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Water Quality Research Update

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Abstract
Water quality research has been a top priority for the directors of the Northwest Iowa Experimental Association. This type of work involves collecting water samples from tile drainage systems or surface runoff. Tile drainage research requires several acres of uniformly permeable soil. Surface runoff research needs several acres with uniform slope. The adjoining 120 acres recently purchased by the association meets the needs for both types of this research.

Disciplines
Agricultural Science | Agriculture

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Water quality research has been a top priority for the directors of the Northwest Iowa Experimental Association. This type of work involves collecting water samples from tile drainage systems or surface runoff. Tile drainage research requires several acres of uniformly permeable soil. Surface runoff research needs several acres with uniform slope. The adjoining 120 acres recently purchased by the association meets the needs for both types of this research.

In 2005, we began building the infrastructure needed for surface runoff research. The objective of this study is to measure the effects of crops, tillage, crop residue, and fertilizer management on nutrient content of water and sediment runoff.

Proper site selection is critical for any research project. A surface runoff experiment is designed for specific soil slopes. These slopes need to be steep enough to provide an adequate sample without exceeding capacities of the collection instruments. For this project, slopes ranging from 2.75% to 4.00% were required. A plot with a length of 100 ft and a width of 20 ft was also needed.

The ISU Agronomy Landscape Analysis Lab, using GPS, helped locate a site on the new farm and a preliminary plot map was prepared. Galva and Sac were the two soil types found, and soil samples were taken to track variations across the site.

A laser level was used to calculate exact slopes. A fall of 33 in. to 48 in. over the plot length was needed for slopes of 2.75% to 4.00%. Plot corners were flagged, and a final plot map was drawn. To complete the map, locations for sumps, tile lines, and grass waterways were incorporated. These improvements will manage water flow to prevent contamination of the collected samples.

Twenty-seven sumps, one per plot, were located at the bottom of the slope and to one side. Metal culverts 5 ft in diameter and 4 ft tall were buried 3.5 ft deep to serve as the sumps. A plastic PVC tube was put in place to direct plot runoff water through the side of the sump and into the tipping bucket collectors. Data loggers will record the water volume and a sample for analysis will be collected. Excess water will be dumped in the bottom of the sump and then will flow out of a tile line.

In the project area there is approximately 4,500 ft of 12-in. nonperforated plastic tile. Four separate lines will act as drains to remove water from the bottom of the sumps. From four to eight plots are connected to each line. Over 1,500 ft of waterways were built to prevent surface water from flowing across more than one plot. They will remove excess water by directing water flow off the site.

Infrastructure for the surface runoff project is scheduled for completion in the spring of 2006. Corn-soybean rotations under both conventional tillage and no-till management are also planned for spring 2006. Swine manure and commercial fertilizer applications are scheduled for fall 2006 or spring 2007. Data collection will begin in 2007.

A second project studying controlled drainage has been planned. The first step was to lay a 15-in. tile across the neighbor's property during January 2006. Later, tile drain lines will be installed for research related to managing tiles. Dr. Antonio Mallarino is leading the runoff study and Dr. Matt Helmers is leading the controlled tile drainage study.