# DOWNLOAD PDF HOW GOOD ARE YOUR SOILS? FIELD AND LABORATORY EVALUATION OF SOIL HEALTH

## Chapter 1 : Haney Information - Ward Laboratories Inc.

*A good soil health assessment done over a number of years allows you to see whether you are going in the right direction. Another reason might be to better valuate your soils. If they are in excellent health due to many years of good management, your land should be worth more when sold or rented than fields that have been worn out.*

September 1, View as PDF: However, high-yielding crops require large amounts of plant nutrients that must be supplied in proper balance from the soil. Soils constantly undergo physical and chemical changes. Some plant nutrients are removed in harvested crops or are lost by leaching and erosion; others become available from the soil or are added from fertilizer. Soil tests measure available nutrients in the soil and serve as the best guide to profitable use of commercial liming and fertilizing materials. One of the most important steps in a soil testing program is to collect the soil sample so it represents the area to be tested. If the sample does not represent an area, the test results and recommendations can be misleading. Get a representative sample so the soil test and recommendations are reliable for the area tested. The following procedures help ensure that you collect representative soil samples. How to Take Good Samples Select the proper tools. A soil probe, auger, spade, and clean buckets may be used in taking soil samples. A soil probe or an auger is better than any other tool because it gets equal amounts of soil from a certain depth. Use the correct soil sampling technique. Sampling is best done when soil moisture conditions are suitable for plowing. Do not include cores from dead furrows, turnrows, strips near trees, old fence rows, fertilizer or lime spill areas, or any other unusual spots. Using a soil map, sample the soils in a field; sample separately the lightand dark-colored soils and recently limed and unlimed areas see map next page. Scrape off crop residue before sampling. Sample cropland to plow depth or another constant depth, depending on crop and tillage practices. Generally, a 6-inch depth is recommended. Sample pastures and lawns to a 4- to 6-inch depth. Sample a row-crop field between the rows, thus avoiding fertilizer band areas. Get a composite sample. The biggest mistakes made in estimating the fertility level of a soil area generally are from improper soil sampling. Laboratory data can be no better than the soil sample. To get a representative soil sample, gather at least 15 to 20 cores. If the tilled soil has been limed or fertilized by broadcasting in the last 2 years, take 30 or more individual cores, depending on soil variability or unknown locations of fertilizer bands. Take each core the same depth, and take the same amount of soil at each site. Gather cores at random in a zigzag pattern over the area involved. This procedure is good because it lessens the effect of any one boring. For example, if you take 20 equal-sized borings in an area and one of them was, by chance, taken in an old fertilizer spill area, it would have little effect on the results of the composite sample. However, if you take more soil at the fertilizer spill area than at any one of the other sites, the larger volume of soil influences the results of the composite sample. Divide fields into uniform areas. Judge for yourself if an area is large enough for a different lime fertilizer rate or treatment. Examples of field situations are illustrated. For example, Field No. Consult the soil map. Process the soil sample. Break up clods or lumps, spread them out, and dry them at room temperature. Apply no artificial heat by stove or furnace because this can change the sample for analysis. Thoroughly mix the soil sample after it has dried. Mildly crush the soil but do not pulverize it to reduce the coarser granules to about the size of wheat grains or smaller a rolling pin works nicely. Keep 1 pint from the original sample. Place this pint in a soil sample box that is available from your county Extension agent or the Extension Soil Testing Laboratory at Mississippi State University. Label carefully to ensure identification maximum of five digits or characters. Prepare a map or sketch of your farm or field layout, showing areas sampled. This helps keep an accurate record of your soil test report. How Often and When to Test Test each field once every 3 years or once per crop rotation. If you avoid the rush times at the laboratory, you get faster service and the results of the soil test in time to serve as a guide for buying and applying fertilizer. For fall plantings, take samples in May, June, July, and early August. For spring plantings, collect the samples the latter part of October, November, December, and January. Standard tests for all samples: Organic matter and estimated reserve sulfur for all row and field crops. The total soluble salts test is performed on all greenhouse and home horticulture samples. Interpreting the Soil Test Report An example of a completed soil test report is on the next page. Identical copies of your report are mailed to your county Extension agent; copies also are on file at the soil testing lab. List fields by number; use the list of crops on the front of the form to select the appropriate code number for each sample. Mail the top two copies of the form, your check or money order, and the soil samples to: Keep the third copy for your files. When you mail the samples, enclose a small number of samples in a sturdy, corrugated mailing container with the top two copies of the form. The package should weigh no more than 20 pounds. Forms, soil sample boxes, and mailing containers are available at your county Extension office. See the county agent for these supplies and for advice on taking soil samples. Contact Your County Office.

