# Decode 6

# **DATA DRIVES DECISIONS** Data Infrastructure for Climate-Smart Agriculture

# THE PROBLEM

Climate-smart agriculture relies on coordinating a complex suite of agricultural practices to provide ecosystem services. But measurement of these benefits is scattered—there is no centralized, nationwide infrastructure for collecting information about ecosystem services practices and benefits.

#### THE SOLUTION

Funding for a coordinated data infrastructure—a national ecosystem services monitoring network—could meet this need. Data is key for driving climate-smart decision making. With better data, producers and land managers can make more informed, far-reaching decisions to improve ecosystem services provided by agricultural land.

#### THE LAST GREAT LAND STEWARDS

Farmers and ranchers do more than provide food, feed, fuel, and fiber. They are also the primary stewards of the nation's soil, water, and nutrient cycles. All ecosystems, natural and managed, have potential to provide "ecosystem services" like:

- Filtering air and water,
- Sequestering atmospheric carbon, and
- Promoting biodiversity.

Agricultural systems are particularly important because there is control over which benefits are delivered and how. Producers or landowners can leverage this control through:

- Ecosystem service markets, and
- Climate-smart agricultural incentive programs.

# COMPLEX SYSTEMS REQUIRE COORDINATION

The concept of ecosystem services is simple; measuring them is anything but.

Different practices and benefits do not work in isolation, or equally well in every location—instead, their impact lies in how they synergize, counteract, or are modified in concert.

A better understanding of how management and benefits interact across the suite of ecosystem services is essential for the success and credibility of climatesmart agriculture programs.

To achieve this understanding, we need a coordinated effort in the research community to:

- Research systems-based approaches to implementation and monitoring, and
- Account for variations in outcomes based on location and different farming systems.

# **A NATIONAL ECOSYSTEM SERVICES MONITORING NETWORK**

These goals require investments in technology, national coordination and communication, harmonization of data, and long-term, crossdisciplinary research support.

A national ecosystem services monitoring network would provide the framework for:

- Coordinating investments;
- Predicting agricultural ecosystem function;
- Feeding data into decision support tools to help producers and landowners choose practices with the most significant, targeted effects;
- Providing benchmarks for credit buyers; and
- Building confidence that investments in ecosystem services are producing measurable results.

Though complex, the effort is not without precedent. It parallels another nationwide network: The National Weather Service.



Left: Harvesting sweet potatoes in Mechanicsville, VA (Courtesy USDA by Lance Cheung. Center: Cotton harvest in Batesville, TX (Courtesy USDA by Lance Cheung). Right: Nikki Onuoha (right) visits Stewart Stein of Stewart Stein Farms Inc. in Belle Glade, FL (Courtesy USDA/FPAC by Preston Keres).

#### **MAKING A CASE FOR DATA NETWORKS**

**Like a meteorological forecast,** an ecosystem services monitoring network would collate a steady stream of data from a nationwide array of farms.

**The National Weather Service:** 

- Gathers information from a nationwide network of local weather stations;
- Compiles information in the same format in a centralized location; and
- Makes the data freely available.

Today, we have reliable weather forecasts *because* the National Weather Services collects, maintains, and supplies this information.

Agricultural data has no similar mechanism for standardized collection, maintenance, and use.

Although efforts are underway to establish measurement, reporting, and verification (MRV) for ecosystem services, nationwide data from many different kinds of operations is vital to ensure equitable participation from all kinds of farms.

**Fortunately, many weather station-type programs** for collecting ecosystem data are already in place.

- The USDA Long-Term Agroecosystem Research (LTAR) network boasts partnerships among 18 research sites focused on sustainable intensification of agricultural production.
- The USDA's Climate Hubs also works with collaborators, such as universities and nongovernmental research organizations, to link USDA research data to practicioners, experiment stations, and individual producers.
- The USDA has also released a call for proposals to monitor soil carbon on lands enrolled in the Conservation Reserve Program.

#### WHAT'S MISSING?

Funding to collect, coordinate, network, and harmonize data from these disparate sources.

Most funding for ecosystems research and data collection comes from USDA's Agriculture and Food Research Institute (AFRI). But AFRI grants do not support long-term research, and infrastructure, nor are its grants large enough to cover the range of projects needed to make participation equitable.

**Funding** for a national ecosystem services monitoring network would provide:

- A means for data collectors to communicate with each other and with technical assistance hubs, and
- Coordination with on-the-ground farmer networks to improve and refine data collection.

### **MEASURING SUCCESS**

The data network's success will be measured in its usefulness. Great care must be taken to keep the data underpinning the repository open, accessible, and available.

To achieve its potential, the data repository must:

- Be amenable to independent researchers developing web tools for searches, analytics, and predictive modeling;
- Ascribe to FAIR (findable, accessible, interoperable, reusable) principles;
- Use consistent file formats; and
- Maintain an open access structure.

The data itself is invaluable; but a FAIR, open access structure is what will drive scientific advancement in climate-smart agricultural practices and beyond.

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