LSU AgCenter
Research · Extension · Teaching

5 Acres or Fewer Farms News

Fall 2019

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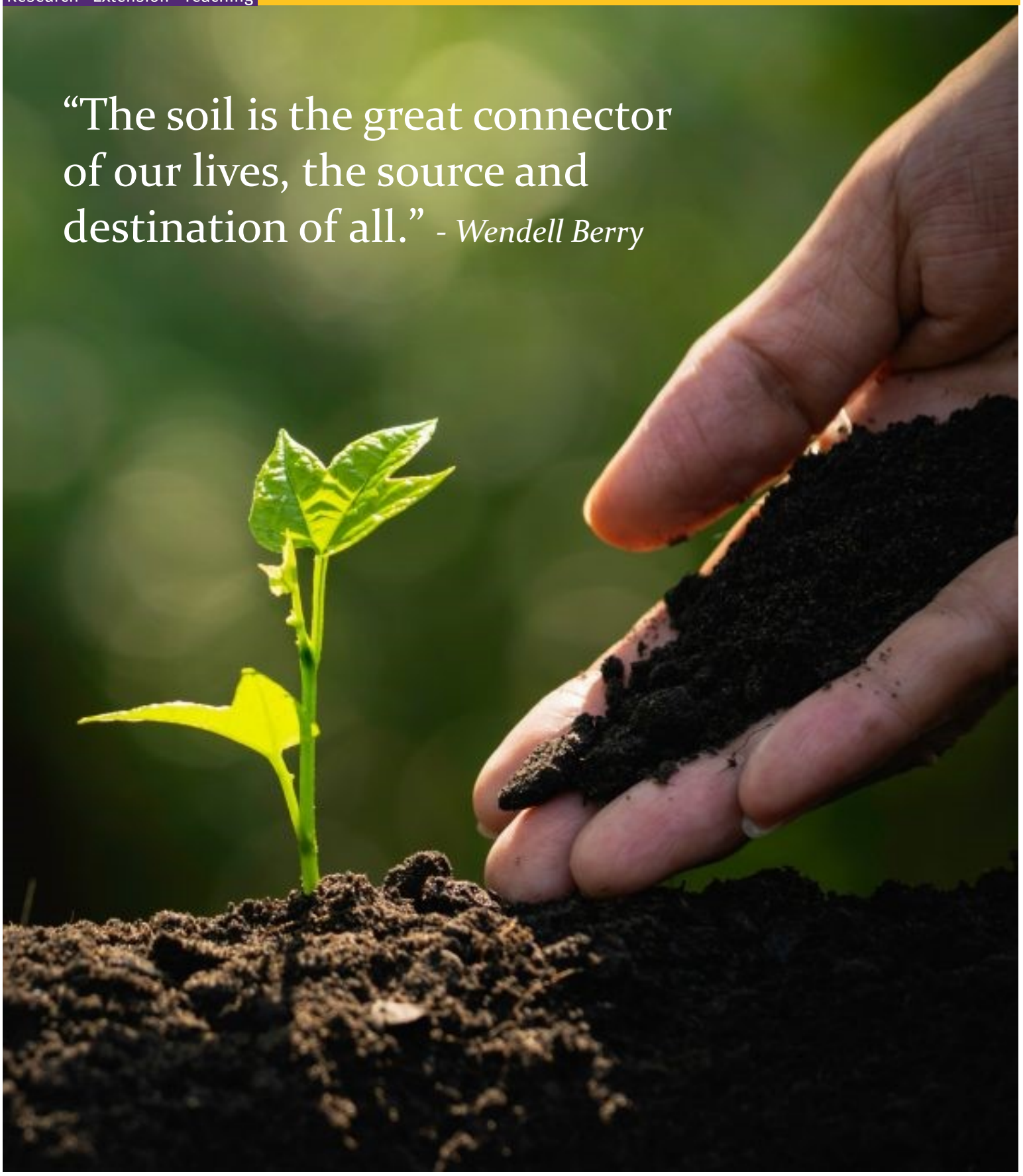


In this issue:

Introduction

By: Dr. Joe Willis, LSU AgCenter Extension Agent

Over the next few months, growers will be taking out the warm weather crops and bringing in all the fall and winter crops as we enter the cool growing season in Louisiana. As you go through this transition period, it would be a good time to take stock of what's going on with your plants underground.

The LSU AgCenter Soil Testing & Plant Analysis Lab in Baton Rouge is a great place to send soil samples for analysis. You can find lots of information about the Soils Lab at the LSUAgCenter.com website under Services or search for "LSU AgCenter Soil Lab" in your favorite internet browser.

A routine soil test is only $10 and will provide results on soil pH, soil texture and levels of Phosphorous (P), Potassium (K), Calcium (Ca), Magnesium (Mg), Sodium (Na), Sulfur (S), Copper (Cu) and Zink (Zn). For an additional $4 you can get organic matter percentage, and for $5 each, you get Aluminum (Al), Boron (B), and total soluble salt levels. You can even get total Nitrogen (N) and Carbon (C) levels for an extra $9 each. If you are growing in artificial medium, then you would need to get a potting soil analysis which gives you the routine test results for $10. Soil test results will also include fertilizer plus lime or sulfur amendment recommendations based on the intended crop.

If you use one of the pre-addressed AgCenter Soil Test kits found at AgCenter o ces and most garden centers, there is an initial $6 shipping fee also calculated into the price for the first test. There are enough sample bags in each kit for 3 separate samples.

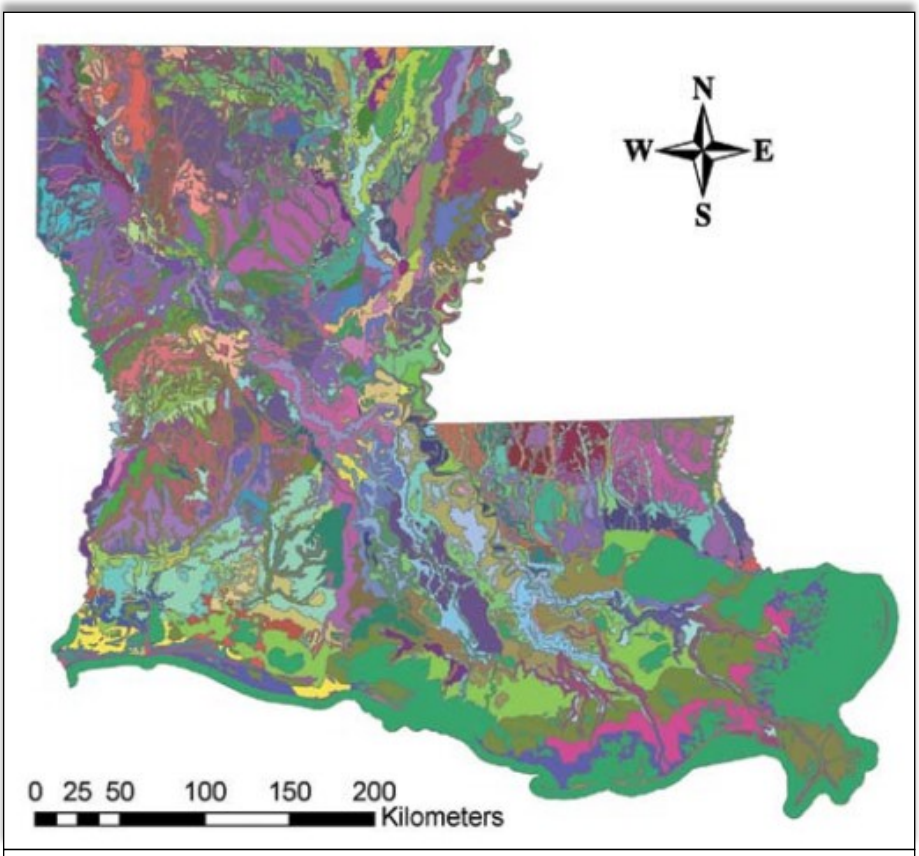
Because the soil is so important in success as a grower, this issue of 5 Acres & Fewer Farms News is dedicated to giving us a better understanding of the complex, nurturing, wonderful and living world of soil. ~

Louisiana Soils

By: Dr. Joe Willis, LSU AgCenter Extension Agent

Louisiana soils are as diverse as its people with more than 300 different kinds. Louisiana even has a state soil, the Ruston soil series. Unique factors of soil formation have combined to produce soils across the state that are fertile, unique and reflective of local ecosystems

There are several soil chemical and physical properties commonly evaluated. The most basic is soil texture. Soil is a collection of particles of different sizes: sand (largest), silt (intermediate) and clay (smallest). These three sizes of particles join in different combinations to form 12 different soil textures. The twelve classifications are sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay, and clay.



This map of Louisiana shows the distribution of various soil types in the state.

Another key soil property is soil color. Using a book of standardized colored paint chips, soil scientists can establish the precise color of the soil by noting the hue, value and color saturation or chroma. Soil color is often an indicator of a number of soil properties, such as % organic matter, which makes the soil dark in color, or iron oxides, which gives soil a rusty-reddish hue.

Organic matter within the soil is vital because it serves as a key nutrient reserve that improves soil fertility. Organic matter typically is highest – around 2-5 percent – in the surface level and tends to decrease with depth. Plowing, hoeing, tilling or any mechanical soil disturbance tends to reduce soil organic matter and effect soil biota compared to no-till natural occurrence.

Soil pH is a measure of acidity or alkalinity which greatly influences nutrient availability. Slightly acidic soil with a pH of about 6.5 is desirable for most plants.

Soil salinity is another commonly measured chemical parameter. Soil salinity is the salt content in the soil. It is expressed in terms of electrical conductivity (EC); soils with higher salinity tend to have a higher conductance.

