**Project Title: Implementation of Cover Crops in Nebraska Corn and Soybean Cropping Systems**

**Contractor & Principal Investigator: Roger Elmore & Humberto Blanco**

**Please check/fill in appropriate box: Continuation research project Year 1 of 3 research project (for example: Year 1 of 2)**

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1. **What was the focus of the research project or educational activity?**

**Our main objective is to provide baseline research and recommendations on cover crop establishment in corn and soybean rotations, both in irrigated and rain-fed conditions. Specific objectives are a) to determine how to establish cover crops (time of planting, choice of cover crop species), and b) to determine if cover crops are beneficial for soil quality, crop yields and profits.**

1. **What are the major findings of the research or educational activity?**

**Corn and soybean yields following the first year of cover cropping were only affected by cover crops in the north-east location (HAL – Concord). At HAL, early planted cover crops reduced subsequent corn and soybean yields. Second year results show good establishment for the early-planted (broadcast) cover crops in all locations except WCREC (Brule). Cover crops were planted earlier in the fall than last year. Fall biomass was sampled for the first time this year, showing that all cover crops emerged but that fall cover crop biomass was low (around 300 lb/a). Biomass measurements in the spring and subsequent crop planting were somewhat delayed due to spring rains. Cover crops before soybeans had the highest biomass production (approximately 50 to 100% more than cover crops before corn), since they were allowed to grow two extra weeks in the spring. In these plots, biomass sampled in mid-April to early-May was highest for rye at each location, up to 4,800 lb/a at HAL; 2,300 lb/a at ARDC, and 3,900 lb/a at Clay Center.**

**Legumes (hairy vetch and pea) and produced less than 400 lb/a of biomass. Legume seeding rates are somewhat low and will be doubled starting fall of 2016. However, slower growth of legumes also contributed to low biomass yields.**

**So for the highest biomass production, we found that a rye cover crop planted early, is best.**

**Rye biomass contained the most N in the spring, about 30 lb/N. Despite being at the heading stage when terminated, rye biomass had C:N ratios around 25:1 and N tie-up is not likely.**

1. **Briefly summarize, in lay terms, the impact your findings have had, or will have, on improving the productivity of soybeans.**

**Early-planted cover crops reduced soybean yields by 3.7 bu/a at Concord. At the other stations, yields of soybeans were not affected by cover crops. Cover crops in no-till soybean systems have been associated with improved soil health and water infiltration, for example research has shown that rye and hairy vetch cover crops can increase soil organic matter and improve water-aggregate stability in corn-soybean rotations. In soybean systems, winter cover crops, especially rye take up unused nitrate, preventing the loss of this nutrient. In our study, rye had taken up 30 lb/a of N which will be recycled back into the soil system upon rye decomposition and will likely be re-used by soybeans.**

**Soybean cropping gradually decreases N and organic C in the soil, but with cover crops, this trend can be reversed. Improved soil health is the result.**

**Cover crops can further improve the productivity of soybean cropping systems by breaking pest cycles and controlling winter annual weeds. Visual observations show that the thick layers of rye after termination were physical barriers to weed growth.**

1. **Describe how your findings have been distributed to (a) farmers and (b) public researchers. List specific publications, websites, press releases. etc.**

**Distribution to farmers**

**Presentation “Cover crop truths: Ignoring the fiction and rural legends”, co-author and presented at crop production clinics in January (4 different dates, statewide), accessible in the proceedings:** [**http://agronomy.unl.edu/documents/2016%20CPC%20Proceedings%20Final%2012-3-15%20with%20COVER%20PAGE.pdf**](http://agronomy.unl.edu/documents/2016%20CPC%20Proceedings%20Final%2012-3-15%20with%20COVER%20PAGE.pdf)

**Presentation “Cover cropping in Nebraska” at the Women-in-Ag conference on 2/26 in Kearney, NE**

**Presentation field day at Mead on August 25.**

**Publication in CropWatch website (August 12):** [**http://cropwatch.unl.edu/2016/spring-biomass-production-winter-annual-cover-crops-corn-and-soybean**](http://cropwatch.unl.edu/2016/spring-biomass-production-winter-annual-cover-crops-corn-and-soybean)

**Distribution to public researchers**

**Poster at the Agronomy Society annual meeting in Minneapolis in November 2015 “Implementation of cover crops in Nebraska corn and soybean cropping systems”**

**Poster at *UNM Agricultural Production Systems Symposium on March 22: “Implementation of cover crops in Nebraska corn and soybean cropping systems” (updated version)***

1. **Did the checkoff funding for your project leverage any additional state or Federal funding? Please list sources and dollars approved.**

**We did not have additional funding.**