4th Annual
Midwest Soil Improvement Symposium: 2014
Research and Practical Insights into Using Gypsum

Economic Impact Study of Gypsum in Agriculture: A Study of Crop Farmers

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Economic Impact of Gypsum in Agriculture: A Study of Crop Farmers

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Our purpose . . .

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- To look at patterns of adoption of agricultural gypsum
- To evaluate sources of value from on-farm gypsum usage to farmers and to society more broadly.
- To estimate the benefit to cost ratios to farmers for gypsum application

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Possible sources of value

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- Fertility management
  - Alternative source of Sulfur and Calcium
  - Improves retention and availability of Phosphorus, Potassium and other nutrients.
  - Improves the efficiency of use of Nitrogen fertilizers
  - Treats aluminum and sodium toxicity
- Improves water infiltration and topsoil drainage
  - Decreases ponding, yield losses due to excess water
  - Improves drought tolerance
  - Lessens soil erosion
  - Lessens nutrient movement off-site
  - May allow earlier field work, diminish yield delays, potentially allow larger farm size or smaller equipment sets.

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Possible sources of value - Continued

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- Improvement of soil tilth / condition
  - Reduces soil crusting
  - Improves air and water space in soil
  - Creates a deeper root zone
  - May reduce draft horsepower needs and fuel usage
- Off farm impacts of soil sediments and water-carried fertilizer nutrients
  - Increased costs of dredging.
  - Increased costs of water treatment
  - Increased water turbidity, growth of water plants and algae
  - Decreased recreational values
  - Potential loss of property values for lakeside property owners.

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Evidence From A Survey of Farmers

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- The primary goal was to determine the extent of usage of gypsum as an agricultural input and to estimate its effectiveness for farmers.
- The survey was administered to Gypsoil customers and to a sample of *No-Till Farmer* subscribers.
  - The survey was conducted in late November and early December.
  - An Internet-based survey was used to gather the data.
- Key observations
  - Most farmers observed a wide array of benefits.
  - Most farmers judged benefits of gypsum to substantially exceed its cost.
  - An important finding was that farmers who have used gypsum for several years had greater benefits than more recent adopters.

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First Year Gypsum was Applied

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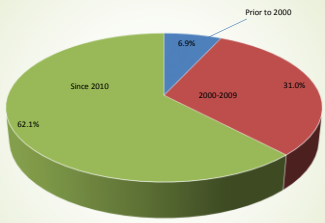

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Percentage of Land Receiving Gypsum 2012/13

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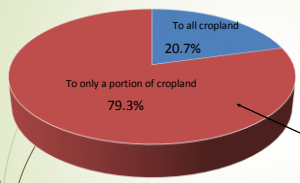

Percentage of cropland receiving Gypsum in 2012 or 2013 – 38.3%

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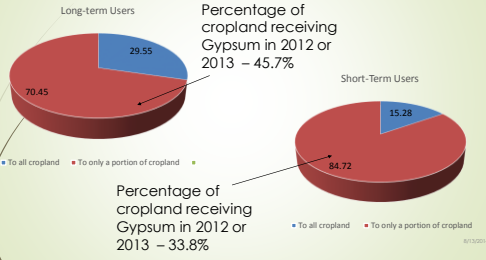
Allocation to Farmland by Long-term and Short-term Users



Percentage of cropland receiving Gypsum in 2012 or 2013 – 45.7%

Percentage of cropland receiving Gypsum in 2012 or 2013 – 33.8%

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Application of gypsum on various crops.

Crop	Mean percentage of crop acreage receiving gypsum	Most common application rates (pounds per acre)
Alfalfa	66.6	1,000 and 2,000
Corn	50.9	2,000
Soybeans or other oilseed crops	48.1	2,000
Wheat or other small grains	45.3	2,000
Hay crops - other than Alfalfa	32.2	1,000

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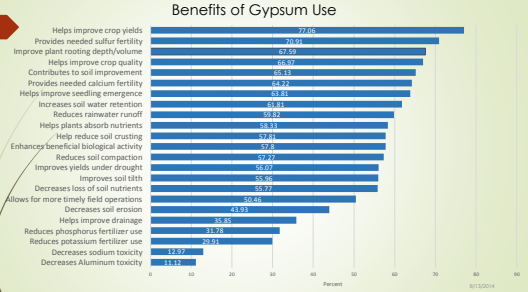
Percent of Farmers who Indicate Moderate to Extremely Important Benefits of Gypsum Use