Finally, cation-exchange capacity (CEC) is a measure of how many cations can be retained on soil particle surfaces. Negative charges on the surfaces of soil particles bind positively charged atoms or molecules (cations) but allow these to exchange with other positively charged particles in the surrounding soil water. Soil CEC is primarily attributable to two components: organic matter and clays

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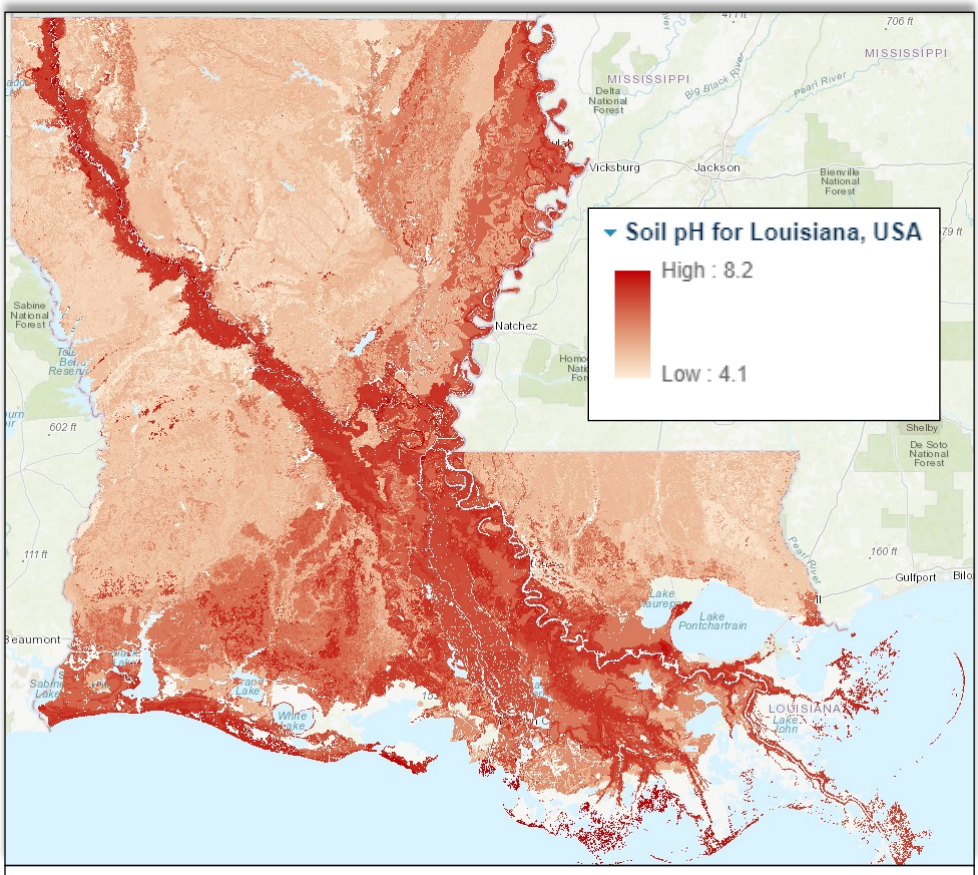
Alluvium indicates a soil that has been deposited by rivers. Given the large number of rivers that cross Louisiana, it is no wonder that so many of our soils are alluvial. Alluvium can be excellent soil for farming and comes in a variety of soil textures from sandy and silty to heavy clays, depending on the source of the sediment. Areas laid down as alluvium typically have flat, deep soils, often with appreciable organic matter content that became mixed into the soil as it travelled down the river system.



This map of Louisiana shows the pH values of soils in the state.

Loess is a type of wind-deposited sediment that is typically silty. In Louisiana, loess is common in East and West Feliciana Parishes, along with Franklin Parish on the Macon Ridge.

Soil properties across Louisiana vary considerably. Soil pH can be slightly acidic (over much of Louisiana) to slightly alkaline (Southshore). Louisiana has high annual rainfall totals. Rain tends to leach nutrients out of soil, so proper fertilization based on soil test results is highly recommended.

Soil textures range from sandy deposits, such as Felicity loamy fine sand, to silt loams, such as Commerce silt loam, and heavy clays, such as Sharkey or Schriever clay. Here, the names Felicity, Commerce, Sharkey and Schriever denote unique soil series. The heavy clay soils, referred to as vertisols, are highly fertile. Clay particles within the soil store and exchange many soil nutrients. Such vertisols, however, are also highly influenced by moisture. They tend to swell when moist, and then crack open when dry.

In addition to these soil physical and chemical properties, soil is home to a diverse range of living organisms that make up the soil biota. Soil biota, the biologically active powerhouse of soil, include an incredible diversity of organisms. Tons of soil biota, including micro-organisms (bacteria, fungi, and algae) and soil "animals" (protozoa, nematodes, mites, springtails, spiders, insects, and earthworms), can live in an acre of soil and are more diverse than the community of plants and animals above ground. Soil biota are concentrated in plant litter, the upper few inches of soil, and along roots. Soil organisms interact with one another, with plant roots, and with their environment, forming the soil food web.

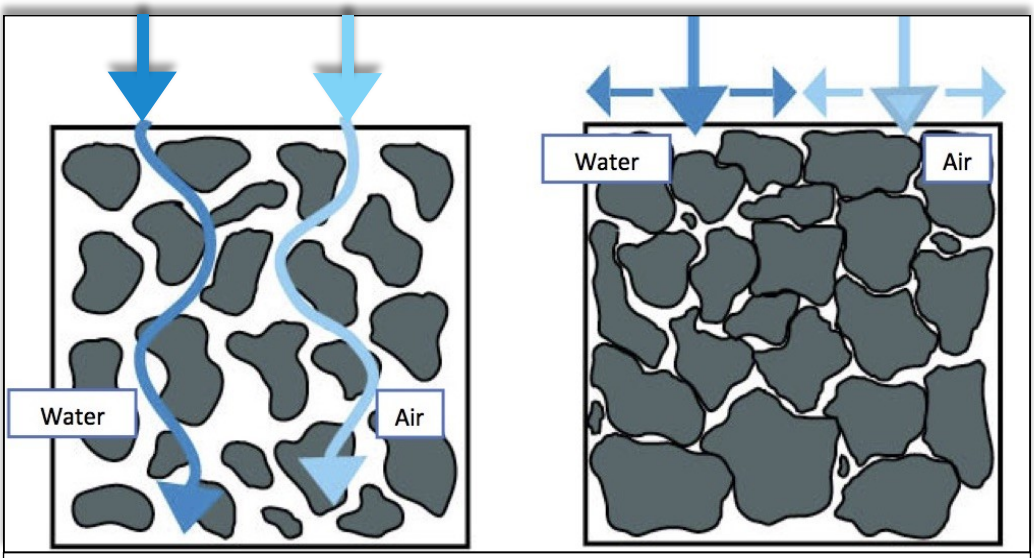
The following articles go into more detail about some of these soil aspects. The importance of knowing and understanding your soil and its relationship with your plants cannot be overemphasized. Hopefully, this edition of the newsletter will remind us that "Soil is more than just dirt." ~

Parts of this article are based on the publication Unederstanding Louisiana Soils by former LSU soils professor Dr. David C. Weindorf .

SOIL COMPACTION ON VEGETABLE FARMS

By: Vern Grubinger, Vegetable and Berry Specialist, University of Vermont Extension

Soil compaction is causing trouble for many vegetable farmers, even if they don't know it. That trouble may be in the form of reduced yields, excessive runoff and soil erosion, or an increase in root disease. Just because compaction is out of sight doesn't mean it should be out of mind.



The graphic above depicts how air and water can move down into uncompacted soil on the left whereas compacted soils on the right can prevent infiltration.

Understanding compaction. Soil is a mixture of minerals, organic matter, and pore space. The mineral particles are a combination of sand, silt, and clay (the soil's texture). These are rather loosely arranged, surrounded by spaces that contain air and water. Soil compaction occurs when the soil's particles are pressed together, limiting the space that's available for air and water. The amount of water in the pore space has a significant effect on how easily soil can be compacted. In a relatively dry soil, there is more friction between the soil particles, so they resist compaction. When su cient water is present, it acts as a lubricant between the particles, and that makes the soil easier to compact. But water cannot be compressed, so once the soil pore spaces are mostly filled with water, it helps soil resist compaction. The result is that neither a dry soil nor a very wet soil will compact as readily as a moist soil. Soil texture can also influence the compaction potential of a soil. Particles of similar size will compact less than a mixture of particle sizes, because smaller particles can fill in the pore spaces between larger particles. Thus, soils with a diverse mix of sand, silt, and clay are relatively susceptible to compaction, compared to soils that are dominated by one class of particle size. Soil structure (the tilth of the soil) also plays a role in compaction, or its prevention. Soils with high organic matter content and good aggregation tend to resist compaction better than soils with low organic matter. Excessive tillage can promote compaction by breaking down soil aggregates and speeding up the decomposition of soil organic matter.

Types of compaction. Surface compaction occurs in the zone of tillage, and subsurface compaction is in the zone below the depth of normal tillage. Surface compaction, including soil crusting, can usually be alleviated with typical tillage operations, but subsurface compaction will remain in place unless special steps are taken to fracture or cut through the compacted soil underneath the tillage zone.

Causes of compaction. A widespread cause of soil compaction is farm vehicle tra c, especially heavy equipment with poor weight distribution. It is common knowledge that compaction from vehicles is made worse when farm operations are conducted before the soil has adequately dried. However, it's

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Standing water in a field is often an indication of soil compaction.

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well known that farming must go on, and sometimes that means getting your work done even if the conditions are not optimal. Tillage is another cause of compaction, especially with implements that shear the soil, such as moldboard plows, disks, and heavy sweeps. When operated repeatedly at the same depth, tillage implements orient soil particles in the same direction, creating a layer of compacted soil known as a tillage pan or plow pan. As with vehicle compaction, the potential to create a tillage pan is greater when the soil is moist than when it's dry.

Symptoms of compaction. The ultimate indicator of compaction is a reduction in yield, but many factors can contribute to that. More direct signs of compaction are: standing water in the field, poor water infiltration and runoff, a wheel-track pattern that is visible in crop growth, difficulty pulling implements through the soil without additional power, and poor root growth that reduces water and nutrient uptake, causing leaf discoloration and/or premature drought stress. Often, such symptoms will be expressed in one field but not another, or in portion of a field because of variability in soil characteristics that affect compaction.