## Chapter 2 : Soil Health and Cover Crops | Virginia Cooperative Extension | Virginia Tech

*Altogether, the Cornell Soil Health Test measures seventeen indicators related to relevant soil processes. The sampling procedure involves taking in-field penetrometer measurements and using a shovel to collect a disturbed sample, which is then submitted to a soil testing lab.*

June 29, Submit requests through the Institute website: Tracy, Project Manager, ptracy soilhealthinstitute. Shafer, Chief Scientific Officer, sshafer soilhealthinstitute. The concept of soil health has captured wide ranging interest across public and private sector agricultural, environmental, and conservation organizations. This high level of interest is well-placed because soil health represents one of those rare win-win situations where practices that are good for the farmer are also beneficial for the environment. Research on the physical, chemical, and biological properties of soil has enabled significant advances in managing agricultural soils and supporting increases in yield over the past years. Several soil health indicators and programs are now in use; however, despite its importance, a widely applicable and universally accepted approach for measuring soil health has not yet been established. Numerous challenges exist, such as the adaptability of different methods and interpretations for different soils, agricultural production systems, and environments; unclear links among measurements, soil processes, and outcomes; ease and cost of measurement techniques; differences in measurement protocols among analytical laboratories; and others. To address this need, the Soil Health Institute invites applications to participate in a coordinated, continental scale evaluation of soil health measurements and their relationships with yield, economics, and ecosystem services. Applications are sought from individuals and organizations engaged in long-term minimum year agricultural field experiments in the U. Applications not selected for sampling in the North American Soil Health Measurement Evaluation project may still be included in a publicly-accessible, on-line GIS directory of long-term agricultural research experiments and sites being established to advance collaborations and opportunities for the agricultural community. Review of applications will be a two-step process. Reviewers will select sites for inclusion in the directory based on the adequacy of information provided to describe the site and experiments conducted there. Sites selected for the directory will then be re-reviewed for possible inclusion in the North American Soil Health Measurement Evaluation Project. Assessments will be based on strength and completeness of information provided, experimental designs and treatments implemented, data quality and continuity, geographic location relative to other available sites regionally and nationally, and overall potential contribution to evaluating soil health measurements, as detailed below. All applicants will be notified of the results. Eligibility and Evaluation Criteria: To be eligible for the directory, a site must have a minimum of 10 continuous years of land use treatments implemented in a statistically valid experimental design. Experimental treatments of interest include those that may alter soil properties, such as evaluations associated with tillage type, crop rotation, nutrient management, irrigation, grazing management, cover crops, organic amendments e. All should be compared to one or more controls. Individuals and organizations conducting such research on governmental, university, and private-sector sites are all encouraged to apply. Experiments selected for inclusion in the directory will then be considered for participation in a North American Soil Health Measurement Evaluation Project. Experiments selected for the Soil Health Measurement Evaluation Project will be based on a peer review of the completeness and strength of documentation describing the experiment s , as noted below. Several sites have already been submitted to SHI for the directory of long-term agricultural experiments. Selection and Partnering Information: Those sites selected for inclusion in the directory of long-term agricultural research experiments will be considered for participation in a continental scale evaluation of soil health measurements and programs. Soils in selected treatments, replications, etc. One local representative at each location will be asked to provide the site-specific information necessary for the evaluation e. In addition, each site in the Soil Health Measurement Evaluation Project will be offered funds to cover travel expenses for one site representative to attend a day project workshop designed to share site information and facilitate collaborations with representatives from across multiple sites. Scientific publications will be developed with authorship from sites contributing data and interpretation. Data from analyses of soils collected at the sites selected for evaluation of soil health measurements will also be available on the SHI website. Site managers will have access to all raw and interpreted data accumulated from their sites. They will be encouraged to participate in database management and data interpretation and to work with the data from their sites or in combination with other sites to develop important soil health information for dissemination across the scientific, agricultural production and public policy communities. Request for Applications RFA released April 20, Long-term site directory and evaluation applications due June 29, Develop site plans for data and metadata collection Aug.

