

# Resilient Agriculture

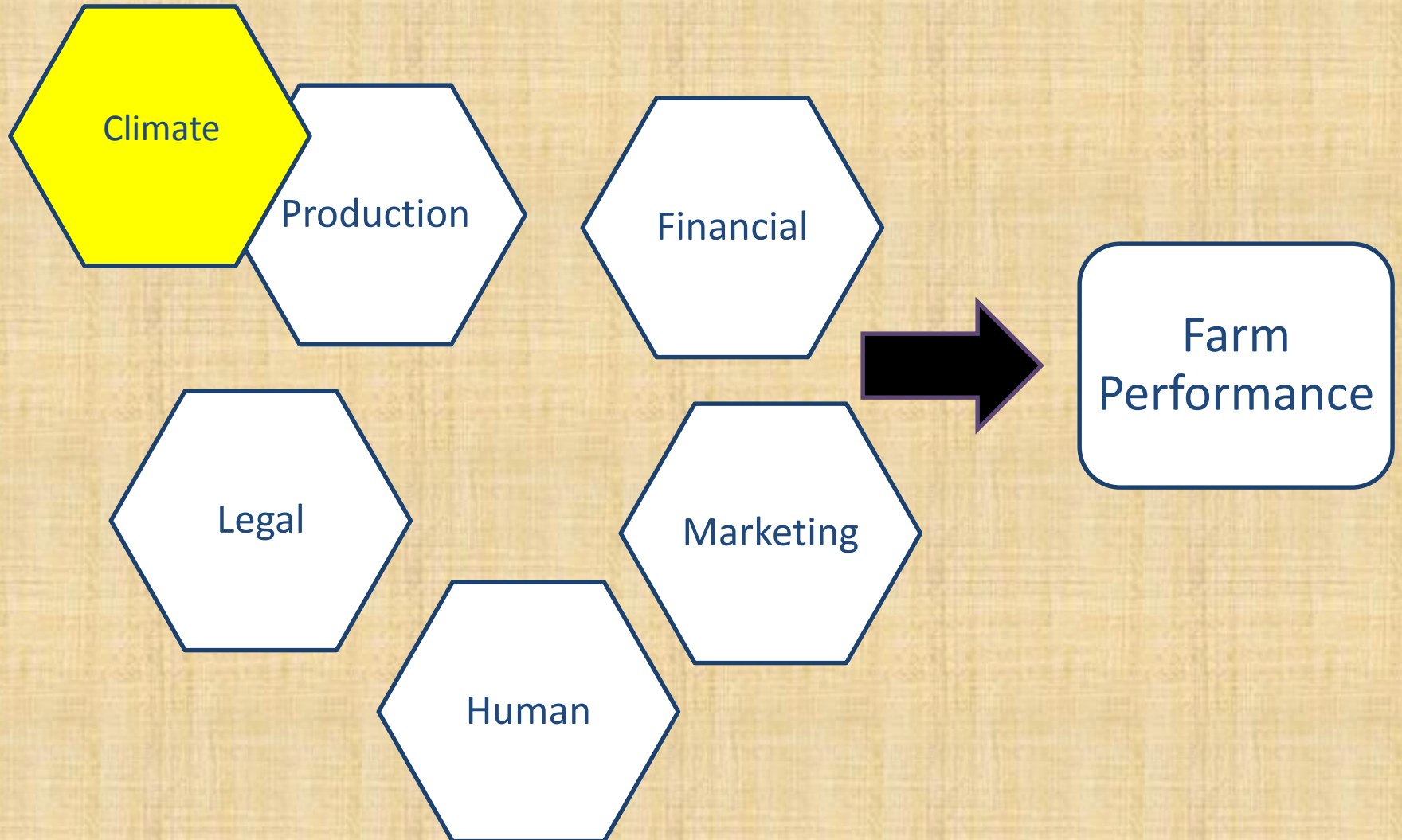
## for a Changing Climate

*“Although agriculture has a long history of successful adaptation to climate conditions, **the current pace** of climate change and **the intensity of projected climate changes represent a novel and unprecedented challenge** to the sustainability of U.S. agriculture.”*

