CLIMATE ADAPTATION IN ACTION





American Farmland Trust SAVING THE LAND THAT SUSTAINS US



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Today's Agenda

- Climate change impacts
- Climate adaptation planning
- Grower experiences
 - Sal Daggett Adaptation planning
 - Kyle Burns Adaptation strategies
- Inspiration
- Q & A







American Farmland Trust saving the land that sustains us

Part 1—Impacts

Climate change impacts on farms in the U.S.



Climate Change & Agriculture The Basics

- Increasing temperatures across **all seasons**
- Causes shifts in precipitation patterns which:
- Create extreme weather events
- Change water availability
- Alter pest and weed lifecycles
- Increase wildfire risk
- Affect farmworker health and safety
- Reduce property values

And the list goes on...





Source: <u>NCA5, 2023</u>

Rate of Temperature Change in the U.S., 1901–2023

Temperatures nationwide have warmed unevenly across the country since the beginning of the 20th century.

The rate of change has increased since the 1960s.

Source: NOAA, 2024



Temperature Change by Season in the Contiguous U.S. 1896–2023



Impacts of Increased Temperatures





Source: Mark Dreiling (moth), Alton N. Sparks, Jr., University of Georgia (caterpillar), Bugwood.org



Source: Master Gardeners of Northern Virginia



Source: Oregon State University Extension



Source: Veronica White











Source: Master Gardeners of Northern Virginia

Change in Precipitation in the U.S., 1901-2023

Wet areas of the country are becoming wetter.

Dry areas are becoming drier.

Source: NOAA, 2024



Observed Change in Total Annual Precipitation Falling in Heaviest 1% of Events (1901 – 2016)

When it rains,

it pours.

< 0

Many parts of the country are experiencing more extreme precipitation events.

Source: NOAA, 2024

ipitation events. Percent Change (%) 0-9 10-19 20-29 30-39 40+



Drought can still affect even the wettest regions of the country.



Intensity: None D0 Abnormally Dry D1 Moderate Drought D2 Severe Drought D3 Extreme Drought **D4 Exceptional Drought**

The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. For more information on the Drought Monitor, go to https://droughtmonitor.unl.edu/About.aspx

Author:

Brian Fuchs National Drought Mitigation Center



droughtmonitor.unl.edu

Climate change contributes to increased fire risk due to dry fuels and fire weather.



Source: Zhuang et al., 2021

Impacts of Changes in Precipitation



Billion-Dollar Disasters





Part 2—Planning

Climate Adaptation for Farms

- Adaptation is inherent
- Creating a process & structure
- Matter of fact assessment
- Finding support & resources



What Does Climate Adaptation Look Like?



Source: Sara Delaney, Univ. of Maine, 2024

Climate Adaptation and Mitigation Fellowship, practices by category 2021-2024

- Soil management
- Water management
- Agroforestry
- Landscape management
- Mitigation
- Temperature management
- Crop/animal selection
- Biodiversity
- Crop protection
- Livestock management
- Climate monitoring
- Disaster response

Healthy Soil is a Universal Strategy





Soil Health Adaptation Practices

- Cover crops and living roots
- Mulch or cover soil
- Find carbon sources to increase organic matter
- Permanent beds to reduce compaction
- Reduce tillage
- Prevent ponding, run off, erosion
- Convert marginal cropland to conservation buffer



Climate Adaptation Planning Process



- 1. GOALS
- 2. CLIMATE IMPACTS
- 3. RISK ASSESSMENT
- 4. ADAPTATION PRACTICES & PLAN
- 5. EVALUATE

and repeat....

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and repeat....

Climate Adaptation Planning for Farms



Start planning for climate adaptation and farm resilience based on the unique variables of your land and operation.

Five steps for farmland climate adaptation planning:

- 1. Define your farm goals and priorities
- 2. Identify specific, observed climate impacts

3. Conduct a risk & vulnerabilities assessment based on your climate impacts and farm goals

4. Develop a set of adaptation practices

5. Evaluate the effectiveness of those adaptations practices and update your plan accordingly



1. Goals What are the overall or immediate goals of your farm operation? **Articulate one to three goals that inform your choices and priorities.** Consider foundational values, financial requirements, organizational strengths, farm resources, aspirations, challenges, etc.

Committed to reducing carbon footprint, being an ecological model of food production.

Financial stability (health insurance, savings buffer).

Have enough free time to play with kids (and rock climb once a month in the summer).

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Contracted Interactions What impacts of climate change have you observed and experienced on your farm? Check all that apply. Circle the most concerning impacts.

