

## **Midwest Cover Crop Council: Ohio Report 2015**

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## **Ohio State University Cover Crop and Soil Health Research**

### **Putnam County Soil Health Agricultural Research Plots (SHARP)**

1. Compare long-term (10+ years) soil changes in **conventional, no-till, and ECO farming (no-till + cover crop) (3x)** on a wheat-corn-soybean rotation (3x) replicated four times (4x) on a new long-term SHARP research site (36 replicated plots) and to document changes in soil health, soil temperature, soil moisture, carbon, nitrogen, phosphorus, soil stability, runoff, water quality, soil erosion, yield, and economics. PI: Jim Hoorman

### **OARDC Northwest Branch**

1. Cereal rye winter cover crop in corn-soybean rotation with compaction levels (0, 10 and 20 tons/axle) and tillage systems (annual subsoiling and continuous no-till) to evaluate the impact of cover crops on reducing soil compaction. PI's: Alan Sundermeier, Randall Reeder, and Rafiq Islam.
2. A 26-yr. tillage research area was expanded to include cover crops treatments. Six different cover crops, or combinations, with continuous no-till. PI's: Rafiq Islam, Randall Reeder, Larry Brown, Alan Sundermeier
3. Penn State Interseeder, Using to interseed cover crops into different crop rotations. PI: Alan Sundermeier
4. Long-term (50+ years) research comparing tillage and crop rotations. Conventional versus no-till with c-s, c-c, and corn-oats-clover crop rotations, replicated four times. PI: Rafiq Islam, Randall Reeder, Alan Sundermeier
5. Organic research on cover crops impact on calcium to magnesium ratio. PI: Doug Doohan, Steve Culman, Rafiq Islam.
6. Medium Red clover frost seeded under wheat. Compare corn yields with no-till vs. conventional tillage. PI: Alan Sundermeier

## **OARDC – Piketon**

1. Cover crops and tillage impact on soil quality and ecosystem services. Cowpea and cereal rye were used as living mulch (cover crops) in No-Till and Conventional Tillage corn-soybean-wheat rotation to reduce N input and emission of Greenhouse Gases (GHGs), enhance C sequestration, improve soil quality, and sustain farm production. PI: Rafiq Islam
2. Impact of cereal rye on transformation and off-site movement of manure nutrients in NT and CT corn –soybean rotation. The study focuses on C, N, and P mineralization and fate including nutrient availability to plants, leaching and surface runoff, and emission of GHGs (CO<sub>2</sub>, CH<sub>4</sub>, NO<sub>x</sub>, and NH<sub>3</sub>). Have a new method for simple measurement of NH<sub>3</sub> volatilization. PI: Rafiq Islam.
3. Islam, K.R. (2015-18) Recycle nitrogen to maximize continuous no-till corn-soybean sustainability with winter-hardy clover blends. Grassland Oregon Association grant. \$ 30,000.
4. Islam, K.R. and Dave Brandt (2015-2016) Maximize continuous no-till sustainability with cover crops. CTC Mini-grant \$ 3,000.
5. Islam, K.R. and R.C. Reeder (2014-2016) Developing a farmer friendly soil organic matter calculator for sustainable soybean production with enhanced ecosystem services and cover crops. Ohio Soybean Council. \$ 25,000.
6. Islam, K.R. and R.C. Reeder (2014-17) Maximize continuous no-till sustainability with cover crop blends and zeolite. Warner Endowment. \$ 15,000.
7. Fausey, N., Rafiq Islam, Warren Dick, Tara VanToai, Randall Reeder, Marvin Batte, Darrell Norton and Dexter Watts (2011 to 2016) Increasing Soybean Productivity while Improving Soil Quality and Mitigating Climate Change. United Soybean Board (USB). \$400,000.

## **Farmer Research**

1. Oilseed Radish with different combinations of cover crops was used to maximize biomass N contribution, control weeds, reduce compaction, and improve soil quality. PI's: Dave Brandt, Randall Reeder, Jim Hoorman, Alan Sundermeier, and Rafiq Islam.
2. Dave Brandt Multispecies Cover Crop mix with 10-9-8-7-6 way mixes replicated 4 times in an 80 acre corn field. PI's: David Brandt, and Rafiq Islam.
3. Jim Hoorman 36 acres of a high nitrogen yielding, early maturing sweet clover seeded with Carl Stuck.

4. Gypsum (0, 1, and 2 tons/a) and oilseed radish are used to evaluate their impact on reducing compaction and improving soil quality. PI's: Bruce Clevenger and Rafiq Islam. (2015-2016) Gypsum effects on cover crops and soil physical health. CTC \$ 3,000.

