The Long-Term Agroecosystem Research Network

Long-term, Coordinated Research to Accelerate the Sustainable Intensification of Agriculture

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The LTAR network

- Initiated in 2012 to continue for 30+ years

- 18 current sites and ~300 USDA and university scientists
  - ARS laboratories/co-located universities
  - Archbold Biological Station/University of Florida
  - Michigan State University
  - University of Nebraska, Lincoln
Why LTAR?

*Coordinated network research accelerates progress to US agricultural sustainability goals*

- Removes intellectual silos (among units, NPs)
- Promotes cross-site research and co-production
- Promotes transdisciplinary research

- Crop and animal scientists, hydrologists, ecologists, social scientists at *multiple research locations work together*
How LTAR works

• Coordinated experiments with common agricultural indicators

• 17 working groups to create network-level outcomes (datasets, technologies, adoption)

• Interoperable datasets, vocabularies, metadata, and analytical tools
LTAR and the Ag Innovation Agenda

LTAR goal alignment with USDA Agricultural Innovation Agenda

• Innovation adoption
  
  *Human dimensions research, co-production with stakeholders*

• Alignment of public-facing agencies
  
  *Embedded Natural Resources Conservation Service, USDA Climate Hub involvement*

• National data collection, trend assessment, and accountability benchmarks
  
  *LTAR Sustainable Intensification Benchmark Monitoring Tool*
LTAR site-level programs

A. “Business-as-usual”: common practices that have limited sustainability or that can be improved

B. “Aspirational”: greater productivity, cost efficiency, and resilience with reduced environmental impacts

C. Provide information on tradeoffs and how they vary across an agroecosystem region
LTAR network products

What has been accomplished by LTAR? A sample:

- National Wind Erosion Research Network
- The Munchinator
- Stakeholder engagement strategies
- Dissolved organic matter measurements
- Livestock tracking
- Manureshed
- Watershed lag time
- Regionalization
- Phenology monitoring
- Water budgets
- FarmBeats
Estimating production dynamics with low-cost PhenoCams

- Integrated Gross Primary Production (GPP) data from eddy-covariance (EC) towers, PhenoCams
Livestock tracking technologies

Web and mobile apps to locate, monitor, and manage livestock, applicable to multiple US rangeland types

- Cross-site use of sensors to track livestock movements and health in rangelands
Win-win Solutions to Address Nutrient Excesses and Efficiencies

National system for replacing expensive fertilizers with manure nutrients

- Analysis of manure nutrient sinks and sources and integration with ARS-patented manure management technologies
Spatial Tools to Understand Innovation Costs and Benefits

Big data approach to extrapolate site-based science to the national scale

- “Regionalization” uses multiple variables to define areas over which experimental results yield similar production, environment, and economic outcomes

Preliminary analysis of LTAR representativeness
Clever use of environmental tracers

- Discern the **nutrient fate and the sources contributing to receiving waters eutrophication** by examining atmospheric ammonia and by utilizing novel urban and agricultural aqueous source tracers.

MESA  
Sucralose

Science of the Total Environment 2014
Comprehensive Indicators for Sustainability

Monitor and improve performance of sustainable intensification strategies

• Stakeholder-driven indicator development
• Indicators reflect production, environment, and well-being
• Leverage metrics gathered across USDA agencies (NASS, NRCS, RMA)
• Integrated with AgCROS database and data analytics

https://usdaars.maps.arcgis.com/apps/MapSeries/index.html?appid=8f2a1f9a38df4310ae0e9e87bb968b7d