

Producers use gypsum's sulfur for high yield and quality in alfalfa and corn

Dan Zinkand for *Progressive Forage Grower*

HAY | SILAGE | PASTURE

For Wisconsin dairy farmer Ken Ihlenfeld, applying gypsum on all of his alfalfa ground provides sulfur that's key to increasing alfalfa yields and quality. For Shawn Gibbs, applying gypsum is a key part of his push to grow more alfalfa and corn by increasing the amount of sulfur available in the soil. Gibbs and his family operate a 500-cow dairy near Waterville, Iowa.

While nitrogen (N), phosphorus (P) and potassium (K) have long been the top-of-mind crop nutrients, it is important not to forget sulfur for high yields of alfalfa, corn, soybeans and other crops, says Ron Chamberlain, lead agronomist for Gypsoil.

"Typically, corn needs about 1 pound of sulfur for every 10 pounds of nitrogen that it uses," Chamberlain says. "How much sulfur must be replaced for crop needs depends on how much sulfur gets removed in the harvest.

"Alfalfa is a high-protein feed," he says. "Sulfur plays a crucial role in amino acid synthesis and protein formation. An alfalfa crop typically removes 5 to 7 pounds of sulfur per ton of forage. If there is a deficiency in the soil, then the plant will not be able to

produce up to its genetic potential."

Applying gypsum before the first cutting of alfalfa will provide the full benefit of the sulfur in the gypsum, Chamberlain says. Growers can also get a positive response in sulfur-deficient situations if gypsum is applied between cuttings, before green-up.

Ihlenfeld has closely monitored sulfur levels in soil tests and also tissue tests alfalfa on his West Bend, Wisconsin, farm. "By looking at our soil tests and tissue tests, we determined that by about a year-and-a-half after gypsum applications we are back down to baseline for sulfur, so now we apply 800 pounds (of gypsum) per acre to all hay ground every year."

Ihlenfeld direct-seeds alfalfa with oats and then takes oats off. After that, he applies gypsum for the new alfalfa. On older stands of alfalfa, he puts on gypsum right after taking off the first cutting.

"You can see a difference after it has been applied," he says. "The hay goes from lime green to dark green within 30 days. I think it all comes down to the sulfur. Gypsum is still – bar none – the cheapest source of sulfur you are going to get."

Like alfalfa, corn needs sulfur, too. Mild deficiency symptoms show up as yellow striping in young leaves. As the plant ages, the entire leaf can turn yellow. Deficiency symptoms can occur anytime during the plant's life when sulfur uptake is insufficient. From emergence through V5 growth stage of development, the corn plant determines the number of kernels on the ear and is a critical time for sulfur availability, Chamberlain says.

"You have to have sulfur and nitrogen available in the right ratios," he says. "Once adequate sulfur is available in the soil to match the available nitrogen, then the new growth in corn, and in subsequent alfalfa cuttings, will be green and vigorous."

Sulfur declines

For decades, sulfur literally fell from the sky in the sulfur dioxide emitted from coal-burning power plants. In fact, 25 to 40 pounds of sulfur per acre was deposited on farm fields depending on how close a coal-fired plant was, Chamberlain says. While good for farm fields and crops, sulfur dioxide created "acid rain" that killed trees and acidified

Figure 1

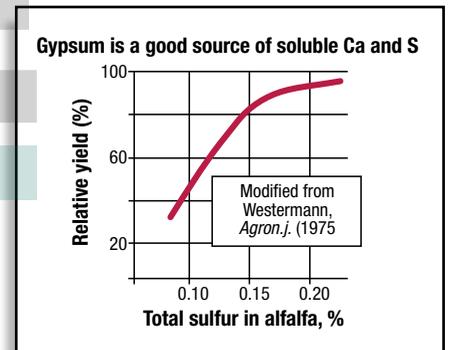


Chart from "Gypsum as an Agricultural Amendment, General Use Guidelines", Bulletin 945, Ohio State University Extension. Liming Chen, Research Associate, School of Environment and Natural Resources, Ohio State University, Warren A. Dick, Professor, School of Environment and Natural Resources, Ohio State University, 2011.

lakes and streams.

