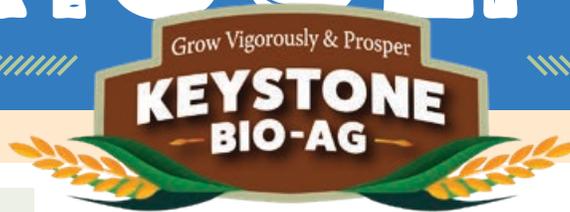


REGENERATING AGRICULTURE

A Keystone Bio-Ag Newsletter



Volume: 3 / Fall 2019

SEASONAL CALENDAR

OCTOBER

- 11th, Keystone Bio-Ag office is closed.
- Get your soil tests taken! Make sure to test for carbon and nitrogen, as an imbalance in ratio will reduce crop yields.
- Get your subsoiling done while the soil still dries out nicely.
- Sap test your strawberries then tweak your program accordingly for a great tasting spring harvest.
- 10% discount on Cycle. See back cover of this newsletter for details.

NOVEMBER

- Orchards: Spray Rejuvenate, SeaShield, and Product 10 after leaf drop. Then spread dry blend according to soil test.
- Reflect back on your season. Which crops paid you well?
- 28th, Keystone Bio-Ag office closed in observance of Thanksgiving Day.

DECEMBER

- Watch for our Winter Newsletter and Prepay Discounts.
- Order Keystone Greenhouse Media for starting plants.
- Call to discuss your soil test results.

Welcome, to a look at what is going on around here. Previously I had mentioned that we are trying to grow tomatoes with organic No-till practices. This is the second growing season for that and it is not working out very well.

The plants stayed too small and quit growing in early August. The soil is hard; we had bottom leaves start turning brown a couple weeks after planting, and after the first flush of tomatoes were harvested, it looked like they were gone. So the yield was lower than usual. But now 3 weeks later they have greened up with 2 ft. of new growth with blossoms and fruit all over. So why the slump?

I kept asking myself why is no-till with ground cover being such a challenge if it's so good for Mycorrhizae fungi, keeping soil covered and undisturbed, not oxidizing soil as much, and so on.

I have come to a few conclusions and there's probably more. The soil is too hard, the available nutrients all seem to be on the top 1 inch. That's where the fertilizer is that we apply and the decaying cover crop. It seems I can never really know if they are getting enough water, or too much, the outside rows went first so it appears like too much water.

If we try it again and I mean IF, I think we will need to subsoil every foot, and mulch with hay or straw instead of ground cover.

Samuel L. Zook



THE ART OF SOIL BALANCING

I don't know about you, but I find the art of soil balancing to be complex in a sense; yet amazing simple and fascinating. I also find that there are many common misconceptions, one of the main ones being calcium and which source to use.

Soil balance is a process; not something that can be achieved in one year. The first step is taking a soil test, which should include carbon and nitrogen. Next is interpretation, which I will discuss now.

Total Exchange Capacity (TEC) is a measurement of the soils' holding capacity. It is like a bucket; the higher the TEC, the more minerals the soil can hold. The TEC can change but is largely dependent on the soil type; sandy soil having a low TEC and clay soil having a high TEC.

Soil pH is an indicator of base saturation balance, which is largely calcium, magnesium, potassium, sodium and hydrogen. When the first four are balanced, both hydrogen and pH automatically balance themselves (on our soil tests, the desired values are in parentheses; calcium 70%, magnesium 15%, etc.). Here's how it works: Soil is like a bucket; it can only hold so much without "overflowing". Every mineral has an atomic weight; hydrogen being the lightest, having an atomic weight of 1, whereas calcium is 40, potassium 39, magnesium 24, etc. This means quite simply that when you over-apply a mineral, especially calcium, magnesium, or potassium, these heavier minerals will push out hydrogen; the "bucket" is full and something needs to leave (overflow). At 6.9 pH (6.5 to 6.8 desired), the soil typically still has 1.5% hydrogen, but at 7 pH, hydrogen disappears, and PRESTO, you have an imbalanced soil that just doesn't produce like it used to.

Organic matter is fairly well understood, and affects the TEC of the soil. Sulfur needs to be added annually because it is subject to leaching unless organic matter is high.

Phosphorus is involved in all of energy transfer; when phosphorus is deficient, it is like running a diesel without the clutch in gear.

Next we get to calcium, magnesium, etc. Did you ever notice how the desired values of these minerals change from field to field? This again reflects back on the soil TEC. It stands to reason that a big bucket will hold more water than a small bucket, likewise a high TEC soil will desire more minerals for proper balance that a low TEC soil will, although the % desired value remains the same.

