Translating Science Into Action

USDA Midwest Climate Hub
U.S. DEPARTMENT OF AGRICULTURE

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USDA Midwest Climate Hub

8 November 2023

Intro To Climate Hubs

Assessments and Syntheses

Delivering relevant information

Outreach and Education

Enabling climate-informed decisions

Technical Support

Facilitating engagement, discovery and exchange

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Agricultural Research Service

NRCS

Climate Smart Agriculture

Climate-Smart Agriculture is guided by three main goals:

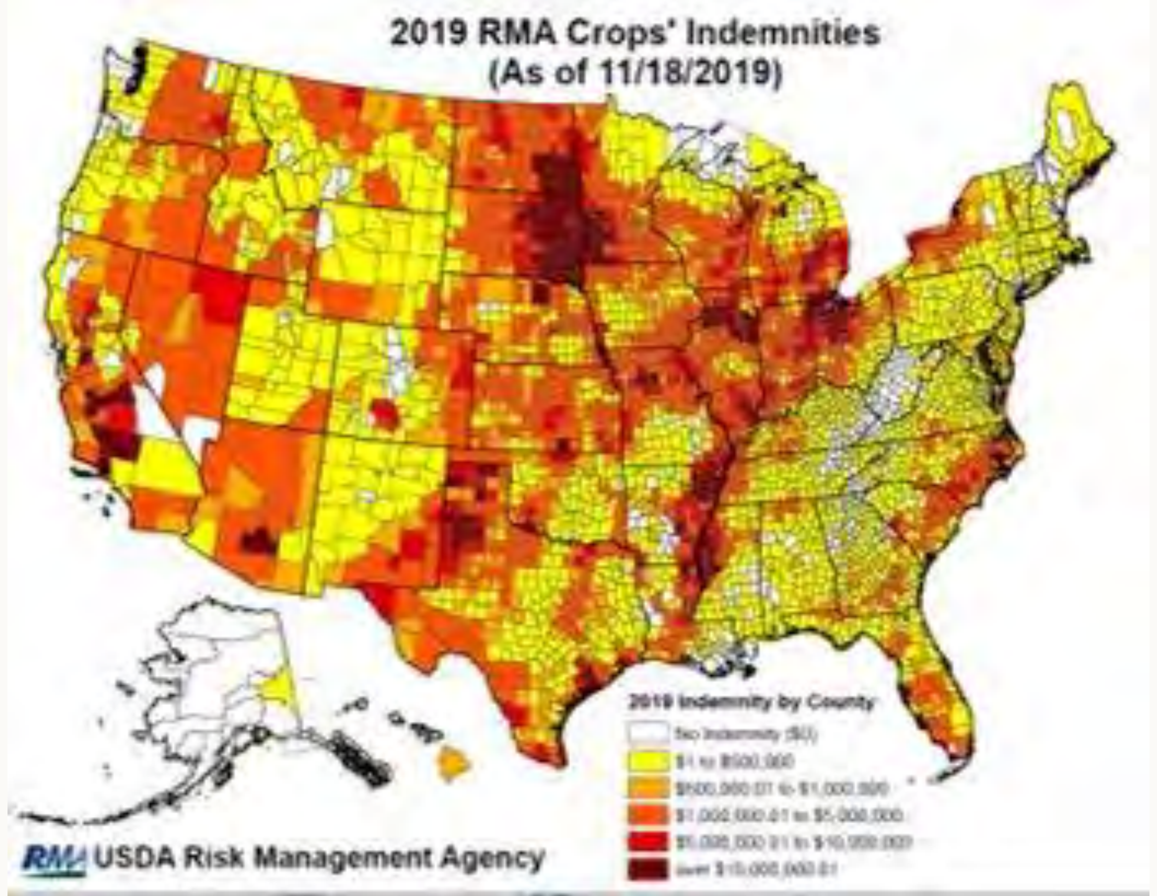
1. **Increased productivity (sustainably intensifying agriculture)**
2. **Enhanced resilience (adapting to climate change)**
3. **Reduced emissions (mitigating greenhouse gas emissions)**

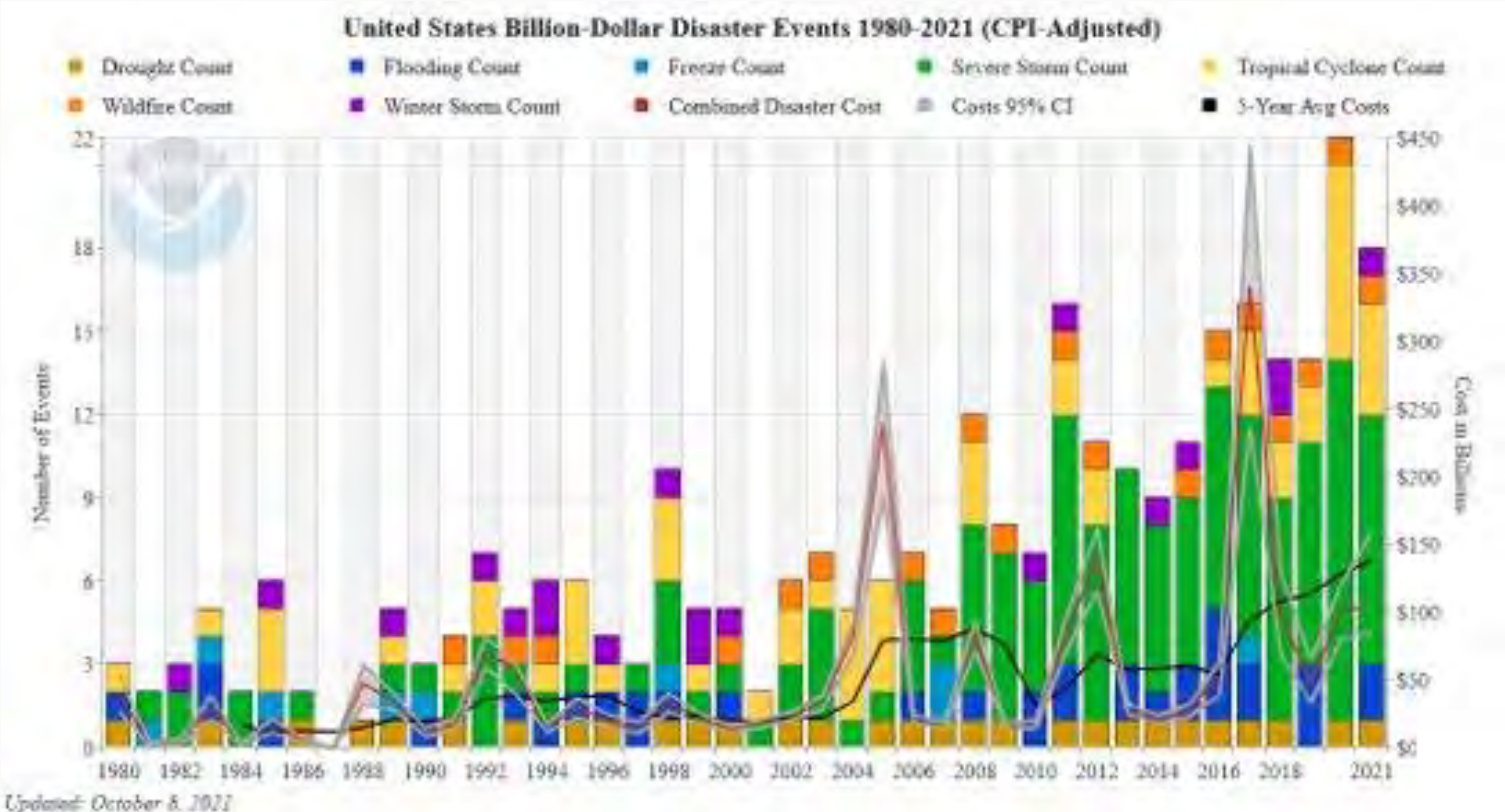
Borrowed from USDA Northeast Climate Hub
https://www.climatehubs.usda.gov/hubs/northeast/topic/role-climate-smart-agriculture-climate-adaptation-and-mitigation-northeast

Climate-Impacted Issues for Agriculture

What are we adapting to?

- **Bigger events**
- **More extremes**
- **Larger disaster issues**
- **Increased variability**



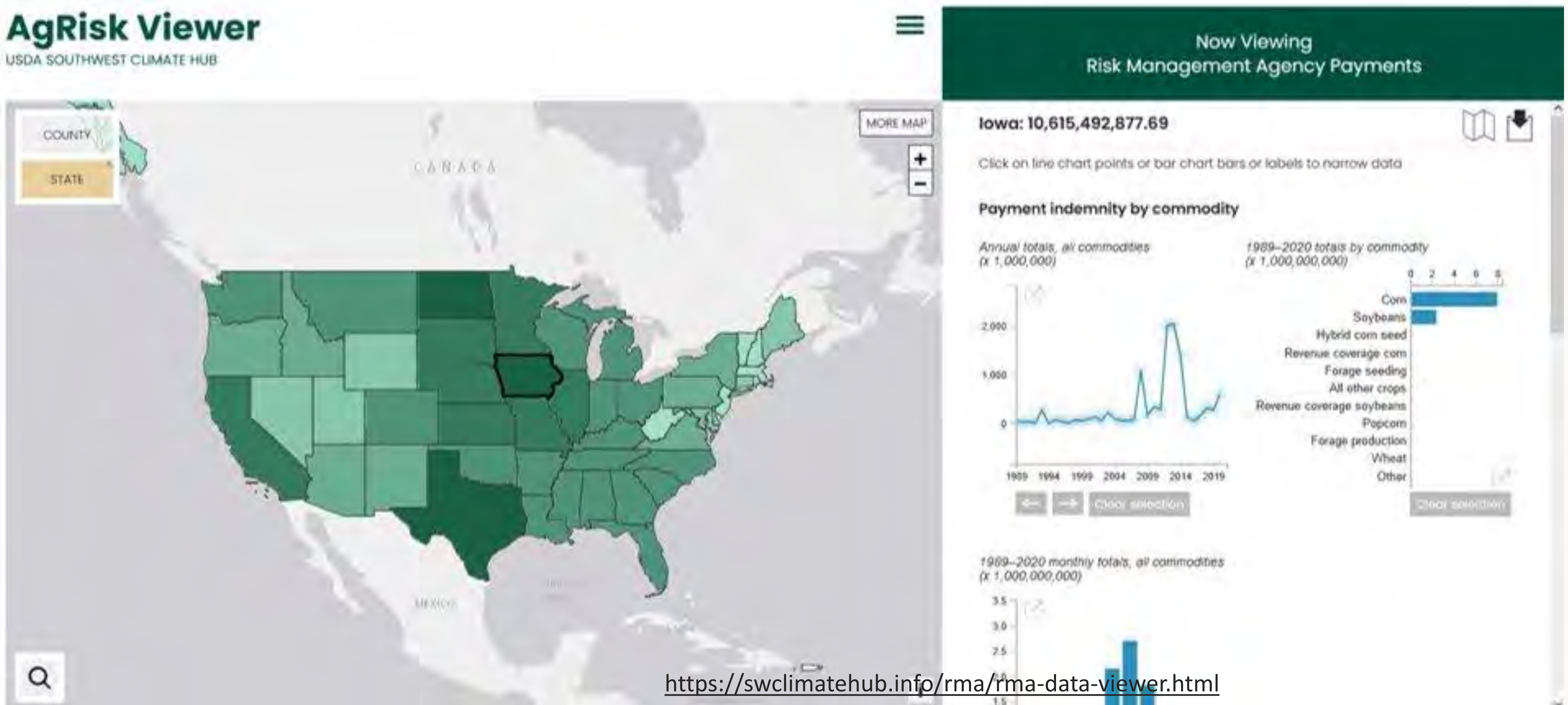


Climate-Impacted Issues for Agriculture

Since 1989, Iowa has the 3rd highest RMA indemnity payments.

