Neely-Kinyon Field Day–2015

EIGHTEENTH ANNIVERSARY OF THE LTAR SITE

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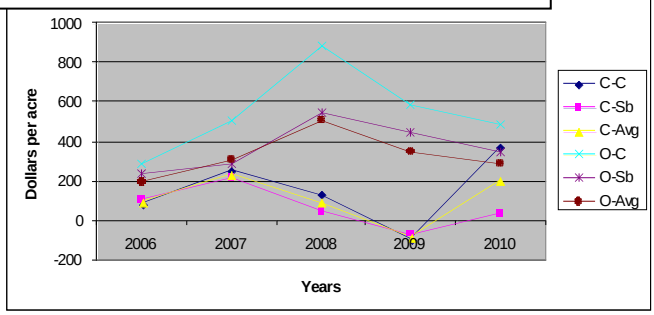
The organic ag industry continues to grow and was listed as a $39.1 billion industry in the U.S. in 2014, up 11.3% from 2013. Our research focuses on best management practices for enhancing soil quality and pest management for transitioning and certified organic farmers. Through timely weed management and crop rotations, we have demonstrated comparable organic corn, soybean, oat, alfalfa, vegetables, and fruit yields compared to conventional crops (see our webpage at <**http://extension.agron.iastate.edu/organicag**>

Organic returns have averaged $100/acre greater than conventional

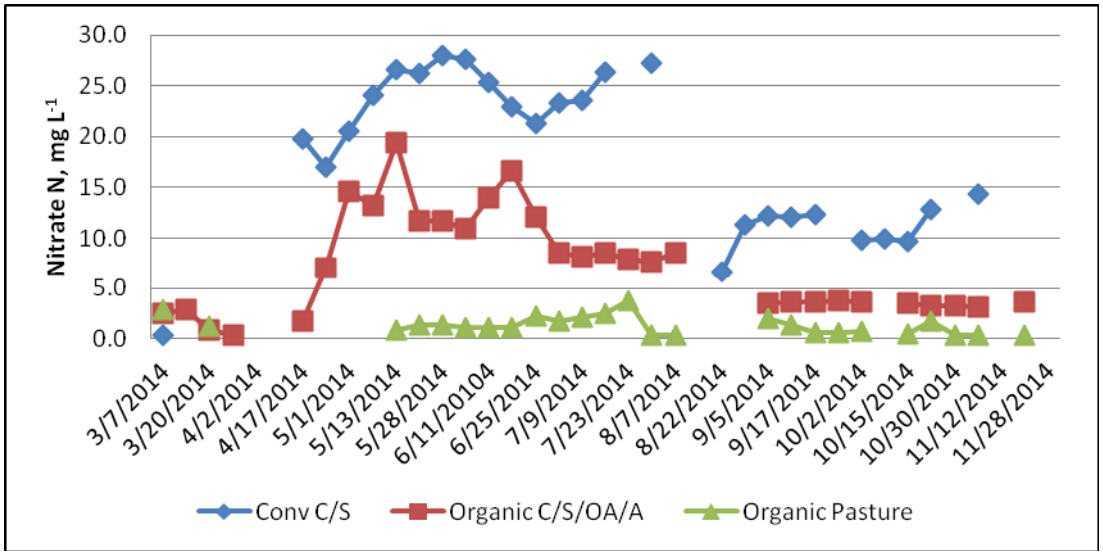


The Neely-Kinyon Long-Term Agroecological Research (LTAR) experiment was started in 1998 to examine suitable crop rotations that provide high yields, grain quality, and adequate soil fertility during the transition to organic and following certification. We are comparing replicated conventional and organic systems, using identical crop varieties, during the 3-yr transition period and are now in the eighteenth year of organic production. **Over the long term, organic corn yields following two years of alfalfa have been equivalent or greater than conventional corn, averaging 162 bu/acre, compared to conventional corn provided 120-145 lb/acre of synthetic nitrogen, which averaged 169 bu/acre. Organic soybean yields, averaging 49 bu/acre, have been similar or greater than conventional soybean yields at 47 bu/acre.** Organic oat 13-yr average: 97 bu/acre compared to the county average of 63 bu/acre. Organic alfalfa 13-yr average: 4 tons/acre compared to county average of 3.5 tons/acre. Over all years, organic returns have averaged twice those of conventional returns. **Organic corn is currently selling for $13.73/bu and organic feed-grade soybeans are $23.35/bu. Feed-grade oats are $5.76/bu and feed-grade wheat is $9.86/bu.**

Soil quality has remained high in the organic system: Dr. Cambardella will present data on LTAR soils.