# DOWNLOAD PDF HOW GOOD ARE YOUR SOILS? FIELD AND LABORATORY EVALUATION OF SOIL HEALTH

## Chapter 3 : Request for Applications â€“ Soil Health Institute

*"Building Soils for Better Crops is one of the most practical guides on soil management available. As we confront a fu- As we confront a fu- ture of peak oil, climate change and depleted fresh water resources, restoring the health of our soils is more imperative.*

Alabama Soil Health Index Soil health is the ability of soil to perform functions that support life on earth. Soil provides food, fiber, and energy to sustain human life. Soil also protects our natural resources by filtering water and decomposing harmful chemicals. Properties of a Healthy Soil High organic matter content Optimal nutrients and pH for plant growth Stable soil aggregates to promote water infiltration Large population of beneficial organisms No contamination Many soils in Alabama could be considered unhealthy due to severe erosion, low organic matter content, and intensive farming practices historically used in the state. It is important to rebuild soil health to conserve this natural resource for use by future generations. Practices such as reduced tillage and cover cropping can increase organic matter and improve soil health in Alabama. What is included in the Alabama Soil Health Index test? Estimated cation exchange capacity and soil group: Cation exchange capacity CEC is the sum of exchangeable cations that a soil can adsorb. Cation exchange capacity is affected by soil texture, pH, and organic matter content. Base saturation is affected by pH, and at extremely low soil pH and base saturation , aluminum toxicity can occur. Soil organic matter content: Organic matter consists of carbon-containing compounds from dead and living plant and animal materials. Soil organic matter increases nutrient- and water-holding capacity of soil and is an important indicator of soil health. This hour test is an indication of microbial activity in the soil and can be used to estimate potential mineralizable N from soil organic matter. Aggregate stability is a measurement of soil structure. Stable soil aggregates increase water infiltration into the soil and are a good indicator of soil health. For this test, soils are classified based upon how well soil aggregates hold together in water. Also mark the soil information sheet for "Soil Health". Do not sample extremely wet soils or very dry soils. If the field is cultivated or plowed, take samples to the depth of tillage usually 6 to 8 inches deep. Mix the subsamples in a clean, plastic bucket. Remove rocks, twigs, roots and vegetation. Samples can be taken at any time of year but are most beneficial in the months prior to crop establishment. Submit samples to your county extension office or mail directly to: Soil Testing Laboratory S. Donahue Drive Auburn University, AL Allow weeks from the time the sample arrives until all the analyses are completed. Results will be returned electronically if a valid email address is listed on the information sheet or a hard copy will be mailed to your address. Interpreting the Soil Health Index An example soil health report is pictured below. For each test measured as part of the soil health index, a maximum score has been assigned based on research which correlates a given soil test to yield. Three color codes will be used for each value in the SQI, green for optimum, yellow for marginal, and red for needs improvement. Recommendations are given in the "recommendations REC " column and in the "comments" section to suggest best management practices, such as cover crops and reduced tillage to improve soil health. At the bottom of the report, the total "soil health index score" is given as a value between 1 and  Most Alabama soils will score between 40 and  The soil health index is most useful to assess how management practices are improving soil health over time. For best use of the soil health index, soil samples can be taken 1 from the same area over time or 2 for areas with a similar soil type and different management practices to assess whether management practices have a positive or negative impact on soil health. Sample Soil Health Report.