- **Texas: $20.6 B**
- **North Dakota: $12.7 B**
- **Iowa: $10.6 B**

- **Drought - largest**
- **Wetness - most consistent**



https://swclimatehub.info/rma/rma-data-viewer.html

Precipitation Change

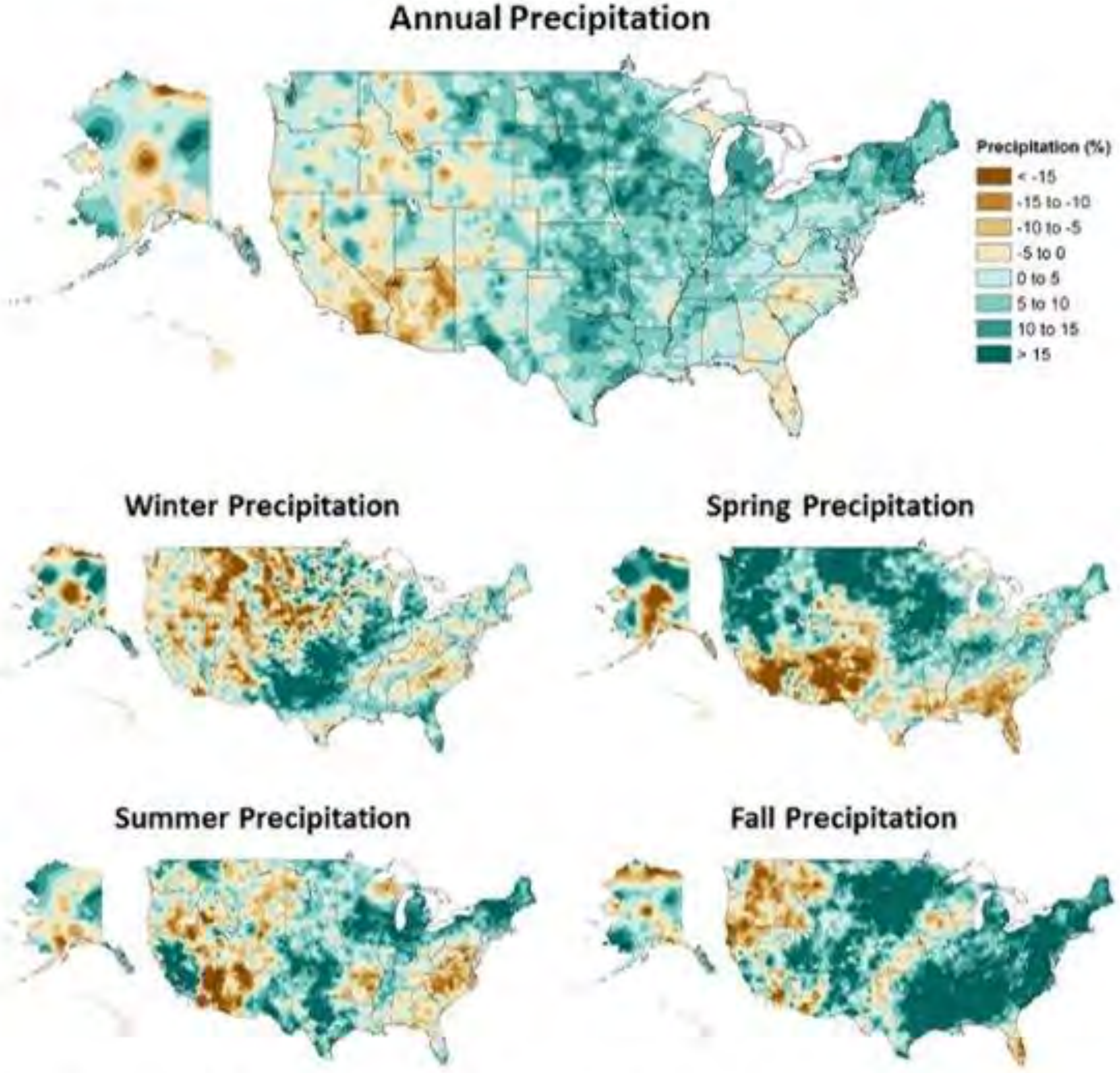
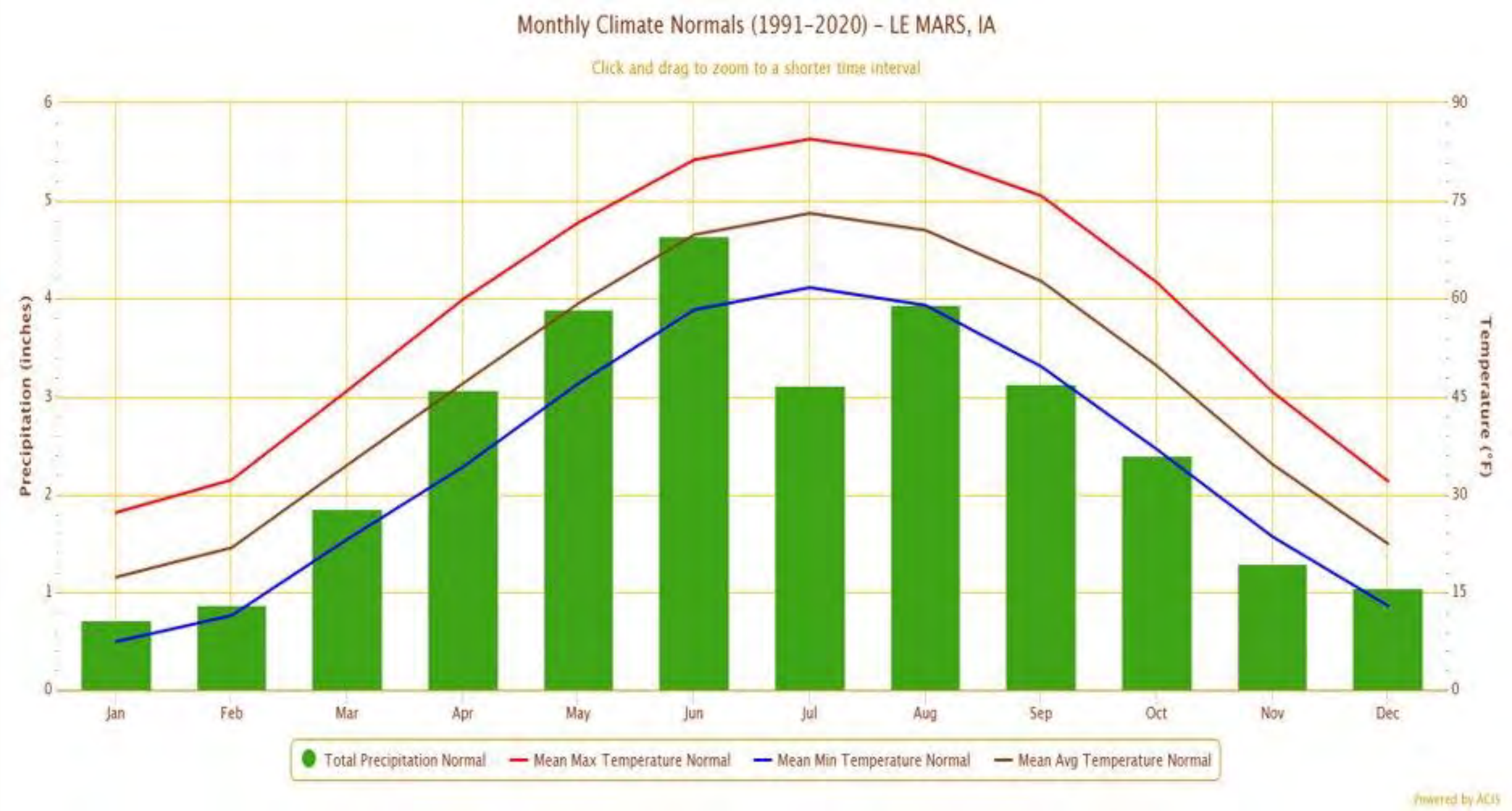


Figure 7.1: Annual and seasonal changes in precipitation over the United States. Changes are the average for present-day (1986–2015) minus the average for the first half of the last century (1901–1960 for the contiguous United States, 1925–1960 for Alaska and Hawai'i) divided by the average for the first half of the century. (Figure source: [top panel] adapted from Peterson et al. 2013,[78] © American Meteorological Society. Used with permission; [bottom four panels] NOAA NCEI, data source: nCLIMDiv).