Measuring compaction. Many growers have seen evidence of a compaction problem, but have yet to prove it. The way to measure both the extent and depth of subsurface compaction is with a penetrometer, which is a soil compaction meter. By pushing the penetrometer into the soil at a number of locations, you get a reading of the pressure required to do so. Having that data helps with decisions about whether to take steps to alleviate compaction, such as subsoiling. Penetrometers cost about $200, and are available from several companies.

Dealing with compaction. The best approach to compaction is to avoid it in the first place. Do not work soils that are too wet. Before conducting tillage, check out the soil's moisture at the depth of tillage operation, not at the soil surface. If the soil can be

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A soil penetrometer can measure the soil compaction.

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pressed into a ball that holds its shape, it is too wet for tillage. Try to chose and use tillage implements in a manner that will reduce the formation of a tillage pan. Moldboard plows and heavy disks, especially those that are widely offset, are known to 3 cause tillage pans. Large, rigid sweeps commonly found on some field cultivators can have a similar effect. Operating these kinds of tools at the same depth for a few years without varying tillage equipment or depth will cause a compacted layer in the soil. Deep tillage with a subsoiler is one way to break up subsurface compacted layers. This requires relatively powerful tractors that are not available to some growers, and is not always effective, especially in the long term, if other practices are not put into place to manage compaction. When subsoiling, it is important to know the exact depth of the compacted layer, so you are sure to set the subsoiler below it.

A new approach to tillage called Deep Zone Tillage aims to break up compacted layers while only disturbing about 1/3 of the soil surface. The units cut strips in surface residues, create 'slots' for plant roots directly under the rows, and leave the soil surface between rows undisturbed. For more information see the reduced tillage in vegetables web site at Cornell University: http://www.hort.cornell.edu/reducedtillage/

Taking land out of vegetable production for 2 to 3 years in order to grow a deep-rooted perennial, can be effective, but may not be an economically viable option for vegetable farmers. Other, shorter-lived cover crops are also known to help reduce compaction. Check the Southern Cover Crops Council website for information on cover crops for your area at southerncovercrops.org. ~

SOUTHERN COVER CROPS COUNCIL

Winter Cover Crop Relative Rankings - GRASSES

ND = Not enough data to rank
1 = High weed potential if allowed to go to seed

Cover Crop Name	Legume N Source	N Scavenging	Soil Builder	Erosion Fighter	Weed Fighter	Good Grazing	Quick Growth	Lasting Residue	Mechanical Forage Harvest Value	Grain/Seed Harvest Value
Annual ryegrass		★★★	★★★★	★★★	★★★	★★★★	★★★	★★★	★★★★	1
Black oats		★★★	★★★	★★★	★★★★	ND	★★★★	★★★★	ND	★★★★
Cereal rye		★★★★	★★★★	★★★★	★★★★	★★★	★★★★	★★★★	★	★★★
Oats		★★★	★★★	★★★	★★★★	★★★	★★★★	★★★	★★★	★★★★

A sample of information on some potential cover crops for our area from the Southern Cover Crop Council. Plants with high soil building and lasting residue scores are good for fighting soil compaction.

Garden Myths:
Compost is the Best Organic Fertilizer

By: Anna Timmerman, LSU AgCenter Extension Agent

The LSU AgCenter has a lot of good information regarding fertilization rates for fruits, vegetables, and ornamental gardens. Typically these recommendations for nitrogen (N), phosphorus (P), and potassium (K) fertilizers are given using a basic 8-8-8 or 13-13-13 balanced fertilizer product per square foot or row foot. If you've gotten soil test results back from LSU, they will have recommended rates of nitrogen (ammonium sulfate, urea, or ammonium nitrate), phosphate (triple super phosphate) and potash (muriate of potash) to apply based on soil availability and crop grown.

A handful of compost made from tree leaves, grass clippings and other organic waste material including newspaper and junk-mail.

The N-P-K values on all bags of fertilizer stand for the percentage by weight that the product contains of each of those three macronutrients. For example: a pound of 8-8-8 contains 8% nitrogen, so .08/lb. or 1.28 ounces of actual nitrogen in that pound of product. (16 oz. x 0.08 = 1.28 oz.)

Organic gardeners do not utilize the above mentioned fertilizer products because they are synthetic. Instead, the seek out natural sources of nutrients. Compost is frequently recommended as a fertilizer, but there are many more efficient organic fertilizers out there.

Compost varies in N-P-K from batch to batch or source to source, but in general the N-P-K of compost falls somewhere within this range:

Nitrogen (N): 1.5% - 3.5%

Phosphorus (P): 0.5% - 1%

Potassium (K): 1 - 2%

Pretty low N-P-K, right? How much compost would a gardener need to fulfil the needs of their crop? The LSU AgCenter's Louisiana Vegetable Planting Guide is a good reference publication for vegetable gardeners and lists general fertilizer recommendations for many vegetables. Let's use okra as an example.

Okra is listed as needing 3-4 pounds of 8-8-8 per 300 square feet of garden OR 100 feet of row.

Let's pretend that we have a 100 foot long row planted with Clemson Spineless Okra and we decide that we need 4 pounds of 8-8-8 in that row to grow a decent crop according to the guide. How much compost is needed to meet that same rate?

Here's how to figure it out for just the nitrogen needed:

At 8% nitrogen, applying 4 pounds of 8-8-8 to the 100 foot row of okra will actually be 5.12 oz. of actual nitrogen, or 0.32 of a pound of actual nitrogen. To meet this target, how much really good compost is needed? We'll assume that we have really good compost with 3.5% nitrogen. *(Continued on Page 9)*

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That 3.5% N is what is immediately available for use by the plants PLUS what is released slowly over time. Within the 3.5% N, approximately 3% is extractible (readily available) nitrogen and 97% slow release nitrogen (more on this later). So at the time of applying the compost to the okra, almost none of it is actually readily available for use by the okra. About 10-30% of the nitrogen in the compost will become available to plants within the first year after application. To apply the 0.32 pounds of actual nitrogen required by the okra: 0.32 lbs. / 0.035 nitrogen in compost (5 N) = 9.14 lbs.

To meet this target, 9.14 lbs. of really good compost will need to be applied to that 100 foot row of okra. (Remember, this is 3.5% nitrogen compost, which is super good quality compost)

BUT! Remember that only 3% of that is actually readily available to the crop. To apply a rate of 8% readily available nitrogen, you'd actually need to apply 304 pounds of really good 3.5% N compost to hit this goal.

Most commercially available bagged compost at the garden center is more like 1% N, so you'd need to multiply this calculated rate by roughly a factor of 3.5 to derive the same available nitrogen goal. That brings the total required compost application up to 1,064 pounds. A yard of compost weighs roughly 1,600 lbs. Remember, this is for a single 100 ft. row of okra.

Compost tea is even weaker and varies widely, but usually has an N-P-K of around 1.5-0-0. Most commercially sold compost tea products, even the high end ones, are unable to legally be registered and sold as fertilizers because they offer so little nutrition to plants. A steady stream of compost tea would be needed to provide any benefit.

Let's calculate how much would be needed for a newly planted satsuma tree. The LSU AgCenter's Louisiana Home Citrus Guide recommends applying ½ lb. of 8-8-8 in mid-March to newly planted trees. That's 0.64 ounces of nitrogen. To apply this rate using compost tea, you'd need to supply 42.66 pounds of compost tea, or roughly five gallons of compost tea over time (a gallon of liquid weighs 8.34 lbs.) As that satsuma tree matures, the fertilizer recommendation increases with the tree's needs to 12 lbs. of 8-8-8 per year, meaning that 1,024 lbs. or 123 gallons of compost tea would need to be applied that year. This would quickly add up if you have multiple trees

A yard of compost represents the amount needed to fill a container measuring 3' wide, 3' long and 3' high.

And those calculations are just for nitrogen, you can do the calculations for phosphorus and potassium on your own, but I think the point is clear. A whole lot of compost or compost tea needs to be added to soil to meet the same soil fertility goals accomplished by a few pounds of synthetic product. Last time I checked, really good finished compost in the New Orleans area was running about $60/yard as a bulk price. A yard of compost is roughly 1600 lbs., meaning the cost is then calculated to be roughly *(Continued on Page 10)*

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16 to 26 cents per pound for bulk compost. Retail plastic packaged bags of compost cost even more per pound. That cost can add up in even a small garden quickly.

So when and why should we use compost in the garden? Compost plays many beneficial roles in any garden, but should not be treated as a sole fertilizer source for any garden or crop. Just some of the benefits of compost include:

- Helps retain soil moisture and nutrients.
- Builds a good healthy soil structure where air and water can penetrate.
- Releases nutrients slowly over months and years.
- Creates habitat for soil microorganisms, which help to suppress disease and pests.
- Sequesters soil carbon and reduces landfill waste.
- Retains other fertilizer sources better and helps to meter it out.
- Buffers the soil pH.
- Increases soil organic matter, reducing compaction.

So what are some organic fertilizers that can be used that are more efficient and cost effective than compost?

Many garden centers are carrying organic fertilizer products that are blends of several organic materials. All are labeled by law with the N-P-K ratio, so gardeners know just what's in the bag. Using synthetic fertilizer recommendations, they should be able to calculate how much organic product to use by following the same math formula from earlier in the article. There are also a lot of free fertilizer application calculators available on the internet.

Commonly found organic fertilizer sources and their range of N-P-K values are listed below:

Good sources of organic Nitrogen (N):

Blood meal (12.5-1.5-0.6)

Fish meal (10-5-0)

Feather meal (15-0-0)

Good sources of organic Phosphorus (P):

Bone meal (7-20-0)

Mushroom compost (0.5-50-0.5)

Rock phosphate (0-25-0)

Good sources of organic Potassium (K):

Granite dust (0-0-5)

Greensand (0-1.5-5)

Kelp meal (1-0.5-10)

Wood ashes (0-5-6)

Greensand, also called glauconite, is a material mined from the ocean floor. It has a bluish-green color and is made of marine potash, silica, iron oxide, magnesia, lime, phosphoric acid, and about 30 other trace minerals.

