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*Supplement of*

## **Assessing stakeholder climate data needs for farm-level decision-making in the U.S. Corn Belt**

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# Coding scheme

## Node

<b>1 Coordination, Collaboration, and Communication</b>
<i>1.1 Communication Channels</i>
Between mass media (TV/internet) and practitioners
Between scientists and policymakers
Between and among communities
Between communities/public and planners/practitioners
Between researchers/agencies and practitioners
Between the government and private industry/practitioners
Between agencies and/or levels of government
Between states
Between private companies and practitioners
Between consultants and practitioners
Between Extension/boundary organizations and practitioners
New modes of dissemination
<i>1.2 Communication Goals</i>
To translate risk assessment/tradeoff (acting vs not acting)
To translate information so clearer to understand
To increase awareness
To create a common understanding of climate change
To support the adoption of sustainable practices
To facilitate exchange of best practices
To explain current conditions (e.g. drought)
To warn about pending events/disasters
<i>1.3 Communication Standards</i>
Clear expression of uncertainty
Clear messages and language

Experts to convey messages

---

Understand stakeholder language and user groups

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#### *1.4 Proposed Coordination/Collaboration*

---

Between scientists and policymakers

---

Between practitioners

---

Between agencies and/or levels of government

---

Between tribal, state, and federal entities

---

Between states

---

Between Extension/boundary organizations and practitioners

---

Between researchers/agencies and practitioners/planners

---

Between different research organizations

---

Between the government and research institutions

---

#### *1.5 Collaboration Goals*

---

To streamline information delivery

---

To combine separate studies

---

To create a partnership/collaboration database

---

To engage practitioners in sustainable practices

---

To achieve stakeholder agreement on baseline information

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#### *1.6 Training and Data Use/Availability*

---

'Clearinghouse' or 'one-stop shop' of information

---

Data availability and accessibility

---

Data usability

---

Evaluation of current decision aids

---

Training to prepare for climate change

---

Training to adopt sustainable practices or improve management

---

## **2 Monitoring and Data Collection**

---

### *2.1 Data Scale*

---

Regional scale

---

## *2.2 Data Rights*

---

Public domain/Free

---

Proprietary/Paid

---

## *2.3 Data Source*

---

GIS

---

Past plans

---

Forecast

---

Historical/Climatological

---

Observational (i.e., current/new data, non-remote)

---

Remote sensing

---

## *2.4 Data Type*

---

Land use

---

Conservation or preservation areas

---

Human development

---

Amount of land cover

---

Forestry - land coverage, biodiversity, old vs. new growth

---

Pests and Diseases

---

Crop diseases

---

Invasive species

---

Pest species and vector borne illnesses

---

Water Resources

---

Drought

---

Flooding

---

Stream flow

---

Stormwater

---

Wastewater

---

Water quality

---

Weather and Climate

---

Air humidity
Air Temperature
Growing Degree Day
Extreme heat
Hail
Ice and snow cover
Precipitation
Wind
Air quality
Program success and other metrics
Soil Health
Soil erosion
Soil compaction
Soil Temperature
Soil Moisture
Survey of data gaps
Topography
<b>3 Policies, Programs, and Law</b>
<i>3.1 Service and Capacity</i>
Autonomy in decision making
Available Markets
Human resources
Familiarity with / knowledge of DSTs
Flexibility in decision making
Funding/Financial Support
Infrastructure
Institutional Memory
Leadership

Structural barriers

---

Time / staff to learn

---

Training opportunities

---

### *3.2 Governance*

---

Expand/Improve law/program enforcement/management

---

Identify responsibility for Tribal trust lands

---

Track authority for land use decisions

---

Create position tracking climate change adaptation

---

Create new types of employment opportunities & positions

---

Political support

---

State guidance/regulation

---

Institutional constraints

---

Competing uses

---

Rigid regulations and restrictive management

---

### *3.3 Law*

---

Assess performance & vulnerability of water law to climate change

---

From interplay between different levels of government

---

Insurance

---

Laws and policies that discourage sustainable development

---

Laws and policies that discourage unsustainable development

---

Resulting from climate change

---

Revisit and evaluate existing laws for potential changes

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### *3.4 Management*

---

Agricultural Management

---

Pesticide application

---

Better weed and invasive species management

---

Crop rotation

---

Cover crops

---

No-Till/Tillage
Trees as cropland borders/buffers
De-stocking cattle during drought
Building in flexibility - resource / financial cushion
Nutrient management
Nitrogen
Manganese
Other Nutrients
Phosphorus
Potassium
Sulfur
Timing of nutrient application
Water management
Stormwater swales
New water planning
Irrigation
Storage (e.g., water supply assessment)
Runoff/drainage
Timing of Drought Response
Runoff control/reduction
Data incorporation in management
Cost/Benefit of Options
Economics
Ecosystem Management (including endangered species)
Leadership
Proactive planning
Risk Management
Standards based on up-to-date climate predictions

Increased staff

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### *3.5 Programs*

---

Data on program and regulation implementation

---

Emergency preparation & response

---

Flexibility in program structure

---

Form new organizations (e.g., research centers)