## Chapter 4 : Soil Testing For the Farmer | Mississippi State University Extension Service

*Field and laboratory evaluation of these different indictors can aid in fine tuning management practices to optimize soil biological, physical, and chemical functions. Figure 1. Soil health indicators and systems inputs.*

What are we reading? How to create local, sustainable and secure food systems. A community resilience guide. White River Junction, VT: The nature and properties of soils, 14th Edition. Managing cover crop profitably, 3rd. Agricultural management practices and soil quality: Measuring, assessing, and comparing laboratory and field test kit indicators of soil quality attributes. Beneficial Uses of Cover Crops. The ecology of sustainable foods systems. An educational program for farm startup and development. Virginia Beginning Farmer and Rancher Coalition. In Press Howard, A. The soil and health: A study of organic agriculture. Schocken Books Karlen, D. The concept, its role and strategies for monitoring. Soil Ecology and Ecosystem Services. Societal value of soil carbon. Journal of Soil and Water Conservation. Building soils for better crops, 3rd Edition. Mineral nutrition of higher plants. Soil and Water Conservation Society. Principles and applications of soil microbiology, 2nd Edition. Farms with a future: Creating and growing a sustainable farm business.

## Chapter 5 : Soil Health Benefits for Sustaining Crop Production | Integrated Crop Management

*The Cornell Soil Health Testing Laboratory is the home of the Comprehensive Assessment of Soil Health (CASH): The Comprehensive Assessment of Soil Health is designed for farmers, gardeners, agricultural service providers, landscape managers and researchers who want to go beyond simply testing the nutrient levels of their soils.*

Bhadha, Jay Capasso, Robert S. Schindelbeck, and Allan R. Not to mention the obvious benefits of the food grows out of soil. This article is intended for growers who wish to improve the quality of their soil, from large-scale commercial farmers to individual home growers, by identifying and managing some common soil constraints. This paper focuses on i common constraints of soil health and related soil management solutions and ii soil health tests relevant to the soils of Florida. What is soil health? Soil health is a term synonymous with soil quality. It refers to the chemical, biological, and physical characteristics of a soil. It is often said that a handful of productive soil contains more living organisms than people living on earth. Managing soil health involves maintaining a habitat for these living organisms, which include bacteria, algae, fungi, earthworms, beetles, mites, nematodes, and plants. When these soil organisms die and decay, organic matter is created, which is primarily made up of carbon compounds. Organic matter is a key component of soil health because it fuels the diverse biological functions of soil organisms, which obtain their energy and nutrients by breaking down plant residues Follett et al. Biologically diverse food webs can reduce pest damage to crops by maintaining populations of beneficial insects and microorganisms that can feed upon pest species or out-compete them for resources. Organic matter improves soil structure, which reduces compaction, and minimizes erosion by enhancing macropore stability and water infiltration into the soil. Enhanced soil structure also improves the ability of agricultural fields to withstand conditions of drought or extreme rainfall. Such hydrology considerations are particularly relevant to the health of Florida soils because potential drainage issues and surface runoff are widespread Figure 1. The mineralization of organic matter helps supply crops with essential nutrients, including nitrogen, phosphorus, sulfur, and most of the micronutrients. Therefore, agronomic practices should consider these various biological, physical, and chemical characteristics of soil health and the integrated role soil organic matter plays in supporting agricultural systems. Distribution of soil drainage classes left and hydrologic groups right in Florida Soil Survey Geographic Database. Profile images of a well drained left and relatively less well drained right soil in Marion Co. Some qualitative assessments that can be conducted in the field include assessing the color and smell of the soil, the root length, and the nodulation of legumes; examining for the presence of earthworms; and visually examining a growing crop for disease and nutrient deficiencies. The most basic diagnostic is to poke the soil with your finger. If the soil is hard or crusty and difficult to push your finger through, then you may be dealing with a poor soil or a poorly managed soil. However, if the soil breaks apart easily with your fingers and opens up, this indicates that the soil has sufficient pore spaces for the plant roots to grow through. The smell of the soil may also be an indicator of soil health. The color of a soil can also be indicative of its condition. Soils that are poorly drained will appear grayish instead of brown, black, or red. Obtaining further information on soil properties can require the use of specialized equipment from a laboratory or a field-testing kit Liebig et al. Soil laboratories have recently begun to offer quantitative testing of essential soil processes. Common Constraints of Soil Health Modern agricultural practices can contribute to soil degradation. Practices such as the failure to return organic residues to the soil, intensive tillage, overgrazing, limited crop rotation, and excessive application of fertilizers and pesticides can deplete soil organic matter and cause the buildup of pests, pathogens, heavy metals, or salinity over time. Some of these practices may need to be implemented regularly for various purposes on the farm, but farmers should consider managing for their effect on soil health. Other soil constraints may occur naturally depending on soil type. For example, Spodosols are naturally acidic and may require lime, while shallow Histosols in south Florida tend to be alkaline due to the presence of calcium carbonate bedrock. Soil texture also influences the ability of a soil to store organic matter.

