Soil Health Initiative

Background:
Soil history shows that many civilizations have collapsed from unsustainable land use. The impact of soil disturbance has been very much underestimated. Soil modification has been taking place indirectly through changes in the vegetative cover, with the forest clearance, natural cycle processes have been interrupted. The United Nations estimates that 2.5 billion acres have suffered erosion since 1945 and that 38% of global cropland has become seriously degraded.

Here in east central Alberta, some of the soils have been farmed for over 115 years. Organic matter levels have deteriorated from production and harvesting of crops as well as natural wind and water erosion events. While soil health is becoming more of a priority among producers, there is considerable *'ground'* to make up. With this in mind, it is time that we start giving the land more attention.

On December 5, 2014 the 68th UN General Assembly declared 2015 the International Year of Soils (IYS) (A/RES/68/232). The Food and Agriculture Organization of the United Nations has been nominated to implement the IYS 2015, within the framework of the Global Soil Partnership and in collaboration with Governments and the secretariat of the United Nations Convention to Combat Desertification.

The IYS 2015 aims to increase awareness and understanding of the importance of soil for food security and essential ecosystem functions.

The specific objectives of the IYS 2015 are to:

- Raise full awareness among civil society and decision makers about the profound importance of soil for human life;
- Educate the public about the crucial role soil plays in food security, climate change adaptation and mitigation, essential ecosystem services, poverty alleviation and sustainable development;
- Support effective policies and actions for the sustainable management and protection of soil resources;
- Promote investment in sustainable soil management activities to develop and maintain healthy soils for different land users and population groups;
- Strengthen initiatives in connection with the SDG process (Sustainable Development Goals) and Post-2015 agenda;
- Advocate for rapid capacity enhancement for soil information collection and monitoring at all levels (global, regional and national).

What is a healthy soil?
Soil health has been defined as:
"The continual capacity of soil to function as a vital living system, within ecosystem and land-use boundaries, to sustain biological productivity, promote the *quality of air and water environments and maintain plant, animal and human health" (Pankhurst* et al., 1997).

A more recent definition by FAO members (2008) is a more broad explanation of soil health:

"*Soil health is the capacity of soil to function as a living system, with ecosystem and land use boundaries, to sustain plant and animal productivity, maintain or enhance water and air quality, and promote plant and animal health. Healthy soils maintain a diverse community of soil organisms that help to control plant disease, insect and weed pests, form beneficial symbiotic associations with plant roots; recycle essential plant nutrients; improve soil structure with positive repercussions for soil water and nutrient holding capacity, and ultimately improve crop production. A healthy soil does not pollute its environment and does contribute to mitigating climate change by maintaining or increasing its carbon content.*"

What are the benefits of a healthy soil?
Healthy soils have many benefits. One of the most important benefits is that healthy soil holds more water (by binding it to organic matter (OM)), improves water use efficiency, and loses less water to runoff and evaporation. As OM increases, it will holds up to 20 times its weight in water.

What are the basic soil health principles to build soil health?
Five principles have been reported to be the most important components to accomplish healthy soils:

1. Minimize mechanical soil disturbance
2. Keeping the soils covered at all times (armor the soil)
3. Growing a living root year around
4. Increase plant diversity above ground to increase diversity below
5. Incorporate livestock grazing

1. **Minimize mechanical soil disturbance**
   Physical soil disturbance such as tillage and overgrazing can result in significant disturbance of the soil physical, chemical and biological properties. Soil microbial activities are disrupted and limit their capacity to promote crop development.

2. **Keeping the soils covered at all times (armor the soil)**
   Bare soil increases soil temperature. It can decrease and kill soil biological activities. Vegetation, plant residue and organic mulch protect the soil surface and feed billions of micro-organisms which recycle nutrient and combat pest infestation to plant roots. Those micro-organisms also create soil pores where more roots can find air, nutrients and water.

3. **Growing a living root all year**
   Living roots will provide a food source for soil microbes (beneficial bacteria and micorrhizal fungi). They also contribute to the formation of soil aggregates.

4. **Increase plant diversity above ground to increase diversity below**
   Increasing plant diversity is connected with soil root diversity. Studies have shown that specific soil microbes require specific plant types. Soils are more productive

when there are more diverse microbial activities in the soil. Plant diversity through rotation and cocktail cover crops will support balanced and diverse soil populations that might reduce weed and pest infestations

5. **Incorporate livestock grazing**
   Land responds positively to the presence of livestock, provided management is appropriate. Farmers have found that using rotational grazing is the fastest and most economical way of improving the soil health. Microbial population also increase and stimulate nitrogen fixing bacteria activities. Addition of manure and urine to the soils recycles nutrients. It is important that the grazing system will allow adequate rest for the plants between periods of grazing.