Some other very popular, commercially available organic animal-based sources of fertility are low in actual nutrient content just like compost, and may not be a cost-effective soil input:

- Worm castings (1.5-2.5-1.3)
- Fish emulsion (5-1-1)
- Composted poultry litter (3-2-2)
- Composted cow manure (2-2-2)

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Fresh manure can also offer a source of soil fertility, which is a whole other article topic, but in general it should be aged and tilled into the soil. For food safety reason observe the 90/120 day rule, which says fresh manure must be applied to a food crop 90 days before harvest for aboveground crops and 120 days before harvest for crops that have edible portions that make contact with the soil. Manure N-P-K varies widely, so many larger organic farms have it tested for N-P-K value to get a handle on just how much to apply. If you can get it free, manure may be a cost-effective source of fertility.

One argument for applying a synthetic fertilizer is that products like 8-8-8 or 13-13-13 provide N-P-K in a form that is immediately available to plants. Crops showing signs of nutrient deficiency can be quickly treated and newly planted areas can be given a boost. Compost and other organic inputs, on the other hand, are considered to be slow release sources of nutrients, and need to be metabolized by soil microorganisms to convert it to a useable form for plants.

This process is known as mineralization and relies on the complex ecology of soil, including the fungi, bacteria, protozoa, insects, and other creatures found within the soil. This process takes time and can take several years in some soil systems. Calculating organic soil amendment applications based on regular soil testing results (yearly testing is recommended) and utilizing soil conservation practices like low or no tillage gardening, mulching, or cover cropping can help to encourage the soil ecology to flourish and create a soil powerhouse able to break organic fertilizers down into forms that plants can use quicker.

Compost is a great soil amendment and offers organic gardeners many benefits, however better organic fertilizer inputs are available at most garden centers. An application of compost boosts soil organic matter, which functions as a habitat for the soil microorganisms that act as the workhorses of an organic gardening system. This alone is a great reason to apply several inches of compost per year to your garden beds. While compost does provide some slow-release nutrition, gardeners should be aware that additional sources of fertility are needed for many of the plants that we commonly grow in our landscapes.

Click on the following link for a complete list of organic soil inputs and their N-P-K values: https://extension.oregonstate.edu/sites/default/files/documents/1/lc437organicfertilizersvaluesrev.pdf. ~

A popular saying is that "Organic fertilizer feeds the soil and synthetic fertilizer feeds the plant". *Although fertilizer is not really plant food.*

2018 Red Cabbage Fertilizer Trial

By: Kathryn Fontenot, Mary Sexton, Whitney Wallace, and Jessie Hoover, LSU AgCenter

Introduction:

Cabbage (*Brassica oleracea*) is a popular cool season vegetable primarily sold at fresh markets in Louisiana. In 2017, 126 producers grew fresh market cabbage on 222 acres in Louisiana. The 2017 gross farm value (GFV) of fresh market cabbage was approximately $2.45 million (2017 Louisiana Ag Summary) Commercial producers yield fair sized green cabbage, but many growers find growing large sized red or purple cabbage difficult (personal communication LFVGA members). Red cabbage with notable size is a challenging crop to produce in Louisiana.

In an attempt to determine if head size could be controlled by variety, a trial was established at Covey Rise Farms in Husser, LA in the fall of 2017. Cabbage varieties were planted in replicates of 3 blocks on black plastic with drip irrigation and fertilized at a rate of 50lbs N per acre as a preplant. Of the varieties trialed, most yielded about the same head size (Fontenot et al., 2018). The 2018 study used three of the red cabbage varieties trialed before but added a fertilizer component to the study. The Southeastern U.S. Vegetable Crop Handbook provides guidelines for fertilizing cabbage. The fertilizer recommendations are based on soil test results. For instance in the 2018 Southeastern U.S. Vegetable Crop Handbook, the recommended rate of fertilizer for cabbage are as follows:

Samples of red dynasty cabbage grown at 1x fertilizer rate (left), 1.5x fertilizer rate (center), and 2x fertilizer rate (right)

Nitrogen recommendations range from 100 to 175 lbs of actual N per acre with 50-100 pounds placed into the field as a pre-plant application and the remaining amount as side-dress applications in at least 2 applications. P and K are soil test dependent. Both with rates of 0lbs., 50 lbs. 100lbs. or 200lbs. per acre for Very High, High, Medium, and Low results respectively.

The objective of this trial was to increase the recommended preplant rate of (*Continued on Page 13)*

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nitrogen (N) by 1.5 and 2 times that of the recommended rates in the SE US Veg Crop Handbook to determine if additional N fertilizer would increase red cabbage head size.

Materials and Methods:

Three red cabbage varieties were selected from the 2017 LSU AgCenter red cabbage variety trial: 'Red Dynasty', 'Red Jewel', and 'Red Express'. Seeds were planted on Sept 18, 2018 into 50 count cell trays using SunGrow media. Seedlings were watered daily on a can yard at the Hill Farm teaching facility at LSU's Campus in Baton Rouge Louisiana. The seedlings were then transplanted into a field located at the LSU AgCenter Botanic Gardens (30.4057072, -91.103358) on Nov 19, 2018.

According to the 2018 Southeastern Vegetable Crop Handbook, a total of 100-175lbs of actual N fertilizer should be applied throughout the growing season with 50-75 actual pounds of N being applied at the preplant application. For this study, 50 lbs. N/acre was used as the 1X rate, 75 lbs. N/acre as the 1.5X rate, and 100 lbs. N/acre as the 2X rate. The cabbage was side dressed twice-using 50 lbs. of actual N/acre in the form of ammonium sulfate at each application during the growing season on Dec 18 and Jan 8, 2018. Therefore, the 1x cabbage received a total of 150lbs of actual N throughout the study and the 1.5X and 2X rates received a total of 175 and 200 lbs. of actual N per acre respectively.

Red cabbage plants were transplanted in field on November 19, 2018. The plants were planted on 48" wide rows. Irrigation was provided as needed. The winter 2018-early 2019 spring was extremely wet. Each plot was 20 ft. long with a skip space of 5 ft. between plots. Each plot had 20 plants and each variety by fertilizer rate was replicated three times. Cabbage was harvested on March 11, 2019. Ten heads from each plot (3 plots per variety by fertilizer treatment) were cut using knives leaving a quarter inch of stem. Outer wrapper leaves were removed leaving 1 to 2 wrapper leaves on each head for fresh weights. Cabbage heads were weighed immediately after harvest.

Grass was a problem in the cabbage field and was sprayed with the herbicide Select at 16 oz./acre on January 10, 2019. Insecticides and fungicides were not used.

Results & Conclusions:

Cabbage grown in the 2X fertilizer plots yielded noticeably bigger cabbage heads for all varieties when physically looking at the heads in the field. However, 'Red Dynasty' was the only red cabbage variety to yield results statistically significant between 1X and 2X fertilizer rates. 'Red Express' and 'Red Jewel' both yielded bigger cabbage heads at the 2X rate; however, this was not statistically significant. We would recommend farmers increase their pre plant fertilizer rate for red cabbage to 2X the given rate in the U.S. Southeastern Vegetable Crop Handbook. This study will be replicated in the fall of 2019. ~

GENERAL FERTILIZER SUGGESTIONS FOR VEGETABLE CROPS*

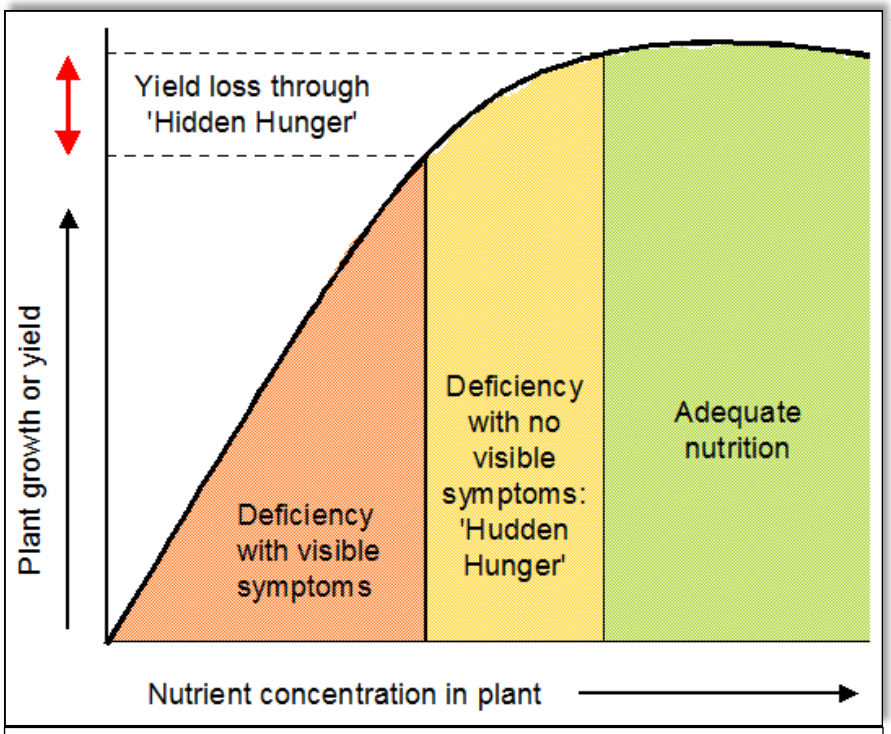
CROP	Desirable pH	Nitrogen (N) lb/acre	Recommended Nutrients Based on Soil Tests								Nutrient Timing and Method
			Soil Phosphorus Level				Soil Potassium Level				
			Low	Med	High	Very High	Low	Med	High	Very High	
			P_2O_5 lb/acre				K_2O lb/acre				
BRUSSEL SPROUTS, CABBAGE, and CAULIFLOWER											
	6 to 6.5	100 to 175	200	100	50	0	200	100	50	0	Total recommended.
		50 to 75	200	100	50	0	200	100	50	0	Broadcast and disk-in.
		25 to 50	0	0	0	0	0	0	0	0	Sidedress 2 to 3 weeks after planting.
		25 to 50	0	0	0	0	0	0	0	0	Sidedress if needed, according to weather.
		Apply 2 to 3 lb boron (B) per acre and molybdenum per acre as 0.5 lb sodium molybdate per acre with broadcast fertilizer.									

Example of fertilizer recommendations from the Southeastern U.S. Vegetable Crop Handbook.

