St. Clair County Farm Bureau

Summer 2020 Virtual Field Day

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ST. CLAIR COUNTY FARM BUREAU

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Speakers for the Virtual Field Day included:

Lauren Lurkins
Director of Environmental Policy, Illinois Farm Bureau (IFB)

Paul Beisiegel
Host Farmer and President, St. Clair County Farm Bureau (CFB)

Nancy Pals
Gypsum *Marketing Coordinator, Boral Resources*

Terry Wyciskalla
Certified Crop Advisor, Wyciskalla Consulting

Julie Hewitt
Executive Director, Illinois Nutrient Research and Education Council (NREC)

Dr. Karl Williard
Professor, Forest Hydrology and Watershed Management, Department of Forestry, Southern Illinois University at Carbondale (SIUC) and Executive Director, Universities Council on Water Resources (UCOWR)

Jennie Snyder
Researcher, Forest Hydrology and Watershed Management, Department of Forestry, SIUC

Dipty Poudel
Master's Degree Student, Forest Hydrology and Watershed Management, Department of Forestry, SIUC

Illinois Farm Bureau Nutrient Stewardship Efforts

Since 2015, IFB has contributed to an impressive statewide effort, the NLRS. Through leadership and participation from our farmer members across the state, IFB has been able to make meaningful contributions toward water quality improvements in Illinois. From 2016 to present, IFB has committed approximately $1.5 million of its own funding to build and maintain its sustainability programs.

The NLRS is a science-based framework for using research, technology and industry experience to assess and reduce nutrient loss to Illinois waters and to the Gulf of Mexico. The NLRS sets forth a plan to leverage existing programs to optimize nutrient loss reduction while promoting collaboration, research, and innovation among the private sector, academia, non-profits, wastewater treatment agencies, the agricultural sector, and state and local government. The primary goals include reducing nitrate-nitrogen losses by 15% and reducing total phosphorus losses by 25% by the year 2025 from established baseline conditions. The NLRS was released in July of 2015 after multiple years of stakeholder discussions in which IFB actively participated. Since 2015, IFB has continued its participation in NLRS meetings and work groups in order to strategically guide the effort. In addition, IFB created new programs in 2015 to support farmer implementation of best management practices (BMPs) to help Illinois meet the goals of the NLRS.

For the past several years, IFB has made it an organizational priority to lead on environmental issues, most notably, the NLRS. IFB's NLRS efforts focus in four priority areas: 1) education and outreach to farmers, landowners and the general public; 2) supporting research of best management practices to reduce nutrient loss from agricultural fields; 3) supporting farmer implementation efforts across the state; and 4) demonstrating progress toward the long-term goals of the NLRS. The IFB Board of Directors committed significant financial resources and support from staff to accomplish some ambitious goals, allowing IFB to tackle environmental challenges head-on. IFB will continue to prove that voluntary, incentive-based conservation, based on science, will move the needle on water quality improvements in our state.

The IFB Nutrient Stewardship Grant Program is one example of the many ways IFB is creating lasting impacts in implementing the NLRS across Illinois. This program funds CFB projects throughout the state focused on improving soil health and water quality. Since 2015, IFB has dedicated over $550,000 to CFBs to complete a wide range of unique projects, including planting test plots of cover crops, watershed planning, water testing, hosting education and outreach activities. For more information on IFB's environmental efforts, see www.ilfb.org/take-action/current-priorities/protecting-our-environment.

St. Clair County Farm Bureau

St. Clair CFB was organized on February 17, 1919, at a meeting held at the Liederkranz Hall in Belleville. The initial membership was 431 members and was governed, like today, by a nine-member board. It was originally organized for the purpose of soil and crop improvement.

The first president of St. Clair CFB was A.O. Eckert from 1919-1926. The Board of Directors also consisted of Frank Patterson-Vice President; L.B. Eidman, Secretary; Julius Engelman, Treasurer; Jacob Baer, William J. Miller, William Keck, Michael Sommers, Jr., and J.T. Wilderman.

The original CFB office was located at the Dr. Twitchell building on South High Street. In April 1931, the CFB moved its offices to the Hotel Belleville, but when the St. Clair Service Company was chartered the same month, the CFB moved again to 15 South High Street. In June 1958, the CFB office moved to a new building located at 407 East Lincoln Street in Belleville. The CFB remained there until its move to the present location at 1478 East State Rt. 15.