One of the primary goals to improve soil health is to increase more organic matter in the soil for feeding the microbes. These microbes will help to improve soil organic matter which captures and holds more water and nutrients, growing more and larger plants that can gather more sunlight to power the process. This constant recycling is dependent on management of the land. Following these five principles will allow the site production to increase its productivity.

CARA Promotes Soil Health

CARA promoted the International Year of Soil and soil health in general during 2015 in several ways.

- Dianne Westerlund and Dr. Yamily Zavala are members of ARECA's Soil Health Team that led a provincial soil health initiative which included development of a website highlighting relevant soil information, coordination of several soil focused extension events, showcased progressive producers across the province (Soil Health Producer Highlights Series, see the end of Soil Health section) and finished the year with an impressive Western Canada Soil Health Conference in Edmonton.
- Dr. Yamily Zavala wrote articles for the Soil Health Initiative (see the end of Soil Health section).
- Dr. Yamily Zavala presented an interactive soil health presentation to 7 local schools and three schools in the Peace region during March and April.
- Dr. Yamily Zavala presented the basics of soil health to producers in Manning, Hawk Hills, Grimshaw, High Prairie and Sexsmith during a trip to the Peace region.
- CARA hosted a soil carbon field day and established a site for monitoring soil carbon change with Peter Donovan of the Carbon Challenge.
- CARA held a Soil Health and Crop Field Day featuring a presentation by Dr. Christine Jones and a demonstration by Soil Ecologist of Australia and Dr. Yamily Zavala.
- CARA established and monitored demonstrations of humalite and cocktail cover crops (see Conservation section).
- Dr. Yamily Zavala consulted one-on-one with several producers regarding interpretation and understanding of their soil test results and options for improving soil health in their operations.
- CARA is in the process of developing a basic soil health monitoring lab to assist local producers with evaluating the effect of various management practices on soil health (see following page for more information).

CARA's Soil Health Laboratory (CARA-SHealth) Initiative

CARA is starting a new adventure which is going to allow us to understand what is affecting the soils of central eastern Alberta. The main goal of CARA's Soil Health Lab is to allow producers to have access to biological and physical assessments to build the bridge for improving their soil health base on localized and side specific constraints.

Main reasons for CARA's SHealth initiative:

- Understand the real status of the soil constraints beyond nutrient limitation and excesses
- Create awareness on soil biological driving forces to improve physical and chemical soil properties
- Create bridges between producer practices and improving soil health
- Identify and evaluate soil management strategies to target soil site specific constraints
- Measure, monitor, suggest and calibrate management strategies to improve soil health in producer fields.

CARA-SHealth initiative will need to:

- Determine soil health Indicators.
  - Build on soil health indicators data base
- Create soil health producer partnerships
- Target management practices to address soil constraints
  - Evaluate management practices to quantify improvement and/or modify those in needs
  - Compare soil health management practices for field specific farmer partnerships
- Provide quality data for applied research activities

CARA-SHealth indicators to be measured:

- Physical Indicators
  - Aggregation stability
  - Surface and subsurface compactions
  - Texture
- Biological Indicators
  - SOM
  - Active carbon
  - Potentially mineralized nitrogen
  - Soil microbial respiration
  - C:N Ratio

CARA-SHealth Farmer-Led Partnership:

- Collect and share information (farmers to farmers)
  - Soil health demonstration farms
- Testing new methods to mitigate drought, erosion, compaction and nutrient efficiency uptake.
- Evaluating the economics involved on soil health and beyond

. . . .More to be discussed with farmers . . . .

Soil Health Applied Research Alliance
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ARECA Soil Health Initiative

This article is part of a series to promote better understanding of our agricultural soil resources along with practices that can influence soil health.