30 Year Climatology (Le Mars, IA)



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Using the new 1991-2020 normal
Shifting drier in the mid-summer

Temperature Change

- Warming
  - Winter
  - Nights
- Adds livestock/human stress
- Push GDD accumulation/phenological state
- Does help increase frost free season period

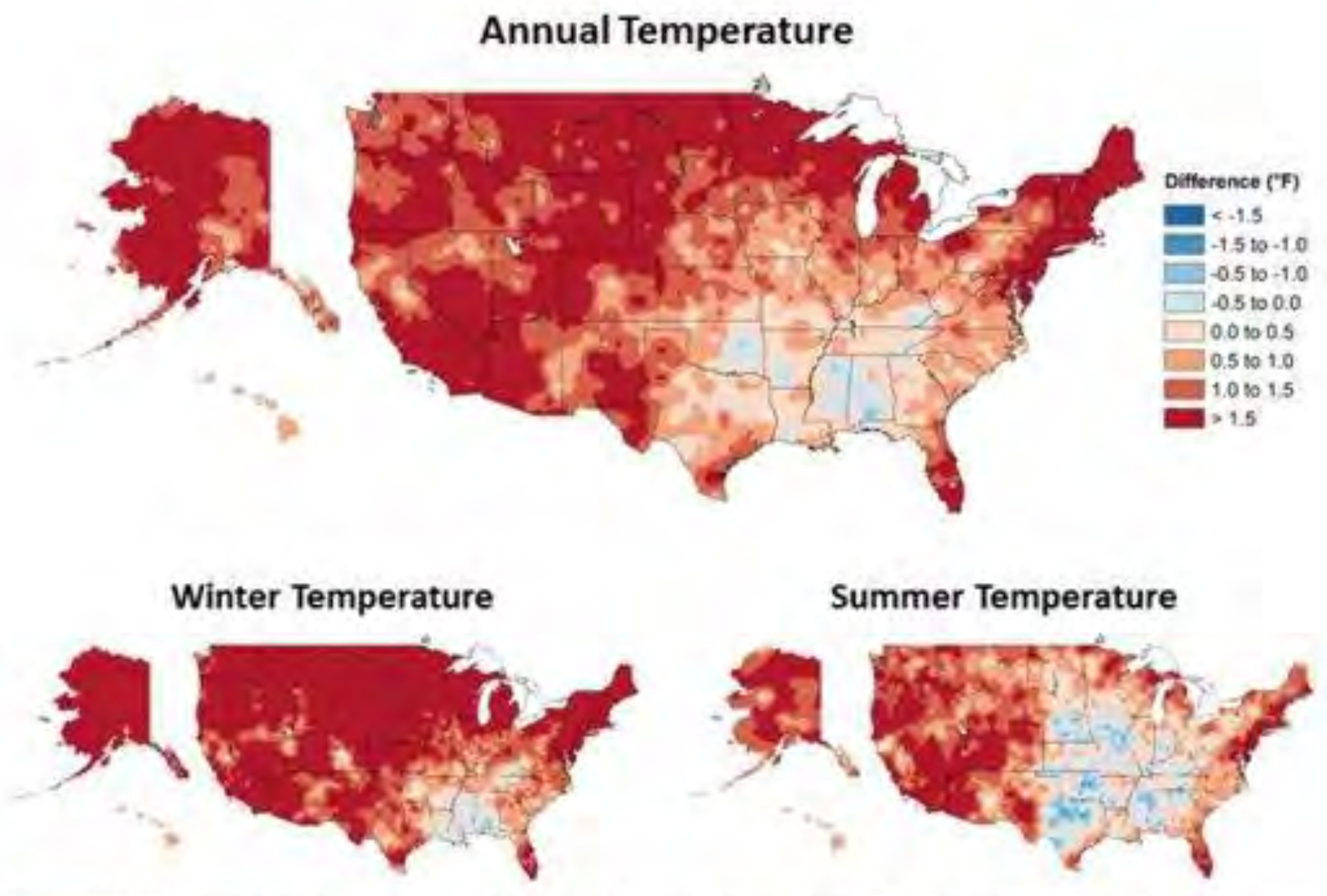

Figure 6.1. Observed changes in annual, winter, and summer temperature (°F). Changes are the difference between the average for present-day (1986–2016) and the average for the first half of the last century (1901–1960 for the contiguous United States, 1925–1960 for Alaska and Hawai'i). Estimates are derived from the nClimDiv dataset.[1,2] (Figure source: NOAA/NCEI).

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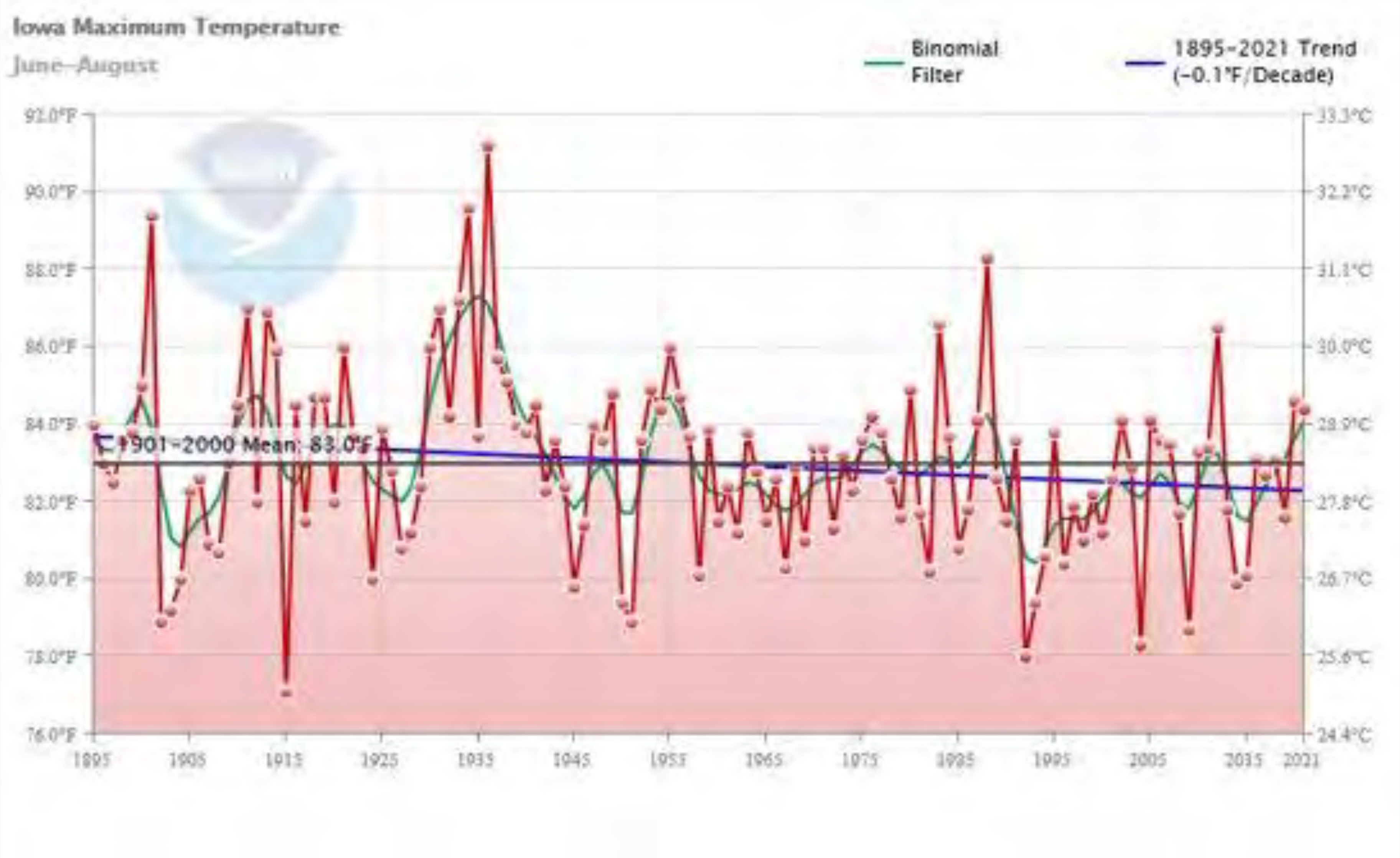
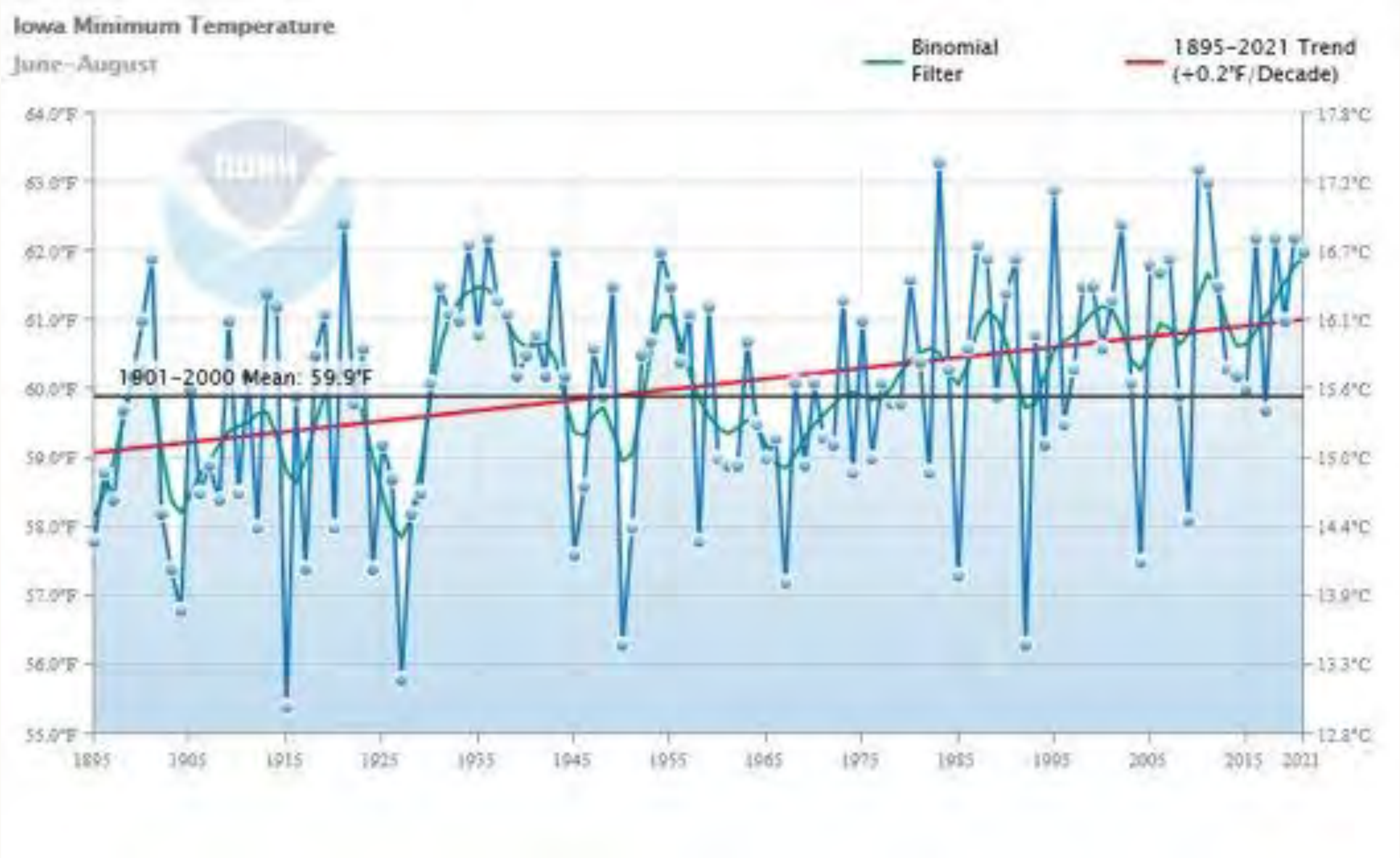
Iowa Summer Temperatures