The amount of sulfur that fell on farm fields began declining after federal law required power plants

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to install equipment that lowered emissions of sulfur dioxide. Over time, that's affected the amount of sulfur in farm fields, Chamberlain says. Results from the 2015 soil tests by the International Plant Nutrition Institute revealed that 81 percent of the samples in Wisconsin, 28 percent in Indiana and about 20 percent in Iowa were low in sulfur. These three states led the nation in the lowest sulfur levels.

Yield pusher

"I'm kind of a yield pusher, so I look for little things (that will help)," says Gibbs. He farms with his brother, Chris, and their parents, Mike and Cindy. Shawn manages the crops and Chris the herd of cows, but the family all helps each other. They grow corn and alfalfa, as well as some sorghum, barley and soybeans. The family grows all of the feed they need for milking cows, heifers and dry cows.

"Gypsum does a very good job of providing both sulfur and calcium that helps grow healthier alfalfa and corn," Shawn Gibbs says. "If you have a healthier plant, then you have better-quality feed. You get out of cows what you feed them." The farm grows three different types of hybrids for corn silage and three different kinds of alfalfa for hay.

In addition to gypsum's nutrient benefits, Gibbs says he's also become more convinced that subtle soil chemistry changes may be important in the yield equation. "I thought that gypsum was a missing piece of the puzzle (to increasing yields)," he says.

Gibbs applied pelleted gypsum in 2013, but after he purchased a lime spreader in 2014, he switched to bulk, powdered gypsum. That year, he applied gypsum between the second and third cuttings of alfalfa and on his corn ground after harvest. He spread 600 pounds per acre on the alfalfa and corn ground. Gibbs says



For Shawn Gibbs, applying gypsum is a key part of his push to grow more alfalfa and corn by increasing the amount of sulfur available in the soil. Gibbs and his family operate a 500-cow dairy near Waterville, Iowa. Photos by Harlen Persinger.

he's already noticed that where gypsum has been applied on fields, they are less compacted, and he's keeping his eyes on how corn and alfalfa yields respond after more growing seasons.

Gibbs says that his grandfather farmed focusing on three nutrients – N, P and K – and his dad concentrated on five – N, P, K, as well as boron and manganese.

"I'm dealing with about 10 nutrients – all of the nutrients that my dad and grandfather managed, as well as sulfur, calcium and a few others," Gibbs says.

"I try to take things (with crop production) to the next level. Everything in farming is a science, but it is also a practice," Gibbs says. "You always try to get better, and the possibilities are endless."

NRCS adopts gypsum practice standard

Last year, the USDA's Natural Resources Conservation Service

(NRCS) reviewed the body of scientific research evaluating gypsum's impact on soil and water quality and developed a national practice standard for using gypsum as a conservation tool on America's farms.

The national practice standard, "Amending Soil Properties with Gypsum Products" or Code 333, provides technical guidelines for gypsum used in conservation and paves the way for cost-sharing incentives for farmers that want to incorporate gypsum in conservation programs. State NRCS offices now have the option of using that standard for specific programs or areas within their states.

Code 333 designates four basic conservation purposes for gypsum applications, including:

- Improving soil health by improving physical/chemical properties and increasing infiltration of the soil

Dan Zinkand

is a freelance agricultural writer based in Salem, Oregon.

- Improving surface water quality by reducing dissolved phosphorus concentrations in surface runoff and subsurface drainage

- Improving soil health by ameliorating subsoil aluminum toxicity

- Improving water quality by reducing the potential for pathogens and other contaminants' transport from areas of manure and biosolids application

So far, gypsum practice standards are now in place in Indiana, Ohio, Michigan, Alabama and Wisconsin (for certain or priority watersheds). For more specific details and information, visit your local NRCS office.




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