

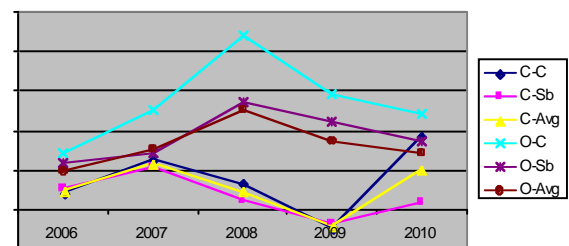
Neely-Kinyon Field Day-2011

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**FOURTEENTH ANNIVERSARY OF THE LTAR**

The organic ag. industry continued to grow, even during the recession, and is currently listed as an \$29 billion industry in the U.S. 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, pepper, broccoli, and medicinal herb yields compared to conventional crops (see our webpage at <<http://extension.agron.iastate.edu/organicag>>

**Organic returns have been \$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 fourteenth year of organic production. **Over 13 years of comparisons, organic corn yields following two years of alfalfa have been equivalent or greater than conventional corn provided 120-145 lb/acre of synthetic nitrogen. Organic soybean yields have been similar or greater than conventional soybean yields.** Corn 13-yr averages (1998-2010): Conv. C-S: 169 bu/acre; Org C-S-O/A-A: 162 bu/acre; and Org C-S-O/A: 154 bu/acre. Soybean 13-yr averages: Conv. C-S: 47 bu/acre (county average: 46 bu/acre); Org C-S-O/A: 49 bu/acre; Org C-S-O/A-A: 50 bu/acre; and S-R or W/RC: 38 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. Organic wheat yields over 8 years: 50 bu/acre compared to county average of 48 bu/acre. Over all years, organic returns have averaged twice those of conventional returns. Organic corn is currently selling for \$11/bu and organic feed-grade soybeans are \$19/bu.

Soil quality has been maintained in the organic system: Soils under organic plots in the LTAR have been shown to have more total Soil Organic Carbon (SOC), Total Nitrogen (TN), biologically active organic N, Particulate Organic Matter C, higher P, K, Mg, and Ca concentrations, and lower soil acidity than conventional soils. Organic soils have had similar inorganic N, aggregate stability, and bulk density as conventional soils. In general, **organic soils are showing enhanced soil function; greater nutrient use efficiency; more labile N and cations; and higher C sequestration.**

For the 2010-season, on April 11, 2010, ‘Spur’ oats were underseeded with ‘BR Goldfinch’ alfalfa at a rate of 92 lbs/acre and 15 lb/acre, respectively. Following harvest of the organic corn plots in 2009, winter rye was no-till drilled at a rate of 75 lb/acre on November 6, 2009. Conventional corn plots

were injected with 28% UAN on May 24, 2010, at 140 lb N/acre, and conventional corn and soybean plots were broadcast with monoammonium phosphate at 112 lbs/acre. Cattle manure compost was applied to organic corn plots at a rate of 12 tons/acre on April 13 and 4 tons/acre to oat plots on April 11. Corn and soybean variety selection and planting methods in 2010 were as follows: Blue River 57H36 corn was planted at a depth of 1.75 in. as untreated seed at a rate of 32,000 seeds/acre in the organic plots and as treated seed in conventional plots, on May 24, 2010. Blue River 29AR9 soybeans were planted at a depth of 2 in. in organic and conventional plots at a rate of 200,000 seeds/acre on May 25, 2010. Conventional corn plots were sprayed with a pre-emergence herbicide on May 28 with 1.5 oz/acre of Balance Pro, 1 lb/acre of atrazine and 32 oz/acre of WeatherMax. Conventional corn plots were sprayed with a post-emergence herbicide on June 24 with 0.75 oz/acre of Steadfast, 1.5 oz/acre of Callisto and 0.25 lbs/acre of atrazine. Conventional soybeans received an application of 1.5 oz/acre of Encompass on May 28 and 6 oz/acre of Fusilade on June 30 as a post-emergence herbicide. All organic corn and soybean plots were rotary hoed and row cultivated three times May 28, June 4, 7, 17, and 29. Oat plots were harvested on July 26 and baled on August 1. Soybean and corn plots were harvested on October 6 and on October 16.