The founders of the St. Clair CFB saw a need. Those 431 men who signed their names to the membership were looking to the future. They also saw all the needs around them in the county. Like our beginning members, the CFB of today listens to farmers on the grassroots level and develops policies from the needs expressed by the members. With continued enthusiasm by our committees, we are confident the needs and challenges of the future will be met.

St. Clair County farmers are committed to doing their part to improve soil health and protect water quality within the county and beyond. In 2020, St. Clair CFB was awarded a nutrient stewardship grant from IFB to collaborate with several partners. This grant is being used to sponsor a virtual field day to present preliminary research findings of a study on flue gas desulfurization (FGD) gypsum and the effects on nutrient loss and yields.

Illinois Nutrient Research and Education Council (NREC) Support

NREC is a collaborative effort by Illinois farmers, the fertilizer industry and the Illinois Department of Agriculture to address issues related to fertilizer use in Illinois.

Created by state statute in 2012, NREC is funded by a 75-cent assessment on each ton of bulk fertilizer sold in Illinois. These funds are invested in research projects and educational programs designed to optimize nutrient use and protect the environment.

A 13-member NREC council annually solicits, reviews and funds projects that fulfill the organization's mission. Environmental organizations provide input to the council.

The NREC Mission

NREC is committed to helping farmers and other users of fertilizer products get the best performance possible from their nutrient applications. To accomplish this, NREC sponsors research and educational programs that have three purposes:

- Ensure adoption and implementation of best practices that optimize nutrient efficiency.
- Ensure soil fertility.
- Address environmental concerns related to fertilizer use.

Since its inception in 2012, NREC has invested over $23 million into nutrient related research efforts. Through the research that is being funded through NREC, Illinois agriculture is working together to meet the requirements of the NLRS. Without this funding, the industry would be without critical research into maximizing the efficiency of agricultural nutrients while minimizing any possible negative impacts to the environment.

Research Priorities

NREC focuses on three main goals when considering research projects:

- Maximize Efficiency
- Minimize Losses
- Mitigate Negative Environmental Impacts

These goals are pursued by sponsoring projects that examine the effectiveness and economic viability of farming practices that will reduce losses of nitrogen and phosphorus to water without being detrimental to yield.

Learn more by visiting www.illinoisnrec.org where you can see a full listing of current projects, review the annual report, and see other priority areas being studied.

Impacts of Flue Gas Desulfurization Gypsum Application on Water Quality and Crop Production in Southern Illinois

Contributed by Karl Williard, Harpreet Kaur, Jon Schoonover, Jennie Snyder, Dipty Poudel, Chris Blattel, and Jackie Crim

Professor, Graduate Assistant, Professor, Researcher, Graduate Assistant, Researcher, and Researcher, respectively, School of Agricultural Sciences, SIUC

Funded by: NREC and IFB

The agricultural community is seeking tools to minimize nutrient losses while sustaining high crop yields. The purpose of this research was to evaluate different application rates of flue gas desulfurization gypsum (further referred to as gypsum) for reducing Phosphorus (P) losses in surface runoff and to determine the effectiveness of gypsum for improving soil physical conditions and their impact on crop production.

Our project was divided into two studies: a surface runoff study and yield plot study. The four treatments for the surface runoff study were as follows: gypsum at 1 ton ac-1, gypsum at 2 tons ac-1, gypsum at 6 tons ac-1 and control (not treated with gypsum). For the yield plot study, treatments were as follows: gypsum at 1 ton ac-1, lime as a source of Ca at 0.735 tons ac -1, elemental sulfur as a source of S at 0.178 tons ac-1 and control (not treated with gypsum). Both studies were under corn-soybean rotation. Surface runoff flumes were installed in summer 2018 at SIU Farms *(Figure 1)*, and yield plots were established in Fall 2018 at SIU Farms and in fields of two regional producers: Paul Beisiegel of Freeburg and Webster's Farms of Kinmundy. Treatments were hand-applied at the runoff study site, and a mechanical spreader was used at the yield plot site. Pre-treatment and post-treatment soil samples were collected in fall following crop harvesting at a depth of 0-15 cm from yield plots and at 0-5 cm and 5-15 cm from surface runoff study. Surface runoff samples were collected after each significant rainfall event (≥0.5 in.), and runoff volume was measured *(Figure 2)*. Soil bulk density, infiltration rates, penetration resistance, standard fertility analysis, and crop yield were also compared among treatments.