### **Papers**

1. Hoorman, JJ. "Ecological Farming (ECO Farming): Improving agricultural nutrient efficiency" In: National No-till Conference. Vol. 23, DVD. (2015 )
2. Hoorman, JJ. "Understanding How Tillage Impacts Soil Structure and Soil Compaction," In: National No-till Conference. Vol. 23, DVD. (2015)
3. Hoorman, JJ and Young CE. "Using Ecological (ECO Farming) Systems to Suppress Agricultural Pests" In: National No-till Conference. Vol. 23, DVD. (2015)

### **Abstracts**

1. Hoorman, JJ. "354-4 Soil Health and Cover Crop Extension Curriculum and Education". Abstracts/2015 International Annual Meetings/Synergy in Science: Partnering for Solutions. DVD ed. Minneapolis: ASA-CSSA-SSSA. ( 2015 )
2. Hoorman, JJ, Islam, KR, Sundermeier, AP, Witter, J, and Reeder, RC. "373-7 Possible Solutions to Soluble Reactive Phosphorus in Lake Erie Watershed and in Ohio". Abstracts/2015 International Annual Meetings/Synergy in Science: Partnering for Solutions. DVD ed. Minneapolis: ASA-CSSA-SSSA. ( 2015 )
3. Hoorman, JJ, Islam, KR, Sundermeier, AP, Witter, J, and Reeder, RC. "373-6 Possible Causes of Soluble Reactive Phosphorus in Lake Erie Watershed and in Ohio". Abstracts/2015 International Annual Meetings/Synergy in Science: Partnering for Solutions. DVD ed. Minneapolis: ASA-CSSA-SSSA. ( 2015 )
4. Hoorman, JJ, Sundermeir, AP, and Young, CE. "356-7 Correlations Between Commercial Soil Nitrogen Tests and the Haney Soil Tests". Abstracts/2015 International Annual Meetings/Synergy in Science: Partnering for Solutions. DVD ed. Minneapolis: ASA-CSSA-SSSA. ( 2015 )
5. Hoorman, JJ, Young, CE, and Sundermeir, AP. "356-7 Using Cover Crops to Solve Environmental Issues". Abstracts/2015 International Annual Meetings/Synergy in Science: Partnering for Solutions. DVD ed. Minneapolis: ASACSSA-SSSA. ( 2015 )

### **Publications In Review**

1. Hoorman, JJ. "Reducing Agricultural Flooding using ECO Farming" submitted for a Book Chapter in Cover Crops and Agricultural Sustainability , 18 pages, Editors: Islam, KR and Reeder, RC. 2015.
2. Hoorman, JJ, Islam, KR, Sundermeier, AP, Archuleta, R. and Brandt, D. "ECO Farming in the 21st Century" Fact sheet in Farm Profitability and the Environment submitted to: Ohio State University. 2015, 4 pages.
3. Hoorman, JJ, Sundermeier, AP, and Islam, KR. "Cover Crops for Corn and Soybeans." submitted to: Ohio State University. 2015, Factsheet 1 page.
4. Hoorman, JJ, Sundermeier, AP, and Islam, KR. "Growing and Managing Forage Cover Crops." submitted to: Ohio State University, 2015, Factsheet, 1 page.
5. Hoorman, JJ, Sundermeier, AP, and Islam, KR. "Growing, Establishing and Managing Cover Crops." submitted to: Ohio State University, 2015, Fact sheet, 1 page.
6. Hoorman, JJ. "Update and Summary on Role of Soil Bacteria." submitted to: Ohio State University Extension. 2013, Fact sheet, 4 pages. In print.
7. Hoorman, JJ. "Update and Summary on Role of Soil Fungus." submitted to: Ohio State University Extension. 2013, Fact sheet, 5 pages. In print.

### **Educational Activities**

1. Hoorman, JJ, Sundermeier, AP, and Noggle, S. Soil Quality and Cover Crop Workshops on ECO Farming, 6 workshops for 315 participants about the benefits of keeping the soil covered with live plants to improve soil and water quality and increase crop yields. Curriculum consists of 7 modules for 8 hours of training.
2. Shedekar, V. and Islam, KR, Gieger, J. Soil Organic Matter Calculator. Developed a organic matter computer program to estimate (95% accuracy) soil organic matter dynamics (+/-) with changing farming practices.
3. David Brant, President of the Ohio No-Till Council had 215 participants at his farm on April 10 with training for Soil & Water Conservation District technicians, and 201 farmers for September 2<sup>nd</sup> for a Ohio Cover Crop and No-Till field days.
4. Over 868 farmers and consultants attended the Conservation Tillage Conference (CTC) at Ohio Northern, Ada, Ohio on March 3-4 2015. A full day session on cover crops had 250 to 350 participants on average for multiple speakers.

### **Impacts: In 2015, OSU Extension Educators assisted or provided the following services:**

- Over 82 cover crop presentations have been made in 14 states to more than 6,000 farmers on how to select, manage and use cover crops to improve crops yields, improve farmer profitability, and protect the environment.
- The acres of cover crops planted each year has been doubling and tripling in number. In 2009, Mercer County farmers planted 3,400 acres of cover crops which increased by a factor of 12.3 to 42,000 acres by 2015. Twenty-one percent of Mercer County cropland is now planted to cover crops annually. In Putnam County, Cover crop acres increased from 2,500 acres in 2012 to 32,500 acres in 2015, or 12.3% of total crop acres. The nationwide average is estimated to be 3 to 5%.