Climate Change and Agriculture in the United States: Effects and Adaptation.  
C. Walthall, J. Hatfield, L. Lengnick, E. Marshall and P. Backlund, et al. 2013.  
USDA Technical Bulletin 1935

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# New Agricultural Risk



# Three Components of Climate Risk

## ***Exposure***

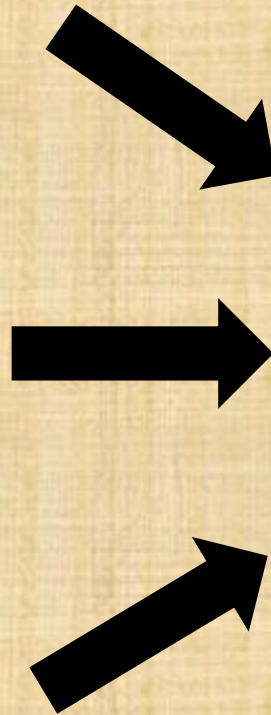
Degree to which a farm experiences climate-related events.

## ***Sensitivity***

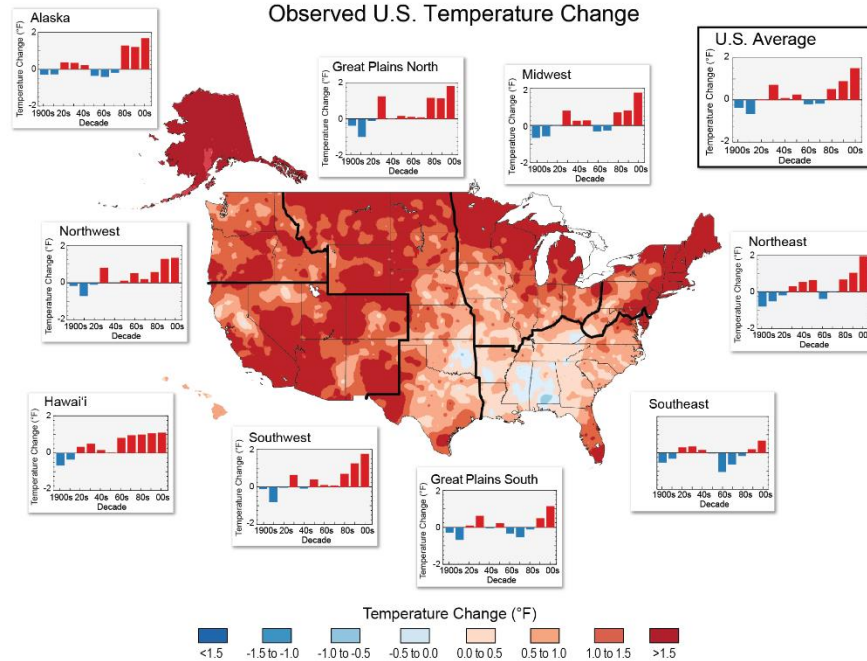
Degree to which a farm is affected by climate-related events.

## ***Adaptive Capacity***

Ability of a farm to cope with climate-related events.