August 2015

Understanding Soil Health: WHAT SHOULD WE KNOW ABOUT IT

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The terms "soil quality" and "soil health" are often used synonymously. Although they are used interchangeably, it is important to distinguish the differences between them. Soil quality has been defined as *"the capacity of a soil to function, within natural or managed ecosystem boundaries, to sustain plant and animal productivity, maintain or enhance water and air quality, and support human health and habitation."* Soil health is defined as "*the continued capacity of soil to function as a vital living system, within ecosystem and land-use boundaries, to sustain biological productivity, promote the quality of air and water environments, and maintain plant, animal, and human health*". Soil health recognizes soil resilience ("the continued capacity of") and the biological properties ("as a vital living system"). They reflect the importance of the soil being able to continue to function over time by self-regulation, stability and by maintaining its biological integrity. Soil quality is related to the soil's inert capacity to function. It is mainly used to evaluate a soil's physical and chemical properties related to soil formation factors in support of plant growth. Soil health better addresses more the interactions among those properties with emphasis on the biological. These interactions are indivisible, interdependent interactions within the soil ecosystem. When one of these properties is off balance (by human intervention for example), it will adversely impact the rest, reducing the potential contribution to ecosystem service for food production.

For the purpose of understanding soil health, basic information on composition and properties of soil as well as their intrinsic interactions in creating a healthy soil environment needs to be discussed.

Soils differ widely and they are formed by many processes. They have developed over thousands of years and are also highly influenced by environmental conditions, parent material, interactions among microorganisms and plants, management, as well as the topography where they were formed. Ideal distribution of soil components have been reported to be 50% pore space (air & water) and 50% solid material (mineral particles & organic matter). Soils have physical, chemical and biological properties. Interactions among these properties play an important role on soil health stability, having consequences for the ecosystem sustainability. Figure 1 shows the main soil property interactions with their most reliable soil health indicators.

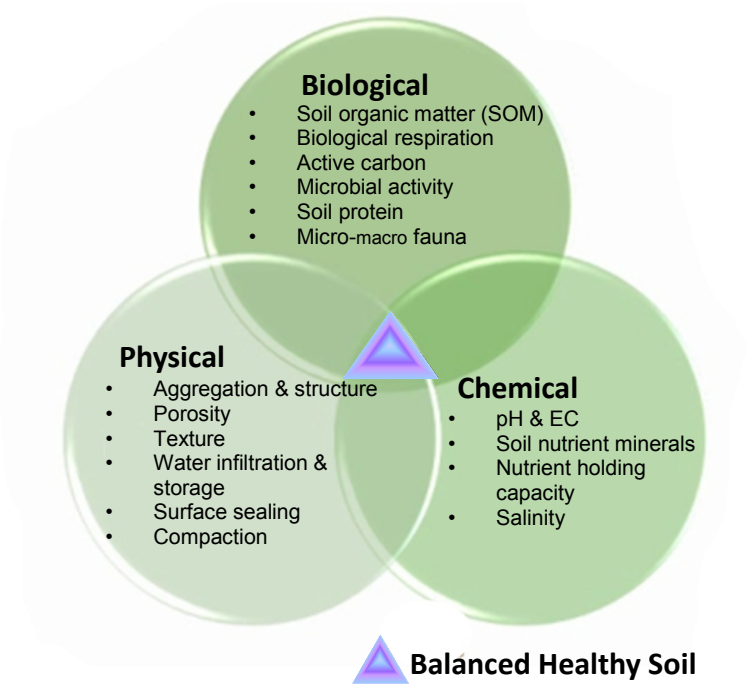

Figure 1. Properties and Indicators of Soil Health

Soil physical properties relate to the composition and proportion of the soil components, described as the texture (silt, clay and sand), structure (patterns of large aggregates) and porosity (pore space). These aspects will influence soil water infiltration, storage and air movement, all of which are important for soil health.

Figure 2 shows different soil structures with their respective water infiltration movements (cited by Colorado State University-Extension). Management practices can negatively impact soil structure.

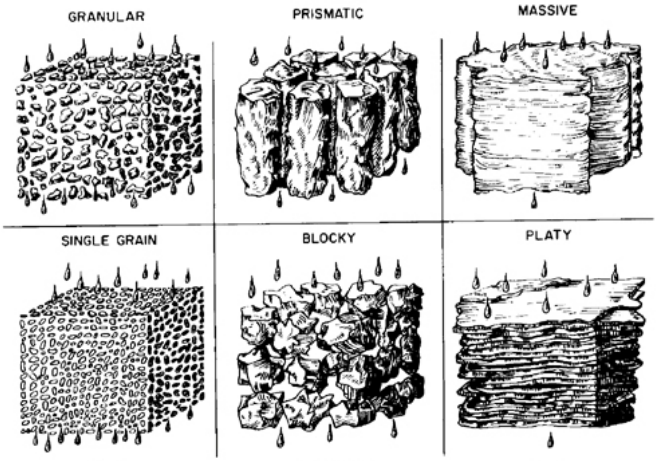

Figure 2. Soil water infiltration movement affected by soil structure

Soil porosity refers to the amount of pores or open spaces between/within the soil aggregate. Aggregates are very important for soil stability against water and wind erosions, and maintaining soil porosity for water along with oxygen supply for roots and

microbial communities. Aggregation can occur in different patterns, influenced by chemical and biological soil properties along with the cropping system, resulting in different soil structures.

