The Arkansas Discovery Farm (ADF) program uses a unique approach based on agriculture producers, scientists, and natural resource managers working jointly to identify on-farm conservation issues and potential solutions to agricultural sustainability challenges. Each Discovery Farm serves as a center to collect economic and environmental data designed to better define sustainability issues. At the same time, we are determining solutions that promote agricultural profitability and natural resource protection. The program uses state-of-the-art water quality monitoring equipment installed on real, working farms. Each Discovery Farm documents the impact of agricultural operations on water resources, while investigating solutions to reduce off-farm impacts if and when they occur. The overall goal of the program is to document sustainable and viable farming systems that remain cost-effective in an environmentally sound manner. The program is based on the following four cornerstones: 1) sound science, 2) unbiased research, 3) stakeholder driven transparency, and 4) strong partnerships.

**Sound science**

The case for relating runoff from agricultural operations to in-stream water quality data is not clearly defined, as very few studies have been designed to monitor runoff from working farms in Arkansas and then track these losses through drainage networks to in-stream monitoring sites. Thus, determining cause and effect relationships between agriculture and in-stream water quality is
difficult due to the current lack of peer-reviewed data. This knowledge gap has been the primary catalyst that makes water issues related to agriculture controversial and emotional. The ADF approach strives to collect data from working farms to help base decisions on sound science rather than on emotion.

On-farm runoff and water use studies do not typically conform to the traditional experimental designs and statistical approaches used in other aspects of agricultural research due to the spatial variability of the issue, coupled with the high cost of state-of-the-art automated water quality sampling equipment. Edge of field monitoring of runoff from the entire field (management unit) is a more appropriate scale, as opposed to traditional, small plots, when studying the effects of agricultural management practices and other hydrologically-related processes on water use and quality.

Typically, three to four fields on an ADF are equipped with monitoring stations to allow comparison of specific management scenarios with a control site. In this manner, singular issues such as water management, tillage, crop rotation, or conservation practice adoption can be correlated to their effects on the quality of water leaving a field. Because this research is conducted on working farms at field-scale, ADF staff cannot predetermine which factors to investigate without first meeting with the host farmer and conducting a thorough farm reconnaissance. A plan can then be drafted which directly applies to the participating farm while also generating experimental results applicable to the other producers within the region. For a current listing of our Discovery Farms, visit our website: discoveryfarms.uark.edu.

**Unbiased Research**

The concern over potential water quality impacts originating from agricultural operations has prompted much controversy and has created a sometimes emotional issue among agricultural producers who feel they have been unfairly targeted. Under the Clean Water Act, the Arkansas Department of Environmental Quality (ADEQ) as well as the United States Geological Survey (USGS) have collected considerable in-stream water quality data. Also, the Arkansas Natural Resources Commission (ANRC) and USGS have developed a network of wells in Eastern Arkansas to monitor declining groundwater levels (ANRC, 2012). It is generally accepted by all stakeholders that irrigation is the primary user in critical groundwater areas of Eastern Arkansas.

Each monitoring station is equipped with a flow outlet structure such as a flume or weir so that runoff volume can be measured either by a flow stage pressure transducer or a flow velocity profiler. At each station, an automated water sampler equipped with a weather station is housed in a storage unit and automatically collects water samples at pre-programmed intervals once water flow is detected at the flume or weir so that a representative, composite sample is collected over the course of a runoff event.

Irrigation water use is monitored with propeller flow meters outfitted with data loggers. On some ADFs, atmometers (evapotranspiration gauges) are being demonstrated as an irrigation scheduling tool to compare to the Arkansas Irrigation Scheduler.

Watermark sensors and dataloggers are being utilized track soil moisture. Monitoring stations at the drainage...
outlet of the field allows for determination of water quality and quantity of tailwater and irrigation system performance.

**Stakeholder Driven Transparency**

While the Division of Agriculture University of Arkansas System provides leadership and expertise to ensure that data is collected in a scientifically rigorous and valid manner, the program is led by the ADF Stakeholder Committee. This group consists of leaders from agricultural organizations with one seat reserved for an environmental organization. The Stakeholder committee is supported by the Technical Advisory Committee, which is comprised of representatives from state and federal agencies who assist the agricultural industry. Currently, the Nature Conservancy and the Arkansas Department of Environmental Quality serve on our Stakeholder and Technical Advisory Committees to ensure transparency among all committee partners. For a current listing of individuals serving on our Stakeholder and Technical Advisory Committees, please visit our website: www.discoveryfarms.uark.edu.

**Partnerships**

In addressing water resource issues, partnerships are essential. Several parties have stepped forward with financial contributions through grants, gifts, and contracts to help fund the ADF program. These partners include both private and public entities, one of which is the participation of the ADF Program in the Mississippi Healthy River Basin Initiative (MRBI) program. The Natural Resource Conservation Service administers this financial incentive program for agriculture in thirteen states along the Mississippi River Corridor and assists producers in conducting edge-of-field monitoring under NRCS Conservation Activities 201 (data collection and evaluation) and 202 (system installation). Three of our Discovery Farms currently participate in this program and are under contract for CA 201 and 202. For a current listing of our ADF Sponsor Partners, visit our website: discoveryfarms.uark.edu.