Organic Research Activities of the USDA’s Agricultural Research Service

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The Agricultural Research Service (ARS) is the Department of Agriculture’s (USDA) chief intramural scientific research agency. Our job is finding solutions to agricultural problems that affect Americans every day, from field to table. Organic research is a vital and ongoing part of the overall ARS research portfolio and occurs at approximately 20% of ARS research locations across the United States. The vision for ARS organic agriculture research is to help the organic industry overcome the challenges it faces related to productivity, profitability, environmental stewardship, and energy efficiency. ARS’s organic research is an interdisciplinary research approach to understand the biological and physical processes innate to plants, soils, invertebrates, and microbes that naturally regulate pest problems and soil fertility so as to not rely on the use of synthetic pesticide and fertilizer production inputs. The agency’s scientists are mainly seeking strategies to prevent the problems faced by organic growers and then, secondarily, looking for therapeutic controls that they can use. From a practical standpoint, this whole-system approach also describes a large part of ARS’s research to improve conventional agriculture. Many of the results and lessons learned from conventional ARS research can be readily applied to organic farming systems, and vice versa. The objective of ARS organic agriculture research is to help producers compete effectively in the marketplace by producing abundant amounts of high-quality and safe products to meet consumer demands. A few illustrative examples of the types of organic research activities being performed by ARS scientists are presented below.

The challenge of integrating conservation tillage practices into organic production systems is a primary focus of the research at the Sustainable Agricultural Systems Laboratory (SASL) in Beltsville, MD, and is detailed in an accompanying article in these proceedings. SASL research seeks to address the challenges related to weeds and fertility in organic production. The research is focused primarily on organic grain production but includes practices that are applicable to vegetable production as well. A major SASL asset is a 17-year Farming Systems Project that compares two conventional and three organic grain crop rotations. Recent SASL research has led to the development of improved cover crops for increased fertility, improved soil conservation, and weed control. A scientist at the ARS National Soil Dynamics Laboratory in Auburn, AL, has been developing new and improved designs for roller-crimpers to manage and terminate cover crops while maintaining high residue cover. Numerous designs and prototypes have been developed and tested in varying cropping systems across the State of Alabama. The most recent version is designed for small vegetable production systems and is powered by a self-propelled, walk-behind garden tractor (additional information on these efforts is available in the February 2013 issue of Agricultural Research Magazine.

A major environmental contaminant in the Mississippi River Basin is nitrate-N, coming primarily from the discharge of agricultural drainage water and shallow ground water in the Midwest. The best field approach for accurate, integrated measurements of subsurface water quantity and quality is the installation of tile drains and a monitoring system capable of providing accurate...
and precise estimates of tile drain water flux and nutrient concentrations. The ARS National Laboratory for Agriculture and Environment in Ames, IA, in partnership with Iowa State University, secured funding from the Integrated Organic Water Quality Program (USDA National Institute of Food and Agriculture, or NIFA) in 2009 to quantify tile drain water quantity and quality and soil and plant carbon and nitrogen parameters under organic cropping- and forage-based systems. It is hypothesized that integrated, multi-functional organic systems will result in improved water retention and water quality by enhancing carbon, nutrient, and water cycling. This hypothesis will be tested through the collection of soil, plant, and water data for at least 8 years that began with the 2012 cropping season.

The objective of an ARS scientist in Salinas, CA, is to develop ecologically based soil and pest management strategies that enhance soil quality, nutrient cycling, and profitability and also reduce off-farm inputs in high-value, organic vegetable production systems. He recently completed the eighth year of long-term systems trials comparing annual lettuce-broccoli production with and without cover crops and varying types and densities of cover crops. Additional information on this study is available in the February 2013 issue of Agricultural Research Magazine. Organic growers in California often devote 5 to 10% of the area in lettuce fields to strips of alyssum. Alyssum flowers attract beneficial insects that provide excellent control of insect pests such as aphids without the need for pesticides. A 2-year study within the organic vegetable systems trials investigated novel intercropping patterns for organic lettuce and alyssum. The study identified more efficient intercropping patterns that will allow farmers to maximize lettuce yields and obtain the pest control benefits of alyssum. These results will benefit organic farmers and may also help conventional farmers minimize pesticide use in lettuce. Another result of the research to date is refined cover crop seeding strategies to help organic producers optimize weed control and commercial crop production.

ARS is also studying some organic animal-based production systems. The Poultry Production and Product Safety Research Unit in Fayetteville, AR, has developed a state-of-the-art organic poultry research facility. This research farm was Organically Certified in February 2010, and studies are being conducted that focus on production and food safety issues important to organic poultry producers. This facility is one of the very few organic-certified poultry research facilities in the United States. Food safety concerns with Salmonella and Campylobacter are high-priority research areas for poultry producers, and collaborative studies between the ARS Unit in Fayetteville, the University of Connecticut, and the University of Arkansas have produced several effective strategies to combat these pathogens, including the use of a fatty acid naturally found in milk and coconuts and essential plant extracts that have antimicrobial efficacy. An Organic Poultry Advisory Board composed of organic poultry farmers from all over the country has been established to provide input on critical research needs. An ARS research unit in Booneville, Arkansas, was awarded a 2010 USDA-NIFA grant to study systems approaches for the control of gastrointestinal nematodes (GIN) in organic small ruminant production. The study will examine forage systems for year-round GIN control; exploit resistant sires, bucks, and breeds to integrate into organic flocks/herds; and examine on-farm use of integrated GIN control. The Booneville location has also recently demonstrated that sericea lespedeza fed to lambs can control coccidiosis with very little chemical intervention.

This brief article introduces some of the organic research conducted by ARS. In addition to research conducted explicitly to support organic agriculture, many of the results and lessons learned from non-organic ARS research can be applied to organic farming systems. Examples include plant varieties that are more disease or drought resistant. If you would like to learn more about ARS activities, please go to our web page at www.ars.usda.gov and click on the "Research" link.