Knowing the type of soil structure can tell us something about soil health. For example, soils with a platy structure indicate a compaction and poor soil aggregate stability issue. Picture 1 shows a platy soil structure and water infiltration pattern (Figure 3). Here, water infiltration rate will be reduced and surface run off may increase, contributing to water erosion risks. There will be less pore space for water storage and air exchange due to aggregate destruction, diminishing growth and interactions of plant roots and microbial communities. Also, nutrients uptake will be impaired and microbial community diversity will also be reduced over time, compromising soil health.

Picture 1. Platy structure and **Figure 3**. soil water infiltration movement pattern

Biological interactions maintain soil life and they are considered the most important soil activities. Many different types of organisms are involved: plants (flora), animals (microfauna, mesofauna and macrofauna) and microorganisms (bacteria and fungi). Most of these organisms are so small that they are only visible using specialized microscope (Picture 2).

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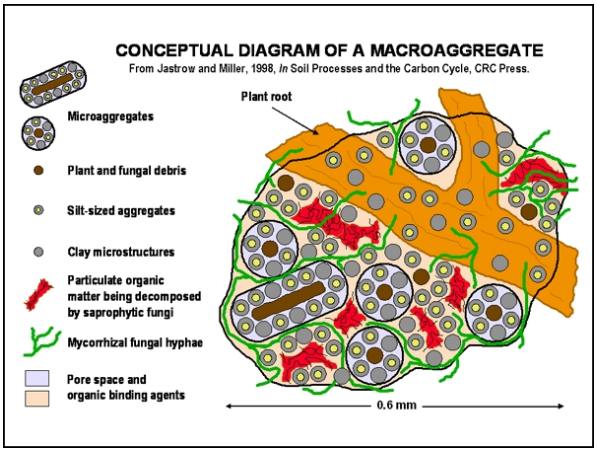
Picture 2. Soil acari's diversity

The role of soil organisms is to keep the soil healthy by improving and maintaining soil aggregation. Plants provide food for microbial communities by root exudates and soil organic matter (SOM) from shoot and root residue. Root decay creates an avenue for water and air movement through the soil profile. The rhizosphere, the soil zone surrounding plants roots, contains the most biological active area of the soil (Picture 3). Figure 4 shows where lots of the aggregates start forming; it contains secreted chemicals (sugar, organic acids), soil particles and fungal hyphae, among other organic materials.



Picture 3 and Figure 4. Soil rhizosphere and aggregate formation

Why are aggregates important?

They are important because soil pores exist between and within aggregates. They are occupied by water and air providing a favorable habitat for soil organisms and plant roots to grow into them. Aggregates are the site where many important biological soil interactions takes place, which in turn contribute to aggregate stability to help prevent run off, erosion, surface crusting and to improve overall soil health. Well-aggregated soils are best suited for supplying crops with oxygen, water and nutrients. They have enough macropores to provide drainage and aeration during wet periods, but also have adequate amounts of micropores to store water for crops and organisms during drought conditions.

Importance of soil biological activities

A few of the main biological activities are:
1) Soil organisms decompose plant residuals, soil organic matter (SOM). They use the carbon and mineral nutrients present in the SOM for their growth. They then release those minerals into the soil when they die.
2) Some microorganisms fix nitrogen (bacteria, rhizobia) from the atmosphere through a symbiotic relationship with legume plant roots. Rhizobium makes nitrogen (N) available to the roots in exchange for carbon (sugar) from the legume. Other microorganisms such as the arbuscular mycorrhizal (AM) fungi are able to increase phosphorus (P)

availability to the majority of plants but not Brassica species (for example, canola). The hyphae of AM fungi extend from plant roots into soil and have access to P, water and other minerals making them available for the plant.
3) Most of the bacteria and fungi in the soil produce compounds during the breakdown of plant residues. These compounds physically and chemically bind soil particles into micro-aggregates. They will form, maintain and stabilize aggregates, improving soil structure.
4) Some microorganisms can produce enzymes that will break down or help in the degradation of agricultural pesticides or other toxic substances added to the soil,
5) Soils with a high diversity of organisms have the ability to help control plant pathogens through predator and prey relationships with every organism either eating or being eaten by another organism. This is thought to be an important mechanism to reduce soil borne diseases in healthy soils.