Weed populations were similar between conventional and organic rotations, with high levels due to excessive rains early in the season. Despite high levels of weeds and challenging weather (plots were under water for three weeks), organic corn yields averaged 141 bu/acre in 2010 and were equivalent across all rotations. The C-S-O/A rotation produced numerically lower yields (119 bu/acre) compared to the four-year organic C-S-O/A-A rotation and the conventional C-S rotation yield (148 bu/acre). Organic soybean yields averaged 53 bushels/acre and conventional soybeans yielded 54 bu/acre. Small grain yields were impacted by extended periods of wet weather in 2010; oats yielded 74 bu/acre of grain in the organic C-S-O/A rotation and significantly higher (91 bu/acre) in the four-year rotation, and 1.2 tons/acre of oat straw. Alfalfa yielded an average of 4.7 tons/acre. Corn grain quality was affected by the poor weather conditions in 2010, with equivalent corn and soybean protein levels (6.4% and 35.5%) across all rotations. There were no significant differences in soybean pest and beneficial insect populations between rotations. Soybean cyst nematodes were low, averaging 100 eggs/100 cc of soil across all rotations, with no significant differences between rotations. Insect pests included aphids, bean leaf beetles, thrips, stinkbugs, and corn rootworms. Beneficial insects included minute pirate bugs, wasps and spiders. There was no damage from corn borer populations and aphid numbers were very low, averaging 11 aphids per 20 sweeps. Bean leaf beetle numbers were also low, similar to 2009, with populations averaging <1 beetle per 20 sweeps. The 2011 season has been extremely challenging, with excessive rains in spring, leading to weed management challenges, followed by extreme weather (33 days over 90 degrees), dry weather in mid-season, high winds, hail, grasshoppers and bean leaf beetles.

### ***Other Organic Experiments at the Neely-Kinyon Farm***

#### ***Organic Pest Mangt. for bean leaf beetle, soybean aphid and soybean disease.***

##### ***Location of experiment: Along Hwy 25, north side***

Soybean aphid 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, has been very promising the last three years, 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. The most predominant beneficial insect is the minute pirate bug, *Orius insidiosus*, which attacks aphids, whiteflies and thrips. Organic-compliant

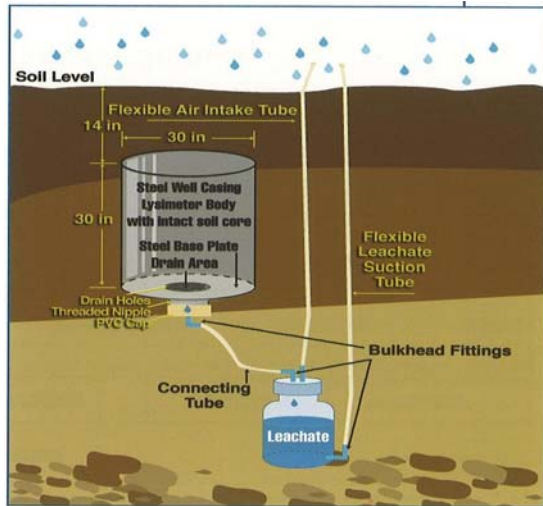
treatments, including PyGanic<sup>®</sup> (McLaughlin Gormley King Corp, Minneapolis, MN), Neemix<sup>®</sup> (Certis USA, Columbia, MD), Neem Blend 45<sup>TM</sup> (karanja and neem oils) (Green Dance World Organics, Paw Paw, MI), and MicroAF (TerraMax, Inc., Ham Lake, MN) have reduced insect pest populations, but not the bean leaf beetle, which did not occur in great numbers in 2008, 2009 and 2010. In 2011, populations seemed to have surged again, averaging 15 beetles per 8 sweeps in the second week of September, but the effect on soybean staining cannot be ascertained until harvest.