---

Incentives

---

Land use planning

---

Link science to program implementation

---

New plant and crop varieties

---

Public support

---

Increased staff

---

## **4 Research Topics**

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### *4.1 Funding*

---

Change way research funding is distributed to recipients

---

Easier submission process

---

For collaboration activities

---

For new research topics

---

That meets end user needs

---

More for existing research topics

---

Needed for local scale planning

---

For co-produced research

---

### *4.2 Modeling*

---

Modeling standards

---

Availability and accessibility of technology

---

Improved expertise

---

Integrated modeling incl. all climate related scientific process

---

Schedule to update maps

---



Standardized modeling format and style across sectors

---

Model products

---

Climate change focused

---

Downscaling of larger scale scenarios to appropriate scale

---

Enhanced mapping updated with recent information

---

More and or improved outlooks and projections

---

Regional and local climate modeling

---

#### *4.3 Research Standards*

---

Macro scale

---

Local Scale

---

Long term

---

State coordination

---

User-driven Research

---

#### *4.4 Specific types of data, analyses, or projects*

---

Alternative or efficient energy sources

---

Best practices

---

Climate change focused

---

Climate change impacts specific to sector

---

Climate change indicators

---

Climate change tipping points

---

Climate science with recommendations for how to adapt

---

Greenhouse gas reduction strategies

---

Interactions between the impacts & stressors of climate change

---

Temperature increase

---

Cost/Benefit Analyses

---

Costs and benefits of options

---

Costs of climate change and benefits of adaptation

---

Identify “no regrets” options

---

Economic
Event specific information
Extreme events
Habitat restoration
Improve understanding of past & current environment conditions
Information on existing policy and programs
Maintaining species and habitat diversity
New crop development
Pilot programs for Stakeholder-researcher projects
Planning, Assessments, Risk Mitigation, & Decision making
Assess performance of regional water quality & health actions
Current state of environment assessments
Determining which information managers and planners use
Identify appropriate adaptation options
Incorporation of climate information into decision making
Risk characterization
Scenario planning
Standardized decision support tools and metrics
Sustainable agriculture practices
Uncertainty or probability analyses
Understand other practitioners' plans
Vulnerability assessments
Determining which information managers and planners should use
Social science
Identify areas of historic or cultural significance
Study of public preparedness for climate change
Tourism related
Suitability of current monitoring efforts

Tribal use of land and resources

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Understanding underlying environmental processes

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Water demand

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**5 Social Issues**

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*5.1 Justice*

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Greater inclusion in research and or decision making

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Support for vulnerable populations

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**6 Document level codes**

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*6.1 Authors*

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Academic institutions

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Within DAWN Scope

---

Indiana University

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Iowa State University

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Kansas State University

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Michigan State University

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North Dakota State University

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Ohio State University

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Purdue University

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South Dakota State University

---

Texas A&M University

---

University of Illinois

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University of Iowa

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University of Kansas

---

University of Kentucky

---

University of Michigan

---

University of Minnesota

---

University of Missouri

---

University of Nebraska

---

University of Wisconsin, Madison

---

Western Kentucky University

---

Beyond DAWN Scope

---

Alabama A&M

---

Arizona State University

---

Bates College

---

California Institute of Technology

---

California State University, Sacramento

---

Central State University

---

Colorado State University

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Cornell University

---

Cranfield University

---

Lawrence University

---

Lincoln University

---

Manhattan College

---

Mississippi State University

---

Montana State University

---

Northern Arizona University

---

Pennsylvania State University

---

Sierra Nevada College

---

State College Pennsylvania

---

State University of New York

---

Syracuse University

---

Texas State University

---

University of Arkansas

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University of Arizona

---

University of California, Davis

---

University of Colorado

---

University of Connecticut

---

University of Idaho

---

University of Oklahoma

---

University of Maryland

---

University of Texas

---

University of Wyoming

---

Virginia Tech

---

Extension

---

Government actors

---

Federal

---

National Weather Service

---

National Oceanic and Atmospheric Association

---

U.S. Army Corps of Engineers

---

U.S. Department of Agriculture

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National Aeronautics and Space Administration

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United States Geological Survey

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State

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Arizona State Land Department

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State of Illinois

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State of Indiana

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State of Iowa

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State of Kansas

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State of Kentucky

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State of Michigan

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State of Minnesota

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State of Missouri

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State of Nebraska

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State of North Dakota

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State of Ohio
State of South Dakota
State of Wisconsin
Regional / Municipal
Private sector actors
NGOs
The Nature Conservancy
The Center for Research on the Changing Earth System
Multiple author partnership
Other
<i>6.2 Funding sources</i>
Grant-based
Government budget (non-grant)
Private donor
University program
None listed
<i>6.3 Geographic Scope</i>
Cornbelt
Midwest
Illinois
Indiana
Iowa
Kansas
Kentucky
Michigan
Minnesota
Missouri
Nebraska

North Dakota
Ohio
South Dakota
Wisconsin
Outside of DAWN scope
California
Texas
Colorado
Wyoming
Montana
Alberta, CA
Maryland
Georgia
Florida
New York
<i>6.4 Publication date</i>
2011 or older
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021