The Hidden Benefits of Lime...

If you were to hear the words “spent lime,” what would be the first thing that pops into your mind? More than likely it would be “disease suppression” or “Aphanomyces reduction” as this specific topic has been the focus of extensive research and publications over the past decade. While correct, the application of spent lime at recommended rates to an Aphanomyces-infested field can help keep the disease at bay, there are a few things about spent lime that you probably didn’t know and the application of this by-product to your fields can offer a lot of “perks” that are often overlooked.

It Has More Nutrient Value Than You Think:

Spent lime offers a nice nutrient supplement (and in some cases even a replacement) to the fertilizer normally applied to the fields in the Minn-Dak growing area. Although the application of spent lime will help increase the levels of potassium, calcium, magnesium, sodium and boron present in the soil, it’s most noticeable effects are nitrogen and phosphorus.

The spent lime at Minn-Dak contains approximately 0.35% nitrogen, which equates to roughly 2.35 lbs. of nitrogen per ton of lime. However, it is important to keep in mind that not all of this nitrogen is readily available to the plant and remains tied up in the soil. Researchers at the University of Minnesota speculate that almost 50% of the nitrogen applied would be available for uptake by the crop the following year.

Minn-Dak's spent lime also contains approximately 5,000 ppm (0.5%) of actual phosphorus. This means that for every 1 ton of spent lime applied per acre, a grower can account for roughly 15.58 lbs. of phosphorus (P_2O_5) along with it. As a general rule of thumb, a grower will raise their soil phosphorus levels by 1 ppm per ton of actual lime applied (Olsen Test). Following university recommendations of 7 to 10 ton per acre of lime and accounting for forecasted fertilizer prices, the fertilizer value of the phosphorus alone ranges from $69 - $98 per acre.

Lime Applied *(TPA)*	Nitrogen Applied per Acre *(Pounds)*	Nitrogen Value per Acre* *(Dollars)*	Phosphorus Applied per Acre *(Pounds)*	Phosphorus Value per Acre *(Dollars)*	Total Fertility Value per Acre *(Dollars)*
1	2.35	$0.71	15.6	$9.83	$10.54
5	11.75	$3.53	77.9	$49.08	$52.61
7	16.45	$4.94	109.1	$68.73	$73.67
10	23.5	$7.05	155.8	$98.15	$105.20

The table above reflects a Nitrogen availability rate of 50%. Diammonium Phosphate (18-46-0) currently retails for $580/ton or $0.63/pound of Phosphorus (P_2O_5) and Urea (46-0-0) currently retails for $550/ton or $0.60/pound of Nitrogen [$CO(NH_2)_2$].

pH Ajustment:

For those with lower pH levels, spent lime can really help. Soils that have lower pH values typically have excess hydrogen. When spent lime is applied to these types of soils, the calcium carbonate ($CaCo_3$) in the spent lime chemically binds to the excess hydrogen forming a water molecule (H_2O), carbon dioxide (CO_2) and calcium (Ca). These three "new" compounds all have their own benefit – water is self-explanatory, plants "breathe in" the carbon dioxide and the remaining calcium molecules are available for uptake by the crop helping the plant strengthen its cell walls and improving its nitrogen efficiency. Contrary to popular beliefs and "coffee shop talk," the application of spent lime will not raise your soil pH above 8.2.

Improved Soil Structure:

As a natural additive, calcium is GREAT for your soil. When compared in size to some of the other soil nutrient particles – calcium is HUGE. On a microscopic level, it is as dramatic as comparing the size of basketballs to baseballs. The incorporation of these large particles into the existing soil really helps "loosen up" the overall soil structure. This allows for increased water movement and improved drainage, makes the soil less prone to issues with compaction and there will be a lot more porous spaces for the plant's lateral roots to grow. The neat thing is that it only gets better with time as every pass made with a tillage implement, either in-season or between, works the lime a little deeper into the soil profile.

Where Does the Spent Lime Come From???

Spent lime is a by-product produced by each of the sugar factories as a result of the raw juice purification process. The product itself is generated by heating quarried limestone (calcium carbonate) in a kiln to temperatures that exceed 2,000 degrees Fahrenheit. This extreme heat breaks down the limestone to form two components - calcium oxide and carbon dioxide – both of which are injected into the raw juice. The chemical reaction that occurs gives the calcium oxide tremendous amount of "charged" surface area which binds to just about everything but sucrose – tying up most of the raw juice impurities when it is bound back with the CO_2 to once again form calcium carbonate. This new "enriched" molecule can then be separated from the purified juice via a series of filters, with the end result being the very product we call spent lime.

Other Odds and Ends:

There are no negative yield impacts on rotational crops (wheat, beans, corn, potatoes, etc.) and in most cases, university research has shown the spent lime application is found to be very beneficial from a yield standpoint. Spent lime can act as a natural irritant to insects and helps reduce the germination of acid-loving weeds such as quack grass. It can even add to the efficiency of certain herbicides – especially those in the Triazine class.

Come and Get It:

Although lime can be loaded out nearly year-round at Minn-Dak, the peak months continue to be June through September – which includes loading out lime during pre-harvest. This unique system has grown in popularity over the past couple of seasons and allows any grower who delivers beets to the factory yard during pre-pile to take advantage of their backhaul by loading up with lime before heading back to the field. Growers at Minn-Dak Farmers Cooperative currently utilize a little over twice the amount of lime produced by the factory each and every year...and with all of the benefits listed above, this is a trend that we do not anticipate to slow down for quite some time.