***Effect of Cover Crops on Corn Performance and Yield (USDA-SARE Project; Dan Cwach, grad student). Location of experiment: Hwy 25, south side***

The Rodale Institute (Kutztown, PA) began experimenting with an Organic No-Till Plus system in 2004, where commercial crops (corn, soybean, pumpkin) were no-till drilled or planted into cover crops that were terminated with a roller/crimper. The roller consists of a large steel cylinder (10.5 ft. wide x 16 in. diameter) filled with water to provide 2,000 lb. of weight. The Rodale Institute supplied Iowa State University with a roller in 2005 for experimentation in Iowa and research began on organic no-till systems. In 2007, no-till organic soybeans at N-K Farm yielded 45 bu/acre, compared to a 50 bu/acre yield in the tilled soybeans. Organic no-till corn in Iowa yielded as low as 10 bu/acre compared with a 124 bu/acre average for the tilled corn, although in Pennsylvania yields have been reported as high as 153 bu/acre from planting corn into a rolled hairy vetch cover crop. The objectives of this experiment were to analyze the role of specific cover crops in a no-till system in weed management and yield enhancement relative to a conventionally tilled system. Cover crops were planted in September comparing six cover crops: hairy vetch (planted at 30 lb/acre), winter rye (240 lb/acre), winter triticale (240 lb/acre), Austrian winter peas (30 lb/acre), a combination of hairy vetch (20 lb/acre) and winter rye (180 lb/acre), and a control with no cover. No-till plots were rolled with a roller/crimper front-mounted on a John Deere 4240 tractor on July in 2010 (delayed because of rains) and on June 7, 2011. Organic corn seed was planted in all plots in 30-inch rows. Tilled corn receives rotary hoeing and row-cultivations while no weed management occurs in the no-till plots. In 2010, due to late planting and subsequent failure of corn plants to reach maturity, plots were harvested for corn silage biomass on September 30 using a 5730 John Deere forage chopper. Winter triticale produced the greatest amount of biomass at 3.7 tons/acre dry matter, followed by winter rye at 3.5 tons/acre, and the winter rye/hairy vetch mix at 3.3 tons/acre. Hairy vetch alone produced a biomass of 1.5 tons/acre, Austrian winter peas 0.94 tons/acre. Although corn plant populations a month after planting were not significantly different between treatments, corn plants in the no-till treatments suffered from competition with weeds and cover crops, as demonstrated by corn height in the tilled plots averaging 64 inches compared to an average of 35 inches in the no-tilled plots. The corn in the no-till hairy vetch plots were significantly taller than the other no-till plots, averaging 46 inches. Corn borer damage was observed in the corn plants, particularly in the no-till plots. Damage ranged between 10 and 22%, with no significant difference between treatments. Corn silage yields in the no-till treatments were significantly lower than in the tilled cover crop treatments. No-till biomass yields ranged between 5 and 9 tons/acre, while the tilled yields ranged from 22 to 28 tons/acre of biomass. There was no statistical yield difference between cover crops sub-treatments, but biomass yield in the no-till hairy vetch treatment averaged 9 tons/acre, which was over 3 tons/acre higher than the next highest treatment of hairy vetch and winter rye at 6 tons/acre. Results are expected to be similar in 2011 with low to no corn grain in no-till plots and reduced yields in tilled plots where cover crops provide the only source of nitrogen.