In the yield plot study, corn yield *(Figure 3)*, soil bulk density, and soil infiltration rates were similar among the treatments and control. Statistical comparison of pre-treatment and post-treatment soil fertility data in surface runoff study at 0-5 cm depth showed a significant reduction in Mg in all of the treatments and an increase in S at 0-5 and 5-15 cm depth in treatments 2 tons ac-1 and 6 tons ac-1 compared to the control.

Gypsum applications resulted in lower dissolved reactive phosphate (DRP) and total phosphorus (TP) concentrations and loads ($p<0.1$) in surface runoff compared to control in the initial post-gypsum application period (Dec. 2, 2018 – May 2, 2019; n = 15 storm events) *(Table 1)*. Sulfate values were significantly higher in all of the treatments compared to control in the initial post gypsum application period *(Table 1)*, indicating that a significant amount of the applied gypsum dissociated into sulfate and calcium in soil. The available calcium likely formed calcium phosphate in the soil, which reduced DRP and TP concentrations and loads in surface runoff in the initial period. P fertilizer was applied to the flumes on May 6, 2019, to support crop production. In the post-P fertilization period, none of the gypsum treatments had lower DRP or TP concentrations or loads in surface runoff than the control flumes. This finding suggests that the applied P fertilizer overwhelmed any remaining P abatement effect of the gypsum in our high P soils. This is supported by an observed decreasing trend in P abatement effectiveness during the initial post gypsum application period. This is also supported by the largest increase in sulfate occurring in the first event following application, and in subsequent runoff samples sulfate concentrations decreased. Total suspended solids (TSS) concentrations and loads were not significantly reduced by the gypsum applications in the initial post gypsum application period or the post P fertilization period. Gypsum applications did not result in any significant increases in heavy metal concentrations in soil or runoff.

The maximum reduction in DRP and TP concentrations and loads occurred at the 6 tons ac-1 treatment level of gypsum, as expected *(Table 2)*. However, the USDA recommended application rate of 2 tons ac-1 provided nearly as high reductions in DRP and TP load as the 6 tons ac-1 rate *(Table 1)*, which confirms that this rate would be a good choice for farmers who may desire the P abatement effects of gypsum without overloading their soils with calcium sulfate. Overall, FGD gypsum appeared to be an effective phosphorus abatement tool for southern Illinois soils to improve water quality. However, its' effectiveness over the long term appears to be in question given our results in the post P fertilization period.

In November 2020, we plan to re-apply gypsum treatments to the surface runoff plots and monitor water quality for another year. In this cycle, we will not apply any additional P fertilizer in spring 2021 to assess the magnitude and duration of the P abatement effectiveness of gypsum at our study site.

Figure 1. *Surface runoff flumes with water collection barrels at the SIUC Farm.*

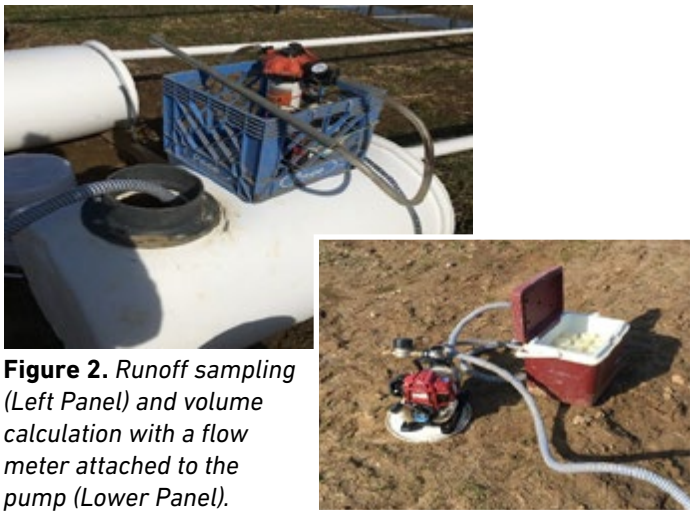

Figure 2. *Runoff sampling (Left Panel) and volume calculation with a flow meter attached to the pump (Lower Panel).*