Recent Years Have Been Much More Challenging

The 2013 and 2014 seasons were much more challenging, and 2015 is turning out to be the same, with excessive rains in May and June, and in 2013-2014, drought in July and August, pointing out the need for constant on-site management and timeliness in planting, rotary hoeing and cultivation for weed control for successful organic yields. For good weed management, the first rotary-hoeing should occur within 2–3 days after planting. **Over the last two years, organic corn yields in the organic four-year rotation (C-S-O/A-A) averaged 141 bu/acre compared to conventional yields of 145 bu/acre. The highest organic corn yield consistently occurs in the longest rotation.** Because of the excessive rains and lower yields in 2014, we upped the organic composted chicken manure (SW Iowa Egg) rate applied to corn in 2015 to 6.9 tons/acre in the 3- and 4-yr C-S-O/A-A rotations and kept a reduced rate of 2.9 tons/acre in the C-S-C-O/A rotation. We have also increased our manure fertilization rate at the USDA Organic Water Quality (OWQ) site outside Boone, and are monitoring nitrate loading from this site.



Organic Has Higher Water Quality

Dr. Cambardella's monitoring of nitrates in tiles under conventional and organic plots at the OWQ site has shown higher water quality under the organic pasture and C-S-O/A-A plots (Figure 1).

Fig. 1. Flow-weighted subsurface drainage water NO_3-N concentrations 2014 (from Cambardella et al., 2014)

Other LTAR Crop Details: Organic soybeans are remarkably resilient, averaging 45 bu/acre over the last two years, compared to 48 bu/acre in conventional plots, despite suffering from poor stands, delayed weed management and subsequent high weed populations. Oat yields averaged 97 bu/acre, with no difference between the three- and four-year rotations. Alfalfa yielded an average of 1.8 tons/acre in 2013, but with more rain in 2014, yields were up to 4.6 tons/acre. Corn and soybean variety selection and planting methods in 2014 were as follows: Blue River 56M30 corn was planted at a depth of 2.5 in. as untreated seed at a rate of 32,000 seeds/acre on May 30, 2014. Blue River 30C3 soybeans were planted at a depth of 2 in. in organic and conventional plots at a rate of 174,000 seeds/acre. Conventional corn and soybean plots were sprayed with four products at recommended rates while organic plots were rotary-hoed and row cultivated, in addition to 'walking' soybeans. Corn borers were again low (<1% damage) in all fields, showing the high degree of tolerance/resistance in conventionally-bred (non-GMO) corn varieties. Corn and soybean grain quality remained high, at 7.3 and 35.4%, and was equivalent between conventional and organic crops.

2015 Season: There have been numerous challenges in the 2015 season, including missing a very short window for planting corn and soybeans in May; and subsequent corn re-planting in certain plots on June 25 after the initial planting of June 8. The farm represents a microcosm of many farms in southern Iowa and Missouri this year: prevented acres, washed-out acres, and lack of high weed management from excessive rains and inability to perform timely operations.

Organic Pest Management for Bean leaf beetle, Soybean aphid and Soybean diseases

Soybean aphids can reduce yields by direct feeding, and interfering with photosynthesis and growth. Natural enemies, including beneficial fungi, such as *Pandora neoaphidis*, can infect aphids and give them a red color, but spraying fungicides can decrease the activity of this beneficial fungus. We also tested organic-compliant fungicides against potential soybean diseases, but so far, soybean rust has not been an issue in Iowa, and other diseases have remained low in all rotations. The aphid-resistant soybean variety, Blue River 29AR9, provided excellent management, with yields averaging 53 bu/acre. Prior to the use of 29AR9, the peak aphid population averaged 337 aphids per 8 sweeps on the non-resistant variety in 2008. In 2014, Blue River 30C3 was planted with the discontinuation of 29AR9; it will be interesting to see if this variety is re-activated with the increase in aphids in the northern part of the state this year. The most predominant beneficial insect is the minute pirate bug, *Orius insidiosus*, which attacks aphids, whiteflies and thrips. Organic-compliant treatments, including PyGanic® (McLaughlin Gormley

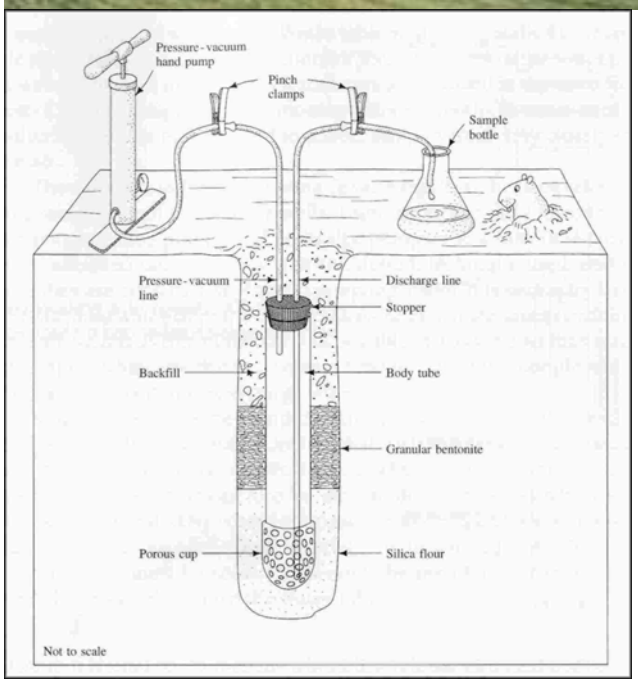
King Corp, Minneapolis, MN), Neemix® (Certis USA, Columbia, MD), Neem Blend 45™ (karanja and neem oils) (Green Dance World Organics, Paw Paw, MI), and MicroAF (TerraMax, Inc., Ham Lake, MN) have reduced insect pest populations, but not the bean leaf beetle, which has not been a significant pest since 2011. In 2015, populations to be somewhat higher than 2014, averaging 3 beetles per 8 sweeps, but the effect on soybean staining will be determined at harvest.

