

# ADAPTING TO & MITIGATING THE IMPACTS OF CLIMATE CHANGE

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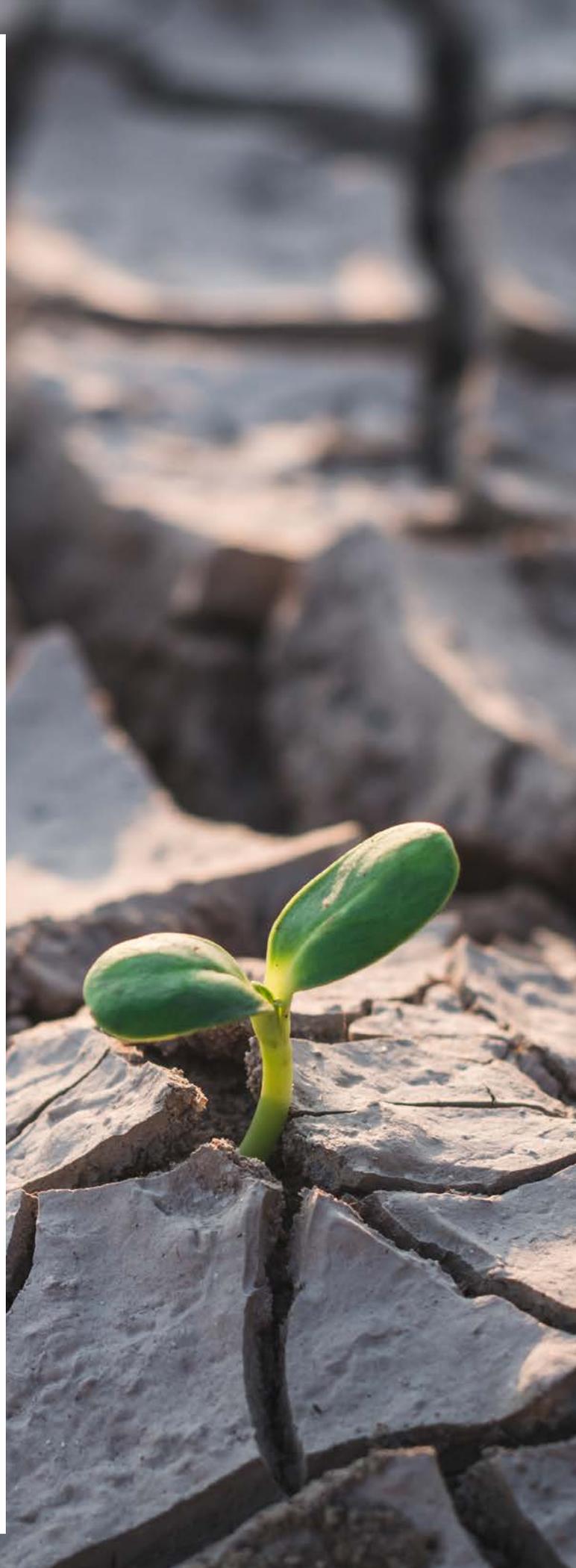
Around the world, agriculture faces the challenge of adapting to and mitigating the impacts of climate change on food, feed, fiber, and fuel systems. Farmers and scientists have already documented intense heat waves, prolonged droughts, more frequent extreme weather, and other changes that impact crop yield, animal productivity, pest, disease, and weed populations, and other aspects of agriculture. With continued support, the Land-grant University system is poised to address these challenges. We must act now to establish global partnerships and invest in research and technology that will mitigate the impacts of climate change in economically feasible, environmentally sound, and socially acceptable ways.