Maximums cooling (fewer hot days)

Minimums warming (warmer nights)

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https://www.ncdc.noaa.gov/cag

Livestock Issues with Temperature and Humidity

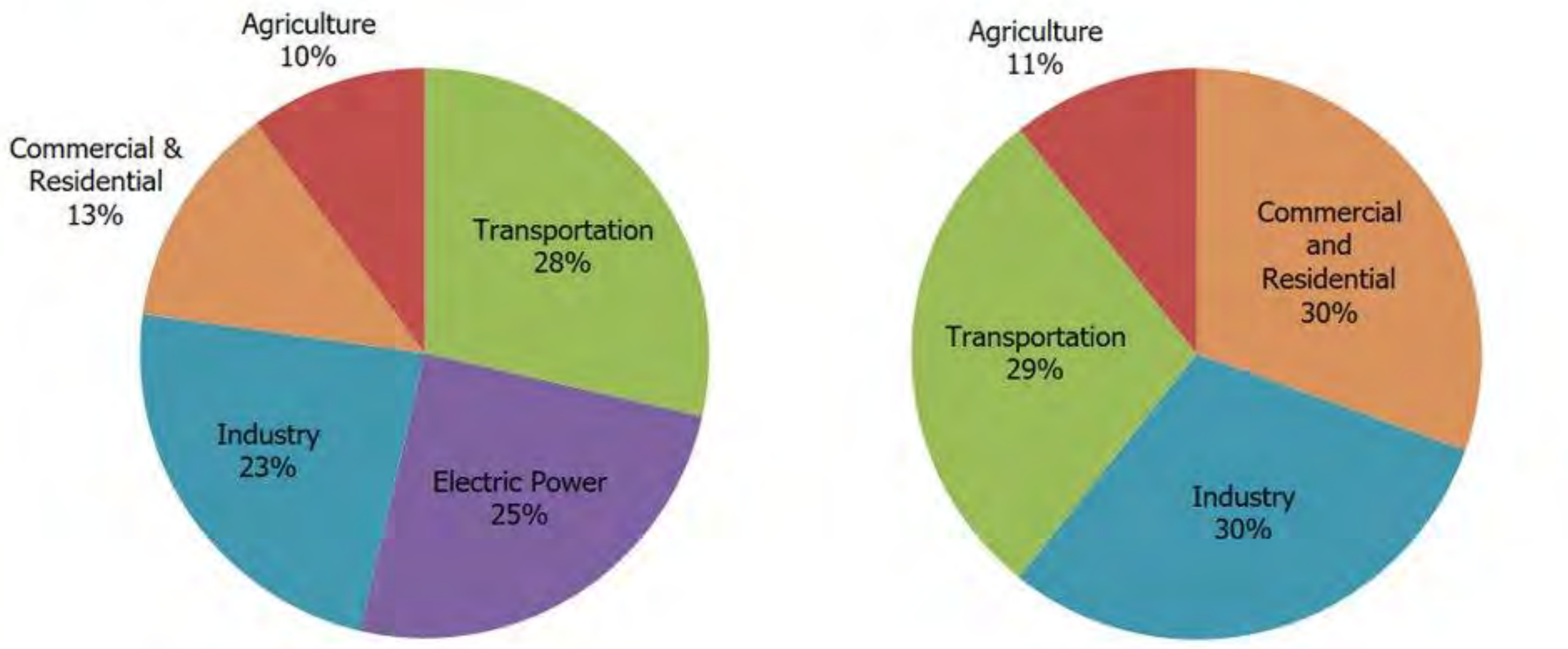
- Warm/humid conditions- less cooling at night
- Creates additional stress on livestock
    - Reduced production
    - Reduced gain
    - Possible breeding issues
    - Mortality- extreme cases

Tougher on humans working in these conditions, too.

Climate-Smart Agriculture

What are we trying to mitigate?

Total U.S. Greenhouse Gas Emissions by Economic Sector in 2021



Total U.S. Greenhouse Gas Emissions by Economic Sector

Total U.S. Greenhouse Gas Emissions by Economic Sector and Electricity End-Use

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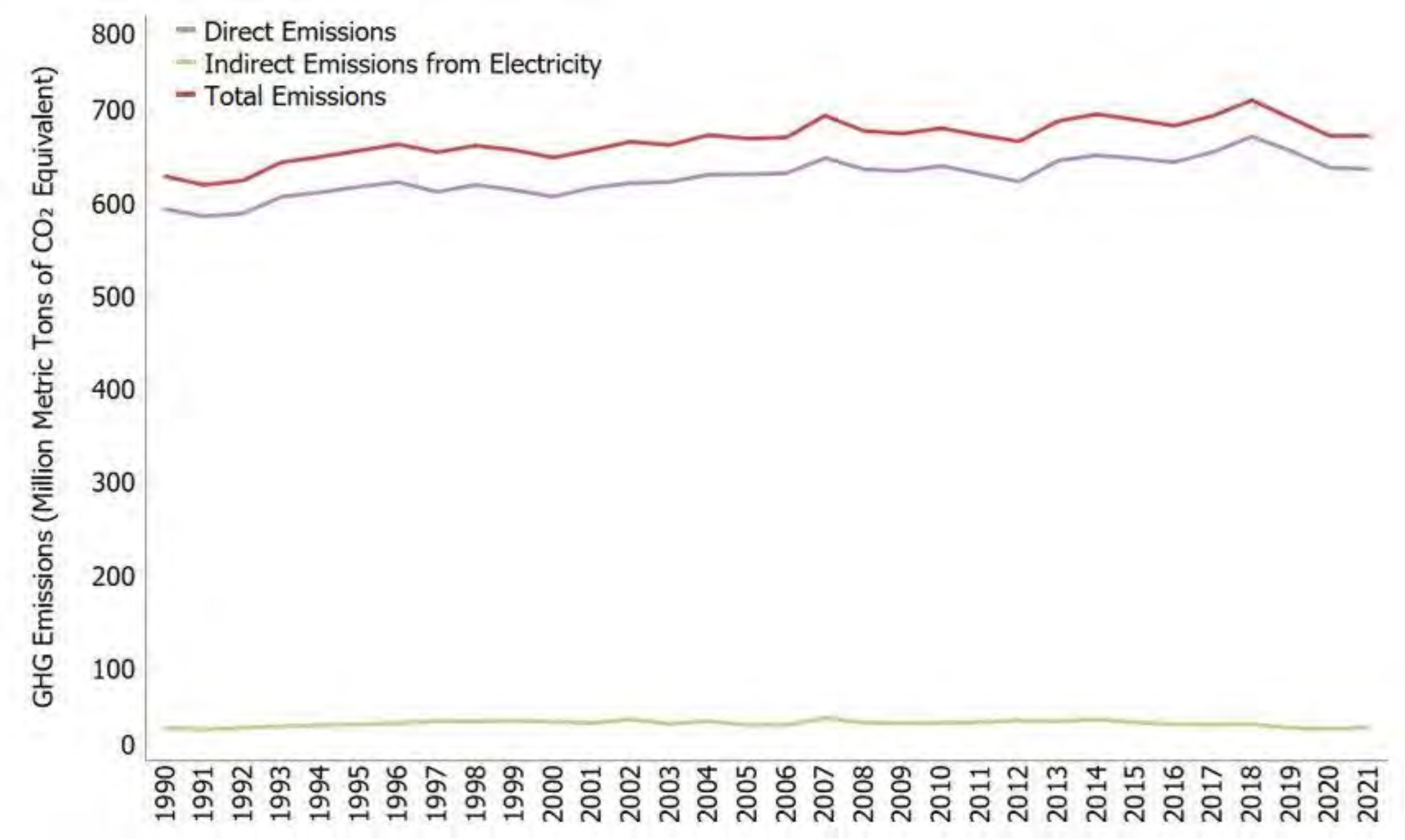
https://www.epa.gov/ghgemissions/sources-greenhouse-gas-emissions

Climate-Smart Agriculture



https://www.epa.gov/ghgemissions/sources-greenhouse-gas-emissions

Climate-Smart Agriculture

CSA- The Problem…

Conceptually, we have the general idea.

What are the realities on the ground?

Climate Smart Agriculture

What does a practice really do?

Can we quantify its capability?

Where do practices work (or not)?

How should practices be implemented?

