**Impacts of 4R Nitrogen Management on Crop Production and Nitrate-Nitrogen Loss in Tile Drainage**

**IPNI-2014-USA-4RN16**

**Co-Principal Investigators:**

Matthew Helmers, Iowa State University

John Sawyer, Iowa State University

**Interpretive Summary for 2016**

This three-year study near Sutherland, IA began in January 2015 and is evaluating three N management practices in corn at 135 lbs of N/acre (150 kg N/ha), and a no N control: 1) fall anhydrous ammonia with nitrification inhibitor (Nitrapyrin), 2) spring anhydrous ammonia (no inhibitor), and 3) split with variable N at sidedress (40 lb of N/acre (45 kg/ha) of urea 2x2 (5x5 cm) starter at planting plus in-season urease-inhibitor- (Agrotain®) treated urea). Each treatment is replicated four times within a corn-soybean rotation, with each phase of the rotation present each year. The objectives are to, 1) determine the effects of N fertilizer application timing on nitrate-N leaching losses through tile flow in each crop phase; 2) determine the effects of N fertilizer application timing on crop yield; and 3) disseminate project findings. Agronomic operations were completed in a timely manner in 2016. The 2016 year was characterized by greater annual precipitation than the 30-yr average with 167% more precipitation in April and 214% more precipitation in September than the normal 30-yr average precipitation (*30.7 inches/calendar year (78 cm/yr) at the Cherokee, IA weather station; about 10 miles south of the project site*).

There was a 57 bu/A (3578 kg/ha) yield increase with the use of N in treatments 1-3 (average 198 bu/A, or 12,428 kg/ha) as compared to treatment 4 where no N was applied. During both 2015 and 2016, no statistically significant corn yield impacts were observed between the treatments where nitrogen was applied. Soybean yields in 2016 were greater than 70 bu/A (4,708 kg/ha) for all treatments. For 2016 in the corn phase, lower nitrate-N concentration with the no nitrogen treatment did not occur as in 2015 (no significant difference between with and without nitrogen application). In 2016 within the soybean phase, the treatment where no nitrogen was applied to the 2015 corn crop had statistically significant lower nitrate-N concentration than fall N treatment or the spring N preplant treatment. For both years in the corn phase, and in 2016 in the soybean phase, the nitrate-N concentration was the same for the control and the split N application. Overall, there were no statistically significant differences in TP or TRP concentrations between treatments.