Calcium is the "trucker of all minerals", and drives root growth and branching. The soil needs to supply enough calcium every day or root branching stops and the plant's ability to absorb soil minerals is greatly reduced. By "branching", I am directly referring to the little white hairy roots that all truly healthy plants have branching off the main feeder roots. An important distinction is that the other 3 growth minerals, potassium, nitrogen, and chloride, also drive root growth, but not branching. So now we know the importance of calcium but that's where we get confused because we can put lime on and get a calcium response, right? Before you think so, you may want to more fully understand the makeup of lime. Lime is two pieces of material that is bonded together, calcium and carbonate, and this bond needs to be broken (split) before the calcium is available. No big deal? Then consider that hydrogen is the element that is needed to split that bond, and when you over-apply lime, you lose your hydrogen (refer back to pH explanation). Now, I specifically said "over-apply"; lime is the cheapest thing around for calcium if you need it, but if you use it where there is little to no hydrogen, you are only benefiting fertilizer companies. Consider this: if calcium is the trucker of all minerals, and calcium gets stuck because there is no hydrogen there to break the bond, guess what happens; everything else gets stuck too! When pH is about right or high, we use Super Sequence as it doesn't require hydrogen to break the bond. Applications of calcium should be timed to make use of the peak calcium release when it is most needed. The main crops that should receive a dry blend this fall are tree fruit, garlic, and berries. Most of the others should wait till spring. One more thing; calcium makes the soil loose when you have hydrogen present, but when it is not present and you apply lime, it turns to tri-calcium phosphate (in plain English — rock). Yeah, want a tight soil?

Magnesium is important for photosynthesis and controlling muscle spasms in humans and animals. High magnesium creates hard soil that sticks more to your boots when muddy. Applying a flush of available calcium is the way to go here, as the calcium will push the magnesium off the soil colloids and make the soil looser. **Potassium** is a plant growth promoter and also drives fruit fill and development. If too high, apply 30 lbs. (only!) per acre Redmond salt to reduce plant absorption of potassium and increase calcium uptake. Remember: calcium equals quality. Think about key high potassium situations such as pastures, honey crisp

apples, and peppers. Additionally, **Sodium** in moderation helps with fruit firmness, and contributes to crop energy. Sodium higher than 40 ppm may indicate a hardpan in the soil, or in greenhouse situation; a lack of natural leaching action.

Boron, similar to sulfur, helps make calcium available to plants and needs to be applied annually because it is subject to leaching. Be careful with boron or sulfur in greenhouses or tunnels; not enough leaching action. Also in its connection to calcium, boron is very important for root health and a deficiency may lead to a 50% reduction in uptake of other minerals. Iron is key for photosynthesis and makes leaves thicker. Most soils are high in iron but plants are deficient because the iron is in the wrong form until good biology is present. **Manganese** makes water available to plants, increases fruit set, and fights a host of diseases. Again, like iron, manganese is often high in the soil but plants can be deficient when biology is lacking.

Copper also fights a host of diseases and helps produce elastic, stretchable skin which reduces fruit cracking. **Zinc** helps leaf size and also has important function in disease control. **Aluminum** can be toxic to plants but 500-700 in soil is typical.

Carbon, C/N Ratio, and Nitrogen are interrelated. Carbon is very important, but perhaps more important than having a 5% carbon soil is to have it balanced with nitrogen in a 10 to 1 ratio. A 2% carbon soil needs 2000 ppm nitrogen for proper balance, for example. If you have a high C/N Ratio, you want to match it with a low C/N Ratio product, which will help to balance the soil. Cycle for example, has a balanced C/N Ratio, while Sea Power has a low C/N Ratio. If you want to use mushroom mulch, you should get it tested as the wrong C/N Ratio can throw your soil off balance. Also, we do not recommend using mushroom mulch in greenhouses or tunnels because they use salt whenever they get a fungal outbreak; they can't use a fungicide because it will kill the mushrooms. So sometimes you get away with it, but when they use salt, it ends up out in the pile, and then your greenhouse is in trouble.

Okay, the next piece to understand is that soil balance is more than balanced minerals; biology also needs to be taken into consideration because minerals can be in the soil, yet unavailable to plants unless you have good soil biology. So while it is true that growing crops that are resistant to diseases and insects is easier with proper pH and soil chemistry balance, it doesn't mean that high pH soil equals no success. The reality is that from a biological perspective, pH doesn't matter because biology can overrule

chemistry. So here are three things that you can do this fall to help get strong biology going.

(1) Apply the fall program: Rejuvenate, SeaShield, and Product 10 are strong microbial foods and inoculants. We have heard many stories of plant residue that decomposes faster - resulting in less disease carryover. And also stories of soil that can now be plowed one gear faster because the soil is more structured, soft, and drains better. Start next season now, especially hemp and other crops that don't tolerate poorly drained soil.