NUTRIENT MANAGEMENT AND MAXIMIZING PRODUCTION

From: The 2019 Southeastern U.S. Vegetable Crop Handbook

Plants remove substances from the soil and air to enable them to grow and reproduce. The specific substances they remove are termed nutrients. Certain of these are generally required in larger quantities, and termed macronutrients. Those needed in smaller quantities, micronutrients, are as important as macronutrients for achieving required metabolic processes in the plant. Most commercial fertilizers include macronutrients nitrogen (N), phosphorus (P), and/or potassium (K), expressed as a weighted percentage ($N\text{-}P^2O^5\text{-}K^2O$). Micronutrients may be supplied along with macronutrients.



Leaf tissue testing can identify "hidden hunger" in plants before deficiency symptoms are visible

Nitrogen Management

Nitrogen is one of the most difficult nutrients to manage in vegetable production systems Nitrogen is readily leached in sandy textured soils that dominate vegetable production regions of the southeastern US. Nitrogen can be immobilized by soil microbes, volatilized if not quickly incorporated, or lost via denitrification under water-saturated soil conditions. Nitrogen recommendations are based on years of fertilizer trials and yield potential. Nitrogen application timings, application methods, and sources are also commonly tested in state university fertilizer trials and have resulted in recommendations for splitting nitrogen fertilizer application for increased fertilizer use efficiency.

Heavy rainfall, higher than normal yields, and production following non-legume cover crops are a few examples where nitrogen fertilizer may be immobilized or lost from the production system. When these nitrogen reduction scenarios arise, an additional application of nitrogen is warranted. Leaf tissue testing is the best option when deciding if and how much more nitrogen is needed to meet expected yields and is described below. Leaf tissue testing can help identify any "hidden hunger" that might exist in the crop. A "hidden hunger" develops when a crop needs more of a given nutrient but has shown no deficiency symptoms. With most nutrients on most crops, responses can be obtained even though no recognizable symptoms have appeared.

Evaluating the Effectiveness of Your Fertility Program—Using Plant Analysis/Leaf Tissue Testing.

Plant analysis is the chemical evaluation of essential element concentrations in plant tissue. Essential elements include those that are required to complete the life cycle of a plant. The elements carbon (C), oxygen (O), and hydrogen (H) are supplied by the atmosphere and water and generally are not considered limiting. Scientists place most emphases on essential elements supplied by soil or feeding

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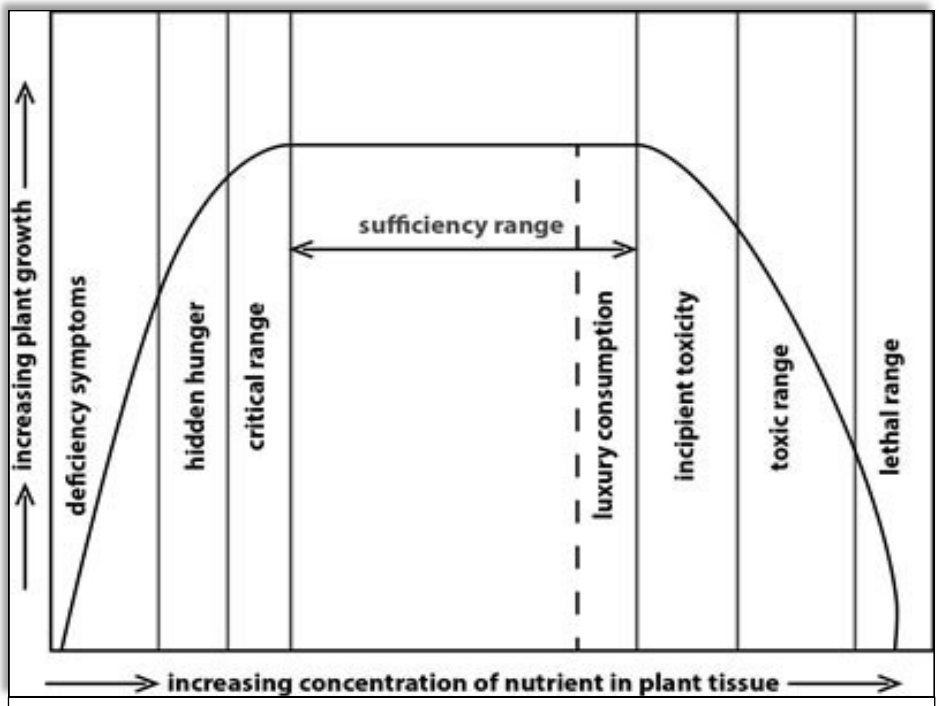
solutions. Macronutrients — nitrogen (N), phosphorus (P), potassium (K), calcium (Ca), magnesium (Mg), and sulfur (S) — are required in greatest quantities. Micronutrients — iron (Fe), manganese (Mn), zinc (Zn), copper (Cu), boron (B), molybdenum (Mo), and chlorine (Cl) — are required in very small quantities. Toxicities of micronutrients are equally important and yield limiting as deficiencies. Plant analysis is also effective in diagnosing toxicities of micronutrients. The interpretation of plant analysis results is based on the scientific principle that healthy plants contain predictable concentrations of essential elements.



Tissue samples can identify sufficiency ranges to help prescribe fertilizer applications thus maximizing yield and reducing waste.

State and private soil testing laboratories can provide nitrogen concentrations as well as those of the other essential macro and micronutrients to aid in mid-season fertilizer application decisions. A program of periodic leaf tissue sampling and analysis will help you optimize your fertility program and often can allow you to correct deficiencies before symptoms become apparent. The best indicator samples have been identified for most economically important vegetable crops. In turn this has provided the basis for developing data for which we can compare values from our analysis to those of established, recognized values. These are called Sufficiency Ranges or Critical Values. For those crops such as tomatoes which receive the greatest research support, indicator samples have been identified by stage of growth. In tomato we have su ciency ranges established for plant tissue samples taken at mid-bloom of the first, second, third, fourth, fifth, and sixth flower clusters.

Critical values have been defined as the concentration at which there is a 5–10% yield reduction. The use of critical values for practical interpretation has limited value. It is best suited to diagnose severe deficiencies and has little application in identifying hidden hunger. Symptoms are generally visibly evident when nutrient concentrations decrease below the critical value. Critical values play an important role in establishing lower limits of sufficiency ranges.

Sufficiency range interpretation offers significant advantages over the use of critical values. First, hidden hunger in plants can be identified since the beginning of the sufficiency range is clearly above the critical value. Sufficiency ranges also have upper limits, which provide some indication of the concentration at which the element may be in excess.

Method for Collecting Leaf Tissue Samples for Analysis

- Each vegetable crop has a specific corresponding plant part that is collected and used to determine foliar nutrient levels. Often this corresponds to sampling the most recently matured or fully expanded leaves. Careful sampling ensures the effectiveness of plant analysis as a diagnostic tool. For major crops, best indicator samples have been identified by stage of growth. For young seedlings, the entire plant is sampled 2.5 cm above the soil level. For larger plants, the most recent fully

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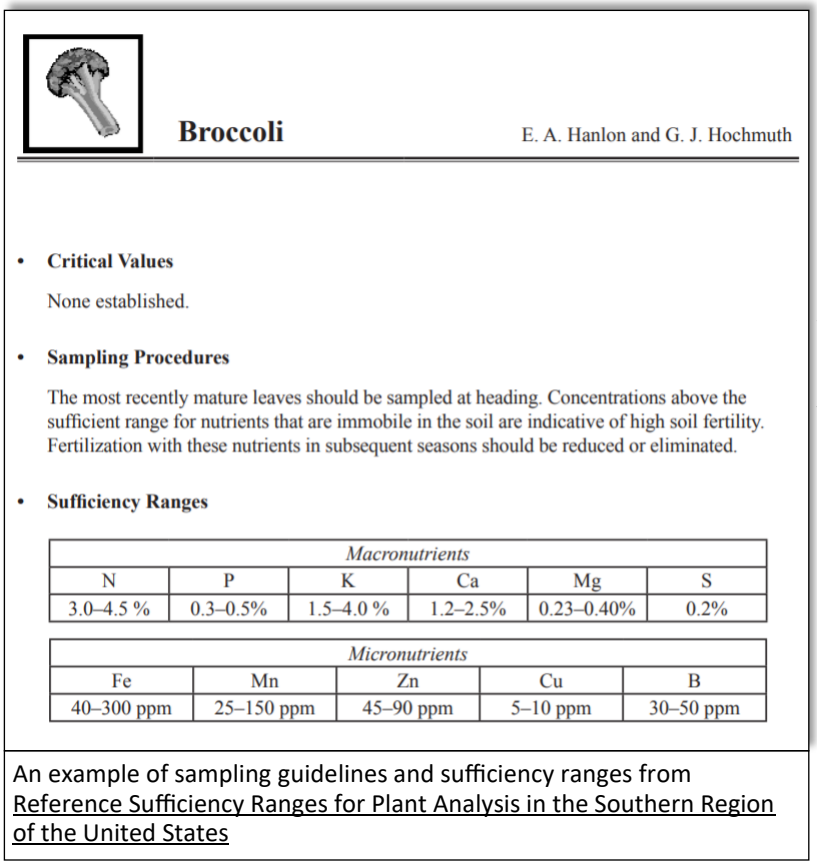
expanded or mature leaf is the best indicator of nutritional status. As some crops, including corn, approach flowering and fruiting, the best indicator of nutritional status is the leaf adjacent to the uppermost fruit (ear leaf). When unfamiliar with sampling protocol for a specific crop, it is generally acceptable to select the most recent mature leaf as the best indicator of nutritional status. Detailed information for sampling most vegetable crops can be found at http://www.ncagr.gov/agronomi/saaesd/scsb394.pdf.

- Sample from 20 to 30 plants.
- Sample across the field, from different rows, and avoid problem areas (low spots, ridges, washed out areas, etc.) unless you are trying to diagnose a problem in one of these areas.
- Sample when the plants are actively growing (typically between 9 a.m. and 4 p.m.).
- Do not collect samples from water stressed plants.
- Send samples to a laboratory in a paper bag. DO NOT SEND SAMPLES IN A PLASTIC BAG. Plastic bags will cause your samples to spoil and will impact results. Contact your local Extension o ce for information on how to submit leaf tissue samples to your state diagnostic labs.