Increased temperatures

Increased seasonal temperatures

More extreme temperatures

Changing precipitation patterns

More frequent extreme precipitation

D Wetter springs or falls

 Saturated soils affecting planting, weeding, and/or harvest Seasonal drought Increased need for irrigation Decreased pasture/forage yield 	 Changing pest or disease patterns. Increased weed vigor Increased cooling needs Heat stress Animal health declines 		
Extreme weather	Seasonal shifts		
 Flooding and/or ponding Increased erosion Nutrient leaching High wind effects Infrastructure damage due to wind, snow, rain, or temperatures 	 Wetter spring/fall Unpredictable frosts, fruit loss Warmer winter/summer Changes in timing of planting/harvest Crop or variety not adapted Pollination mismatches 		
Wildfire & smoke impacts			

Other (write in)

Projected Changes in Weather in the Northeast for mid-century (2041-2070 average)						
ANNUAL TEMP	ANNUAL PRECIPITATION	GROWING SEASON	HOT DAYS	HOT SPELLS	COLD DAYS	EXTREME PRECIPITATION
+ 4 to 8 F	+ 1 to 7 inches	+ 19 to 27 days	+ 3 to 21 days	+ 1 to 7 days	- 6 to 24 days	+ 2 to 4 days
Avg temp increas- es, and increases in each season.	Seasonal increase greatest in winter Decrease in sum-	Warmer, wetter springs	Least change in northernmost are- as	Increase in consec- utive days over 95	Greatest decrease in the north	More days of pre- cipitation exceed- ing 1"
Milder winters	mer					

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3. Risks Assessment Based on your observations of climate impacts, and taking into

account projected changes in climate, **what are 4 major vulnerabilities of your farm operation?** What areas of land, important crops, animals, or essential infrastructure are a priority to protect? What is at most risk? Where do the identified climate impacts directly impact your top farm goals?



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Flooding in east fields along river: loss of crops, erosion, possible loss of equipment

Heat stress for plants and people: harvesting mostly greens, must be done early, can't harvest stressed greens

Small margins overall: doesn't provide financial buffer in case of disaster



Reliance on heirloom tomatoes for 40% of summer income: increasing disease, inconsistent pollination, hail damage

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4. Adaptation Practices

1: Write down what you identified as your **most significant risks** to climate impacts.

2: Using ideas on the previous page, **note what strategies might be used** to mitigate these risks?

3: Consider **what specific practices** could serve to increase the resilience of your farm?

Remember that adaptive practices should include:

Considerations of feasibility and potential effectiveness
Flexible management that can adapt with new information
"No regrets" decisions that will create broad benefits with little risk
Resources that are available and supported in your network

•A specific, practical timeline

Practices S Strategies Adaptatior

Prioritize soil health Reduce tillage to improve soil aggregation Maximize days in cover crop Increase soil organic matter Increase water infiltration Reduce compaction Improve soil aggregation Address ponding Increase water retention Increase soil organic matter Mulch, cover crop, tarp or keep surface residue Nutrient management Anticipate potential nutrient runoff during heavy rains Use lower release fertility Supplemental fertility in response

to precip

Soil resilience

Water management

Reduce severity of flooding •Slow & catch water •Plan ahead if you know fields regularly food •Permanent beds

Manage water flow

Prevent erosion
Channel water away from row crops
Create swales or grassy strips
Keyline plow
Improve drainage from fields, roads, greenhouses
Grade farm roads

Anticipate flooding

Reduce compaction
Install tile drainage
Have dry storage for equipment & inputs

Prepare for drought

Improve irrigation equipment
Use sensors for efficient irrigation

Diversification

Crop production • Split production between high tunnel and field • Increase diversity of crops • Consider predicted seasonal changes in temp, precip, frost • Diversify markets, farm revenue streams • Consider custom grazing

Less risky crops

Trial new breeds, or species
Trial new or short DTM varieties
Add successions
Reevaluate crops that will succeed in current or future conditions

Adjust for crop loss

Plan for lower yields
Plan for slower animal growth or lower milk production
Increase number of successions

Crop/animal strategies

Maintain livestock health and performance Improve pasture Reduce heat stress (indoors & outdoors) Prevent emergent disease related to mud or heat Prepare for disease testing & vet emergencies Back up water resources Establish dry lots

Manage impacts of pests & pathogens

Disease resistant varieties and breeds
Succession plantings
Make alternative forage or feed plans
Scout for pests (predictive models may be outdated)

Adjust crop plan

Perennial plantings for spring
Less risky crops
Take at risk land out of production
Plant valuable crops in safer fields
Consider custom grazing or cropping

Infrastructure

Protected production •High & low tunnels •Shade cloth •Wind breaks •Permanent beds to water infiltration or flooding

Manage temperature

Barn and greenhouse ventilation
Optimize postharvest cooling
Climate controlled storage
Shade/cooling for employees

Manage water

Build ponds
Install well
Improve irrigation infrastructure (pipes, pumps, reels, redundancy)

Financial planning •Financial cushion •Crop insurance

Ecosystem integration

Diverse habitat •Pollinator habitat

 Create riparian buffer zones

Manage farm as part of landscape

Water flow
Windbreaks
Invasive species control
Whole farm planning

Revaluate land

Convert marginal crop or pasture land to permanent wetland, buffer or habitat
Move infrastructure
Secure new fields or relocate farm

Labor

Sources of laborHousingFunding for projects

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Reliance on heirloom tomatoes for 40% of
summer income: increasing disease,
inconsistent pollination, hail damage

Strategy:

Diversification, Infrastructure, Crop Strategies

Practice:

Diversification: Explore alternative high-grossing crops to add to income stream

Infrastructure: Dedicate one high tunnel to late season heirloom tomatoes

<u>Cropping</u>: Trial heirloom hybrids with disease resistance, invest in fan to reduce HT humidity

4. Adaptation Practices

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5. Evaluate

Choose one or two criteria to measure the

effectiveness of your climate adaptation practices.

