectors/regions?

   ~How do we prioritize needs?
Part 3: What next?

1. Highlights from today’s conversation

2. Next steps - white paper, journal paper, ? Other

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Thank you!