Sandy soils contain less organic matter than soils containing fine textured silts and clays because sands have larger pore sizes that can store more oxygen, which increases the decomposition rate of organic matter. Strong chemical bonds between clay and silt particles and organic matter can also slow down decomposition rates Herrick et al. Discussed below are some of the common soil constraints found in Florida and appropriate soil management solutions that can help improve soil quality. Soil Compaction and Poor Aggregation: Soil compaction and aggregation affect root growth, erosion, and the water storage capacity. Applying organic amendments and limiting tillage can mitigate compaction and poor aggregation. Transitioning to limited or no till will help to retain organic matter and alleviate compaction and poor aggregation in the long term, but will not immediately solve compaction issues. Weed, Pathogen, and Pest Pressure: Weeds, pathogens, and pest pressure significantly reduce crop yields throughout the world and are major management considerations for farmers. Integrated pest management approaches should be considered for dealing with these constraints. Healthy populations of beneficial organisms, cover crops, and crop rotation are important soil management practices that can limit these pressures while building soil health. Crops require a sufficient supply of nutrients for optimal growth and yield, but excess nutrients can damage crops and pollute waterways. Farmers also waste money when they apply more than the optimal amount of fertilizer to their crop. Soil tests and fertilizer recommendations from testing labs are essential to applying the ideal fertilizer rate to crops. Soil depth is important in the area that soil roots penetrate in search of nutrients and water. Insufficient soil depth can stunt root growth and leave fields at higher risk of flooding during extreme rainfall events. Soil subsidence and plow layers may reduce soil depth in the root zone in Florida. Deep tillage equipment can lower plow layers, while adding organic amendments and keeping fields flooded can reduce soil subsidence. In Florida, salinity is prevalent in coastal areas or may occur due to excessive application of fertilizers and the use of poor quality irrigation water. Salinity can be treated by applying excessive amounts of water to flush salts out of the root zone. Artificial drainage and salt tolerant plants can also help to remove salts from the soil profile. Heavy metal contamination can affect soils. Heavy metals can be managed to become less soluble and so less likely to be absorbed by plants by increasing pH to 6. Measuring and Managing for Soil Health Not all soil tests are equally relevant to any given site. For example, earthworms are not present in all healthy soils but they are generally a good indicator of soil quality in agricultural systems. Tests that can be conducted in the field with the use of a field kit include active carbon, earthworms, surface hardness, subsurface hardness, some nutrients tests, pH, and electrical conductivity. Penetrometers are important tools for measuring surface hardness and subsurface hardness in the field. Pocket spectrophotometers are available for measuring active carbon, and field conductivity meters are available for measuring electrical conductivity. Indicator strips can be used to measure both soil-pH and soil-nitrate, an important form of plant-available nitrogen. Other tests are best conducted in the laboratory where specialized equipment can be used and results are less likely to be influenced by user bias. Some of the common tests used to evaluate soil health are physical tests, chemical tests, and biological tests. Traditional soil tests have tended to focus more heavily on chemical indicators than biological and physical indicators of soil quality due to their role in supporting crop nutrition. We recommend that soil health assessments be used to supplement these tests, since the physical and biological functions of soil influence nutrient availability. No matter how soils are assessed they should be tested at similar times each year using the same methods or laboratory in order to accurately measure changes in the soil over time. Physical Tests Available Water Capacity: Uses pressure chambers to find the difference between how much water samples store at field capacity and wilting point. It can be measured by placing a sample of soil on a sieve and simulating a standardized rainfall event. The soil that remains on the sieve determines the percent aggregate stability. This is generally included in a standard soil testing lab. Can be measured using a pH meter or indicator strips that use dyes that change color. It is determined using an electrical conductivity meter. They are determined by digesting soil with concentrated acid at high temperature. Is a measure of the number of earthworms in a square foot by 12 inch deep hole. Earthworms activity in the soil assists with cycling organic matter and improves infiltration and aggregation. It is determined by wetting air dried soil, and capturing and quantifying CO2 produced. It is measured by quantifying potassium permanganate oxidation using a spectrophotometer. Presence of earthworms in organic soils. The use of cover crops, crop rotation, organic amendments, and limited tillage are important practices to consider for increasing soil organic matter content notably by adding organic materials with qualities affecting soil characteristics differently from the crop debris and crop roots. Over time these practices will help eliminate many soil constraints that often stem from the depletion of soil organic matter. Healthy soils will be more resilient to extreme weather events, support diverse populations of soil organisms, and save farmers money on inputs, such as fertilizer, while maintaining or increasing yields. This sustainable use of the soil will also allow farmers to leave behind fertile farmland to support and feed the next generation. Soil Science Society of America. A Hedge against Drought: Original publication date March  Visit the EDIS website at http: The Institute of Food and Agricultural Sciences IFAS is an Equal Opportunity Institution authorized to provide research, educational information and other services only to individuals and institutions that function with non-discrimination with respect to race, creed, color, religion, age, disability, sex, sexual orientation, marital status, national origin, political opinions or affiliations.