Summary

Having a better knowledge of soil components, properties and their interactions is the basis for understanding soil health. Soil health indicators can be assessed separately as chemical, physical and biological properties, but what it is important to know is their interactions. They are the driving force to create and sustain healthy soils. In a healthy soil, all the soil properties are interacting without being detrimental to each other. Healthy soils have good tilth, adequate root depth, enough nutrients, good water storage and drainage, low soil borne disease pressure and quick recovery from adverse climatic events (resilience).

Basic principles reported to build soil health in a cropping system are: minimize soil disturbance, keep soil covered all the time, maintain a living root system for as long as possible during the year, use plant diversity to increase soil biological diversity and integrate livestock into the cropping system. Increasing plant diversity above ground will result in greater biological diversity below ground. This biological diversity will help to improve SOM turn over, soil aggregation, water use efficiency and nutrient release, among others. Soil health will improve the plants ability to gather more sunlight to continue powering vital soil interactions that are highly influenced and dependent on good land management. Following the above principles will allow the ecosystem to increase its productivity by improving and sustaining the soil health.

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ARECA Soil Health Initiative

This article is part of a series to promote better understanding of our agricultural soil resources along with practices that can influence soil health.

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Soil Health Assessment: An introduction to farmers

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The more you know about your soil, the better you can care for it. Standard soil tests have primarily focused on the soil chemical composition. Recommendations generated from these analyses have been for applying soil amendments (fertilizers, gypsum, lime, etc.) for increasing crop yields, but not for improving intrinsic soil conditions. The biological and physical conditions of the soil are often overlooked. Soil is a living biological ecosystem (habitat for microbes) and the impacts of some soil management activities negatively affect its physical and chemical conditions. Soil biological functions are related to nutrient cycling, soil aggregation and soil water fate, among other soil properties.

Soil health assessments (SHA) provide us with information about soil constraints beyond nutrient deficiency or excess. They measure soil degradation or improvement from targeted management practices. SHA will create awareness as farmers get answers to several important questions: What is their soil condition? Are the soil properties functioning properly? What can be done for improvement? These questions not only take into consideration the most important soil health “indicator” constraints, but also their interactions for understanding the actual soil conditions. SHA does not only give soil amendment recommendations, it also allows farmers to select the best available soil management practices to significantly boost productivity and quality of their cropping systems while improving their soil health. As a consequence, their farmlands will then be monitored for farming system risks and their farms will be more valuable.

Soil management practice contributions to improve soil health were learned in the ‘30s through the ‘60s but were then forgotten with the use of soil chemical amendments. SHA is a relative new approach when compared with the standard soil analytical evaluations. Indicators measured by soil health protocols should be those soil properties which are representative of key soil processes necessary for the proper functioning of the soil. They should provide information about the status of a specific important soil process that can be managed to improve crop quality and yields, reduce risk to the environment as well as to secure agroecosystem long term sustainability.

Soil Health Assessments and Tests

Many Laboratories are now moving beyond standard soil nutrient testing. Recently, there have been several different soil health assessments and tests developed. Many have not been standardized but have still shown improvement of the soil health in many farmlands. The most well-known soil health approaches are: soil respiration tests (such as the Solvita Test), the Cornell Soil Health Assessment and the Haney Test. They report information that has been used to suggest and/or recommend soil health managements to improve soil overall condition.

Soil Respiration

Soil respiration is considered an indicator of soil health and is measured as carbon dioxide (CO2) emissions from the soil. It is directly correlated to soil biological activities: microbial biomass, carbon sequestration and nitrogen (N) mineralization rates. As soil organic matter (SOM) residues are incorporated into the soil, microbial activity will increase. Microbes then break down SOM, building up humus and emission of CO2. On the contrary, when the incorporation of organic residue declines in the soil, microbes will starve for food and respiration declines, SOM turnover decreases and the soil's ability to sustain humus content is inhibited. Declining CO2 respiration rates are also associated with soil compaction as well as intensive tillage, which compromise soil humus accumulation. The overall soil health might be improved or jeopardized depending on microbial activity. The relationship between these processes is an important indicator of soil health.