Broccoli E. A. Hanlon and G. J. Hochmuth

- **Critical Values**

None established.

- **Sampling Procedures**

The most recently mature leaves should be sampled at heading. Concentrations above the sufficient range for nutrients that are immobile in the soil are indicative of high soil fertility. Fertilization with these nutrients in subsequent seasons should be reduced or eliminated.

- **Sufficiency Ranges**

Macronutrients					
N	P	K	Ca	Mg	S
3.0–4.5 %	0.3–0.5%	1.5–4.0 %	1.2–2.5%	0.23–0.40%	0.2%

Micronutrients				
Fe	Mn	Zn	Cu	B
40–300 ppm	25–150 ppm	45–90 ppm	5–10 ppm	30–50 ppm

An example of sampling guidelines and sufficiency ranges from Reference Sufficiency Ranges for Plant Analysis in the Southern Region of the United States

Phosphorus Management

Crops are very likely to respond to P fertilization when the soil test indicates that P is deficient to very low or low. A soil testing deficient to medium will sometimes respond to P fertilization and will sometimes not. Soils testing optimum or exceeds crops needs are unlikely to respond to P fertilizer, but P may be applied to maintain the fertility level in the optimum range. Crops are more likely to respond to P fertilizer when growing conditions are favorable for high yields.

It is often recommended that a band of P fertilizer be placed near the seed as a starter fertilizer regardless of the P fertility level. High phosphorus fertilizers are often referred to as pop-up' fertilizers because of their positive effect during early growth when soil temperatures in early spring can be very low. Banded P is especially helpful at low soil test levels. Even at P soil test levels that exceed crop needs, a small amount of banded P may benefit crop establishment. When the soil test level is deficient, P should generally be applied as a combination of broadcast and banded methods. When the level exceeds crop needs, only a small amount of P should be applied as a band. Many soils exceed crop needs category for P due to previous fertilizer and manure applications. When applied in excess of crop removal, P accumulates in the soil. Phosphorus is strongly adsorbed to soil particles and very little is subject to loss via leaching. When the soil test level exceeds crop needs, growers can benefit economically by withholding P fertilizers.

Potassium Management

Crops are very likely to respond to K fertilizer when the soil test indicates that K is deficient to very low or low. A soil testing deficient to medium in K may or may not respond to K fertilizer. Crops are more responsive to K when growing (Continued on Page 17)

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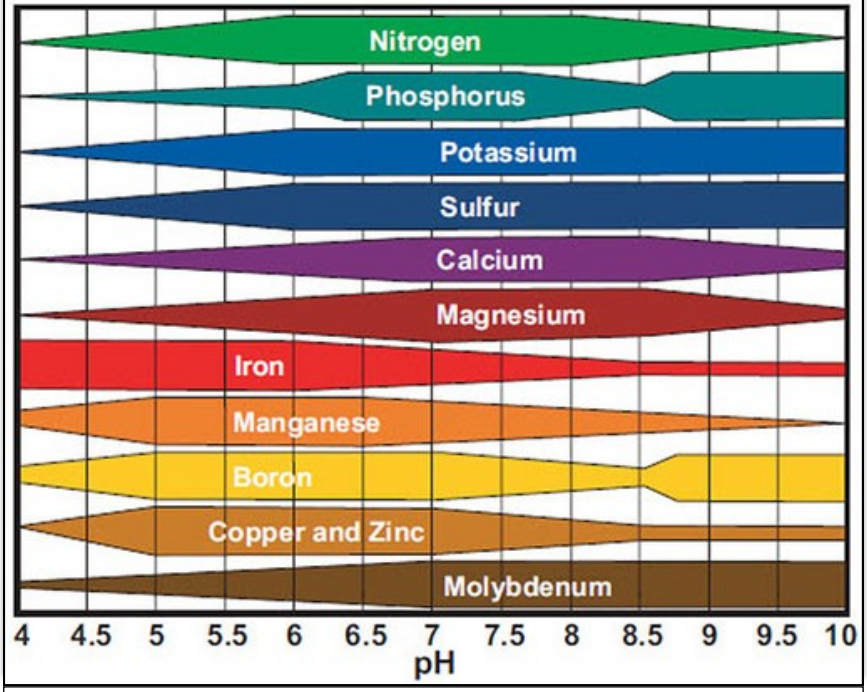
under drought stress than when growing under favorable conditions. Soils testing optimum or exceeds crop needs are unlikely to respond to K fertilizer, but K may be applied to maintain the soil fertility level in the optimum range.

In general, most of the K fertilizer should be broadcast. When the fertility level is deficient, it may be advantageous to apply a portion of the total K application as a band. There is generally no benefit to applying banded K when soil fertility levels are optimum or exceeds crop needs. Crops remove larger amounts of K than P from the soil during a growing season. In addition, sandy soils have low reserves of K, and K is susceptible to leaching. Therefore, frequent applications of K are needed to maintain K at an optimum fertility level.



This graphic of nutrient availability at various pH levels show that soil pH is critical in nutrient availability to plants.

Secondary Nutrients

Calcium (Ca), magnesium (Mg), and sulfur (S) are included in the secondary element group. Calcium may be deficient in some soils that have not been properly limed, where excessive potash fertilizer has been used, and/or where crops are subjected to drought stress. Magnesium is the most likely of these elements to be deficient in vegetable soils. Dolomitic or high-magnesium limestones should be used when liming soils that are low in magnesium. Magnesium should be applied as a fertilizer source on low-magnesium soils where lime is not needed. Magnesium may be applied as a foliar spray to supply magnesium to the crop in emergency situations (2 TBSP of Epsom salts per gallon of water).

Sulfur is known to be deficient in vegetable crop soils in coastal plain soils. Sulfur deficiency is often mistaken for lack of nitrogen because the symptoms are similar. Onions are one crop that will need additional sulfur over what vegetables normally require, particularly on coastal plain soils.

Micronutrients

Boron is the most widely deficient micronutrient in vegetable crop soils. Deficiencies of this element are most likely to occur in the following crops: asparagus, most bulb and root crops, cole crops, and tomatoes. Excessive amounts of boron can be toxic to plant growth. This problem can occur when snap beans (a sensitive crop) follow sweet potatoes (a crop where boron is applied late in the season).

Manganese deficiency often occurs in plants growing on soils that have been over-limed. In this case, broadcast 20 to 30 pounds or band 4 to 8 pounds of manganese sulfate to correct this. Do not apply lime or poultry manure to such soils until the pH has dropped below 6.5, and be careful not to over-lime again.

Molybdenum deficiency of cauliflower (which causes whiptail) may develop when this crop is grown on soils more acid than pH 5.5. An application of 0.5 to 1 pound of sodium or ammonium molybdate per acre will usually correct this. Liming acid soils to a pH of 6.0 to 6.5 will usually prevent the development of molybdenum deficiencies in vegetable crops.

Deficiencies of other micronutrients in vegetable crops in the Southeast are rare; and when present, are usually caused by over-liming or other poor soil management practices. ~

Work Smarter - Not Harder

The Southeaster U.S. Vegetable Crop Handbook should be one of the first resources that you consult when growing vegetables. Every aspect of production from scheduling, soil preparation, planting, disease and pest control to harvest and storage is covered for our most important economic vegetable crops. Know what to expect before problems arise and be ready with the solution.

Recommendations for fertilizer and pesticide applications are based on scientifically tested least input practices to maximize production while preventing waste and minimizing environmental impact. There is also information about organic alternatives for production.

Download a digital copy at https://www.growingproduce.com/southeasternvegetablecrophandbook/

A Great Resource: The USDA Web Soil Survey

By: Dr. Mary Helen Ferguson, LSU AgCenter Extension Agent

The Web Soil Survey provides important information for those who are contemplating what and where to plant on their own property, considering whether or not to buy land for a particular use, or advising others about the use of their land. This resource is provided by the USDA's Natural Resources Conservation Service (NRCS, formerly the Soil Conservation Service). Soil surveys have been around for over 100 years. USDA Soil Surveys for individual various parishes and counties were formerly available as books that could be requested from local NRCS offices. Like many things, this information is now available online.

The first step in accessing the soil survey information for a piece of property is to go to https://websoilsurvey.sc.egov.usda.gov and click on the green button that says, "START WSS." You can locate property by address, parish/county, or latitude and longitude, under the tab that says "Area of Interest."

If you are looking up information about your own property, you will probably be able to identify the boundaries of the area in which you are interested in the resulting satellite image. If it is not property that you are already familiar with, you may want to use your parishes geographic information system (GIS) site (typically provided through the assessor's office) to find out where the property lines are.

In the Web Soil Survey, you can zoom in or out to get a better view of the area in which you are interested. Then, click on one of the "AOI" boxes to draw a rectangle or other shape around the area of interest. Once you have selected the area that you want, click on the "Soil Map" tab at the top to take you to an overlay of the satellite image, showing the soil map units. The units will be indicated with two letter abbreviations, like "Ca" or "Go." To find out what those abbreviations mean, look at the left side of the screen.

The building in which my o ce is located at the Hammond Research Station sits on soil that is abbreviated as "Ca." The Ca soil unit, I learn, is a Cahaba find sandy loam with a 1 to 3 percent slope. Cahaba is the soil series. (Yes, soils have names.) Fine sandy loam is the texture of the surface layer of this soil.

The surface texture is an important consideration in agriculture. A sandy loam, for example, is a good soil for many horticultural purposes, such as vegetable production. It drains well but holds more water and nutrients than a straight-up sand would.

The surface layer is not the only layer of importance, though, and by clicking on the soil unit name, we can pull up a much more detailed description of the soil map unit. In the box that pops up when you click on the name of the soil unit, the "Typical profile" section provides a description of what soil textures can be expected deeper in the soil profile. The information will not be correct to the inch for every site, but it provides a useful approximation.

Going back to the top of the box that appears after you click on the name of the soil map unit, there is a line that indicates whether or not the unit is considered "prime farmland." Of course, what is called "prime farmland" will *(Continued on Page 20)*

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not be ideal for every type of agriculture, so you will need to investigate further to determine if it is suitable for what you want to do.