## Chapter 6 : North American Project to Evaluate Soil Health Measurements â€“ Soil Health Institute

*Monitor your soil health with your own tests on soil biology, chemistry and physics. More informed decisions Make more informed management decisions as you start to fully understand how things are evolving above and below ground on your farm.*

The Haney Test is designed to work with any soil under any management scenario because the program asks simple, universally applicable questions. Is your soil in balance? What can you do to help your soil? Each soil sample received in the lab is dried at 50o C, ground to pass a 2 mm sieve and weighed into two 50 ml Erlenmeyer flasks 4 g each and one 50 ml plastic beaker 40 g that is perforated to allow water infiltration. The 40 g soil sample is analyzed with a 24 hour incubation test at 24oC. This sample is wetted through capillary action by adding 20 ml of DI water to an 8 oz. The two 4 g samples are extracted with 40 ml of DI water and 40 ml of H3A, respectively. The samples are shaken for 10 minutes, centrifuged for 5 minutes, and filtered through Whatman 2V filter paper. The water extract is also analyzed on a Teledyne-Tekmar Torch C: N analyzer for water-extractable organic C and total N. These organic acids are then broken down by soil microbes since they are an excellent carbon source, which returns the soil pH to its natural, ambient level. For example, if the soil respiration number is 80 ppm CO2 and the organic C: N ratio decreases we credit more release from the organic N and P pools based on CO2 and the lower C: For soil with high CO2, low C: N and a high soil health score, we add an additional calculation from the organic N pool, however, we do not credit more N release than we can measure from the organic N and organic P pools. This number is the total N from the water extract from your soil in ppm. It contains both inorganic N and organic N sources from your soil. NO3-N is the form of N that is easily lost from soil through surface runoff, subsurface leaching, erosion, and in water logged conditions it can revert back to a gas. The majority of inorganic soil N is in the NO3-N form. Organic N is the total water extractable N minus the total water extractable inorganic N in ppm. This form of N should be easily broken down by soil microbes and released to the growing plant providing minimal chance of loss since the N is bound in large organic molecules. This pool represents the amount of potentially mineralizable N in your soil. This lists the same type of results as nitrogen but for inorganic P and organic P. Soil Respiration 1-day CO2-C: This result is one of the most important numbers in this soil test procedure. This number in ppm is the amount of CO2-C released in 24 hours from soil microbes after your soil has been dried and rewetted as occurs naturally in the field. This is a measure of the microbial biomass in the soil and is related to soil fertility and the potential for microbial activity. In most cases, the higher the number, the more fertile the soil. Microbes exist in soil in great abundance. They are highly adaptable to their environment and their composition, adaptability, and structure are a result of the environment they inhabit. They have adapted to the temperature, moisture levels, soil structure, crop and management inputs, as well as soil nutrient content. In short, they are a product of their environment. Since soil microbes are highly adaptive and are driven by their need to reproduce and by their need for acquiring C, N, and P in a ratio of  P , it is safe to assume that soil microbes are a dependable indicator of soil health. It is clear that carbon is the driver of the soil nutrient-microbial recycling system. This consistent need sets the