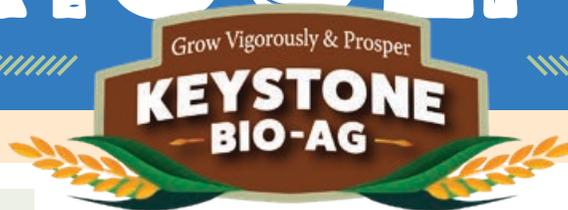


REGENERATING AGRICULTURE



A Keystone Bio-Ag Newsletter

Volume: 1 / Spring 2019

SEASONAL CALENDAR

MARCH

- March 20; Keystone Bio-Ag consultant with John Glick, Consultant in Howard. If interested in hosting a meeting, contact John Glick.

APRIL

- Releasing the Regenerative Agriculture Handbook (\$25.00)
- April 10; Keystone Bio-Ag meeting in Path Valley (AM) and Juniata County (PM). Call Alvin Peachey for details.
- April 15; Regular farm visits beginning for Lancaster Area.
- April 17; Keystone Bio-Ag consultant with John Glick in Howard area.



Business Hours are 7-5 Monday through Friday. In order to serve our customers as well as we can, our consultants have a weekly consultant meeting, resulting in them being unavailable every Tuesday morning until after 10:15.

Welcome. I would like to take this opportunity as we start a new year to thank all of you whom we can call our customers, for your dedication to proving that it is possible to produce above average crops. For your input of the challenges that you see, it helps with our research and development which I highly enjoy doing. And especially those of you who signed up for the Lean Holistic Management Program, you have given us a jump on the spring rush. And we look forward to a rewarding season with you.

Our biggest challenge is that we are never satisfied. My dad's favorite saying is "good better best never let it rest until your good is better and your better is best." It might seem sometimes that we are always changing programs and recommendations, but usually they are just tweaked a little bit. We strive to keep the big picture in mind. And it must make sense with our mission of encouraging soil life to grow and multiply while protecting our precious carbon resources. And also give you a positive return on investment.

So if you are a little confused sometimes take heart, speak up, and let us know what's on your mind. The better working relationship you have with us the better we can address one limiting factor at a time.

Samuel L. Zook

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CONTENTS	1000 Sq. Ft.	2000 Sq. Ft.	3000 Sq. Ft.	4000 Sq. Ft.
PREMIUM BLEND	2 BAGS	4 BAGS	6 BAGS	8 BAGS
CYCLE	1 BAG	2 BAGS	3 BAGS	4 BAGS
FOLIAR PACKAGE	2 GAL.	2 GAL.	2 GAL.	2 GAL.
OP-8	1 oz.	2 oz.	3 oz.	4 oz.
NORMAL PRICE	\$120.50	\$183.00	\$245.50	\$308.00
SALE PRICE	\$109.00	\$163.00	\$217.00	\$268.00

Cut & Save

GROWING HEALTHY CROPS - PRACTICAL IMPLEMENTATION

Most of us have had or heard conversations about growing really healthy plants, but what has often been missing is a conversation about practical ways of actually achieving it. How do we grow the healthiest crops possible with the best return on investment? How do we know which management practices to use if we can't do everything because of a limited budget?

So where do we start? From my perspective, the driver of the entire system is photosynthesis - a process through which plants collect energy from the sun for producing sugars. This is an exciting answer for two reasons: First, because the volume of photosynthesis is normally only 20% of what it is in really healthy crops, and secondly, because photosynthesis doesn't take years to change like soil often does - it can change dramatically in as little as 24-48 hours.

The question that we need to ask is, what drives photosynthesis? Here is the answer: there are 4 critical components that plants need in order to photosynthesize; water, carbon dioxide, sunlight, and chlorophyll. The first one that is in limited supply will limit or even completely stop photosynthesis.

Water. It may seem a little bit odd to have a conversation about water, but I think it actually is not because the moment plants have a limited supply of water, photosynthesis stops. A number of years ago, we were working with a tomato farmer who was getting about 12 lb. per plant, from plants that on neighboring farms were commonly producing more like 20-25 lbs per plants. This farmer was irrigating 3 times per week and putting on a fertilization of nutrients once per week.

When he asked how he could increase yields, we told him that he doesn't require any additional nutrients, but what was actually needed was a more consistent water and fertilization supply. We told him that the optimum for both water and nutrient applications for indoor environments is applications every day. He didn't want to do that, so he switched to irrigating 5 times per week and fertilizing 3 times per week, which resulted in increased yields up to 18-20 lbs. per plant, with very similar amounts of nutrition. That convinced him, so the following year he put in an automated system for both the fertilization and the irrigation, which resulted in yields of 25-27 lbs. per plant. This was a result of just

increasing the consistency of watering and fertilization; not actually spending more money on nutrition.

Carbon dioxide, CO₂. This is probably the biggest limiting factor for most plants because they are almost all chronically deficient in carbon dioxide. Every day, the earth has this natural inhaling and exhaling effect which is called reduction and oxidation. In the evening, oxygen and nitrogen move into the soil through the reduction process, which biology rapidly consumes. In the morning, carbon dioxide is released through the oxidation process.