Climate Risk

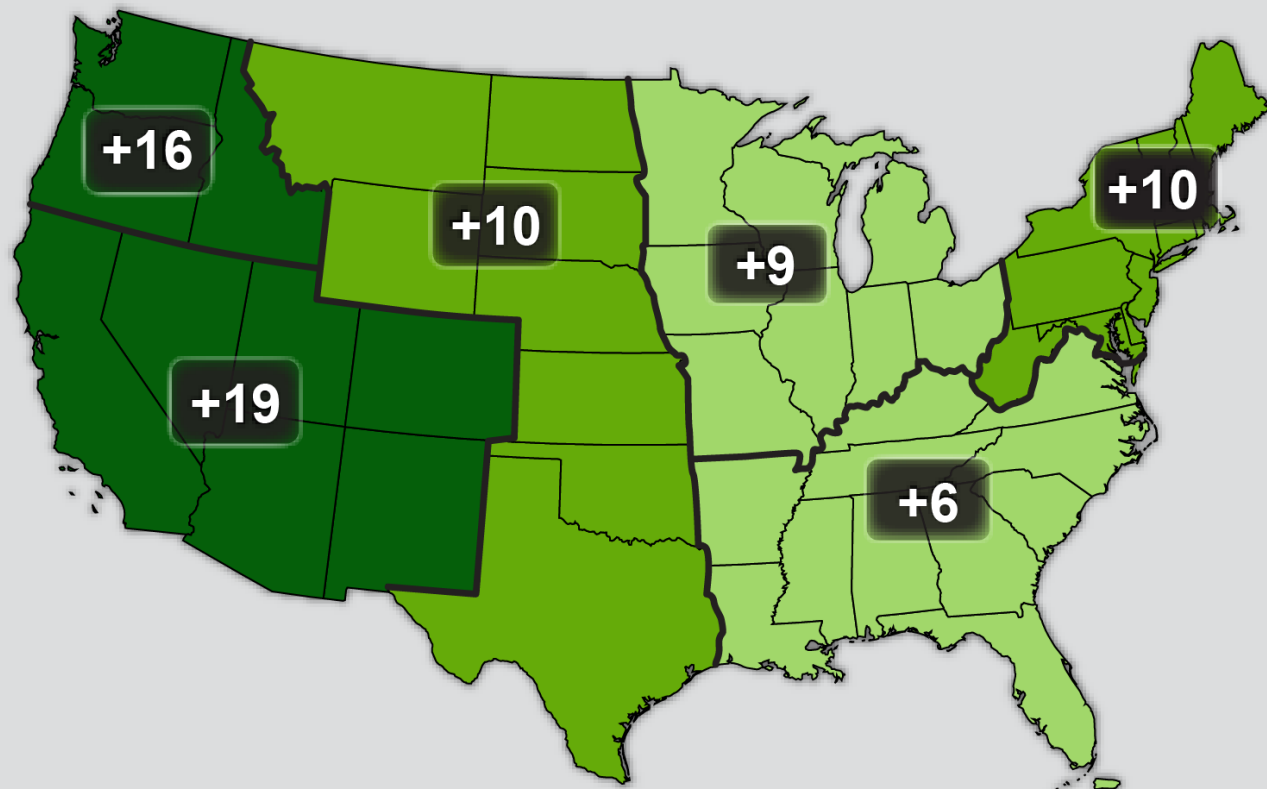


*Degree to which a system experiences climate-related events*

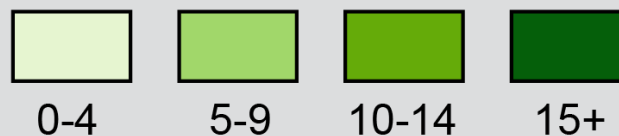
# EXPOSURE

National Climate Assessment <http://nca2014.globalchange.gov/>

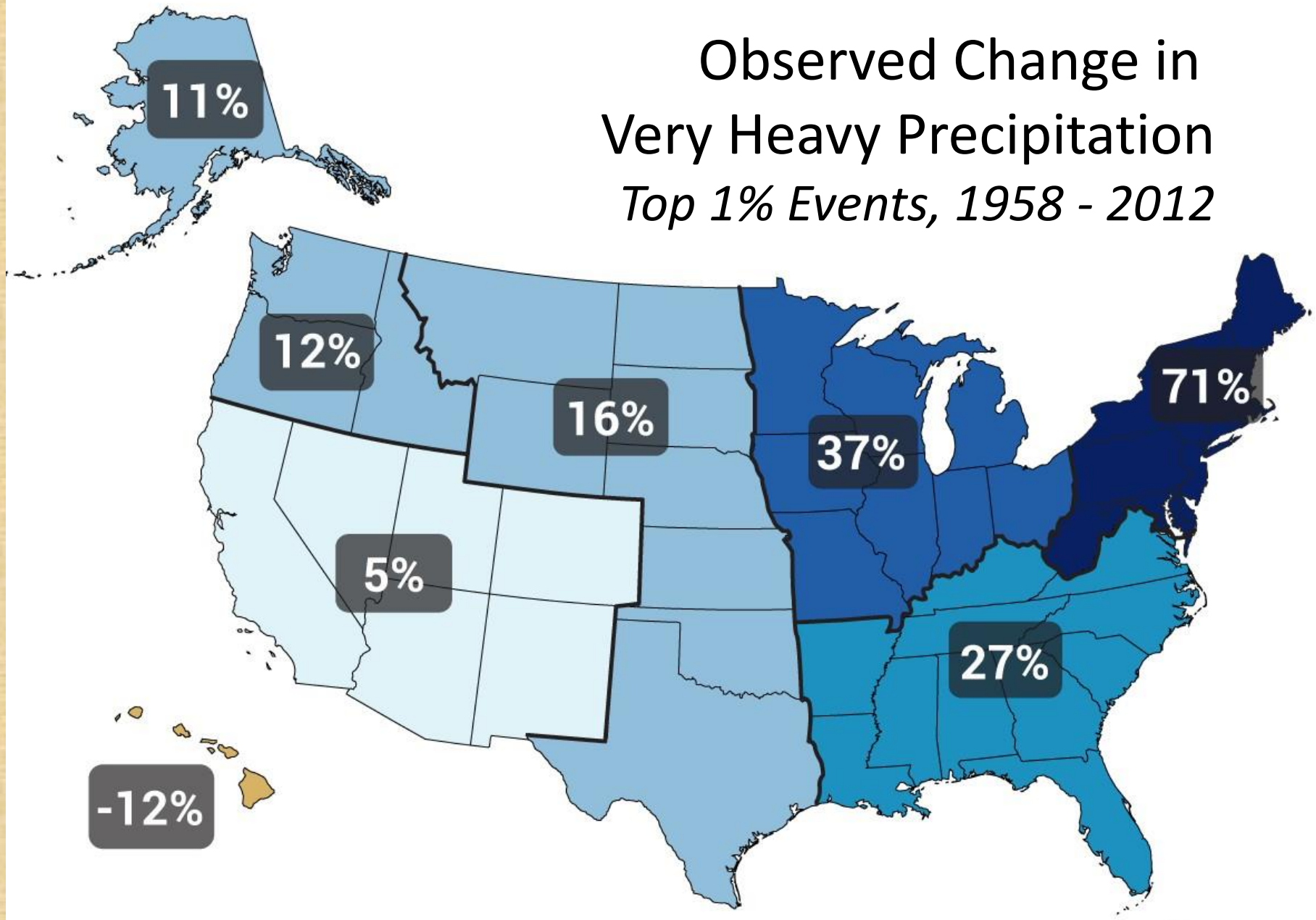
# Observed Increase in Frost-Free Season Length



Change in Annual Number of Days



# Observed Change in Very Heavy Precipitation *Top 1% Events, 1958 - 2012*



# Farm Sensitivities?



# Farm Resources Contributing to Adaptive Capacity?

- Soil
- Water
- Farmscape
- Infrastructure
- Production system
- Management
- Extreme events plan
- Recovery reserves



# RESILIENCE



**Diversity**  
Culture Space  
Response Function  
Species Social  
Time Race

**Modularity**



**Balanced Portfolio**



# Managing Climate Risk: Three Basic Strategies

## **Resistance**

Farmer Responds

## **Resilience**

Agroecosystem  
Responds

## **Transformation**

Locally-Adapted  
Agroecosystem  
Evolves

# Resilient Design Criteria

## Ecological

- Self-Regulated
- Functional Diversity
- Response Diversity
- Spatial and Temporal Diversity
- Appropriately Connected
- Coupled with Local Natural Capital
- Exposed to Disturbance