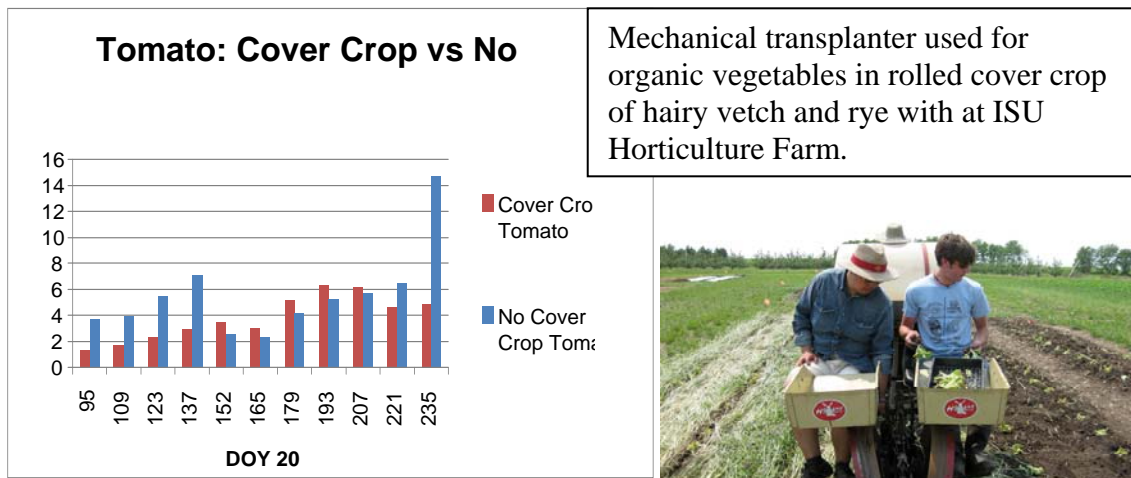
***USDA-Organic Transitions Project: Effect of Cover Crops, Compost, No-Till and Mulch on Organic Vegetable Production (with Dr. Cynthia Cambardella, USDA-ARS National Lab for Ag and the Environment, Ames, IA)***

This new project, funded by USDA in 2010, will examine 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 (drawing of lysimeter under Rodale Institute's organic plots below).



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. Research began in Fall 2010 with planting the cover crop plots at a rate of 25 lb hairy vetch + 90 lb rye/acre. Treatments are replicated four times for a total of 48 plots. The cover crop was terminated on June 7 with the Rodale Institute roller/crimper. Tomato ('Defiant', Johnny's Seed, Albion, ME) and onions ('Nabechon') were hand-transplanted. Because extensive spring rains caused a delay in planting, transplants were too large for the mechanical transplanter (see photo below).

Compost was applied at a rate of 100 lb N/acre in Spring 2011 and also side-dressed after tomato establishment. Carbon and nitrogen budgets are being developed from plant and compost inputs, soil profile C and N content, and nitrate-N leaching rates below the rooting zone. To date, excellent tomato yields have been harvested in mulched and tilled treatments, with low yields in the organic no-till, contrary to high yields in the 2006–2007 organic no-till tomato experiment at the N-K Farm. Tomato quality appears to be higher in the mulched treatments, with greater levels of diseased plants in the tilled treatments. Onions will be harvested in October. Preliminary lysimeter data are showing that the average root zone nitrate N concentrations under tomato and onion are similar and do not exceed the drinking water standard of 10 ppm. The concentration of leached N has been consistently lower under onion grown with a cover crop, and lower under tomato with a cover crop in spring and on Aug 24, which were high rainfall periods. Soil quality comparisons will be made in October.



All produce is either sold to support farm activities or used by ISU Dining Services for the Iowa Organic Conference to be held at the Scheman Building, Iowa State University, on November 21, 2011 (on the ISU webpage: [www.ucs.iastate.edu/mnet/organic10/home.html](http://www.ucs.iastate.edu/mnet/organic10/home.html))

### ***Organic Grape Vineyard Demonstration***



In 1899, Iowa ranked 11<sup>th</sup> in the United States in grape production and sixth in 1919. When the focus was shifted to corn and soybean production in the 1930s and 1940s, grape production decreased and with the introduction of the corn herbicide 2,4-D, damage sustained from herbicide drift in the remaining Iowa vineyards was significant enough to cause a great decline in Iowa grape production. Since 2000, there has been a resurgence of interest in grape production in Iowa, primarily for the wine industry. Organic grape production is widespread in California, Washington, and in the humid sub-tropical country of New Zealand. Like organic apple production, organic grapes require an intensive organic spray program for disease prevention, with anthracnose and black rot the most prominent diseases. While there are no resistant cultivars, 'Bluebell', 'Edelweiss', 'Foch', and 'Frontenac' appear to tolerate disease conditions better than other cultivars. Vines were planted in 2001 on a single-line trellis at a spacing of 7 feet apart with 9 feet between rows. Bird netting was used in 2011 and greater yields were obtained. Trellis lines need to be repaired for maximum production.

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