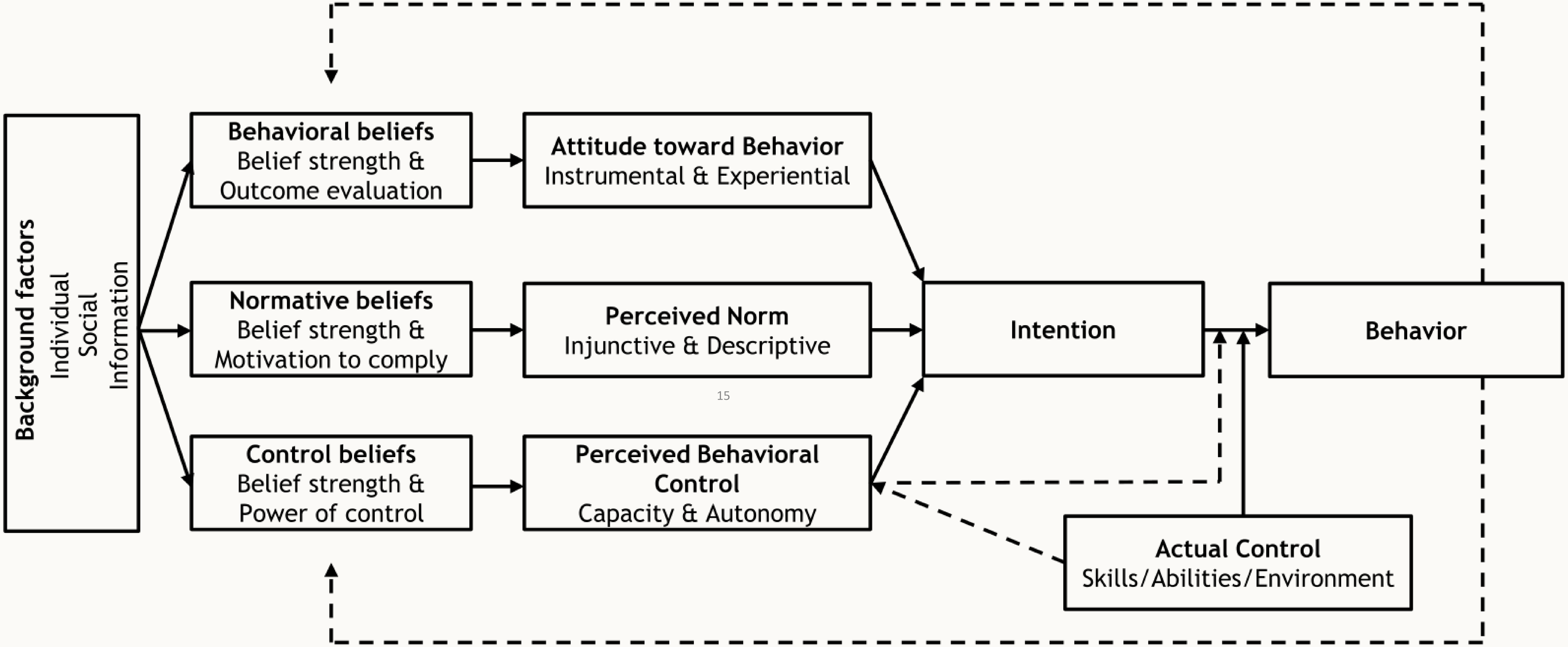
How do we get practices adopted?

Can a practice be implemented incorrectly?

Can actions after a practice undo its effects?

What about for different crops?

The Reasoned Action Approach
(Fishbein and Ajzen, 2010)



Diffusion of Innovations

(Rogers, 2003)

Figure 5-1. A Model of Five Stages in the Innovation-Decision Process

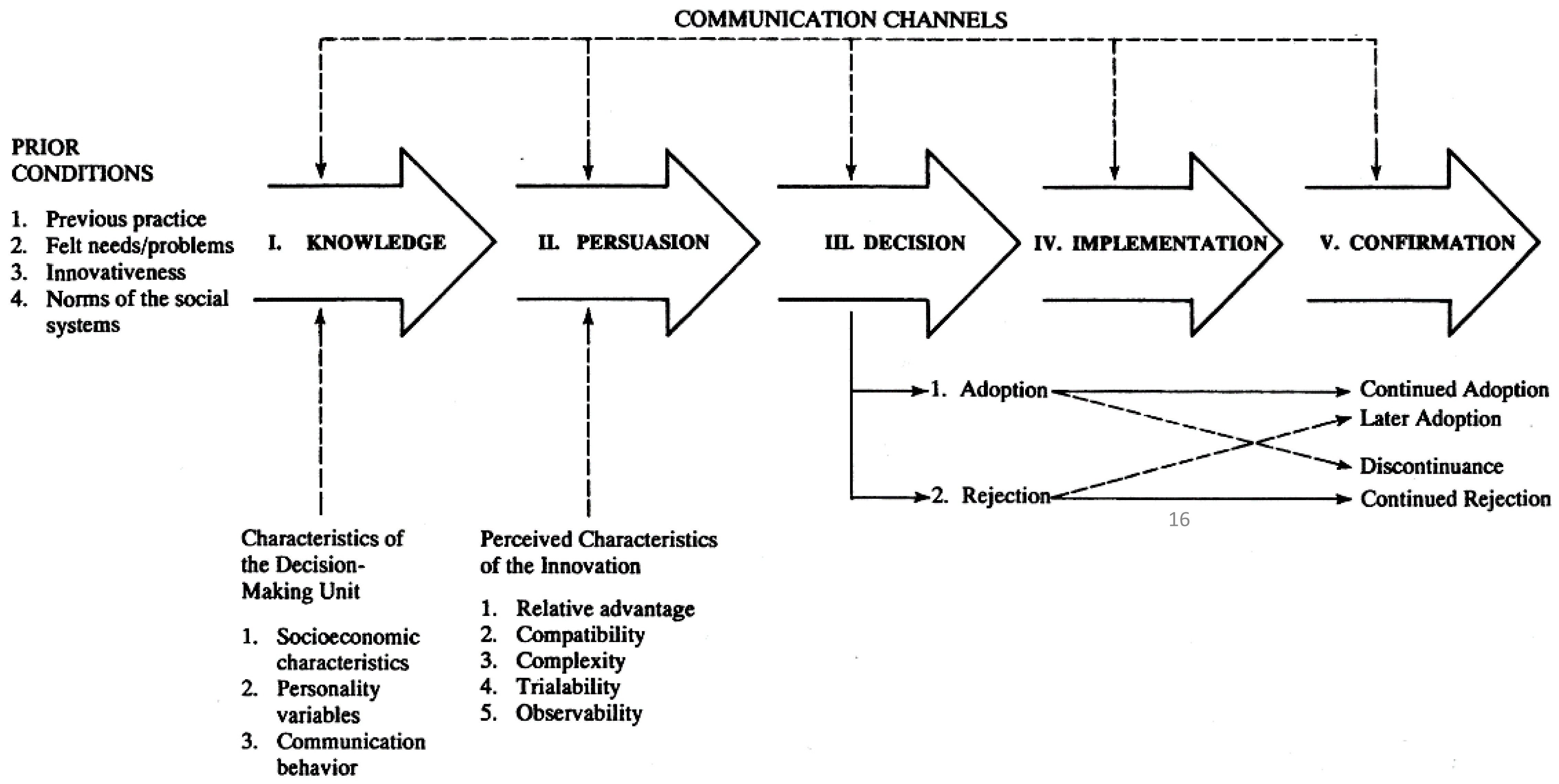
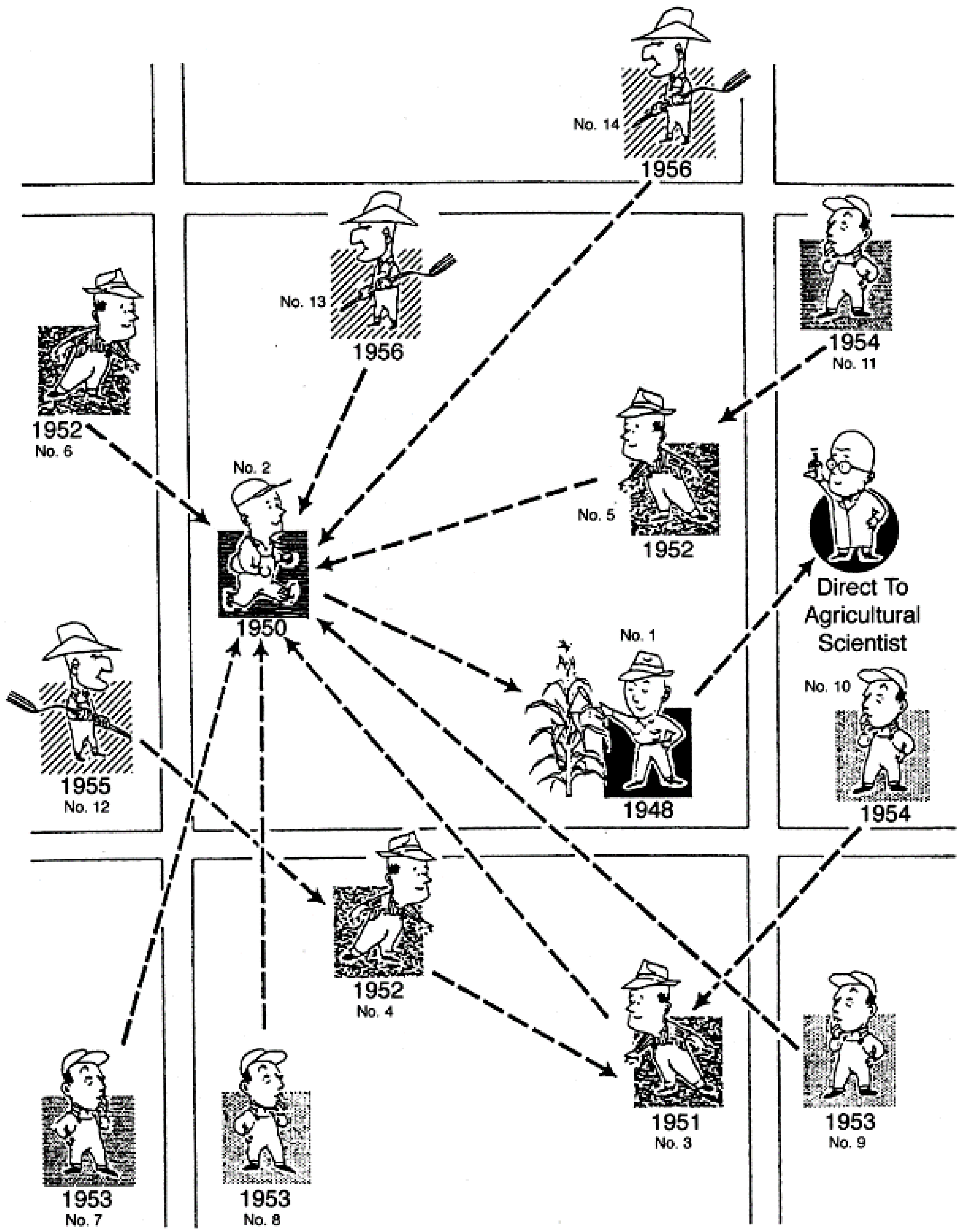
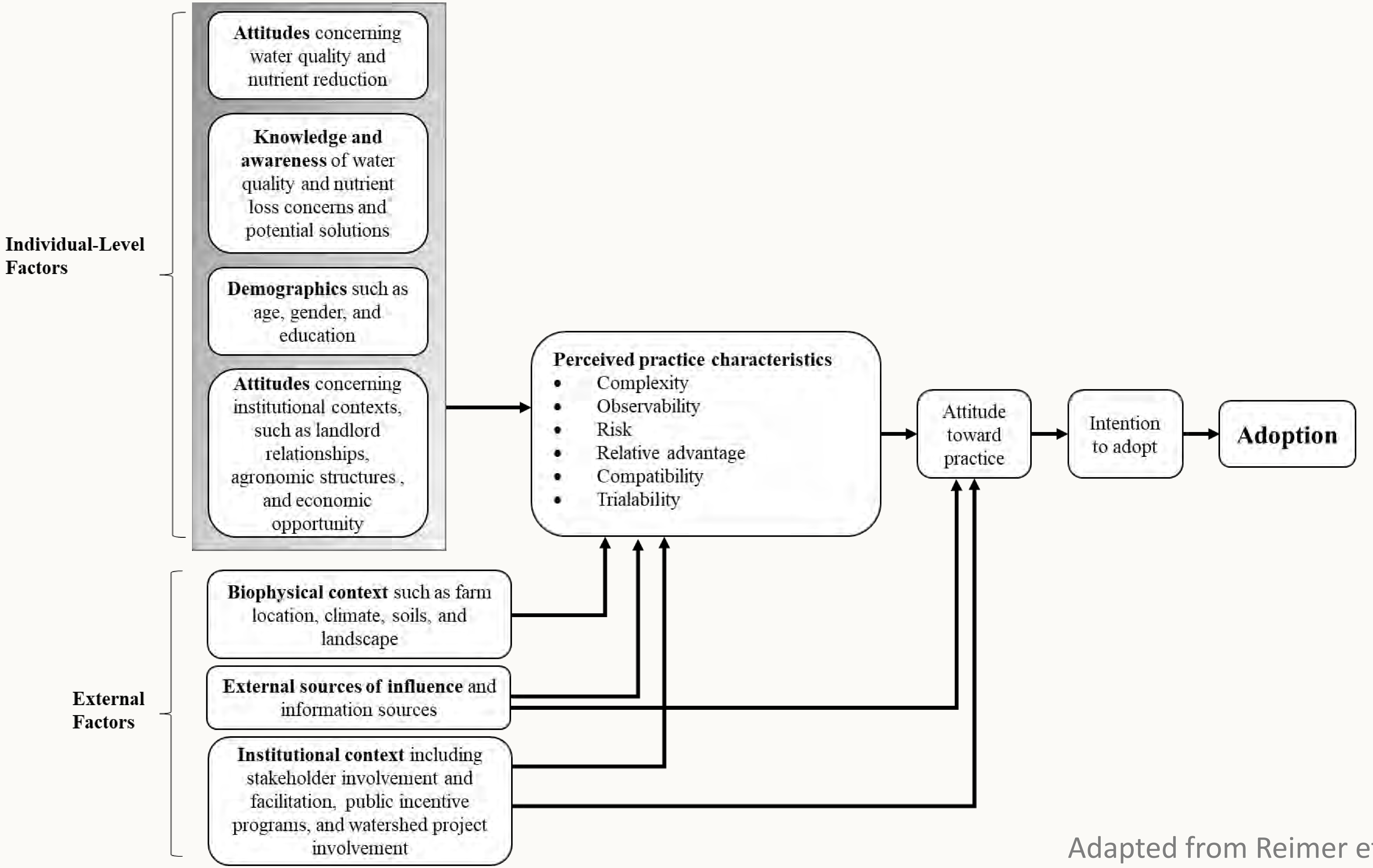