The Solvita® Test, (Solvita is Latin for "soil life"), was developed for measuring soil's natural biological functioning as soil respiration (CO2). It is reported that with this test, CO2 respiration can be easily measured and be used to quantify soil microbial activity and potential mineralized N. The rate of CO2 measured is generally regarded as an indicator of soil health. This method needs to be standardized, taking into consideration cropping systems, environmental conditions, soil sampling and laboratory analysis protocols. Information generated as CO2 emissions per surface area have been used for developing soil management strategies for improving soil health conditions with practices such as cover crops. It has also been reported that this test gives results which are typical of actual field conditions but tend to be inherently more variable than lab results. Consequently, further field based evaluation is required. The Solvita Test has been gaining momentum; it has been offered in more than 30 commercial labs around the world (US, South Africa, Australia and the UK).

Cornell Soil Health Assessment

The Cornell Soil Health Assessment evaluates soil health indicators for biological constraints: soil respiration, soil protein, organic matter, and active carbon; physical constraints: available water capacity, sub and surface hardness, and aggregate stability; chemical constraints (Modified Morgan or Melich III extractant): pH, P, K, and minor elements; and other soil constraints for site specific condition not included in their standard assessment. Data generated are reported on a "color-coded scale" (red, yellow and green in a 0-100 scale). Low values are in red and/or values with yellow colours providing very important information about soil processes that are not

functioning optimally. The reports generated on targeted soil constraints include mineral recommendations based on standard soil test. For addressing physical and biological constraints and/or for maintaining soil functionality, suggestions for short and long term management are given.

The Haney Test

The Haney Test considers the measurement of biological and chemical indicators of soil properties as follows: chemical (weak acid (H3A) extractant): N, P, K, Ca, Fe, Al; and biological: soil respiration (Solvita Test), soil water extractable organic C and N and Carbon to Nitrogen (C to N) ratio. The information generated from these tests report a "Soil Health Calculation Number" which varies from 1 to over 50. This score indicates where the soil health condition is now. It is used as soil health baseline data that over time, and with different management might quantify improved soil health of a given cropping system over the years.

The Haney Test uses a different approach but still considers many of the same soil nutrients as the standard soil test, but incorporates soil microbial activities. This test brings in and considers a very important concept of biological activity as something influencing nutrient availability and therefore what should be fertilized for. What the Haney test does, is to consider the C to N ratio. This information is considered for providing NPK fertilizer recommendations and suggesting cover crop ratios of legumes to grasses.

What should be known about C to N ratio?

Soil Health raises a lot of N management related issues. The C to N ratio is very important, especially for N fertility managements. If it is very high, the soil is unlikely to mineralize N from soil residue because the microbes will utilize all N to decompose that SOM. The carbon will be used for respiration and the N will be tied up in their cellular structure, unavailable for mineralization. If the C to N ratio is low, the microbes will use all C and not the N so the N will be mineralized into plant available forms. This interaction is also affected by the rate of respiration. If respiration rate is high, this interaction will happen faster. But if there is low respiration, it will be a slow process.

How does the Cornell Health Assessment compare with the Haney Test?

The Cornell assessment includes chemical, physical and biological constraints while the Haney test does not test for the physical constraints.

They have different biological constraints identified: Cornell identifies the active carbon fraction and soil protein while the Haney Test measures water-extractable organic C. They have similar respiration assays, but the Haney test (Solvita) measures the CO2 burst in a 24 hours period while Cornell's test measures it in a 4 day period. The Haney nutrient recommendations are based on biological and chemical protocols, but Cornell's mineral recommendations are generated using standard soil testing protocols.

Cornell suggests management strategies to address constraints identified in physical/biological/chemical measurements and in connection to the USAD Natural Resources Conservation Service (NRCS) practices. Haney recommends soil

management for nutrient applications and cover crops (%legume / % grass) generated by biological processes and C to N ratios, respectively.

The Haney approach of considering indicators of SOM quality (C to N ratios) and biological activities is a very important component to include in any soil health evaluation to provide better nutrient recommendation for the cropping system.

Chinook Applied Research Association (CARA) Initiative for Soil Health Testing in Alberta

At CARA, we will be exploring which soil health indicators will provide vital information on how soil components are interacting for farmers to have a better understanding of their soils to improve them now and for future generations.