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Average Importance Scores for Gypsum Benefits by Long and Short-Term Gypsum Users

Source of benefits	Adoption prior to 2010	Adoption 2010 and later
Helps improve crop yields	3.7	2.9
Provides needed sulfur fertility	3.3	2.8
Contributes to soil improvement	3.6	2.5
Improve plant rooting depth/volume	3.5	2.5
Provides needed calcium fertility	3.3	2.5
Helps improve crop quality	3.2	2.5
Helps improve seedling emergence	3.2	2.4
Enhances beneficial biological activity	3.1	2.3
Helps plants absorb nutrients	3.2	2.2
Increases soil water retention	3.1	2.2
Improves yields under drought	3.0	2.3
Improves soil tilth	3.2	2.1
Reduces rainwater runoff	3.1	2.2
Reduces soil compaction	3.0	2.2
Help reduce soil crusting	3.0	2.1
Decreases loss of soil nutrients	3.1	2.1
Allows for more timely field operations	2.7	2.0
Decreases soil erosion	2.7	1.7
Reduces phosphorus fertilizer use	2.2	1.4
Helps improve drainage	2.1	1.4
Reduces potassium fertilizer use	2.3	1.3
Decreases sodium toxicity	1.3	0.6
Decreases Aluminum toxicity	1.0	0.6

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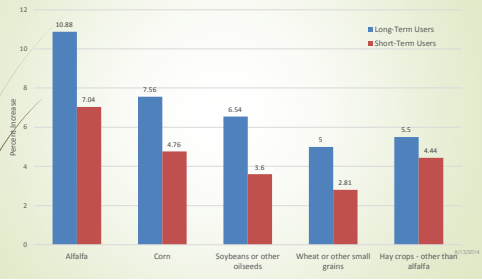
Average Yield Increases for Long-term and Short-term Users



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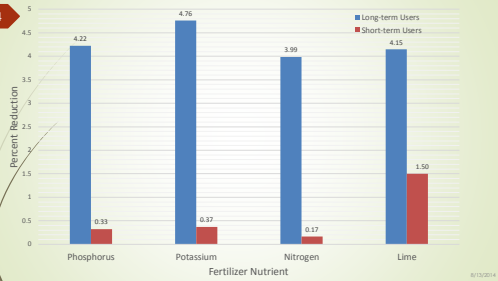
Fertilizer Cost Savings for Long-term Vs. Short-term Gypsum Users



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Benefit to cost ratio for gypsum use.

Benefit to cost ratio measures the value of benefits per dollar of cost of gypsum purchase and application.

Measure	Benefit / Cost Ratio
Median benefit to cost ratio	1.50
Average benefit to cost ratio	1.68
Average B/C ratio for long-term gypsum users	1.76
Average B/C ratio for short-term gypsum users	1.63

These B/C ratios likely are lower bounds estimates because most respondents probably did not include benefits associated with increased timeliness, reduced erosion, and similar other benefits that are difficult to quantify.

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Calculated B/C ratios

Estimated partial net benefits per acre and benefit to cost (B/C) ratios resulting from gypsum application for long-term users.

Crop	Base Yield (per acre)	Yield change[a]	Price per unit ($)	Revenue change ($/ac)	N, P, K Fertilizer savings ($/ac)[a]	Gypsum cost ($/ac)[b]	Partial net benefits ($/ac)	B/C
Alfalfa (Ton/ac)	6	10.9%	225	146.88	9.13	29.89	126.13	5.2
Corn (bu/ac)	170	7.6%	4.4	56.55	6.35	30.04	32.86	2.1
Soybeans (bu/ac)	50	6.5%	12.5	40.88	2.93	30.87	12.93	1.4

a Yield change percentages and NPK cost savings are based on response from long-term users.
b Based on mean application levels for surveyed farmers. Gypsum cost of $43/ton applied is used.

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Summary

- Gypsum use is growing
  - 62% of gypsum using farmers had adopted since 2010
  - Long-term gypsum users apply gypsum to a larger percentage of their acres.
- Most farmers saw benefits for a wide variety of soil and crop growth characteristics.
- The average gypsum-using farmer estimated that they received $1.68 of benefits for every dollar spent on gypsum application.
- There is clear evidence that benefits of gypsum use increase over time
  - Farmers who have used gypsum for 4 or more years gave higher evaluations for all criteria than recent adopters, and estimated their net benefits to be larger.

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Questions

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