Figure 7-4. The Diffusion of a New Weed Spray in an Iowa Farm Neighborhood

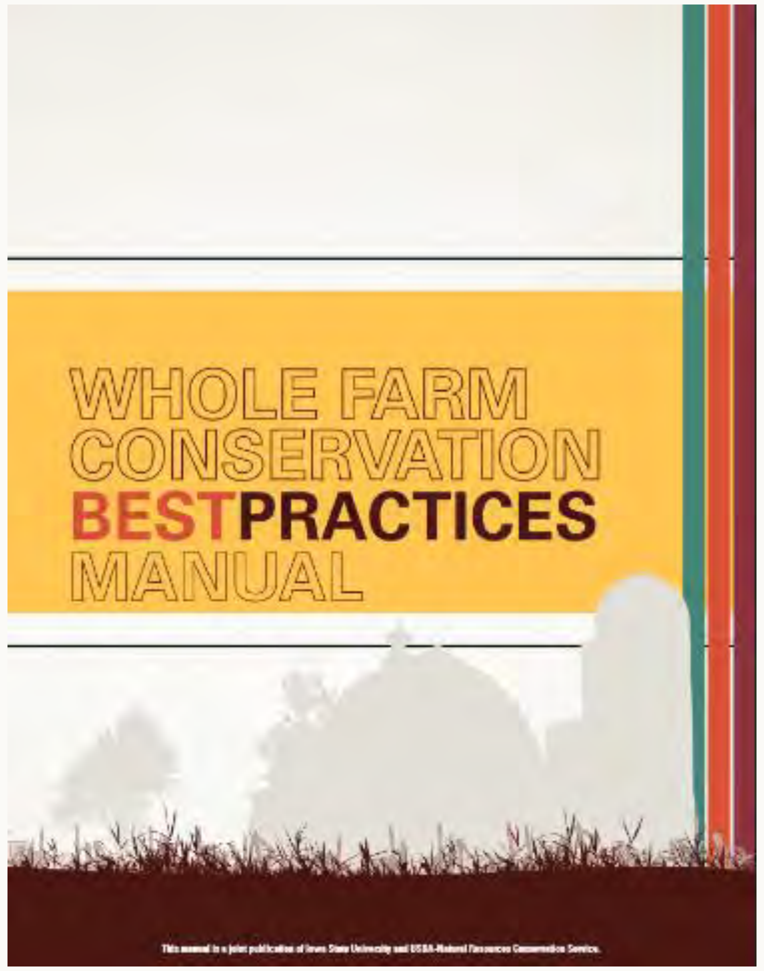




Adapted from Reimer et al. 2012

Don Poggensee, USDA-NRCS Photo Gallery

Lynn Betts, NRCS/SWCS Conservation Media Library



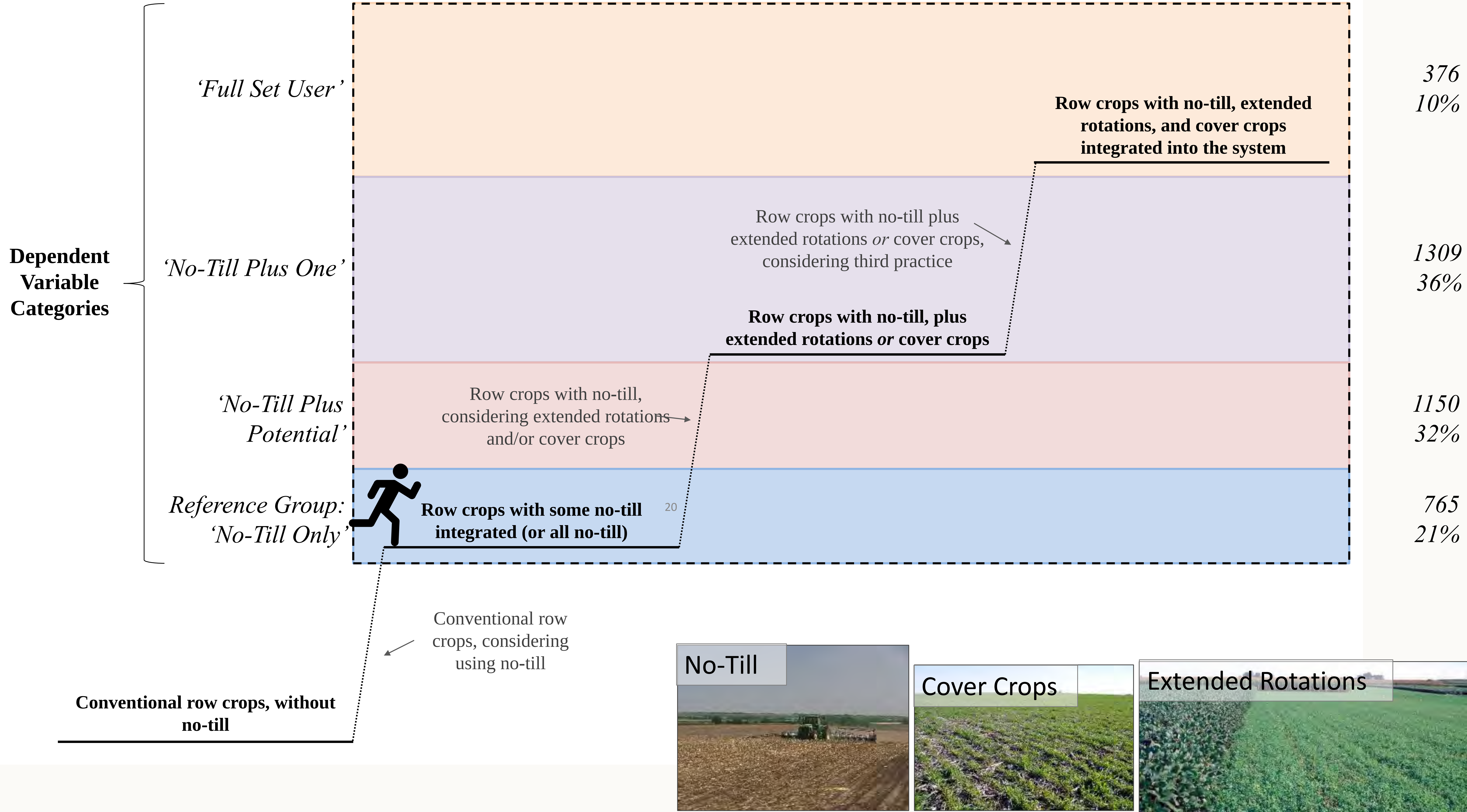
Matt Liebman, https://www.ucsusa.org/resources/rotating-crops-turning-profits

Research Gaps

1. Understanding intention (openness) as a dependent variable
2. Predicting the use of multiple, complementary practices

Research Question

Which factors influence farmers' progression towards adopting multiple complementary conservation practices?