Soil health testing could be a challenge for us considering that we currently don't have all the necessary instruments to evaluate all of the soil health biological, physical and chemical indicators. However, a cost-effective soil health testing package will be developed to bridge the gap between standard soil testing and biological and physical soil constraints.

The approach will be to use currently available soil health assessments taking into consideration the need to adjust and to integrate key soil aspects. Emphasis will be given to manage the soil in a way to improve its biological properties. Some researchers have suggested that by simply knowing a soil indicator value such as soil organic matter (SOM) or respiration rate for example, they can predict other soil health process such a microbial respiration, aggregate stability and nitrogen mineralization. Other researchers have found that when SOM data is combined with soil respiration and soil protein there is a better estimate of potential N mineralization. These findings will provide good baseline information for our soil health lab initiative, but once local farmers get their soil tested, the values generated will be used for engaging in a long term adaptive management strategy for measuring, managing, monitoring and calibrating (correlating) our soil health protocols and management tools to improve soil health in the province.

Summary

Although experts have been debating and discussing which soil test provides the best information for fertilizer recommendations, they all agree on one thing: soil health is a priority. Starting to look at interdependent soil interactions such as C to N ratios with the microbial activity influences on nutrient release will not only create awareness among farmers but also within the soil science community to understand and manage soil health properly. Soil health is a long term investment. For this reason, an initiative to assess soil health conditions in Alberta needs to look at different strategies to find the best combination of approaches for the generation of good data for standardization and calibration in soil health testing methodology for Alberta's soil environmental conditions.

Soil Health Producer Highlights Series

My Farm, My Soil, My Story

Ron & MaryAnn Barnett, Barnett Family Farm—Oyen, AB

* What does "Soil Health" mean to you and why is it important?

Soil Health is important to us. Soil Health on our farm is one of the main elements helping us towards having profitable cropping results with grains, hay and pasture

* What management practices have you used to improve soil health on your operation?

Ron has fenced out numerous grazing fields to rotate stock so controlled grazing occurs. We have dugouts built strategically around the land and with this have also seen an increase in bird populations. We have always liked seeing the trees and brush around sloughs and have never done clearing. This provides outstanding wildlife habitat.

We have used re-grassing cropped/cultivated fields on a rotation of 6 – 8 years, depending on conditions. Ron has found packing fields with a roller after seeding has improved the seed bed for alfalfa and forage catches. As it turned out the 160 acre field that was in mustard last season (2014) was planted this spring (2015) with alfalfa and seems to be the very best catch ever. Our brother in law, Pat Kuhn and his son Drew, rent our cultivated land and tried to harvest the volunteer mustard but the alfalfa is still growing so much they could only catch the tops of the mustard plants with their reel. Even into October the alfalfa seems to be still growing.

We have used chem-fallow for the last 8 – 10 years and prior to that we used tillage for weed control and moisture preservation. Chem-fallow seems much better in both cases. Diversity in crop rotations (eg. alfalfa, cereals, pulses and oilseeds) has contributed to improved soil condition as well.

* What changes have you seen?

We have seen improved tilth and yields on cropped fields following alfalfa or other forages in the rotation. We have tried varied forage mixes. In August (2015) we were checking our fields and were interested in seeing how a little corner of 4 or 5 acres was producing. It had been native grass and was worked up to square up and combine two fields and was seeded this spring. We could see the line and difference so took a photo and you can clearly see the extra growth and color on the new land. When we stepped on the new area from walking from the old part you could feel the new soil had more of a spongy feel to it and the straw was more flexible as we walked through.

* What are the biggest challenges for soil health in your area?

The biggest challenge we have in this area is retaining and using the moisture we get to the best possible results. That is why we found the Field Day, July 24/15 put on by CARA with Dr. Christine Jones of Australia so interesting. It is amazing how they are bringing back tracts of land to productivity that became desert like from abusive practises. She had powerful slides to help us see what she meant. Dr. Jones gave us an understanding of the fundamentals of soils, as she sees it, and how fertile soil is a function of photosynthesis and microbial re-synthesis and the relationship between healthy soil and the quality and quantity of food it produces.

* How do you advocate for soil health?

We advocate for soil health mostly by example, but also bring up the importance of looking after the land to almost anyone who is interested – especially to younger people. We feel it is never too late to learn – mixing practical experience with science and research.

* Do you have any future plans for improving the Soil Health on your operation?