The problem is that most soils are so tight that this gas exchange is not happening like it is designed to. To correct this, we recommend doing two things because when you use those in combination, they work better than either of them could alone. The first is going out with the subsoiler to get rid of the hard pan. But we have observed that using a subsoiler is not enough. We need to correct the actual cause of hard soil: lack of good soil biology. These two pieces are critical for good gas exchange and carbon dioxide. I might add that when this happens effectively, you are starting to develop a disease suppressive soil because good gas exchange supports the disease suppressive biology better than the disease enhancing biology.

Sunlight. One of the things that I find intriguing about sunlight is that it is not usually the limiting factor for photosynthesis like many people have traditionally thought. The reason for saying this is because when we have really healthy plants, the trichomes on the leaves actually communicate in the infrared spectrum, allowing it to photosynthesize through the night.

Chlorophyll. The chlorophyll molecule in plants is where the sun energy is fixed into, so when we have this piece working really well, we can make maximum use of all the energy coming from the sun. There are 5 minerals which are critical for this part; Nitrogen, magnesium, iron, manganese, and phosphorus.

Now I have given you an overview of the critical components of photosynthesis. There would be much more to say about each of them, but those are topics for the Regenerative Agriculture Handbook or future newsletters. What we want to discuss next is, what are the management practices that

need to be addressed to actually make this happen, even on a budget?

Priority #1. Applications of biological inoculants such as Rejuvenate, OP-8, and Spectrum:

There are a number of reasons why this is priority one, but perhaps the most important one is that biology can access water which plant roots cannot, even in dusty dry soil. Dusty dry soil is still at about 60% of its water holding capacity, thus when we have good biology, we have a more consistent water supply. Secondly, biology is needed for good gas exchange, releasing carbon dioxide, creating loose soil that has a good crumb structure, as well as triggering the mineralization process which makes soil minerals available.

Rates for Rejuvenate are 1-3 gallons per acre, depending on how fast you want to see results. OP-8 should be applied with Rejuvenate at a rate of 4 oz. to remove all the chemical residue that ties up minerals and restricts biology. Spectrum rate is 50 grams per acre (1.76 ounces), which contains disease suppressive bacteria, nitrogen fixing bacteria, as well as chitin digesting bacteria, which can kill the larvae of overwintering insects. It is also beneficial to add some Sea Shield with this mix. Do not spray biologicals over 60 psi - unless you want to rupture the microbial cells and kill them.

Seed treatments also fit well into this category, like using Bio Coat Gold at a rate of 2 ounces per 50 lbs. of seed for corn planters, sometimes more for vegetable seeds.

Priority #2. Foliar applications:

The foliar applications that I am talking about here are specifically those that address the chlorophyll minerals which are low. Again, the chlorophyll minerals that need to be in adequate supply are; nitrogen, magnesium, iron, manganese, and phosphorus. I find it important enough that I will list the deficiency symptoms of each of these in the Regenerative Agriculture Handbook, but one in particular that I will mention here is manganese deficiency. Manganese deficiency is expressed as a leaf vein that is lighter in color than the rest of the leaf. If you observe this really closely, you notice that almost all plants are deficient in manganese, which is not good at all because manganese is needed for water hydrolysis; breaking apart the water molecule so that it can be used in the photosynthesis process. What I am describing is that the soil can have adequate moisture but the actual plants cannot use it for sugar production and photosynthesis. Spraying manganese sulfate is not very effective, or manganese that is not chelated because specifically

the manganese needs to be chelated in the reduced form, and it needs to stay in the reduced form.

Generally speaking, the nutrient applications that are most commonly deficient are iron, manganese, and phosphorus, but we have observed that when we use OP-8, the phosphorus becomes a lot more available. So we might add 1 qt. of both Rebound Manganese and Rebound Iron to the foliar, in addition to some amino acids which contribute to total nitrogen. I should also add that enzymes are a critical piece to make these reactions happen, so we find that it is helpful to add 2-3 ounces of Micro 5000 and 2 ounces of Pepzyme.

I find it interesting that the healthiest crops that we have seen have high levels of total nitrogen, as measured on sap analysis, but have both nitrates and ammonium levels at ZERO. Nitrates and ammonium are a sign that the plant is under stress and is not working properly. Plants with high levels of nitrates will be very susceptible to diseases and insects. The minerals that are needed to convert nitrates into total nitrogen are magnesium, sulfur, molybdenum, and boron, or you can try a product called Photo Mag at 1-3 qt. per acre.

However, water quality plays a critical role in how effective these foliar applications are. In fact, this has become so pronounced that the rule of thumb that we use is, if your water has 10 grains of hardness per gallon (171 ppm), you are losing 70% effectiveness of everything that you just applied, so make sure you test your water and do something if necessary. Foliar spraying with rain water is usually ideal but if you can't make that work, we recommend that you get a reverse osmosis system to remove the hardness from the water.

