Regional Water Challenges and Opportunities to Increase Crop Resilience

Jon Hobbs[1], Lois Wright Morton[2], J. Arbuckle[2], Adam Loy[3]

Resilient Agriculture 2014

[1]Jet Propulsion Laboratory, California Institute of Technology
[2]Iowa State University
[3]Lawrence University

SUSTAINABLE CORN.ORG
CROPS, CLIMATE, CULTURE AND CHANGE

USDA
United States Department of Agriculture
National Institute of Food and Agriculture

NASA

This research is part of a regional collaborative project supported by the USDA-NIFA, Award No. 2011-68002-30190:
Cropping Systems Coordinated Agricultural Project: Climate Change, Mitigation, and Adaptation in Corn-based Cropping Systems

Research Questions

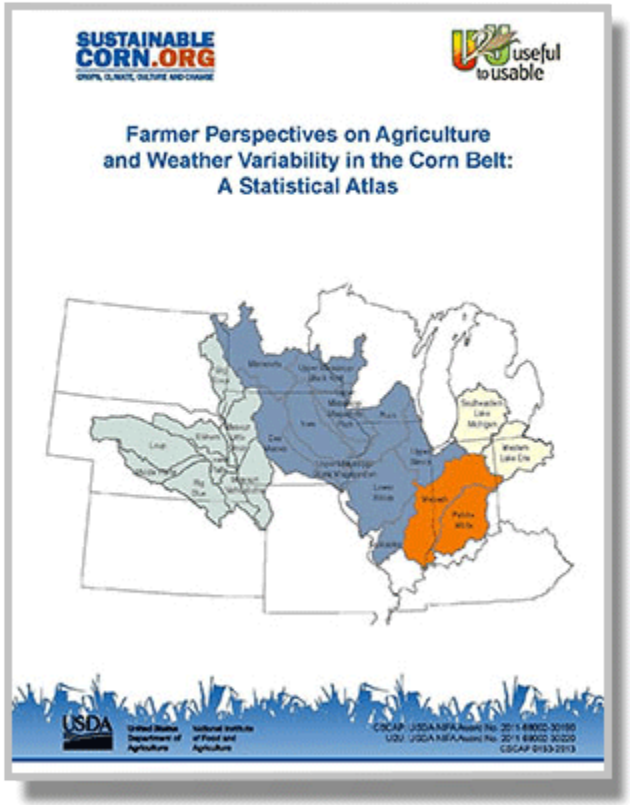
- How do farm management practices vary across the Corn Belt in response to its spatially-varying climate?
- Does perceived risk relate strongly with management practices?
- What socioeconomic factors relate to management practices?
- What local relationships exist between recent weather events and reported management practices?

SUSTAINABLE CORN.ORG
CROPS, CLIMATE, CULTURE AND CHANGE

USDA
United States Department of Agriculture
National Institute of Food and Agriculture

