

Adapting Farms to Weather Extremes and Climate Uncertainty

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1. Where do I find the Adaptation Workbook for Agriculture?

The Adaptation Workbook is presented in Chapter 4 of the Adaptation Resources for Agriculture report posted as a handout with a copy of this webinar's presentation. Blank worksheets are available at the end of the report. The official copy of the report is posted at USDA's Climate Hub home page under the menu for Adaptation Assistance:

http://www.climatehubs.oce.usda.gov/sites/default/files/adaptation_resources_workbook_ne_mw.pdf

An interactive online version of the Adaptation Workbook for Forestry exists at the Northern Institute of Applied Climate Science website. New features for urban forestry and agriculture have recently been added so check them out here: <https://adaptationworkbook.org/>

2. Can I get a print copy of the Adaptation Resources for Agriculture report?

Send requests for print copies of the report to Mike Wilson at mike.wilson@lin.usda.gov

3. Could you point me to a document that summarizes expected climate changes in the Pacific Northwest that is written at this level for a land manager?

All of USDA's regional Climate Hubs are developing resources for providing adaptation assistance relevant to their challenges and opportunities. Until the menu and workbook is tailored for the Pacific Northwest, the Northwest Vulnerability Assessment provides a summary of expected changes.

<http://www.climatehubs.oce.usda.gov/northwest>

4. What work is being done now to evaluate current cash crop hybrids with respect to anticipated changes in climate?

There are efforts underway to evaluate corn, soybean, and wheat response to the changing climate. The changes in temperature expected by the mid-century reveal that corn production could decrease but in soybean there is less of an impact because they have a higher temperature threshold for growth than corn. In wheat, there is a negative effect of the increasing temperatures during the spring time because these temperatures shorten the grain-filling period. There are studies underway to compare different germplasm of crops for their sensitivity to both temperature and water stresses.

5. It appears that climate change is being used synonymously for global warming. If so, why not use the term global warming?

In short, climate change describes a whole suite of changes being observed and expected whereas global warming just captures one aspect. The suite of changes include changes in annual precipitation accumulation and seasonal distribution, more extreme temperature variations and less stable weather patterns, and changes in consequent cycles in nature. Whereas these changes are being observed locally by people, overall the earth is holding onto more energy from the sun resulting

in average surface air and ocean temperatures getting warmer globally. The concept of global warming while useful to policy makers does not seem so useful to helping individuals make decisions for their farm.

Bottom line, use the language that resonates best with your audience to motivate actions that maintain agricultural sustainability.

6. Is USDA updating general growing zones for North America to address climate change?

The USDA Plant Hardiness Zone map, which represents 30 year averages of extreme cold temperatures, was updated in 2012 and showed in general that the zones had moved north by approximately two counties. While this trend gives an indication of the general changes, local microclimates still direct actual growing conditions.

7. What is your opinion of including an assessment of climate change for a watershed-scale resource assessment?

Finding climate change information that is applicable at finer scales can be difficult but is being developed. Many areas of the country are experiencing longer stretches of dry periods leading to increased irrigation and stress on groundwater recharge increasing the risk of conflicts between agricultural and other water uses. Reach out to your USDA Climate Hub director and ask for help as there are many stakeholders working on addressing water management challenges.

8. Any resources for strategies and approaches for ranchers and rangelands?

Each of the USDA Climate Hubs are developing similar resources for their typical resources and stakeholders. Both the Northern Plains and Southwest Climate Hubs are work on them.

9. Is there any effort being made to update soil surveys to include climate change issues for specific soil groups?

Many soil survey regions are monitoring temperature and moisture on benchmark soils, and these data will be used to alter climatic-based classifications (e.g., moisture or temperature regimes) and/or the geographic distributions of soil types. Soil interpretations are being examined in areas of greatest climate change impact, such as in the northern latitudes where Gelisols are mapped (e.g., presence/absence/depth to permafrost).

Also, there is an active Ecological Site Description program within the NRCS Soil Science Division that investigates factors impacting the ecology of an area and describes ecological state and transition models for how the area may change. Specific soil components are organized into groups that respond to stressors such as drought, rainfall patterns, temperature changes and other climatic stressors that impact vegetation type and quantity. ESDs that are completed can be found on the NRCS Web Soil Survey. Newer state and transition models contained in an ESD can include impacts of climate change. For example, warming of hydric soils alters the dynamics of important biogeochemical compounds such as methylmercury, methane, sulfur compounds, and carbon dioxide. Sea level rise alters moisture and salinity characteristics of large areas of coastal soils.

10. What can be done to improve the resiliency of monocultures to the impacts of climate change?

Using the full menu of adaptation strategies improves the likelihood of crops persisting through the impacts of variable and extreme weather and climate. Start with sustaining fundamental functions of soil and water resources, but don't forget to develop tactics to reduce existing stressors and manage fields as part of a larger landscape. Then consider actions to reduce risks of warmer and drier conditions and extreme weather and finally look at the overall farming system, management and infrastructure. For instance, crop rotation is a common tactic used to address declining soil

productivity under a continuous monoculture but by itself may not be enough to handle the impacts of climate change.

11. What climate model (or models) did you use for some of the figures (ex 3-6 degrees increased by 2041-2070) and how did you select it?

Regional climate trends and scenarios come from the U.S. National Climate Assessment by Kunkel, et al. 2013b, which is listed in the literature cited section at the end of the Adaptation Resources for Agriculture report.

12. How does one measure effectiveness, i.e. of soil resiliency and know if their tactics are working?

Each of the four examples show what items are monitored and what criteria were developed to evaluate effectiveness. See the Nebraska example specifically for monitoring and management actions that improve both the short and long term resiliency of soil to drought and heavy rains.

13. Any advice on managing for persistence verse managing for change when it comes to planning investment in agricultural adaptation infrastructure e.g. dams for water storage?

An example of altering water storage infrastructure for persistence is during regular clean out and maintenance, expand the capacity of the structure to hold more as would be needed for an expected longer drought. If such a tactic doesn't look feasible, consider a more transformative change like replacing the structure with a series of deeper water wells or green infrastructure that stores water under shaded conditions.

14. Are their financial incentives to help farmers improve a soil's capacity to buffer against adverse impacts of climate change?

YES! NRCS's [Environmental Quality Incentives Program \(EQIP\)](#) and [Conservation Stewardship Program \(CSP\)](#) provide assistance for the adoption of soil health improvement practices, such as cover crops, residue and tillage management, conservation crop rotations, and agro-forestry.