Agroecosystems research tackles complex issues. Trying to balance economics, food production, and environmental impacts means there are multiple goals and all are a top priority. Often these competing goals require trade-offs, be that in production or conservation efforts, and while researchers can make suggestions, they rely upon landowners, farmers, ranchers, and public land managers to implement these practices.

In some cases, those stakeholders and end-users can be involved in the research process. For example, farmers can share yield data from year to year or conduct trials planting new cultivars. There are also opportunities to work directly with farmers, stakeholders, and even private citizens to design research and collect data. Sites can be used as test plots for new management practices from production to conservation. All of these open up science to a broader suite of participants and may require researchers to take a different approach to designing experiments or collecting data.

When working with stakeholders and citizens, researchers need to consider ways to incentivize involvement, keep people engaged, and share results. Researchers who are considering working directly with stakeholders need to recognize the challenges and benefits and how timelines change when stakeholders are involved. While the circumstances of each project are unique, there are lessons to be learned from successful projects, which may provide a framework for researchers interested in involving stakeholders in their research programs.

Participatory research in agronomy & soil science

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On-Farm Data

Many farmers conduct experiments from year to year as they fine-tune practices for each individual field. As part of this process, they keep records of what changes they are making as well as the yield response. With the advanced technology on today’s equipment, it is possible to look at differences in yields not just among fields, but within a field based on GPS data. These data can be combined with landscape features like elevation and soil type or management practices, including fertilizer application.

As more farmers collect these detailed data sets, researchers see the potential to combine the information into a massive data set—one that includes multiple years, crops, and geographic variation. This might allow the exploration of new relationships as well as testing and developing new hypotheses.

One of the benefits of this big data approach is the potential to fine-tune recommendations based on the most influential variables. ASA, CSSA, and SSSA member Tom Morris, Professor of Plant Science at the University of Connecticut, points out that general recommendations are based on averages and do not take into account the nuances of individual fields. Given that very few fields are “average,” these general recommendations are considered starting points. More data would likely improve management recommendations based on key variables and help farmers increase yields and maximize profits.

Just because farmers have the data, does not mean they are willing to share it—or at least share it widely. Some may be willing to share their data with their small, local, community but not want to let the data be added to databases designed to be used for statewide, regional, or national assessments. In general, people want to maintain their privacy in large databases that many researchers can access. Therefore, researchers who are asking for data need to be clear about use, privacy, and how findings will be reported back to those participating.

Volunteering data is one way to participate in research while another is volunteering land and access to researchers. In the upper Midwest, farmers are volunteering to have a conservation approach installed on their farms as part of a research project. The STRIPS (Science-based Trials of Row-crops Integrated with Prairie Strips) project, a collaborative effort out of Iowa State University, uses native prairie plants to reduce sediment loss in row crops.

The initial phase of the STRIPS project was conducted on the Neal Smith National Wildlife Refuge (NWR) where experimental plots were set up in 12 small watersheds. These experimental plots were put on land that was managed by a commercial farmer, so the design was appropriate for “real world” conditions from the beginning, explains ASA member Matt Liebman, Professor of Agronomy at Iowa State University and collaborator on the STRIPS project. Using these instrumented watersheds, the research team examined how prairie strips sown into cropland affected a large number of agronomic, biological, and hydrological responses. The team also used the experiment as a demonstration site to show how the STRIPS were established and their effectiveness to farmers, conservation agency staff, and the public.

The second phase has involved putting prairie conservation strips onto working farms across the Midwest. Currently, the project has 38 on-farm sites in various stages of development. Farmers contact the research team, and they work together...
Farmers, ranchers, and private citizens are becoming involved in agronomic and soil science research. Participation takes many forms: collecting data, sharing records, providing access, and informing experimental treatments. Stakeholder involvement in science requires trust and transparency among those involved and can improve communication surrounding complex environmental issues.

with them to customize the strips to accommodate landscape features and equipment. Across all sites, there is a consistent goal for a 10% conversion of cropland to prairie. In the initial 10 years of the project at the Neal Smith NWR, the investigators found that a 10% conversion reduced sediment loss by 95%. As this project expands, the team is continuing to assess soil loss from fields planted with prairie strips.