Data Source

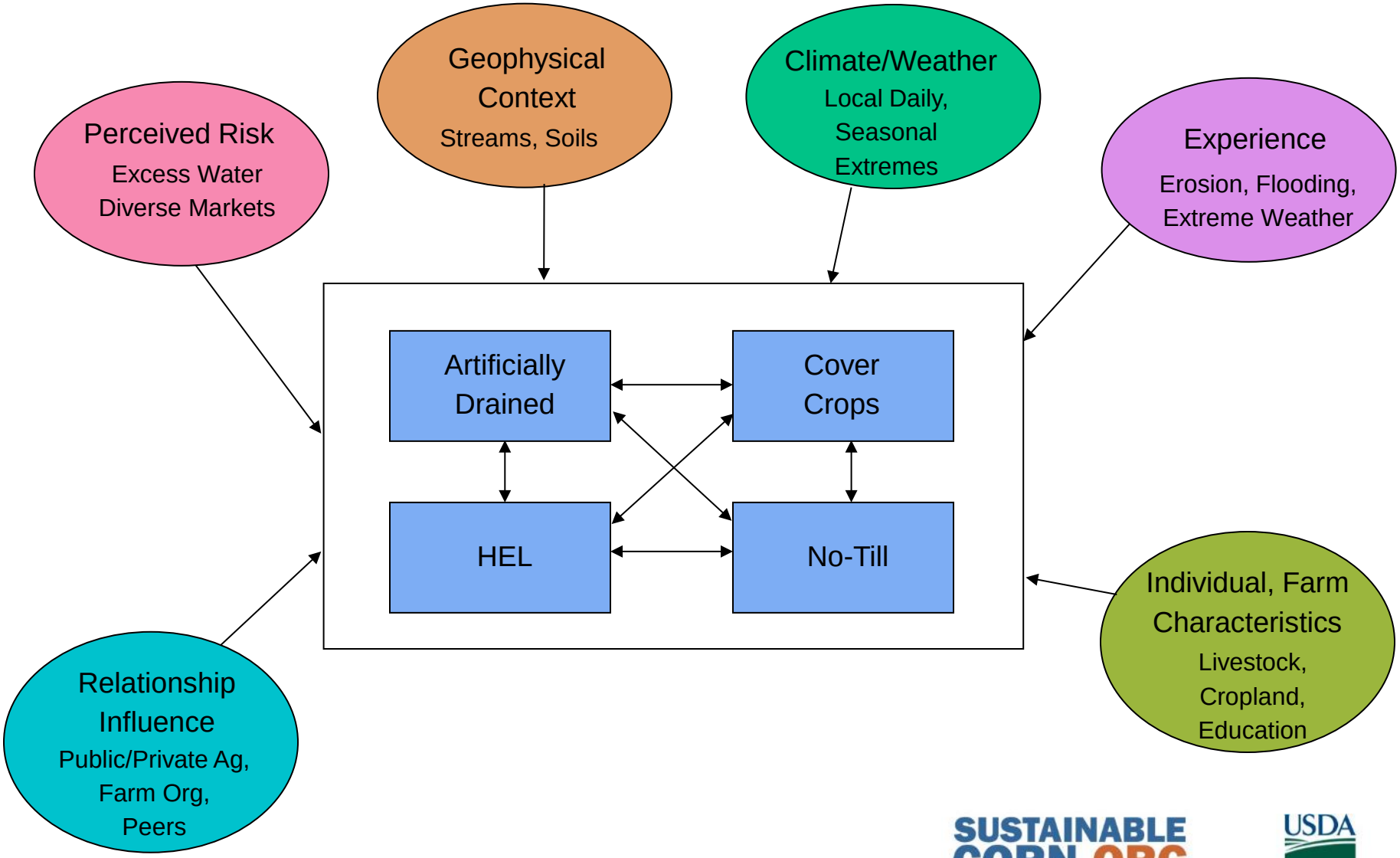
- February 2012 survey of nearly 5,000 producers across the Corn Belt
- Sustainable Corn, Useful 2 Usable (U2U) collaboration
- Item of interest: “In 2011, what percentage of the land you farmed was … ?”
  1. Artificially drained
  2. HEL planted to crops
  3. No-till
  4. Planted to cover crops



SUSTAINABLE CORN.ORG
CROPS, CLIMATE, CULTURE AND CHANGE

USDA
United States Department of Agriculture
National Institute of Food and Agriculture