Besides soil texture, I am interested in the depth of the water table. This information is found under the "Properties and qualities" section within the map unit description. A water table within a few feet of the surface imposes a restriction for some perennial crops, like pecans. Most trees will not establish roots where the soil is saturated, so the root system is restricted to the area above water table.

Soil texture and depth-to-water-table are primary things that I look at when using the soil survey, but there is much more information that can be gleaned. If you click on the "Soil Data Explorer" tab and look under the "Suitabilities and Limitations for Use," there is information about the expected suitability of that site to a wide – and I mean wide – range of activities. The type data that is available for a given area varies among locations to some extent, but below are some examples of what I can find for my location.

Jefferson Parish, Louisiana

Ka—Kenner muck, drained

Map Unit Setting

National map unit symbol: 1jfsn
Elevation: 0 feet
Mean annual precipitation: 51 to 72 inches
Mean annual air temperature: 59 to 77 degrees F
Frost-free period: 265 to 315 days
Farmland classification: Not prime farmland

Properties and qualities

Slope: 0 to 1 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Poorly drained
Capacity of the most limiting layer to transmit water (Ksat): High to very high (2.00 to 20.00 in/hr)
Depth to water table: About 12 to 48 inches
Frequency of flooding: Rare
Frequency of ponding: None
Salinity, maximum in profile: Nonsaline to slightly saline (0.0 to 4.0 mmhos/cm)
Available water storage in profile: Very high (about 20.9 inches)

Example of soil description from the Web Soil Survey

Under "Vegetative Productivity" and then "Yields of Non-Irrigated Crops," I can get an estimate of how many cows can be supported on a bahiagrass or bermudagrass pasture in different areas of the property. Under "Soil Health," I can find out about how susceptible a site is to soil compaction or how suitable it is expected to be for a facility that composts plant-based wastes. Under "Land Management," I can find out about expected limitations to installing fence posts or about how much of a hazard there is that pesticides applied on the property will leach into groundwater.

Under "Water Management," I can read about expected limitations to pond construction or different types of irrigation systems. Under "Recreational Development," I can find out about the potential of using this site for a campground or hiking trails. Under "Sanitary Facilities" and then "Septic Tank Absorption Fields," I can find out about expected limitations to putting a septic field on different areas of the property.

For more technical information, you can click on the "Soil Properties and Qualities" tab near the top and get an abundance of data on various soil chemical and physical properties, as well as climatic data.

Some of the information available in the Web Soil Survey is also available in an app called SoilWeb 2.0, from the California Soil Resource Lab. It allows you to look up the soil unit directly under you and information related to it.

NRCS has local o ces throughout Louisiana and can provide assistance with using soil survey data. To find contact information for your parish office, go to https://www.nrcs.usda.gov/wps/portal/nrcs/main/la/contact/local/. ~

SoilWeb 2.0 App Offers Valuable Soil Info on the Go

By: Tammy Cheever and Dee Ann Littlefield, USDA NRCS

Have you ever wondered about the soil you are standing on, at any given spot in the United States? Curious about what soil type it is? How about if the soil is easy to dig? If the soil is ideal for supporting the weight of a house or a barn? Or simply, if it will help you grow better tomatoes?

Thanks to an innovative mobile app, the world's largest soil survey data base is available on the go. The USDA's Natural Resources Conservation Service and the University of California at Davis recently announced that the SoilWeb app, version 2.0, is available as a free download from Google Play (Android) and the Apple app store (iOS). The app was created through a partnership between NRCS and UC Davis.

With its embedded GPS system, SoilWeb provides convenient, instantaneous soil information from the exact soil beneath the user's feet. The app gives users greater accessibility to the NRCS soil survey information that has been collected across the United States since the late 1890s. The app presents the data in mobile form, helping users make better-informed decisions about the location they are researching.

The information can inform insurers about flooding frequency and builders about if the location could be suitable for roads, basements, or septic tanks. The agricultural real estate industry, farmland owners, and farmers interested in renting or purchasing land commonly need information about soil productivity and land capability. Knowledge of soil is also important to home gardeners and landscapers. Although soil survey information can be used for general planning, a professional onsite evaluation is needed to supplement this information in some cases.

Location accuracy settings allow users to select between standard accuracy (less accurate but uses less battery power) and high accuracy (more accurate but may use more battery power). The location auto-refresh feature allows users to access soil maps and data real-time even as they travel about their property.

Users can simply click "Get Soil Data" on the app's home screen and get detailed soil survey data for that spot. Furthermore, they can get information on soil taxonomy, soil series descriptions, soil property depth profiles, land classification ratings, hydraulic and erosion ratings, forest productivity, and soil suitability ratings.

The "Details" tab in the soil series description offers robust site information indicating if the site is a good location for a pond as determined by slope and water-holding capacity. This feature can also determine if site is suitable for cropland, including the type of crops it is best suited for and even the types of plants one could expect to find at that location – from trees to forbs to grasses. This is especially helpful for long range management plans for the property.

Soil suitability ratings provide customer reports based on a user's interest. Categories include agriculture, forestry, engineering, irrigation, urban/recreation, soil contamination awareness, and wildlife. This portion of the app displays what the soil could be best suited for and provides information on how to manage the land for best productivity.

When producers look out across their fields and pastures, they have a good idea of what is growing above the ground. But it is soil underneath that really drives their management systems. The better farmers and ranchers understand the soils beneath their land, the more they can improve the production capability on their land.

The SoilWeb app offers this and more from the convenience and ease of a mobile device. Download it today. It's free and we know it will become an important tool in your farming toolbox. ~

Soilless Media Fertility & Nutrition

By: Dr. Jeb S. Fields, Assistant Professor & Extension Specialist, LSU AgCenter Hammond Research Station

I am often asked about soil test reports for soilless media. A test will come back with a plethora of information that is very helpful in the right circumstance. However, it is important to note that when dealing with soilless media there are two measures that stand above the rest. Nearly all nutritional issues can be diagnosed and remedied through the use of pH and soluble salts measures. Additionally, it is very important that you identify the media as soilless media.

Some examples of soilless growing mediums including pine bark, compost, coconut coir, bagasse, perlite, and vermiculite.

Soilless media is commonly referred to as potting mix, composts, or organic soils. These are often comprised primarily of pine bark, peatmoss, and/or composts. These are called soilless as they contain very little mineral components (sand, silt, and clay). We use these media in containers, raised beds, and prepared landscape beds. It is important to identify a sample as soilless media or select the option for soilless media extract (SME) when sending in a soil sample for analysis at the LSU AgCenter Soil Testing Lab. Not only are tests for soils and soilless media conducted in a different way, but the results will be interpreted differently as well.

<u>Soilless Media pH</u>

Let's start with a quick chemistry lesson. Many of us understand that pH is a measure of the acidity and basicity of a solution. This is correct, but there is more. In fact, pH is actually a measure of the activity of hydrogen ions in a solution, although it is often considered to represent the concentration of hydrogen ions.

Soilless media pH is important, because it regulates the availability of nutrients in the media. Below is a nutrient availability chart. As the media pH changes, different nutrients become more or less available for the plants. It is for this reason that pH is such an important measure for our media analyses. Plants need different nutrients at different concentrations. That is why many plants require different pH media. Many of the horticultural plants we cultivate perform best in slightly acidic soils - having a pH between 5.5 and 6.5. Other plants require a more acidic rooting environment, often a pH between 4.5 and 5.5. Some of these acid-loving plants include azaleas, gardenia, camellias, and blueberries, just to name a few. It is important to make sure that your plants are growing in the proper pH media

The majority of soilless media adjustments are to increase pH, due to the fact that most organic materials (i.e. bark and peatmoss) are acidic in nature. Often soilless media will *(Continued on Page 23)*

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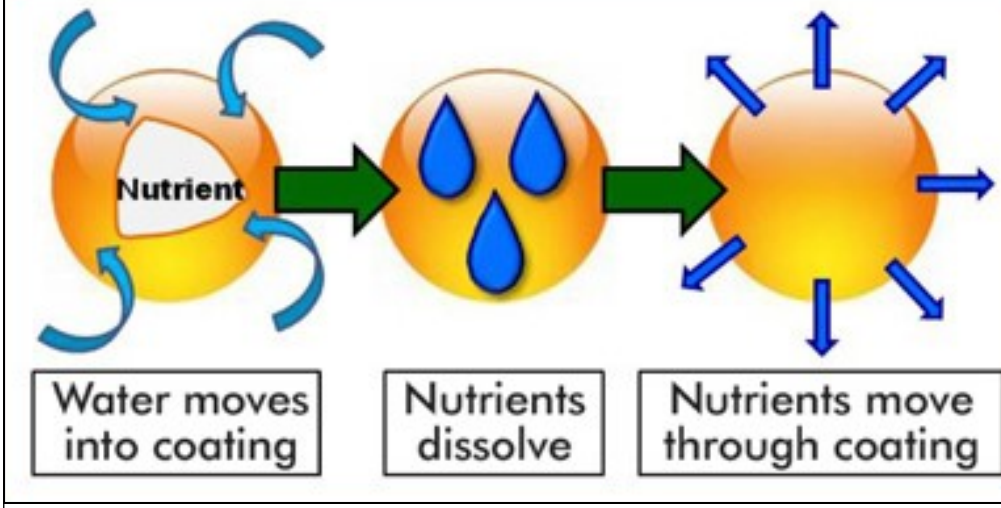
have the pH adjusted prior to being sold, but not always. If the pH needs to be raised, the primary method is the addition of lime or limestone. Limestone comes in different grades based upon the particle size of the material. We consider pulverized lime to be very fine limestone, which resembles a fine powder. This reacts rapidly and will affect the pH fairly quickly, but will not have a lasting effect. This is partly a result of increased surface area associated with smaller particle size. On the other hand, crushed lime is ground to a coarseness similar to table salt or even sand. With the increased particle size, there is less surface area to react, so the reactions are slower than with pulverized. However, coarser ground lime, while slower to react, will control pH longer. We recommend blending the two lime particle sizes at a 1:1 ratio (half pulverized half crushed), for quick action and lasting control in soilless media.