What will indicate success? How often will you take that measurement?

Measure income from heirloom tomatoes as percent of total, decrease to 30%

Increase percentage of heirloom production in HT to 20% of total, trial 4 hybrid heirloom varieties and track yield



In Summary:

This climate adaptation planning cycle should be repeated over time as new practices yield results, information is gathered, and new challenges emerge. Congratulations on getting started, and good luck with your climate resilience planning!

Use tools like the NRCS In-Field Soil Health Assess-

ment, financial analysis, soil health tests, forage

yields, or other data to measure success.

Prioritization and Triage



Precautionary Actions



Flexible and Adaptive Mgt



Support Mitigation



"No Regrets" Decisions



Emergency Plan



Planning Tools



FIVE STEPS TO YOUR REGENERATIVE CLIMATE RESILIENCE PLAN

A Workbook for Farmers

Version 1.0 | November 2023

For use alongside the companion website: RegenerativeFarmResilienceGuide.org



Center for Regional Food and Farming

	MAINE
•	Cooperative Extension

USDA Northeast Climate Hub

Welcome to the Climate Adaptation and Mitigation Planning Tool

For a printable version of this tool, visit <u>https://www.adaptationfellows.net/planningtool</u>

This tool was developed to help farmers and agricultural advisors complete climate adaptation and mitigation planning. It was designed to be general enough to use with a wide range of agricultural operations. To use the tool, please complete the tabs in order from 1 to 5. The amount of time required to complete the planning process will vary depending on the risks your farm faces, the number of strategies you are able to use, your record keeping practices, and more. The tool supports the 7-step adaptation and mitigation planning process described in the figure below:

Step 1. On-Farm Risk Assessment

last updated June 2024

V2.0

Instructions: Start by considering the various climate change effects that could influence your farm. Choose climate risk factors from the "climate risk factor bank" in row 12, or add your own. Fill in column B with these risk factors. Use column C to consider the specific ways in which these risk factors will influence your operation or team. For example "winds from the southeast put high tunnels at risk on a regular basis." Use column D to brainstorm any *benefits* these changes may have. Use column E to note any resources you may have that can be used to address the risk. Finally, in column F rank these climate risk factors (column B) from the highest to lower risk to your farm.

Who is filling out this assessment:

Date:

CAMF

Farm name:

Climate risk factor High temperatures, low temperatures, temperature swings, high precipitation, low precipitation, wind, extreme weather events, wildfire, bank flooding, pests and/or disease, supply chain disruptions, land prices, other climate risk factors that pertain to your farm

В	С	D	E	F
Climate Risk Factor	What concerns or problems does this create on the farm?	What benefits could we gain from this risk factor, if any?	What resources do we already have to address this risk?	Ranking of Risks (1 = highest risk; 7 = lowest risk). Use each value only once, only list as many risks as you feel are important for your farm.

Grower Experiences



PLANNING

Sal Daggett Stubborn Oak Farmstead

PRACTICE

Kyle Burns Burns Blossom Farm



Stubborn Oak Farmstead



Climate Impacts



Burns Blossom Farm



Climate Impacts



Keeping soil covered



Keeping soil covered



Season Extension



Diversifying revenue streams





Inspiration!



Promising Climate Adaptation Strategies

- Whole systems planning
- Protective structures
- Diversification
- Water source
 development & storage
- Financial planning
- Emergency plan
- Raised beds & controlled traffic
- Storm water management
- Living mulch in pathways





Slide credit: Alissa White

Permanent beds, raised bed, reduced tillage





Flexible Irrigation Strategy







Storm Water Management





Mulch, Tarping, Rotation





Photos: Jeremy Barker Plotkin

Interseeding Cover Crops





Funky Zone Till







Living Mulch Pathways









Climate Resilience



Primary Resources

Climate Adaptation Worksheet for Farms https://farmland.org/climate-adaptation-worksheet

Climate Adaptation and Mitigation Fellowship Planning Tool https://www.adaptationfellows.net/planningtool

Five Step Guide to Farm Resilience https://regenerativefarmresilienceguide.org

Adaptation Resources for Agriculture: Responding to Climate Variability and Change in the Midwest and Northeast https://www.climatehubs.usda.gov/sites/default/files/adaptation_resources_workbook_ne_mw.pdf

Cultivating Climate Resilience on Farms and Ranches https://www.sare.org/wp-content/uploads/Cultivating-Climate-Resilience-on-Farms-and-Ranches.pdf?inlinedownload=1

Adaptation Resources for Agriculture: Case Studies https://www.climatehubs.usda.gov/hubs/topic/adaptation-resources-agriculture-case-studies-using-adaptation-workbook

Soil Health and Organic Farming: Organic Practices for Climate Mitigation, Adaptation and Carbon Sequestration https://ofrf.org/soil-health-and-organic-farming-reports/



Thank You

We hope you enjoyed our presentation