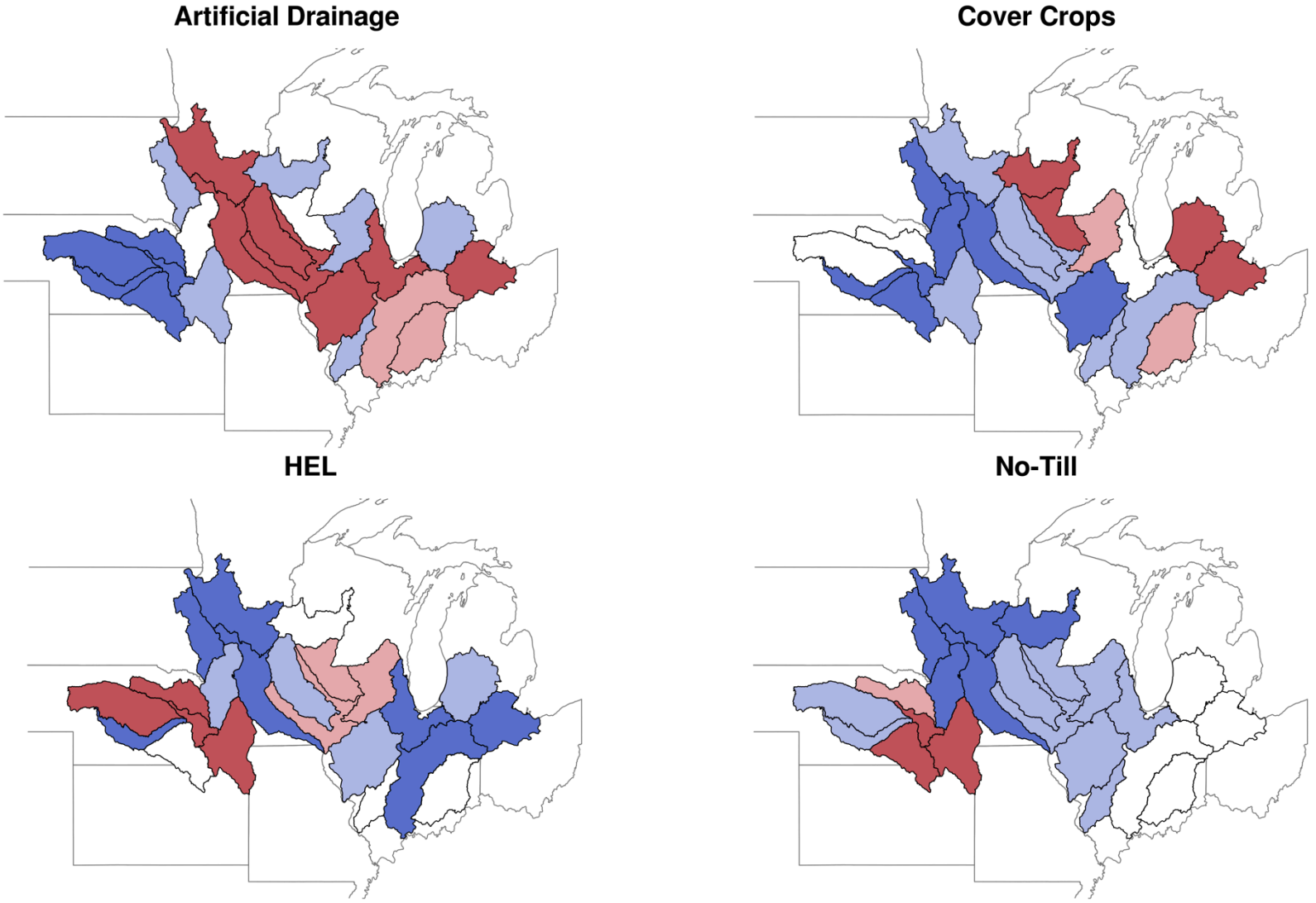
Conceptual Framework



SUSTAINABLE CORN.ORG
CROPS, CLIMATE, CULTURE AND CHANGE

USDA
United States Department of Agriculture
National Institute of Food and Agriculture

Suite of Practices



SUSTAINABLE CORN.ORG
CROPS, CLIMATE, CULTURE AND CHANGE

USDA
United States Department of Agriculture
National Institute of Food and Agriculture