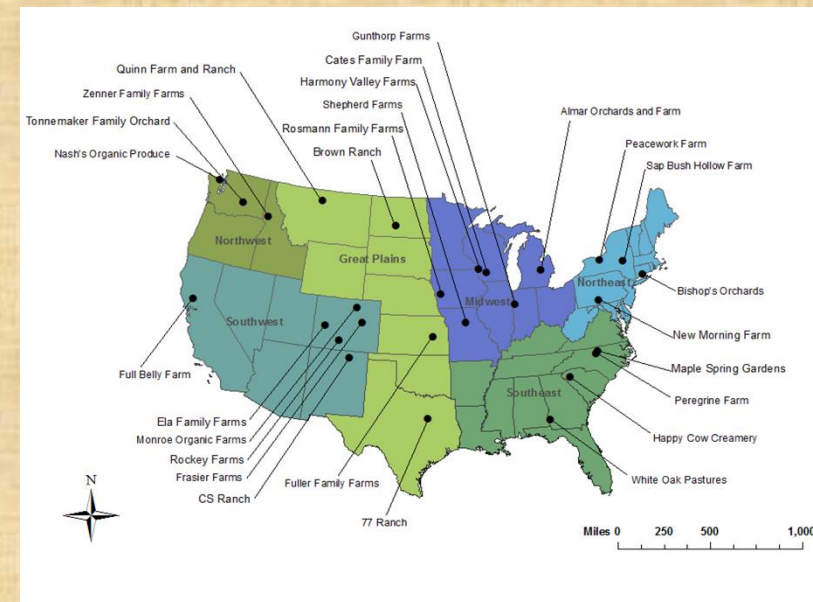
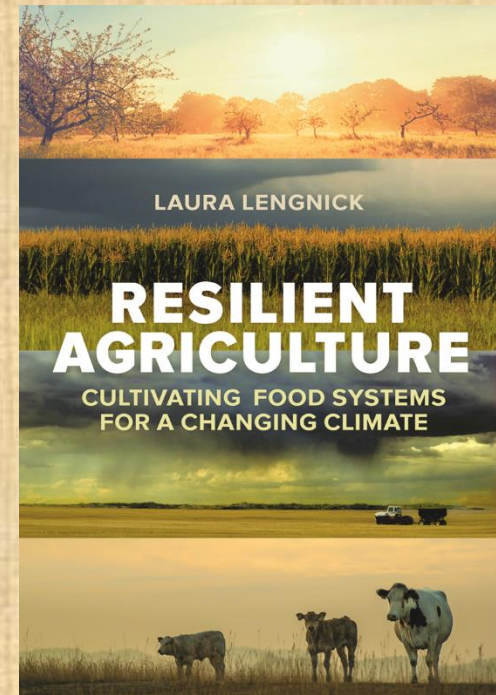
## Social

- Self-Organized
- Functional Diversity
- Response Diversity
- Builds Human Capital
- Reflective and Shared Learning
- Honors Legacy
- Globally Autonomous and Locally Interdependent
- Reasonably Profitable

***Is Sustainable Agriculture Climate Resilient?***

# Is Sustainable Agriculture Climate Resilient?

- Case study of 25 award-winning sustainable U.S. producers
- Fruits, vegetables, grains, livestock
- 20 to 40+ years at same location
- Climate effects/adaptation?
- Key resilience assets?
  - Soil quality
  - Biodiversity
  - Diversified, high value markets