Dependent Variable Categories
'Full Set User'
'No-Till Plus One'
'No-Till Plus Potential'
Reference Group: 'No-Till Only'
Row crops with no-till, extended rotations, and cover crops integrated into the system
Row crops with no-till plus extended rotations or cover crops, considering third practice
Row crops with no-till, plus extended rotations or cover crops
Row crops with no-till, considering extended rotations and/or cover crops
Row crops with some no-till integrated (or all no-till)
Conventional row crops, considering using no-till
Conventional row crops, without no-till
376
10%
1309
36%
1150
32%
765
21%
No-Till
Cover Crops
Extended Rotations

Individual-Level Characteristics

- **Awareness and concern**
- **Support for action**

- **Perceived agronomic barriers**
- **Perceived economic barriers**

- Age
- Education

- Crop acres
- Percent of crop acres rented
- Pasture acres

External Factors

- **Public sector influence**
- **Social network influence**
- **Private sector influence**
- **On-farm research NGO influence**

- *Watershed organization participation*
- *Receipt of cost-share or tech. assistance*

Status as user or intended user of complementary set of practices

- No-till only
- No-till plus potential
- No-till plus one practice
- Full set user

Bolded variables are scales – mean of five-point responses.

Italics variables are binary (yes/no)

Results: Which factors affect the odds of being on a certain part of the stepladder?

No-Till Only — COMPARE →

		No-Till Plus Potential	No-Till Plus One	Full Set
Individual-Level Characteristics	Support for action	+11% ***	+88% ***	+124% ***
	Perceived agronomic barriers	-15% *	-21% **	-26% **
	Percent of crop acres rented (10%)	-3% *	-6% ***	-5% **
	Pasture acres (10ac)	+5% ***	+8% ***	+11% ***
External Factors	On-farm research NGO influence	+19% *	+53% ***	+54% ***
	Private sector influence		-13% *	-20% *
	Receipt of cost-share or tech. assistance	+36% **	+134% ***	+146% ***
	Watershed project participation		+33% *	+46% *

*** p<0.001
** p<0.01
* p<0.05

Key Points

- Some factors are predictive of the “stepladder” stages **and** show a gradational effect
- An Iowa row crop farmer is more likely to be further along in this “stepladder” if they…

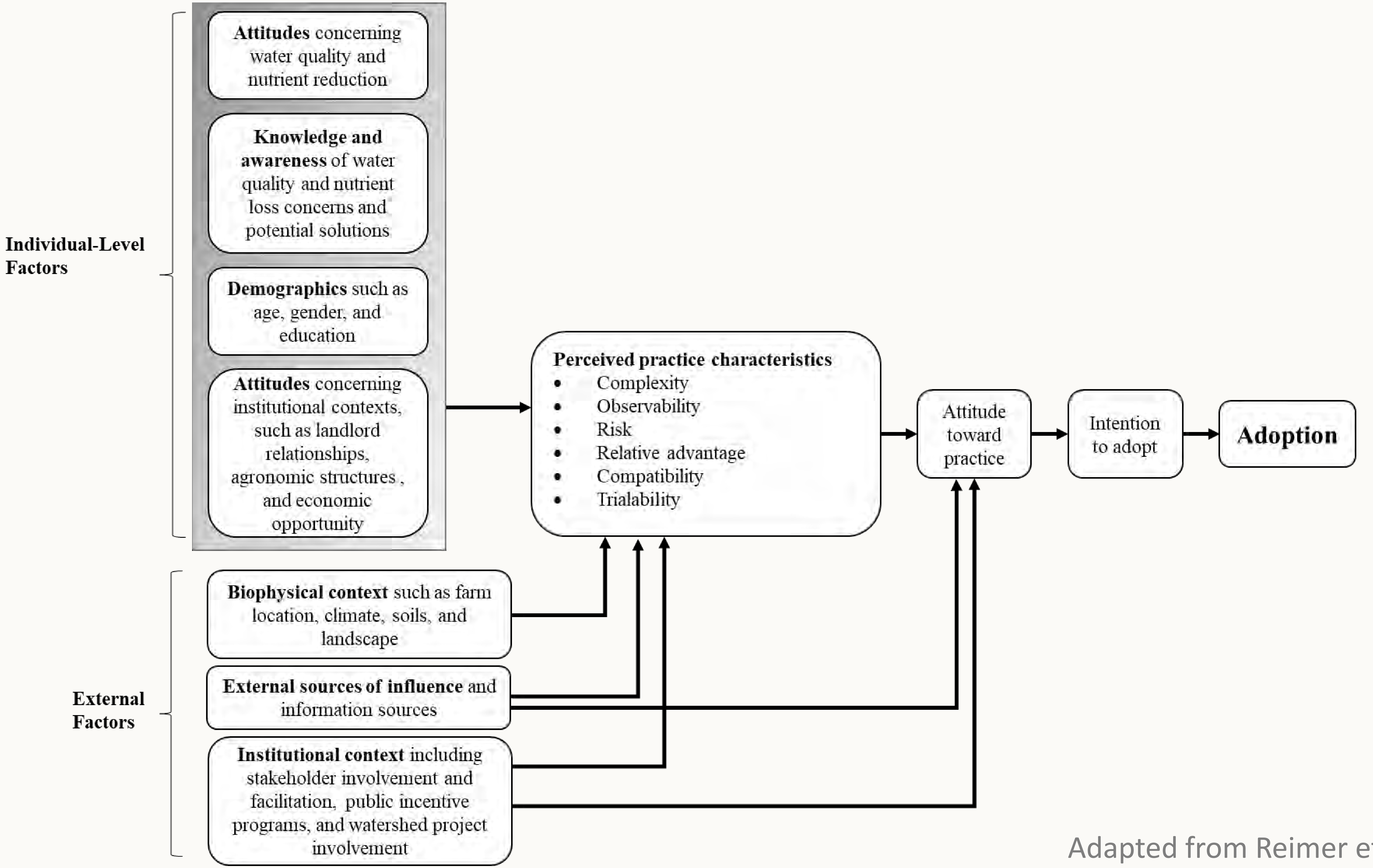
  …**support** taking action on nutrient loss and water quality.

  …are less concerned about there being agronomic barriers to water quality improvement in Iowa.

  …**own much of their land** and **have pasture**.

  …make decisions based on information from **on-farm research NGOs** and consider private sector sources less influential.

  …have received **cost-share** or technical assistance in the last five years or participate in **watershed management** groups.



Adapted from Reimer et al. 2012

www.adaptationfellows.net

CAMF

ABOUT PROGRAMS CURRICULUM BLOG APPLY

Row Crops Program

A program for Midwest producers and advisors working with row crops.

The Midwest region is an important agricultural region in the United States, generating $55 billion in crop sales in 2019. However, extreme weather events including drought and flooding are negatively impacting agricultural production. This Climate Adaptation and Mitigation Fellowship cohort seeks to create a community of row crop producers and advisors who will learn about climate change adaptation and mitigation together. States in the Midwest region include Michigan, Ohio, Wisconsin, Minnesota, Iowa, Missouri, Indiana, and Illinois. This program is for farmers growing corn, soy, and other grains, and for those advising farmers in this region.

Here's how a Climate Adaptation and Mitigation Fellowship works:

1. Working in pairs, engaging in groups

Fellows work in pairs: one farmer and one agricultural advisor work together for the duration of the program. Fellows can either apply as farmer/advisor pairs, or have a partner assigned after submitting an application. While most work is done in pairs, this is also a cohort-based program. Fellows will have many opportunities to connect with other farmers and advisors outside their pair throughout the program. This is also a peer learning program – information, knowledge, and experience flow from farmer to farmer, farmer to advisor, advisor to farmer, and advisor to advisor.

2. Education

Educational topics including climate change impacts, communicating about climate change, adaptation and mitigation strategies, disaster preparedness, strategies for financing adaptation and mitigation, and how to create an adaptation and mitigation plan will be covered through online learning. All educational content will be recorded and available to fellows to watch any time after the content is delivered. Learning sessions will be held at the beginning and end of a program, with supplemental webinars and online discussions in between.

3. Planning & Support

Following the opening learning sessions, fellows will work in pairs to create a farm-specific climate risk assessment, and adaptation and mitigation plan. A member of the "Educator Team" will provide resources and assistance throughout the planning process. Fellows will also be offered opportunities to share with one another, and attend optional educational programming as they work on their plans.

4. Implementation & Sharing

Once fellow pairs have completed their climate adaptation and mitigation plans, they are encouraged to find ways to implement the plan. This might look like finding funding for an element of the plan, creating a demonstration or field trial, or integrating climate risk management into the farm business plan. At a final meeting, fellows will share their completed plans, and discuss on-farm next steps to actualize their plans.

Working in Pairs

Education

Planning & Support

Implementation & Sharing

Outcomes According to 34 Fellows

(17 farmer fellows, 13 agricultural advisor fellows, and 4 farmer/agricultural advisors)

28 Fellows reported that hearing other fellows discussing their adaptation strategies made them think in a new way about climate adaptation strategies they could use on their farms or incorporate into their programs.