stage for a standardized, universal measurement of soil microbial biomass through their respiration activity. Since most soil microbes take in oxygen and release CO2, we can couple this mechanism to their activity. This number in ppm is the amount of organic C extracted from your soil with water. When we analyze the water extract from the same soil, that number typically ranges from ppm C. The water extractable organic C reflects the quality of the C in your soil and is highly related to the microbial activity. This N pool is highly related to the water extractable organic C pool and will be easily broken down by soil microbes and released to the soil in inorganic N forms that are readily plant available. This number is the ratio of organic C from the water extract to the amount of organic N in the water extract. N ratio is a critical component of the nutrient cycle. Soil organic C and soil organic N are highly related to each other as well as the water extractable organic C and organic N pools. Therefore, we use the organic C: N ratio of the water extract since this is the ratio the soil microbes have readily available to them and is a more sensitive indicator than the soil C: N ratio above  As the ratio decreases, more N and P are released to the soil solution which can be taken up by growing plants. We apply this same mechanism to the water extract, as the C: N falls; we credit more N and P mineralization on a sliding scale. We like to see this number between 8: It represents the overall health of your soil system. The calculation looks at the balance of soil C and N and their relationship to microbial activity. This soil health calculation number can vary from 0 to more than  We like to see this number above 7 and increase over time. This number indicates your current soil health and what it needs to reach its highest sustainable state. Keeping track of this soil health number will allow you to gauge the effects of your management practices over the years. This is a suggested cover crop planting mix based on your soil test data. This is a recommendation of what you can do to increase your soil health number, but it is not what you have to do. It is designed to provide your soil with a multi-species cover crop to help you improve soil health and thus improve the fertility of your soil. Nutrient value per acre: Current fertilizer prices are multiplied by the nutrients present in your soil. This is the value in dollars of nutrients currently in your soil. NO3-N Only traditional evaluation lbs per acre: This value represents the amount of N in your soil when testing for only nitrate, similar to common soil tests. Haney Test N Evaluation lbs per acre: This is the amount of available nitrogen measured using the Haney Test and is the same as the available N value on the report. Nitrogen Difference lbs per acre: This number represents the difference in the amount of nitrogen we found using the Haney Test compared to the NO3-N only approach. Nitrogen savings per acre: This value represents the amount of nitrogen saved in dollars per acre when using the Haney Test compared to traditional testing measuring only NO3-N. This table provides recommended values for various plant essential nutrients in lbs per acre that your soil needs to produce your stated yield goal for a specific crop. You must provide a crop and yield goal for each sample in order to get recs. Any questions regarding soil health testing may be directed to Lance Gunderson at Lgunderson wardlab.

## Chapter 7 : Comprehensive Assessment of Soil Health

*Farmers and growers are concerned about the current health of their soils (compared to 30 or 40 years ago), and some of these concerns are supported by soil analysis data collected over the same period Most farmers.*