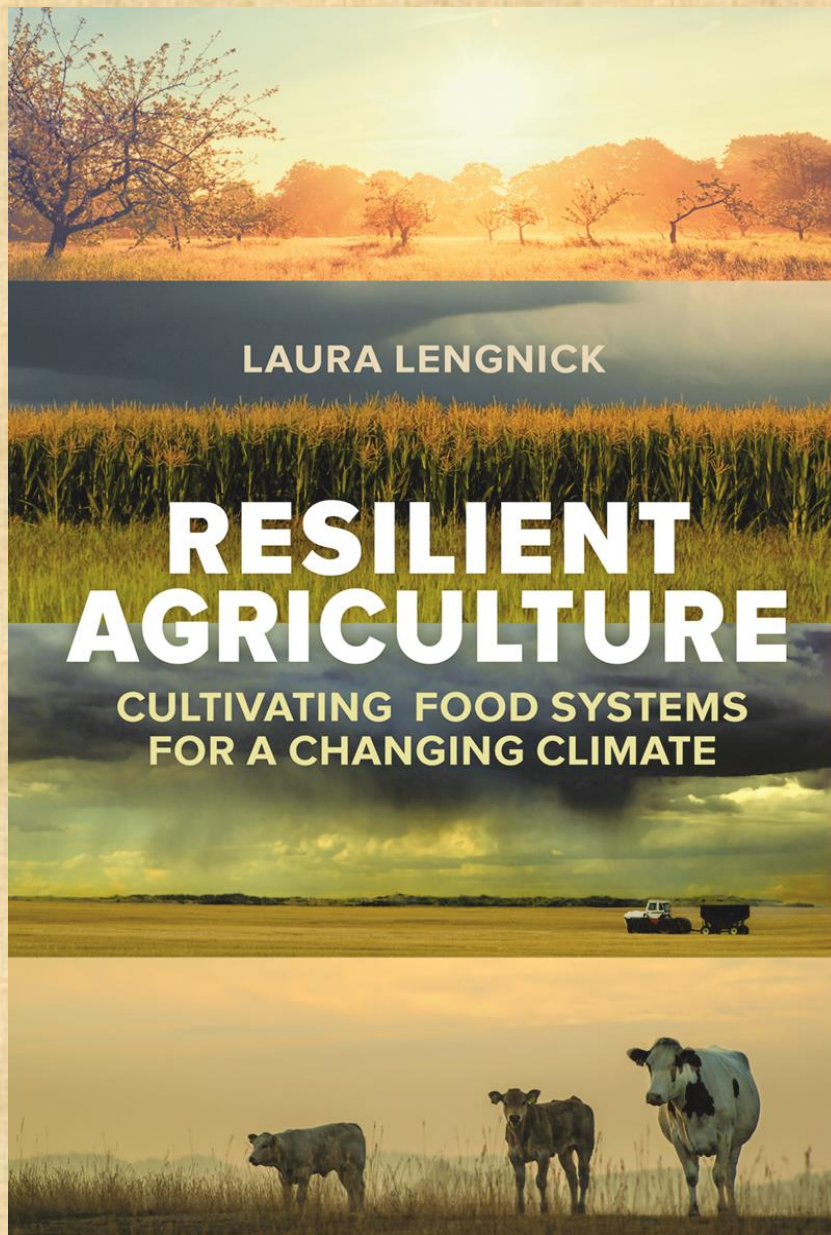


# Other Research?

- 1000 commodity crop producers in MS, TX, NC, WI will **diversify cropping** and **buy more crop insurance** if climate effects intensify Rejesus et al. 2014
- 150 farmers in Maine in seven major commodity groups are **diversifying crops, building soil quality, adding drainage, irrigation, protected growing space.** Jemison et al. 2014
- 15 dryland farmers in the Golden Triangle of Montana are **diversifying crops, building soil quality, increasing profitability** by reducing costs and/or selling into **high-value direct markets.** C. Stephens 2015

# Key Actions Now

- Learn more about your farm's exposures, sensitivities, and adaptive capacity
- Address key climate risks using a mix of resistance, resilience and transformation strategies
- Begin monitoring farm performance
- Make an extreme events plan
- Invest in recovery reserves



*Climate Listening Project*



*Cultivating Resilience Video Series*



Climate Learning Network

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