Liebman says that this project shows that “change in the landscape doesn’t need to be dramatic to get large environmental benefits.” Similarly, small changes in the approaches to research, by involving stakeholders, may generate big changes in the adoption of practices to the benefit of farmers and the community.

Stakeholder Science

There are also opportunities to work directly with farmers, stakeholders, or private citizens to design research and collect data. This stakeholder-driven science, also called participatory research, is well suited when trying to find solutions to situations that are complex or controversial. If the potential solutions will require compromises, bringing those most affected by the research into the process can increase the likelihood of adoption.

One example is The Collaborative Adaptive Rangeland Management (CARM) experiment. The CARM experiment is located on the USDA’s Central Plains Experimental Range, which is a Long-Term Agro-ecosystem Research (LTAR) network site located on the shortgrass steppe of eastern Colorado. Eleven stakeholders representing ranchers from the Crow Valley Livestock Cooperative, Inc., public land management agencies, university Extension, and non-governmental conservation organizations are engaged with a multi-disciplinary research team of range scientists, ecologists, and social scientists.

David Augustine, a landscape ecologist with the USDA, and colleagues have been working with these representatives from the beginning of the project. The research team brought stakeholders together to identify goals and decide what the possible treatments were to achieve the goals. “They design the treatments, and

Dig Deeper

Check out slides, audio, and video from a symposium on this topic at last year’s Annual Meeting at: http://bit.ly/2mz3RWc.
we collect all of the data,” Augustine says. By giving stakeholders the decision-making power, and sharing the results, participants are learning rather than being told what to do.

Augustine anticipated there might be some conflict bringing a diverse group of stakeholders together. However, as participants get to know one another and realize they want to see similar outcomes, Augustine has seen “an increased exchange between stakeholders.” Giving everyone a seat at the table and a voice in the process helps different groups learn about each other, find common ground, and reach necessary compromises.

When involving stakeholders, research teams need to have plans for changes in levels of engagement by any individual or group over the course of the project. The CARM experiment has seen changes in the individuals representing stakeholder groups but has maintained representation for the duration of the project. For researchers planning to initiate a long-term stakeholder-driven project, they must anticipate that the stakeholders or representatives of collaborating agencies may lose interest or move on to new jobs and need to be replaced, or that stakeholder groups could be restructured or change how staff resources spend time.

Working with stakeholders can also include working directly with the public. Mónica Ramírez-Andreotta, an Assistant Professor with a joint appointment in the College of Agriculture and Life Sciences and College of Public Health at the University of Arizona, works directly with people in communities that may be exposed to environmental contaminants through daily activities, such as, but not limited to, home gardening. Ramírez-Andreotta says when a researcher works directly with stakeholders, there is an opportunity to determine the challenges and concerns of the local community as well as their research questions based on their lived experiences in the area.

In the Gardenroots project, which Ramírez-Andreotta designed along-side the community so that citizens can collect samples, people can learn more about their environmental health and risk of exposure to arsenic and other pollutants. While it may seem easy to give instruction on collecting water, soil, and plant samples, a great deal of time went into writing instructions and training community representatives and participants on the methods. Because citizens are collecting samples on their own, researchers need to provide instructions that minimize the potential for sampling error or contamination.

Ramírez-Andreotta also points out the need for context when reporting data back to people, particularly when the research has an impact on their health and quality of life. However, even for citizen science projects where people collect observational data, like bird counts, research teams need to have quality communication to maintain engagement and built trust.

While it does not change the scientific method, this participatory model does change some aspects of the research process. There is a need to build relationships and trust and potentially longer timelines to account for training, meetings, and data sharing with stakeholders. However, the involvement of stakeholders is an approach that suits many agroecology research questions and may speed the dissemination of research results and changes in management practices.

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