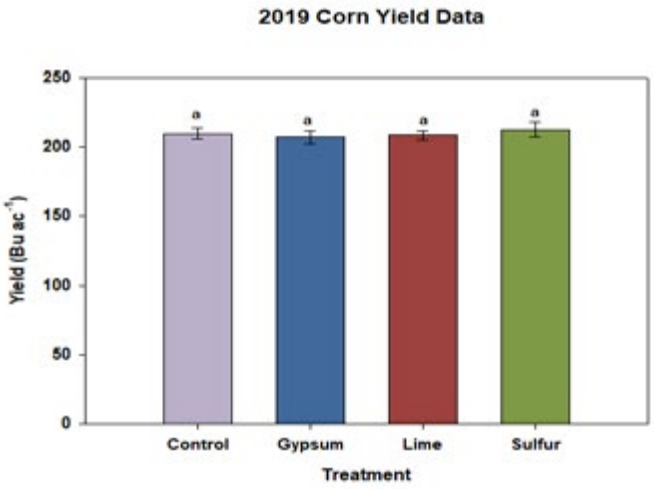

Figure 3. *Mean corn yield values from two field sites (Beisiegels' and Websters') following different treatment applications (Control, Gypsum @ 1 ton/ac, Lime @ 0.735 tons/ac, Sulfur @ 0.178 tons/ac). Means with different letters are significantly different at alpha = 0.05.*

Treatment	DRP Load (% change)	TP Load (% change)	Sulfate Load (% change)	TSS Load (% change)
Gypsum @ 1 ton ac^{-1}	35.5	32.6	-604.2	25.2
Gypsum @ 2 tons ac^{-1}	45.2	44.9	-1850.0	26.5
Gypsum @ 6 tons ac^{-1}	51.6	55.1	-2768.8	43.3

Table 2. *Percentage decrease in DRP load, TP load, sulfate load (negative value shows an increase), and TSS load in surface runoff in initial post-gypsum application period (Dec. 2, 2018 – May 2, 2019; n = 15 storm events) compared with control at the SIUC farm study site.*

Initial Post-Gypsum Application Period									
Treatment	Runoff Volume (L)	DRP Conc. (mg L^{-1})	DRP Load (kg ha^{-1})	TP Conc. (mg L^{-1})	TP Load (kg ha^{-1})	Sulfate Conc. (mg L^{-1})	Sulfate Load (kg ha^{-1})	TSS Conc. (mg L^{-1})	TSS Load (kg ha^{-1})
Control	125.32a	1.12a	0.31a	1.68a	0.49a	1.79d	0.48d	166.05a	49.34a
1 ton ac-1	90.34ab	0.94ab	0.20b	1.51ab	0.33b	12.18a	3.38a	236.59a	36.92a
2 tons ac-1	84.02b	0.81b	0.17b	1.36b	0.27b	40.68b	9.36b	248.63a	36.28a
6 tons ac-1	71.67b	0.85b	0.15b	1.37b	0.22b	78.41c	13.77c	237.96a	27.96a
Post-Fertilization Period									
Treatment	Runoff Volume (L)	DRP Conc. (mg L^{-1})	DRP Load (kg ha^{-1})	TP Conc. (mg L^{-1})	TP Load (kg ha^{-1})	Sulfate Conc. (mg L^{-1})	Sulfate Load (kg ha^{-1})	TSS Conc. (mg L^{-1})	TSS Load (kg ha^{-1})
Control	70.5a	1.82a	0.26a	2.61a	0.39a	0.79d	0.09d	265.61a	37.82a
1 ton ac^{-1}	74.73a	1.83a	0.31a	2.33a	0.39a	2.04a	0.23a	256.44a	28.9a
2 tons ac^{-1}	66.34a	1.94a	0.27a	2.29a	0.32a	4.74b	0.39b	195.92a	22.1a
6 tons ac^{-1}	67.11a	1.75a	0.27a	2.13a	0.33a	19.84c	1.80c	198.44a	22.3a

Table 1. *Impacts of gypsum applications on water quality of surface runoff in the initial post-gypsum application period (Dec. 2, 2018 – May 2, 2019; n = 15 storm events) and a subsequent post-P fertilization period (May 21, 2019 – Jan. 10, 2020; n = 16 storm events) at the SIUC farm study site. P fertilizer was applied on May 6, 2019. Means with different letters are significantly different at alpha = 0.05.*

Contact Information

You can contact the St. Clair CFB at:

618-233-6800

To learn more about all other IFB Nutrient Stewardship Virtual Field Days, visit: www.ilfb.org/FieldDays

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