

ENVIRONMENTAL STEWARDSHIP & SUSTAINABLE PRACTICES

During the past two centuries, expanding populations and food production have depleted natural resources and degraded ecosystem services like fresh air, clean water, recreation, and others that we rely on. We must reinvent our agricultural systems and practices so that they are not only productive enough to meet the demands of growing populations, but also guarantee long-term environmental health and sustainability. With continued support and investment, the Land-grant University system is poised to train scientists, engineers, and farmers to think about complete systems and develop sustainable management practices that heighten environmental stewardship.

RESEARCH PRIORITIES



Improve systems-level data analysis and modeling tools



Manage waste and runoff



Assess the value of ecosystem services



Reduce use of chemicals that can harm environmental health



Develop plants and livestock that require fewer non-renewable inputs



Reduce the carbon footprint of agriculture

CAPACITY & RESOURCES



Institutions in all 50 states and many U.S. territories with research sites representing diverse ecosystems, communities, and food systems



State-of-the-art laboratories, greenhouses, and other research facilities and tools



Scientists, educators, students, and staff with expertise in agricultural and environmental sciences



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, farm and commodity groups, environmental organizations, and the private sector



SUCCESS STORIES

Investing in research can lead to science-based policies and sustainable agricultural systems that protect the environment. Research and Extension at America's Land-grant Universities have made key advances. For example:

In 2015, **Utah** was the 2nd driest state in the nation, but one of the top per capita users of water. **Utah State University** Extension's "Water Check" program deploys interns to check water use and educate homeowners and groundskeepers about conservation. In just **2 counties**, checks have saved more than **175 million gallons of water.**

University of Minnesota scientists used nanotechnology to create a sponge that absorbs mercury from water, quickly kills microbes, and turns contamination into a non-toxic substance that can be disposed of in a landfill. A sponge the size of a basketball can clean up **Lake Como**, which is **68 acres** and up to **15 feet** deep.

327,760 pounds of nitrogen, **102,240 pounds** of phosphorus, and **43,360 tons** of sediment were kept out of the **Soque River** by 47 watershed restoration projects implemented with the help of **University of Georgia** Extension.

Iowa State University helped install prairie strips on **35 farms** in **9 states**. Research showed that small strips of prairie plants in corn and soybean fields can reduce soil, nitrogen, and phosphorus runoff by up to **95%.**

"Rice Irrigation," a mobile app developed by **University of Arkansas** for rice farmers, cut irrigation water withdrawals from the Mississippi Valley Alluvial Aquifer by

23 billion gallons.

Rutgers University scientists designed new composters and practices that have provided more affordable, environmentally friendly manure disposal for horse farmers.

80% of **Michigan** pork producers adopted feeding strategies recommended by Land-grant Universities, reducing annual herd ammonia emissions by 21% or **2,047 tons.**

Research showed decreasing nursery temperatures by **15°F** overnight does not harm pig performance or welfare. If **20 million pigs** are managed this way, the industry could reduce carbon dioxide emissions by **309 million pounds** and save **\$34 million per year.**

5 networks operated by Land-grant University researchers provide nationwide atmospheric deposition monitoring. Data support research and education; guide environmental stewardship, agricultural practices, and air quality regulations; and ensure food safety, human health, and agricultural productivity. In 2014, data were downloaded **27,000 times** by **37,000 users** in **150 countries.**



Researchers at Land-grant Universities in **multiple states** are using new and improved methods to measure the economic value of ecosystem services. With this information, government agencies, land managers, and private landowners are able to weigh the costs and benefits of different management options, estimate potential losses under certain land use, climate, and natural disaster scenarios, and predict how mitigation strategies might reduce losses. Accurate estimates also make it easier to develop business models that account for ecosystem services and design programs that use economic incentives to encourage eco-friendly actions.



Research findings, new survey tools, and trainings are helping organizations like the U.S. Forest Service, Environmental Protection Agency, and Natural Resources Conservation Service develop water stewardship programs and policies that use agency resources efficiently and achieve meaningful, tangible water quality improvements. For example, **University of Minnesota** and **University of Maryland** researchers increased civic engagement in stormwater management programs.

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
- 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



Experiment Station
Committee on Organization
and Policy (ESCOP)