The Illinois Nutrient Research & Education Council (NREC) was established in 2012 for the purpose of supporting science based research and outreach programs that are designed to measure the impact of environmental and management factors that affect nutrient reactions in the soil and utilization of nutrients by plants. The results from these programs will provide farmers the information needed to design production systems for their conditions that will minimize environmental impact, optimize harvest yield and maximize nutrient utilization. NREC is a private-public partnership established in The Illinois Fertilizer Act.

In September 2013, NREC solicited proposals for projects to be considered for funding in 2014 that focused on the NREC mission. NREC received 26 proposals by the deadline of November 1, 2013. Research based proposals were sent to highly qualified scientists for peer review. The NREC Research Committee met on December 17, 2013 to review the proposals and peer review reports in order to provide a funding recommendation to the Council. The Council met on January 5, 2014 to consider the committee recommendation and determine which projects to fund. The Council voted to fund 15 projects totaling $2,558,750.59. The Council felt that these 15 proposals, a combination of research and outreach programs, have the greatest chance of fulfilling the mission of minimizing environmental impact, optimizing harvest yield and maximizing nutrient utilization.

Dr. Robert Hoeft serves as the NREC Research Coordinator. NREC requires project investigators to submit progress reports to assure that research protocols, treatments and educational efforts provide the best opportunity for quality results.

The 2014 projects, in subject areas, are as follows:

**Nitrogen & Phosphorus Management and Water Quality**

NREC selected four projects in this subject area:

*Nitrogen Management Systems in Tile Drained Fields: Optimizing Yields While Minimizing Losses* (University of Illinois; Dr. Mark David, Dr. Emerson Nafziger, Lowell Gentry). Because nitrogen losses from tile systems will likely stay in the forefront of state nutrient reduction strategies, this project is designed to determine the effect of current and new nitrogen management practices on nutrient losses via tile lines and yield. The expectation is that this project will be conducted over a number of years to determine the impact of nitrogen management systems under variable soil moisture conditions.

*4R Research Farm: A Field Scale Comparison of Nitrogen Efficiency within Conventional and Alternative Management Systems* (Illinois State, Dr. Shalamar Armstrong). This project in central Illinois will evaluate nitrogen management practices including the impact of cover crops on nutrient loss and yield. This project partners with CBMP on outreach and demonstration at this site.

*Late Application Nitrogen Management in Corn Systems to Optimize Yields and Reduce Nutrient Losses in Southern Illinois* (Southern Illinois at Carbondale; Dr. Rachel Cook). N applications until early June is a technique
that reduces N loss potential from denitrification. In most cases, surface applied urea based materials are the products of choice for such delayed applications. A portion of urea N will be lost through volatilization if rain is not received within a few days of the surface application. This study will evaluate the effect of including a urease inhibitor and a coated urea material on reducing volatilization loss as measured by yield. The researchers will also evaluate the impact of late application of urea with and without an additive on plant injury.

**Phosphorus Runoff Potential from Surface and Subsurface Fertilizer Applications in No Till and Strip Till** *(University of Illinois; Dr. German Bollero, Kristin Greer, Chris Rudisill).* This project is in its second year of funding from NREC. Unlike N, P is not mobile in soil, but is mobile with soil. Research has shown that most of the P in lakes and streams associated with agriculture is coming from erosion off fields and from stream banks. Using rainfall simulation techniques, the researchers are studying the effect of tillage and surface versus subsurface P fertilizer placement on P runoff on slightly sloping lands.

**Crop Production Research**

NREC selected five research projects on improving crop production:

**Updating P and K Responses and Crop Removal Numbers for Illinois** *(University of Illinois; Dr. Maria Villamil and Dr. Emerson Nafziger).* State agronomy guidelines have been criticized for using outdated crop nutrient removal values given that plant populations, hybrids and new varieties have changed significantly in recent years. Grain samples will be collected from farmers across the state to update crop removal data for P & K.

**Phosphorus and Potassium Recommendations** *(University of Illinois; Dr. German Bollero, Dr. Antonio Mallarino, Kristin Greer and Chris Rudisill).* This project is in its second year of funding from NREC. It will improve soil based fertilizer recommendations by correlating soil test nutrient levels to crop response in corn, soybeans and wheat. The current recommendations were established over 40 years ago calling into question the validity of current recommendations given today's production systems. This project will coordinate with the project above.

