Global Maize Project
Ames, Iowa Site

2011 Report

John Sawyer and Roger Elmore
Department of Agronomy
Iowa State University

The project site was set up in the 2010 crop year, for example implementing the corn-soybean crop rotation, collecting background soil samples, and measuring yield uniformity in each crop. Treatments were initiated beginning in the fall of 2010. Baseline soil sampling was completed in the fall of 2010 before tillage and fertilizer application. After soil sampling, fall fertilizer application and tillage was conducted in preparation for the 2011 crop year. In addition to the study area, an area was designated as a non-nitrogen limiting reference for active canopy sensing, and areas were set up so treatments could be practiced before implementing in the study plots.

The main system plots include farmer practice and ecological intensification, with sub-plots being no nitrogen application and nitrogen application. A general treatment protocol summary follows.

Farmer Practice

1. Nitrogen rate each year for corn based on the current-year Corn Nitrogen Rate Calculator for Iowa in a corn-soybean rotation, rate at the upper end of the calculated profitable range, and nitrogen price and corn price from the ISU Estimated Costs of Crop Production in Iowa, Ag Decision Maker, publication for each year. Nitrogen source is anhydrous ammonia, applied in the spring before tillage.
2. The no-nitrogen plots receive no nitrogen, therefore if phosphorus is applied, 0-46-0 is used as the P source.
3. Phosphorus and potassium fertilizers are applied as needed based on soil tests.
4. No sulfur fertilizer is applied.
5. Tillage is spring disk/field cultivate before corn, and fall chop corn stalks, fall chisel plow, and spring disk/field cultivate before soybean.
6. The corn hybrid is an adapted triple stack, planted as early as possible and for a final stand of 30,000 pl/acre. No scouting for foliar diseases or fungicide applications.
7. The soybean variety is an adapted RR, planted May 1 for a final stand of 100,000 pl/acre. Scout for aphids and treat if needed; no disease scouting or fungicide application.

Ecological intensification

1. Nitrogen rate set at 120 lb N/acre (total), the historical mid-point of the nitrogen recommendation range in Iowa for the corn-soybean rotation. The nitrogen applications

include 30 lb N/acre preplant broadcast ammonium nitrate, 90 lb N/acre sidedress injected UAN solution at the V4-V6 corn growth stage. Canopy sensing is conducted at the mid-vegetative stage (V10) to determine if additional nitrogen application is needed. No additional nitrogen was applied in 2011.

2. The no-nitrogen plots receive no nitrogen, therefore if phosphorus is applied, 0-46-0 is used as the phosphorus source.
3. Phosphorus and potassium fertilizers are applied as needed based on soil tests.
4. Sulfur fertilizer (gypsum) is applied at 15 lb S/acre in the fall each year before corn.
5. Tillage is fall strip-till before corn, and no-tillage before soybean.
6. The corn hybrid is an adapted triple stack (same in both systems), planted when soil is ideal after April 15 for a final stand of 37,500 pl/acre. Scouting for foliar diseases and fungicide application as needed.
7. The soybean variety is an adapted RR (same in both systems), planted May 1 for a final stand of 150,000 pl/acre. Scout for aphids and treat if needed and scout for disease and apply fungicide as needed.

In each system, the corn canopy is sensed with an active canopy sensor at the V10 growth stage and plants are collected at maturity for determination of above ground dry matter and carbon, nitrogen, phosphorus, and potassium. Yield of corn and soybean are determined with a plot combine.

In 2011, there were no soybean grain yield differences ($p>F$ at 0.075) between the systems (58.8 and 60.8 bu/acre for the farmer practice and ecological intensification, respectively). For corn grain yield, the nitrogen application was significant ($p>F$ at <0.001) between without and with nitrogen (138 and 221 bu/acre for without and with nitrogen respectively). There was no effect of system ($p>F$ at 0.508) or interaction between system and nitrogen application ($p>F$ at 0.158). Therefore, the site was highly nitrogen responsive in both systems; but systems or differences in nitrogen source and application rate had no effect on corn yield (farmer practice with nitrogen at 220 bu/acre and ecological intensification with nitrogen at 222 bu/acre).