The same principle of hard water also applies to drip, but we normally use the Aquamomics Water System there instead of RO or rain water, because it really isn't practical to use those sources of water for such large applications. I might add that we do not recommend water that is softened with a softener because the sodium and chloride tends to make the minerals basically ineffective.

Speaking about water, it might be worthwhile to point out that irrigating with hard water creates hard soil and decreases gas exchange and carbon dioxide.

Next to the chlorophyll minerals in order of importance are other biostimulants and root stimulants, such as applications of Accelerate, which can be used to increase the quality and quantity of bud and fruit set as well as triggering good root health.

Priority #3. Planting and fertilization:

This priority is where we use products in transplant water, liquid or dry applications in corn planters, and drip applications for fruits and vegetables.

For corn planters, we are using a granulated product called Cycle at a rate of 150 to 300 pounds per acre. As far as liquids for planters, we are conducting some trials to see which products will respond the best. It appears like Key Factor with a microbial inoculant is winning, but Sea Crop might win as well. Our final recommendations will be in the Regenerative Agriculture Handbook. I will add that Sea Crop and Sea Stim are probably the best option if the organic certifier is giving you grief about added micronutrients.

We generally add Key Factor as a complete fertilization product but testing should be done to check the specific crop requirements.

Priority #4. Cover crops:

Cover crops should be used whenever possible for 2 reasons; healthy cover crops will feed microbes that we built up in the soil. It is critical that these microbes have a food source so that they continue to reproduce themselves. Secondly, cover crops capture carbon dioxide that would otherwise be lost into the environment.

Priority #5. Soil amendments:

I know this seems different from what many people tend to think, but when looking at return on investment, soil amendments are the last priority. The starting point for us is using an available source of calcium, usually 400 lbs. per acre of Super Sequence. We don't use lime a lot because it is grossly overused in our area. Cycle is also a pretty good product that really triggers fungal activity which is key to building soil organic matter really fast.

That is the order of importance that I would use if I had a budget. I know I put out a lot of information very fast, but if you are interested in growing really healthy crops, you need to read and reread this article until you understand it. I literally can't tell you how important this is.

There are a lot of topics left to discuss, like blossoming and pollination, cell division, etc., but I need to leave off now. If you need more information, call your consultant or order the Regenerative Agriculture Handbook.

AEA also created a chart called the Plant Health Pyramid, which outlines how plants become resistant to diseases and insects. \$3.00 per chart.

Until next time....

Melvin F. Fisher

GROWING TIPS



ROW CROPS

Use Cycle for dry row corn starter, 150 pounds per acre. Inoculate seeds with Bio Coat Gold at 2 oz. per 50 lb. bag. For liquid applicator, use 1-2 gallons of Key Factor per acre.



DAIRY

For alfalfa, use 200 lbs. each of Super Sequence and Cycle this spring. At green up, spray Bug Beater Plus and OP-8. We now handle Somato-Chek in boluses, great for lowering SCC and mastitis. Use Xcite if having herd problems.



PRODUCE

Pay close attention to critical points of influence, such as cell division stage. In this time period, most fruit quality and storage problems can be prevented by having adequate calcium; but it doesn't work to just add calcium. Add manganese and boron.



ORCHARD

Almost all insect and disease problems can be corrected by having adequate nutrition during blossoming and pollination, including fireblight. Sea Crop and Micro 5000 work well to stop fireblight in its tracks. Fruit quality problems can be prevented at cell division stage.



GREENHOUSE

Use Keystone Greenhouse Media to jumpstart your plants. Water quality is critical in greenhouses because of salt buildup in the ground.



GARDENERS

Want to produce really healthy food? Check out the garden package special in this issue.

Regenerative Agriculture Handbook

At Keystone Bio-Ag, we believe that every insect and disease can be more effectively prevented with nutrition than with chemicals, because healthy crops are resistant to diseases and insects. We created the Regenerative Agriculture Handbook to share this knowledge and make it available to everyone. The handbook includes crop challenges and recommendations, articles on soil and plant health, how to interpret soil tests, sap tests, and water tests, and product catalog. Roughly 125 pages. We will be releasing the handbook in early April. Price: \$25.00

New Policy Notice

In order to help our customers more effectively, each consultant is now responsible for making all the recommendations for the growers in his area. This policy is now in effect so that the main consultants at our New Holland location can occasionally take time to travel with our consultants in outlying counties when they visit their customers. We also plan on having afternoon field walks (in outlying counties) where you can learn more about plants and ask your questions. Please contact your local consultant if you would like to host a field walk, need recommendations, or have suggestions on better customer service, education, etc. If you have questions that your dealer can't answer, we are happy to have a three way phone conversation with you and your consultant.



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John Glick, Willow Bank Seeds

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Dennis Keener | 570-412-2195

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Dan Stoltzfoos | 717-661-7343

Counties of service: Lebanon County and northern Chester County, plus dairy consulting throughout Lancaster County

PRODUCTS

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SERVICES & DEVELOPMENT

RESEARCH & EDUCATION

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