USDA-Organic Transitions Project: Cover Crops, Compost, No-Till and Mulch in Organic Vegetable Production

This project, funded by USDA in 2010, is examining ways to encourage organic transition by developing recommendations for organic vegetable cropping systems that maximize soil quality, foster carbon sequestration, and minimize nutrient loss through cover crops, composting, and reduced tillage. Monitoring treatment effects includes collecting data on yields, pest status, soil quality, and water quality through plot lysimeters. The treatments we are studying include three tillage comparisons: (1) tilled followed by straw mulch (2) tilled without straw mulch and (3) organic no-till; and two organic fertility treatments (1) composted animal manure alone (no cover crops) and (2) composted animal manure + cover crops. Fall cover crops are planted in October at a rate of 25 lb hairy vetch + 90 lb rye/acre. Treatments are replicated four times for a total of 48 plots. Cover crops are disked under or terminated with the Rodale Institute roller/crimper. Because of extensive spring rains, cover crops were not disked until June 3 and not rolled until June 6, making a planting date of June 18– two weeks behind schedule. Compost is applied at a rate of 100 lb N/acre each Spring and organic fertilizer side-dressed after vegetable crop establishment at 50 lb N/acre. In 2014, abundant pepper and sweet corn yields were obtained in mulched and tilled treatments (Table 1), with lower yields in the organic no-till, contrary to high yields in earlier organic no-till tomato experiments at the N-K Farm when rainfall was more normal. Highest pepper yields (3,268 to 4,241 lb/acre) were in plots that were tilled, mulched and had compost applied. Similarly, the highest sweet corn yields (ranging from 1,967 to 2,333 lb/acre) were in plots that were tilled and had compost applied.

Although the no-till plots did not have favorable yields in 2014 in Iowa, **soil quality parameters** have been higher in no-till plots. Soils results from the 2013 organic sweet corn plots showed that organic no-till contained the highest amount of soil organic carbon (SOC) at 30.3 g/kg. The two tilled treatments without a cover crop had the lowest microbial biomass carbon (MBC). Treatments with cover crops and compost had the highest MBC, demonstrating the value of composted manure in adding beneficial soil microbes. Overall, soil quality data showed enhanced storage of soil organic C, total N, and biologically active soil C and N when cover crops were planted in the fall before vegetable cropping; improved soil structure under reduced tillage; and more soil organic C, total N, biologically active soil N, and higher plant nutrient concentrations when composted animal manure was applied in the spring. **Lysimeter data** (Figure 2) has been showing that the concentration of leached N has been consistently lower under vegetables grown with a cover crop and in no-till.

Rodale roller-crimper used to crush cover crop at rye anthesis and drawing of lysimeter.



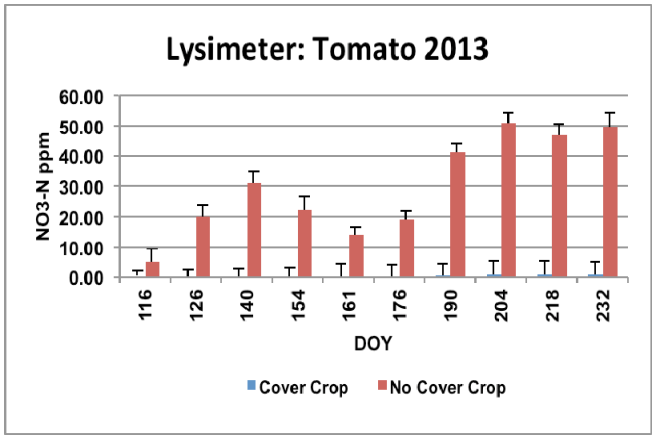


Fig. 2. Lysimeter data has been showing that the concentration of leached N has been consistently lower under vegetables grown with a cover crop and in no-till.

Table 1. Organic vegetable yields: 2014.

Yield	NC-AM-T-M	NC-AM-T-NM	C-AM-NT	C-AM-T-M	C-AM-T-NM	C-NT
Pepper (lb/acre)	3,268	4,241	2,660	4,115	4,117	2,117
Sweet Corn (lb/acre)	2,164	2,333	785	2,167	1,967	1,158

C= Cover Crop; AM= Animal Manure; T=Tilled; M=Mulch

All produce is used by UI Dining Services for the Iowa Organic Conference to be held at the Memorial Union, University of Iowa, on November 22-23, 2015.

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