**Residue Management, Tillage, and Nitrogen Response in Continuous Corn** *(University of Illinois; Dr. Emerson Nafziger).* This project began in 2005 and was funded by FREC until funding lapsed; NREC is ensuring that the final two years of this research are completed in order to see what a decade of residue removal, tillage, and N rates have had on soil properties and provide the best possible information on the advisability of removing corn stalks from Illinois soils, and whether or not tillage and N rate responses change as a result of stalk removal.

**Measuring Soil Quality Changes in Corn and Soybean Rotations** *(University of Illinois, Dr. Maria Villamil, Dr. Emerson Nafziger).* At six locations in Illinois, this study will investigate how different crop production and crop rotations impact soil structure, carbon sequestration, microbial activity, water relations and nutrient cycling and the impact of these soil related consequences on crop yield.

**A Comprehensive Corn Nitrogen Research Program for Illinois** *(University of Illinois; Dr. Emerson Nafziger).* This project involves on-farm and research center trials that will enable the study of combinations of factors that might effect nitrogen response. This includes rate studies, variable rate technology, combinations of fertilizer sources, inhibitor treatments, and application timing to provide economic and environmental returns for Illinois farmers.

**Cover Crops**

NREC selected two projects focusing on cover crops:

**An Agronomic and Environmental Assessment of Cover Crops in Illinois** *(University of Illinois; Dr. Maria Villamil, Dr. Emerson Nafziger, Dr. Rachel Cook (SIUC)).* This project is in its second year of funding from NREC. Despite a
great deal of research and promotion of cover crops, adoption rates in corn/soybean rotations remain low. The need for neutral information on the long term impact of cover crops to determine how they might be used most effectively and provide Illinois farmers an economic and environmental return is the purpose of this research; research is on-going throughout the state at 15 on-farm locations and at university research centers.

**The Effect of Cover Crops on Surface Water Quality** *(Illinois State; Dr. Catherine O'Reilly, Dr. Shalamar Armstrong)*. Located at Money Creek in McLean County, researchers will conduct this project utilizing two paired 300 acre sub watersheds that drain into the creek, to determine the effect of various cover crops on stream water quality.

**Outreach and Education**

NREC funded three projects that provide outreach and education to farmers and the ag industry.

**Keep it for the Crop (KIC)** *(Illinois Council on Best Management Practices)*. This program is in its second year of funding from NREC. KIC program engages fertilizer retailers and farmers in eight priority watersheds established by IEPA. The program works directly with farmers to conduct on-farm nitrogen rate trials and phosphorus application trials, using protocols developed by the University of Illinois, for the purpose of helping farmers develop a reliable, optimum nitrogen rate on their farms. KIC also utilizes N-Watch to help farmers determine residual nitrate after harvest, track nitrate movement in the soil and evaluate when cover crops may be beneficial to sequester residual nitrogen. KIC has shared the information learned from on-farm research through a series of educational meetings and is coordinating a program with ag retailers to measure and report adoption of 4R nutrient stewardship practices by farmers in the priority watersheds.

**Analysis of Farmers Nitrogen Management Practices in the Lake Bloomington Watershed** *(Illinois State University; Dr. Ashlin Spaulding, Dr. Shalamar Armstrong, CBMP)*. Information being collected from ag retailers on 4R practices being used in the watershed based on the fertilizer source, timing and rates of application will be correlated with information provided by farmers in the watershed.

**4R Research/Outreach Farms** *(Illinois Council on Best Management Practices)*. This program is in its second year of funding from NREC. The purpose of this project is to help establish and coordinate the operations of the Discovery Farm in Lexington, a second on-farm site in Champaign County currently in development and installation of a third site. CBMP will help bring together the results of agronomic and water quality findings and disseminate this information to farmers using site demonstrations, field days, and seminars. CBMP will help serve as a liaison between farmers and researchers at these sites to help assure interaction and problem solving in the discovery process and provide outreach and education on a consistent basis.

**Buffers**

NREC funded one project on buffers:

**Multifunctional Buffers on Marginal Farmland to Improve the Environmental Profile of Agriculture and Diversify Production Opportunities** *(University of Illinois, Dr. Sarah Lovell, Dr. Samuel Wortman, Dr. DoKyoung Lee, Dr. Nick Paulson, Dr. Anthony Yannarell)*. The goal of this research is to establish and evaluate different multifunctional perennial systems appropriate for marginal farmland or sensitive areas. The goal is to determine how effectively these buffers can scavenge nutrients and reduce greenhouse gases while providing an opportunity to market alternative products generated from these buffers such as energy, forage, cover or wildflower crops.