Unusually Wet/Dry Seasons

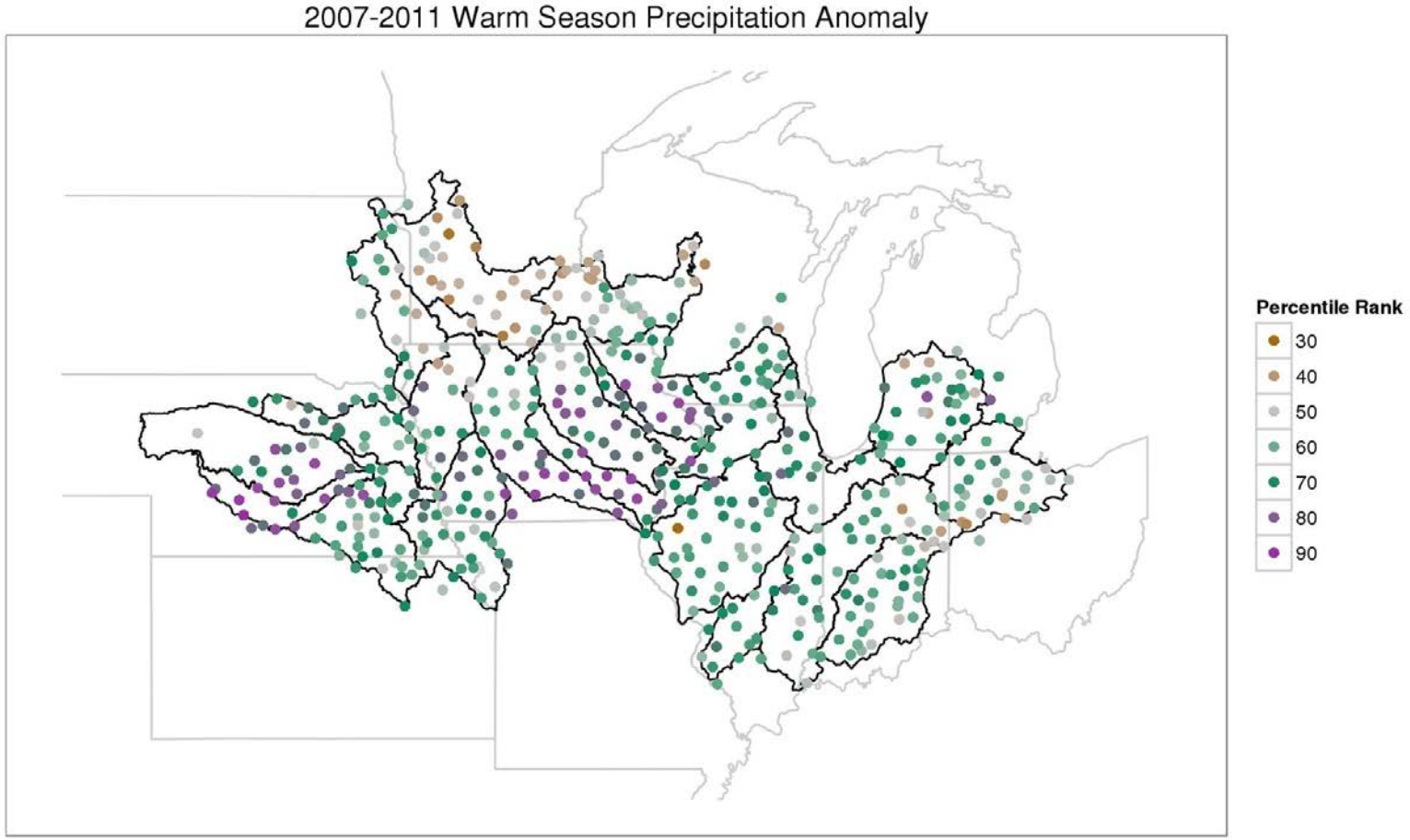


Figure: Seasonal-scale precipitation patterns for 2007-2011.

SUSTAINABLE CORN.ORG
CROPS, CLIMATE, CULTURE AND CHANGE

USDA
United States Department of Agriculture
National Institute of Food and Agriculture

Key Findings

- Adopting a suite of practices is already common.
  - Cover crops, no-till and HEL
- Climate and soil are strongly associated with several practices.
- Economic factors are significant for some practices.
- Local associations with weather events are evident.

SUSTAINABLE CORN.ORG
CROPS, CLIMATE, CULTURE AND CHANGE

USDA
United States Department of Agriculture
National Institute of Food and Agriculture

Key Findings

- Weather and climate interaction

	Dry Climate	**Wet Climate**
Unusually Dry Growing Season	Drought resilience	Resilient practices to retain soil moisture
Unusually Wet Growing Season	Economic drivers make marginal land productive	Vulnerable to prolonged periods of saturated soils

- Daily-scale and seasonal-scale extremes present different challenges but also interact.

SUSTAINABLE CORN.ORG
CROPS, CLIMATE, CULTURE AND CHANGE

USDA
United States Department of Agriculture
National Institute of Food and Agriculture

Acknowledgments

- Comments from Lori Abendroth, Rick Cruse, Matt Helmers, Tom Kaspar, and Eileen Kladivko have aided this research.
- This research was supported by USDA-NIFA Cropping Systems Coordinated Agricultural Project: Climate Change, Mitigation, and Adaptation on Corn-based Cropping Systems project no. 2011-68002-30190.
- Survey data were produced in collaboration with USDA-NIFA Useful to Usable (U2U) Award no. 2011-68002-30220.
- Additional data were provided by the Iowa Environmental Mesonet.

SUSTAINABLE CORN.ORG
CROPS, CLIMATE, CULTURE AND CHANGE

USDA
United States Department of Agriculture
National Institute of Food and Agriculture