Controlled release fertilizer granules are coated with various membranes That allow small amounts of water in to dissolve the nutrients and release them into the surrounding soil. *Graphic from the International Plant Nutrition Institute.*

Sometimes we may need to lower the pH of soilless media. In this case, we typically recommend a sulfur source - elemental sulfur in particular. Elemental sulfur will form sulfuric acid in the presence of water, lowering the pH of the substrate solution. Be careful with lowering the pH, as too much can harm plants. Moreover, some fertilizers also lower the media pH.

<u>Soilless media nutrition</u>

Controlled-release or slow-release fertilizers are used in soilless media. One of the primary reasons for using a controlled-release fertilizer is the low exchange capacity in most soilless media. Field soils tend to have higher exchange capacity or increased ability to hold mineral nutrients and allow for plant uptake. Soilless media tends to have relatively low exchange capacity, meaning that nutrient storage is quite low. As a result, much of the fertilizer that is put into a container is lost through excessive leaching with irrigation. Controlled-release fertilizer ensures that the fertilizer stays in the container longer.

The three nutrients that horticultural plants require at the highest concentrations are Nitrogen (N), Phosphorous (P), and Potassium (K). These, along with Calcium, Magnesium, and Sulfur are considered macronutrients. Other nutrients that are required at lower concentrations are considered micronutrients. It is important to remember that both macro- and micronutrients are equally important to plant health; the difference is just based on the quantity needed by the plants.

Fertilizers will be labeled with three numbers, and these numbers stand for the percentage by weight of nitrogen, phosphate (P_2O_5), and potash (K_2O) in the fertilizer, which represent N, P, and K. Most of our horticultural plants utilize N, P, and K at a 3:1:2 ratio. As such, we recommend using a matching 3:1:2 fertilizer in most instances. Some examples of 3:1:2 fertilizers are 15-5-10, 18-6-12, and 21-7-14. Alternatively, if you are not sure, you can use a balanced fertilizer (i.e. 13-13-13 or 10-10-10). However, if your soil test report indicates a too low or too high levels in one or more of the nutrients, you can adjust fertilizers to correct.

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For instance, if you have low N, but adequate P and K, consider using a Nitrogen heavy fertilizer (i.e. 27-0-0).

While it is helpful to know the individual mineral nutrient concentrations from a soil report, the soluble salts measure is a very useful tool. Soluble salts measurements - sometimes referred to as electrical conductivity (EC) - are used as a relative identifier of the nutrient concentration in the media and is reported in dS/cm. In reality, EC is a measure of the ability of a solution to conduct electrical signals. The reason this is so helpful in soilless media is that pure water is a very poor conductor of electricity, thus it has a very low EC. The salts (nutrients) increase the conductivity of the substrate solution. Therefore the higher the nutrient concentration, the higher the EC. If the soluble salts are high, you should exercise caution and only add fertilizer if the plants need a specific nutrient. Instead you can add extra water (irrigate longer) to leach out some of the salts. If the soluble salts level remains high, you may have an issue with high EC in your irrigation water, which can be problematic to plants. If the soluble salt level is low, fertilizer can be added as needed. ~

Salinity class	ECe (dS/m)	Salinity effects on crops
Non-saline	< 2	Salinity effects are negligible
Slightly saline	2–4	Yields of very sensitive crops may be restricted
Moderately saline	4–8	Yields of many crops restricted
Very saline	8–16	Only tolerant crops yield satisfactory
Extremely saline	>16	Only a few very tolerant crops yield satisfactorily

This chart shows the salinity class rating for ranges of Electrical Conductivity along with expected crop outcomes.

Coming Events

Southern Sustainable Agriculture Work Group

Annual Conference

January 22-25, 2020

Little Rock, Arkansas

The Southern SAWG Annual Conference is well-known for providing the practical tools and solutions you need at our annual conference. It is the must-attend event for those serious about sustainable and organic farming and creating more vibrant community food systems! This popular event attracts farmers and local food advocates from across the nation each year. We offer outstanding "field-tested" presenters, a full slate of hot-topic conference sessions and pre-conference courses, several field trips, a poster display and a trade show.

Visit www.ssawg.org/january-2020-confernce for more information.

Scholarships available to eligible applicants. Visit surveymonkey.com/r/LASARE-SSAWG2020 for information.

Coming Events

October 4, 2019 - St. James Parish Ag Day - Gramercy, LA. All Pre-K through 3rd grade students from St. James Parish will be participating in as many as 28 hands on Ag-tivities at Fast Food Farm. https://www.facebook.com/events/398134177721981/

October 10, 2019 - Tea Processing Workshop - Hammond, LA. Perfect for beginning and prospective growers seeking a basic understanding of the stages of tea processing! The event will be held at the LSU AgCenter Hammond Research Facility from 8:30AM-3pm and will include a tour of the Fleur de Lis Tea Farm, hands-on tea making, a tour of the tea research field, and tea tasting! RSVP to Mandy Clayton at 985-543-4125 or MClayton@agcenter.lsu.edu.

October 22-23, 2019 - Louisiana Farm to School Conference - Baton Rouge, LA
Local food procurement, school gardening, and education are the three tenets of farm to school. This conference is for educators, extension, farmers, and all representatives of the local food system seeking to get fresh, locally-grown produce into Louisiana schools! A special Meet the Buyer, Greet the Grower procurement networking event will be held the evening of October 22 to facilitate connections between farmers, whole sale buyers, distributors, and child nutrition directors. Find more information and register at LAF2SC2019.eventbrite.com. Sponsorship options and limited resource scholarships available.

November 13, 2019 - Industrial Hemp Informational Meeting - Alexandria, LA. Save the date! Find more information and updates at www.lsuagcenter.com/industrialhemp.

November 15-16, 2019 - On Farm Composting School - Bogalusa, LA. Hosted by Local Cooling Farms' Grant and Kate Estrade. Course is designed for composting professionals, farmers, ranchers, gardeners. Cost is $250 per person and event is rain or shine. Must register in advance due to limited seating. Call Grant Estrade at 504-234-3564 or email grant.estrade@gmail.com to sign up.

November 21, 2019 - LA SARE Farm Certification Training and Farm Audit - Alexandria, LA.
Learn about all of the local, state, and federal certification programs available to producers, including USDA Certified Organic, GAP, FSMA, Certified Naturally Grown, Certified Grass-fed, LDAF Louisiana Grown, etc. A farm tour at Inglewood Farms will follow and include a mock farm audit. Info TBA and will be available at www.lsuagcenter.com/store. Email Sydney Melhado for more info at smelhado@agcenter.lsu.edu

November 26, 2019 - Annual Fall Garden Workshop - Baton Rouge, LA. Save the date! More details to come! Go to www.southernsare.org/Regional-News/Join-Our-Mailing-List to join the Southern SARE mailing list to receive news and updates about coming events.

January 22-25, 2020 - Southern SAWG Conference - Little Rock, AR. Save the date for Practical Tools and Solutions for Sustaining Family Farms! https://ssawg.org/january-2020-conference

February 22, 2020 - Citrus Symposium - Violet, LA. Save the date! Docville Farm 5124 E St. Bernard Hwy. Email GNOGardening@AgCenter.LSU.edu for more information.

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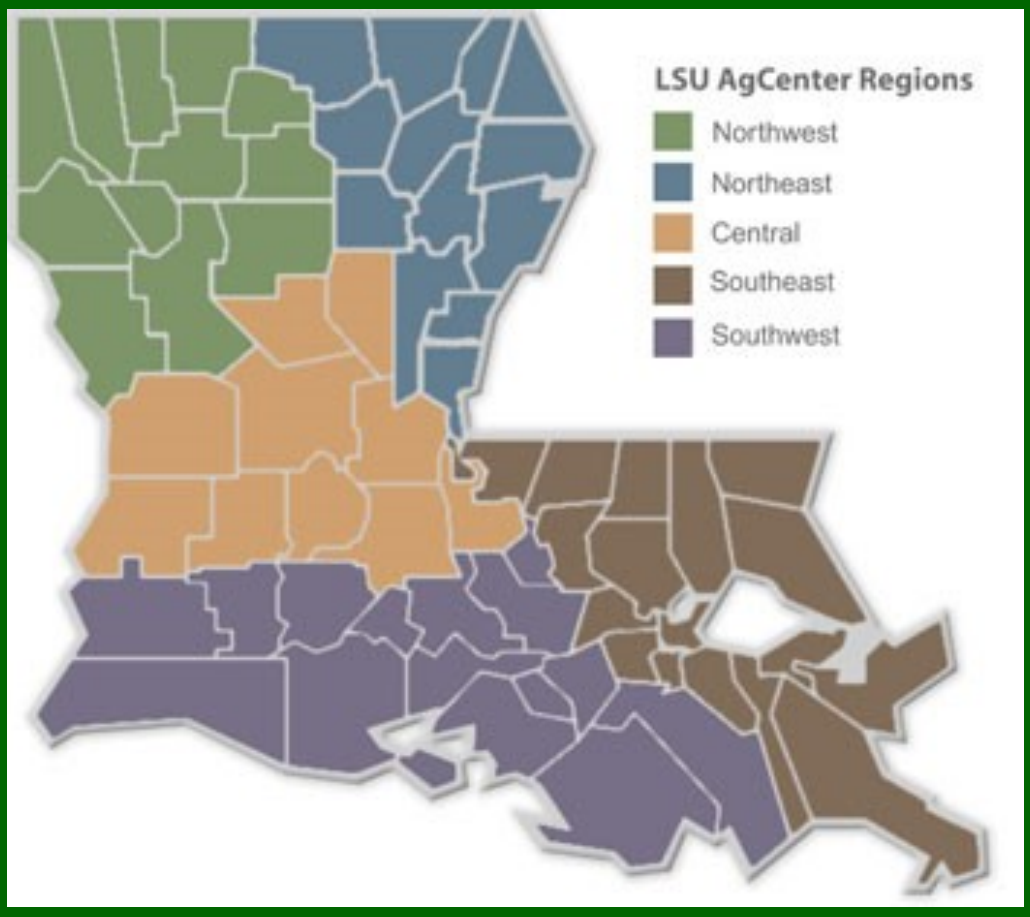

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