## RESEARCH PRIORITIES

-  Reduce greenhouse gas emissions and improve carbon sequestration on agricultural lands
-  Breed crops and livestock that can tolerate water stress and extreme temperatures
-  Collect robust data for climate modeling and predictions
-  Improve climate change education
-  Develop decision-making tools that account for variability and uncertainty
-  Guide policy and regulation and enhance global cooperation

## CAPACITY & RESOURCES

-  Institutions in all 50 states and many U.S. territories with research sites representing diverse ecosystems, communities, and food production systems
-  State-of-the-art laboratories, greenhouses, computational centers, and instrumentation
-  Researchers, educators, students, and staff with climate science expertise
-  Impartial, peer-reviewed science, technology, and recommendations
-  Far-reaching Extension networks to work with and inform communities across the U.S.
-  Partnerships with government agencies, engineers, environmental organizations, and the private sector



## SUCCESS STORIES

Research and Extension programs at America's Land-grant Universities have shown that investments in science and technology can provide solutions for adapting to and mitigating climate change in agriculture:

Using actual field trial data instead of estimates for the first time, **University of Wisconsin** found that changes in temperature and precipitation caused soybean yields to be **30% lower** over the last 20 years than if the changes had not occurred, resulting in losses of **\$11 billion**.

**Michigan State University** researchers are bringing big data research into ecology to open up new levels of analysis and gain deeper insights on the significance of lakes to climate change and the global carbon cycle.

**5,500** producers, professionals, scientists, and community members using **University of Nebraska-Lincoln** Extension resources increased their knowledge and use of climate information by **89%**.

**University of Missouri** scientists designed a model that predicts the frequency of future wildfires based on climate conditions, helping guide fire preparedness and management.

Land-grant University economists taught conservation agencies how to use portfolio diversification tools adapted from the finance industry to make "safe bets," or pick a mixture of wildlife sanctuary sites that will be effective far into the future even as climate change affects habitats.

**University of Arizona** researchers supported development of a Bayer greenhouse complex, which allows faster, more efficient development of seed corn varieties used worldwide by greatly reducing water needs and shortening the plant breeding process by **several years**.

**University of Maryland** surveys revealed that a majority of **Mid-Atlantic** farmers are using irrigation and drainage management and making strategic cropping system choices to adapt to moisture and precipitation uncertainty.



Surveys administered by Land-grant Universities in **multiple states** show how climate change will affect tourism and recreation, illuminating ways these industries, and the communities that depend on them, can adapt to changing weather patterns and travel plans.



Scientists at Land-grant Universities are developing crop and livestock varieties that can withstand heat and poor soil conditions that may be exacerbated by climate change. For example, a **multistate** team bred beef cattle that not only have good meat tenderness and marbling, but also tolerate heat stress, which causes **\$369 million** in annual losses nationwide. These improvements will help keep cattle healthy, cut losses for producers, and ensure a stable supply of high quality meat for consumers even in hot, humid climates. Researchers also developed new forages that are essential for raising animals on marginal land, including alfalfa, red clover, and birdsfoot trefoil varieties that better tolerate dry, salty, and acidic soils.



Regulators in **Rhode Island, Massachusetts, and Vermont** accepted new design guidelines for bottomless sand filters created by a **multistate** team of Land-grant University scientists. These filters make septic systems resilient to rising sea levels and groundwater tables. Recently, project scientists have expanded their outreach to assist **U.S. territories** that have a high risk of experiencing these climate change impacts.

The Grand Challenges are part of the *Science Roadmap for Food and Agriculture* developed by the Experiment Station Committee on Organization and Policy (ESCOP) to guide food and agricultural research. A unit of the Association of Public and Land-grant Universities, ESCOP governs the research activities of Land-grant Universities and Agricultural Experiment Stations. Borne out of the Hatch Act of 1887 and the Evans-Allen Act of 1977, these premier institutions are supported by USDA NIFA and by collaborations across federal, regional, state, nonprofits, and private institutions. For more information:

- [escop.info](http://escop.info)
- [aplu.org](http://aplu.org)

To learn about the research needs, resources, and success stories for other Grand Challenge areas, see the rest of this series: [escop.info/roadmap](http://escop.info/roadmap)



Experiment Station  
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