The Barnett's are always open to looking at new ideas and Ron reads many publications on farming in general. They participate in programs such as the ones CARA puts on. Planting cocktail cover crops looks very interesting and Ron has taken our nephew, Drew Kuhn, over to the CARA plots at Oyen to observe. Young farmers have to be armed with knowledge so they can draw their own conclusions and decisions. The young farmers have to be able to handle increased pressures and manage the environmental, social and economic issues. Our girls and partners are not farming now but we forward much of the information onto them and discuss with them so they are aware of how we operate and manage our farm. This is part of our Succession Planning.

* How has improving your soil health improved other aspects of your operation?

As much as we may love the land and take pride in looking after it, it comes down to economics. We are seeing profits and consciously want to leave the land in better/best condition for future generations.

Ron & MaryAnn operate near Oyen, AB and incorporate diversity in crop rotation to achieve healthy land.

The Chinook Applied Research Association (CARA) is a driven by farmers and ranchers in east central Alberta to bring innovative and profitable practices to the local agricultural industry.

Soil Health Producer Highlights Series

My Farm, My Soil, My Story

Marj Veno—Hanna, AB

* What does "Soil Health" mean to you and why is it important?

Soil health compares to your personal health. Whenever everything works the way it should, you feel good. Soil is much the same. When all things are working in balance, our grazing season is much longer, cattle gain better, and the general appearance of the prairie is healthy.

* What management practices have you used to improve soil health on your operation?

Have stockpiled native forages to be used for winter grazing, swath grazed, bale grazed, grazed tame pastures in spring to allow native pasture to set seed, built dugouts so there is a good water source on every quarter of land we own.

* What changes have you seen?

Much evener grazing so some areas that were traditionally overgrazed because they were close to water are healthy stands of native grass. Have trees growing along riparian areas and bluffs of trees growing on some prairie that was burned off in the early 1900's.

* What are the biggest challenges for soil health in your area?

Rainfall or the lack of it.

* How do you advocate for soil health?

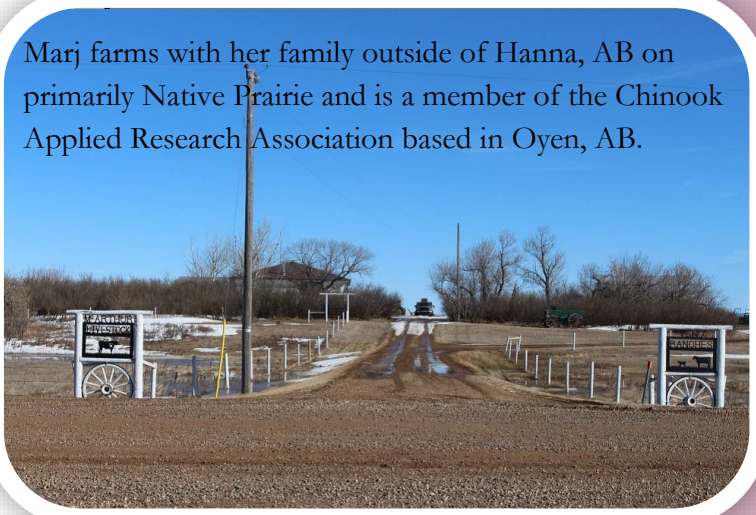
Share our experiences with other producers at meetings etc. Show our winter grazing and how we make it work. Mother Nature is still the boss and we do have sufficient feed on hand if snow gets too deep.

* Do you have any future plans for improving the Soil Health on your operation?

Getting and keeping invasive weeds under control, continued vigilance reading the grass and being flexible to change a grazing rotation if it will improve soil health and consequently the grass quality and amount.

* How has improving your soil health improved other aspects of your operation?

Stockpiling native grass has put a good layer of thatch on the ground that keeps the moisture in the ground . Have seen a much thicker , healthier and more diverse prairie plant stand. I think it all starts with good management of what's on top of the soil and consequently the soil given a chance will improve quickly and directly affect your bottom line.



Marj farms with her family outside of Hanna, AB on primarily Native Prairie and is a member of the Chinook Applied Research Association based in Oyen, AB.

The Chinook Applied Research Association (CARA) is a driven by farmers and ranchers in east central Alberta to bring innovative and profitable practices to the local agricultural industry. Our program of applied research, demonstration and extension projects provides a link in the transfer of knowledge and technology between research and the producer. Producers, industry, government and others can access reliable data on crop, livestock, soil and water projects that is relevant to the area and its soil and climatic conditions.