(2) Subsoil compacted soils: to check if you have a compaction layer in the soil, dig a hole 2 feet deep then use a knife and pull upward toward the top of the soil. If you find resistance, that is where the bottom of the hardpan is. We recommend this method because a penetrometer only tells you where the top of the hardpan is; you need to know where the bottom is and subsoil accordingly. Good gas exchange (breathable soil) is the foundation of a living system and will reduce nitrogen requirements. How? Denitrifying bacteria thrive in anaerobic soil,

and when you have good gas exchange, the only microbes that thrive are the facultative anaerobes, which are the disease suppressive group of microbes. Also as air flows into breathable soil, the nitrogen (78% of air) can get converted into nitrogen that is usable to soil and plants. Note: if you have an orchard, or other place where subsoiling is not appropriate, you can try aerating instead.

(3) Apply humus compost — without added minerals. True humus changes soil, but the humus sites must be empty in order for it to act as a powerful magnet; pulling other minerals to it and preventing them from tying up with each other. Humus can also be used to keep fertilizer that you add in a plant available form; just be aware that the humus used in such a fashion will not have that reaction again in the soil.

The bottom line is that good biology and cover crops are probably the fastest way to drive soil change, and should be used in combination with mineral balance.

Have a great autumn! — Melvin

Melvin F. Fisher

FARM SPOTLIGHT:

Marcus from Triple Tree Flowers is experiencing substantially better growth and more flowers this year. He is using the Keystone Bio-Ag Cut-Flower Program since this spring and is very impressed. In particular, he gives a lot of credit to the Aquamomics Water Unit which he installed because of his hard water, the Accelerate which pushes bloom, and the biological program (he used Rejuvenate, Spectrum, and OP-8) which increases quality, and disease and insect resistance. He commented that the first six weeks of the plants life is its most important stage where you want to get everything right and off to a good start, which is why he likes the Keystone Greenhouse Media to start his flowers. It gives the flowers the excellent start that they need for overall health.



GROWING TIPS

ROW CROPS

Subsoil fields and spray the fall program (Rejuvenate, SeaShield, and Product 10) to reduce soil compaction. Use cover crops for soil builders. Take a soil test and start your 2020 planning.

DAIRY

Winter is coming and so are molds and mycotoxins; feed Xcite for cow health. Use Wollastonite (calcium silicate) on cow walks as a good barn-dry and crop enhancer. Use OP-8 in pits to dissolve soaps from wash water.

PRODUCE

Cole crops and root crops need a lot of boron and calcium. If your crops need more trace minerals, use MicroPak. Start your next season this fall; take a soil test, subsoil if needed, use fall program.

ORCHARD

Take a soil test and spread dry blend in November or December. Timing dry calcium applications is critical for reducing fruit quality challenges. Aerate soil and use the fall Rejuvenate program. Ask for an orchard program sheet.

GREENHOUSE

Subsoil, then irrigate your greenhouses (with good water) for 24 hours to leach excess salts / sulfur. Then spread 1 ton humus compost and use fall program. Grow a good cover crop.

GARDENERS

Ask your rep to take a soil test and put your garden on the list for subsoiling (if needed). Spray 1 pint Rejuvenate and ½ oz. Product 10 per 1000 square feet to make soil looser. Ask about Premium Blend.

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CYCLE: 10% OFF!

Cycle is a dry pelleted fertilizer that we are seeing good results from. We are running a special on Cycle through October due to limited stock this spring, and our supplier is saying that he cannot guarantee enough next spring either. However, he does have stock there that we can tap into this fall. So for a guaranteed supply at 10% off, send your check in now: envelope must be postmarked on or before October 31, 2019. Call for current prices. Offer valid only prepaid orders only; no exceptions.



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Please contact us if you no longer wish to receive our quarterly newsletter.

– DEALER LIST –

Alvin Peachey | 717-935-2413
9-12 a.m. Monday, Wednesday, and Friday or by chance.

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PRODUCTS

WHOLESALE & RETAIL

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always produce great tasting food and feed with high nutritional value. Our guaranteed process enables farmers to reduce or eliminate harmful chemical applications. We stand by our belief in sharing knowledge, inspiration, and active research through our *Regenerative Agriculture Handbook*, educational meetings, and quarterly newsletters, as well as through our personal on-farm or phone consultations. Our ultimate goal is to help you grow vigorously and prosper.

In everything we do, we believe in thinking differently from the mainstream agriculture. We believe in working with nature rather than against it. Our approach is that diseases and insects are not the problem; they are only the symptoms of nutritional imbalances, which means that we need to find and resolve the reason why plants do not have a functional immune system. Keystone Bio-Ag has developed a nutritional management program with which it is now possible to produce plants that are resistant to diseases and insects. This model, when implemented properly, will