15 Farmers reported making changes or adopting climate adaptation/mitigation practices after engaging in the program.

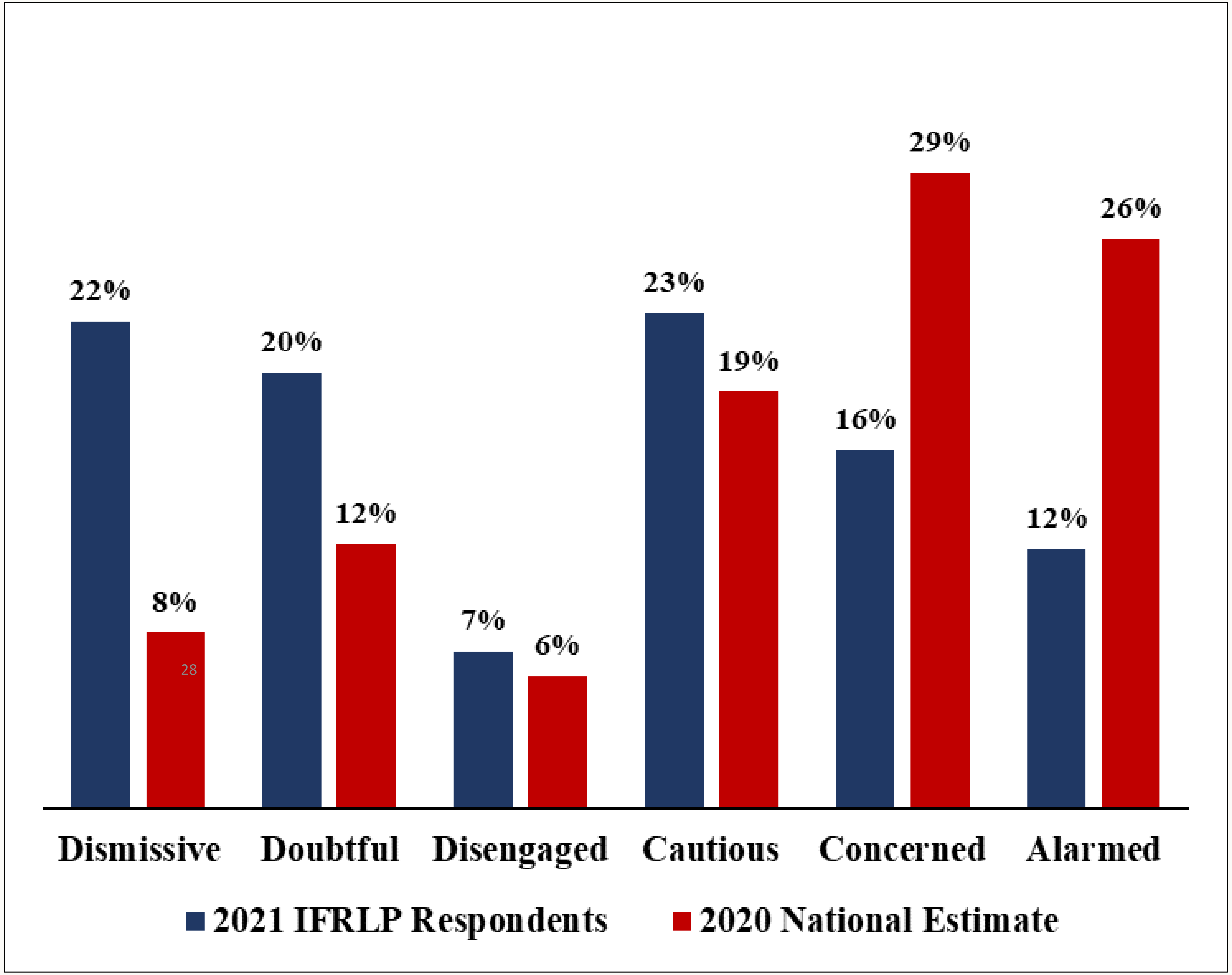
For more documented outcomes of the pilot project, visit www.adaptationfellows.net/past-programs

1. **How important is the issue of global warming to you personally?**
   (Not at all important, Not too important, Somewhat important, Very important, Extremely important)

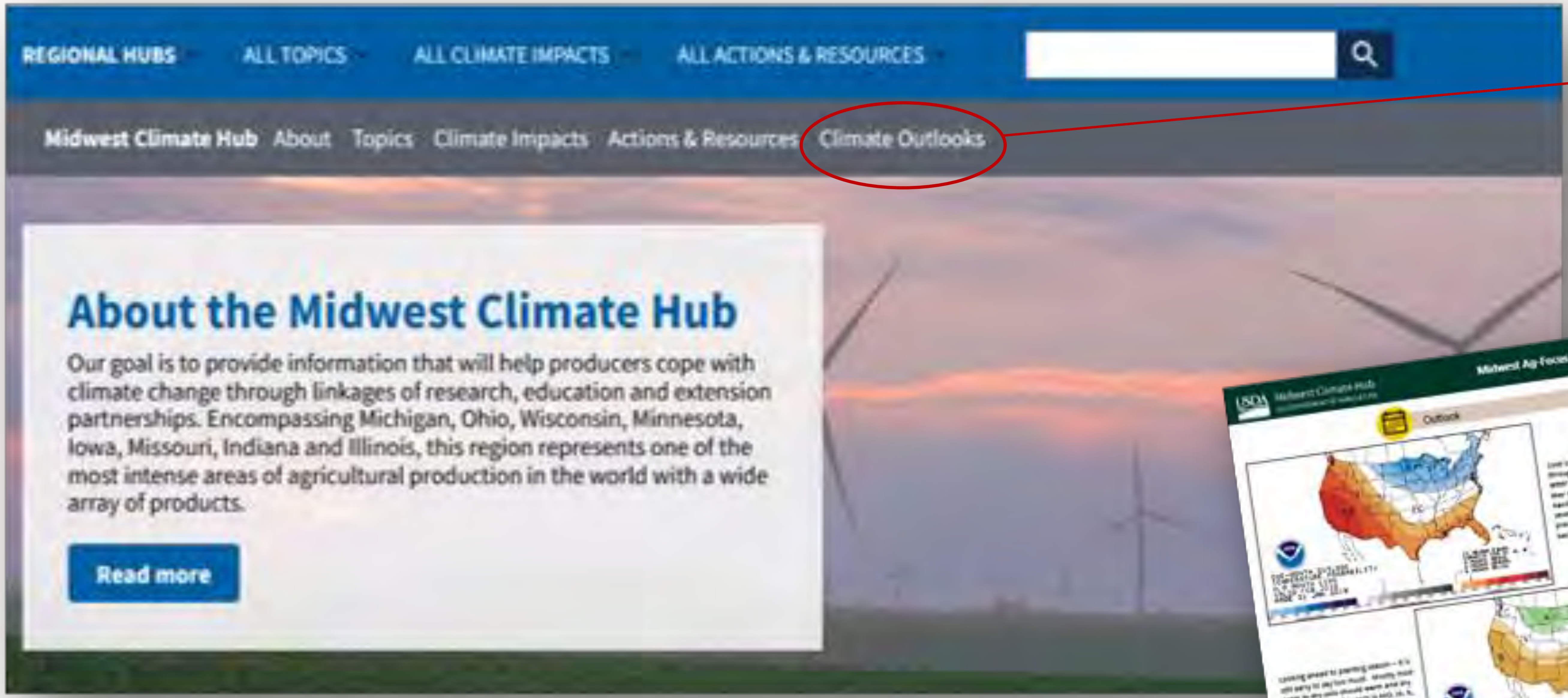
2. **How worried are you about global warming?**
   (Not at all worried, Not very worried, Somewhat worried, Very worried)

3. **How much do you think global warming will harm you personally?**
   (Don't know, Not at all, Only a little, A moderate amount, A great deal)

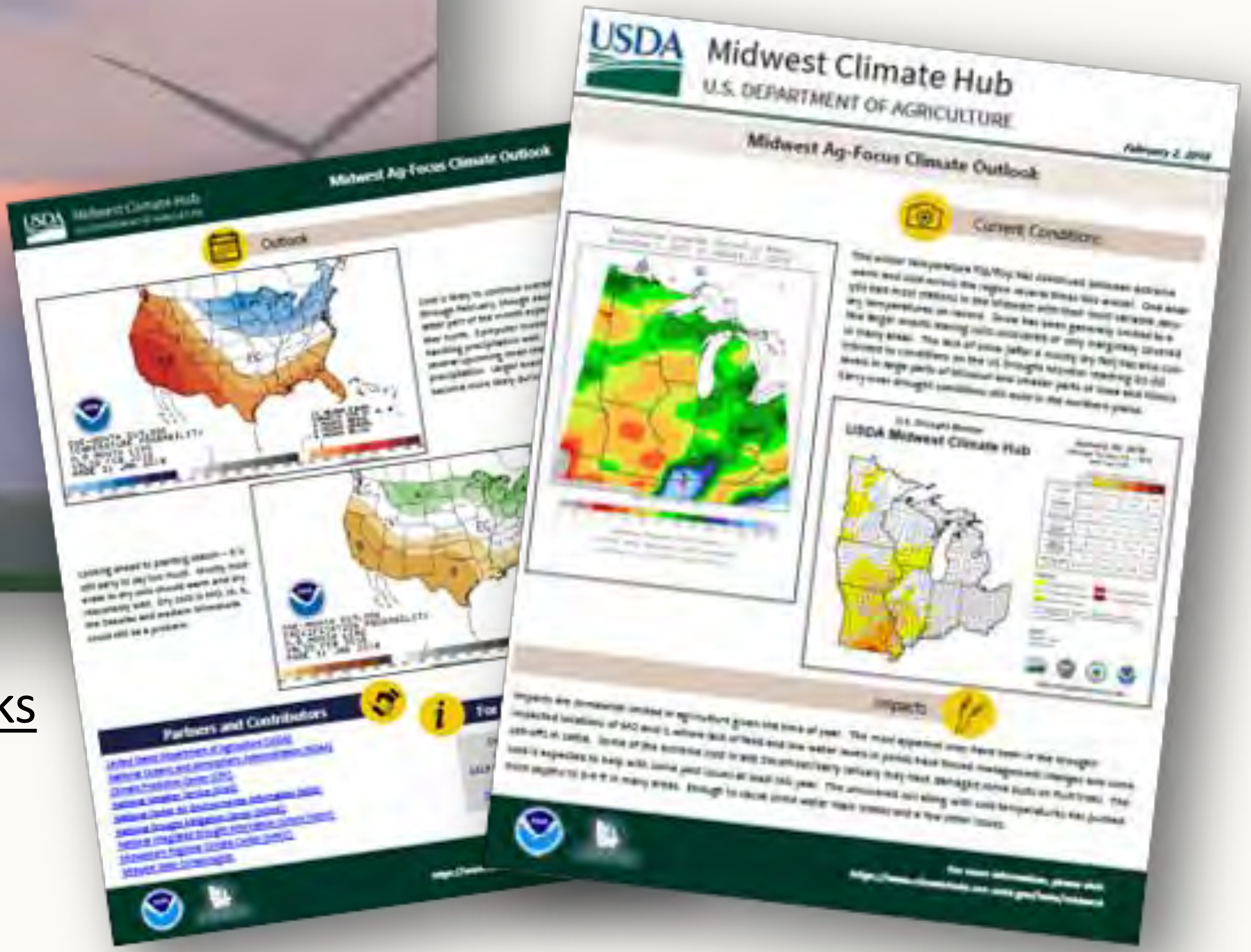
4. **How much do you think global warming will harm future generations of people?**
   (Don't know, Not at all, Only a little, A moderate amount, A great deal)



Climate Hub- Operational Products



Midwest Ag-Focus Climate Outlook



https://www.climatehubs.usda.gov/hubs/midwest/climate-outlooks

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