Healthy soils increase the capacity of crops to withstand weather variability, including short term extreme precipitation events and intra-seasonal drought. The extreme drought in resulted in variable yield reduction to corn and soybean production in Iowa with the worst impact on fields with conventional tillage systems i. Increasingly highly variable weather conditions present increased risks to crops and require more careful attention to conservation planning to mitigate impacts on soil health and crop productivity. Furthermore, healthy soils maintain or enhance water and air quality through the improvement of soil C storage and water infiltration, and support human health and wildlife habitat. What influences soil health? Soil management practices, cropping systems, and weather conditions influence soil health. Therefore, a healthy soil that is well managed can increase soil water infiltration and storage, storage and supply of nutrients to plants, microbial diversity, and soil carbon storage. Soil organic matter SOM is a central soil property that is heavily affected by management practices, which in turn influences soil physical, biological, and chemical functions. The relationships between soil organic matter and management inputs such as tillage and cropping systems can be documented through the evaluation of soil health indicators Fig. Those indicators reflect the level of response of the soil system to different management inputs. Field and laboratory evaluation of these different indictors can aid in fine tuning management practices to optimize soil biological, physical, and chemical functions. Soil health indicators and systems inputs. The central soil property that influences soil functions is organic matter. The key services for production agriculture are: However, these functions are sequentially influenced by each other starting with organic matter as the building block for the well linked functions. Tillage effects on soil health The increased use of intensive tillage and other management practices in row crop production systems can increase soil erosion, reduce soil health and water quality, and the capacity to achieve sustainable agricultural production systems. Soil erosion is always associated with tillage intensity, especially during the spring season when soils are most vulnerable to water erosion due to lack of vegetation or residue cover to protect the soil surface from high rain intensity. Many factors contribute to this problem, but tillage is the prime contributing factor. Soils under modern production agriculture have lost significant amount of their carbon pool because of erosion, decomposition, and leaching. This loss in soil organic matter by cultivation is in part caused by the oxidation of organic matter and $CO_2$ release in addition to losses through surface runoff and soil erosion. Conservation practices improve soil health Soil management and conservation practices that protect soil health are not only economically and environmentally necessary, but the right approach to sustain and increase soil resiliency. This can be achieved by adopting conservation plans that are practical, site specific and an integral component of the overall agriculture production system to achieve intended objectives. These conservation plans would include no-tillage and reduced tillage i. In addition, many soil conservation plans include practices such as cover crops, the construction of grass waterways, terraces, buffer strips, and pasture erosion control systems with manure application and soil testing. Summary The benefits of healthy soils in sustaining crop production are most evident when growing conditions are less than ideal. Healthy soils increase the capacity of crops to withstand weather variability and short term extreme precipitation events and intra-seasonal drought. Soil health functionality is highly influenced by soil organic matter, a central soil property that influences soil physical, biological, and chemical functions. The interrelationships between soil organic matter and management inputs such as tillage and cropping systems can be documented through the evaluation of soil health indicators of biological, physical, and chemical properties. Best management practices that build soil health and sustain productivity are many and can lead to better ecosystem and societal services. The implementation of such practices should be considered on regional and site specific basis. Site specific adoption of different tillage and conservation practices integrated within the overall production system can effectively increase crop productivity and soil ecosystem services. These conservation practices include, but are not limited to, no-tillage, strip-tillage, cover crops, perennials, grass waterways, terraces, buffer strips, and other measures for erosion control. A systems approach to conservation management of row cropping systems is important to enhance soil health and improve water quality. As an effective solution to building soil health and improving water quality, conservation practices should be an integral and essential component of nutrient reduction loss, sediment and nutrient loading plans. Corn grown in No-till system. Links to this article are strongly encouraged, and this article may be republished without further permission if published as written and if credit is given to the author, Integrated Crop Management News, and Iowa State University Extension and Outreach. If this article is to be used in any other manner, permission from the author is required. This article was originally published on April 13,  The information contained within may not be the most current and accurate depending on when it is accessed.

## Chapter 8 : SL/SS Tools for Evaluating Soil Health

*The Soil Quality Test Kit Guide describes procedures for 12 on-farm tests, an interpretive section for each test, data recording sheets, and a section on how to build your own kit. The NRCS does not build or sell soil quality test kits. Test kits can be purchased from Gempler's or Murray FFA in.*

## Chapter 9 : Alabama Soil Health Index

*The Soil Health Institute announces methods for evaluating soil health indicators at a continental scale The concept of soil health is gaining widespread attention because it promotes agricultural practices that are not only good for the farmer and rancher, but also good for the environment.*