

Alberta Soil Health Benchmark Monitoring Project

This project is supported by the Canadian Agriculture Partnership (CAP) Environmental Stewardship Program.

Background

The project is designed to promote a better understanding of soil health and develop a provincial data base of physical, biological and chemical soil parameters, all of which contribute to an overall measure of soil health. The project will also measure the impact of various farmers' management practices on soil characteristics.

Chemical components of soil have been intensively evaluated by commercial soil testing labs in Canada, used primarily for chemical fertility recommendations. The role of soil biology, however, is not well understood and physical characteristics have not been monitored in detail. Evaluation of biological soil characteristics has only become available during the past few years in laboratories in the United States and more recently eastern Canada. Existing biological tests have not been calibrated and monitored specifically for Alberta soils. CARA's Soil Health Lab, under the direction of Dr. Yamily Zavala, provides a unique service in evaluating soil health constraint indicators. A biological and physical baseline developed within the province will provide a framework which can help define strategies for managing and improving the productive capacity, and sustainability, of our soils. Understanding and managing for a diverse micro-biological functional group underground may contribute to an overall healthier soil by improving soil aggregation, soil water infiltration and storage as well as improved carbon sequestration. The improved aggregation stability will also contribute to enhanced carbon sequestration levels in the soil. Healthy soils produce healthy plants resulting in a higher quality food product. Understanding soil health will give Alberta producers a valuable tool for use in making strategic management decisions on their farms and ranches. Sustainable productivity of a soil is a function of physical, chemical and biological soil functions.

Participating Organizations

- Battle River Research Group (BRRG)
- Chinook Applied Research Association (CARA)
- Farming Smarter (FS)
- Foothills Forage and Grazing Association (FFGA)
- Gateway Research Organization (GRO)
- Grey Wooded Forage Association (GWFA)
- Lakeland Agricultural Research Association (LARA)
- MacKenzie Applied Research Association (MARA)
- North Peace Applied Research Association (NPARA)
- Peace Country Beef and Forage Association (PCBFA)
- West Central Forage Association (WCFA)

Progress to Date:

Staff from all participating organizations have visited fields and pastures across the province to do on site evaluations of compaction and infiltration and to collect samples for lab assessments. 1297 samples have been processed to date (606 in 2019 and 691 in 2020). These samples were

collected by the 11 partnering associations on 713 fields belonging to 331 farmers and/or ranchers. Reports for each field have been shared with the associations and their cooperating producers. Dr. Yamily Zavala has met with several of the farmers through webinars to discuss the reports.

Data from the sites is being compiled into a large data base. Management practices farmers are using at each of the sites will be monitored during the next few years. Sites will be revisited to determine the impact of management during the 2019-2022 period.

| | 2019 | | | 2020 | | | Total | | |
|--------------|------------|------------|---------------|------------|------------|---------------|------------|------------|---------------|
| | Farmers | Fields | Total Samples | Farmers | Fields | Total Samples | Farmers | Fields | Total Samples |
| BRRG | 1 | 1 | 1 | 16 | 22 | 38 | 17 | 23 | 39 |
| CARA | 23 | 47 | 56 | 21 | 43 | 185 | 44 | 90 | 241 |
| FS | 14 | 31 | 38 | 21 | 35 | 57 | 35 | 66 | 95 |
| FFGA | 13 | 54 | 82 | 7 | 24 | 36 | 20 | 78 | 118 |
| GRO | | 23 | 34 | 8 | 17 | 28 | 8 | 40 | 62 |
| GWFA | 10 | 19 | 26 | 19 | 32 | 34 | 29 | 51 | 60 |
| LARA | 8 | 20 | 38 | 0 | 0 | 0 | 8 | 20 | 38 |
| MARA | 0 | 0 | 0 | 22 | 27 | 94 | 22 | 27 | 94 |
| NPARA | 17 | 38 | 48 | 10 | 23 | 27 | 27 | 61 | 75 |
| PCBFA | 18 | 78 | 155 | 24 | 26 | 68 | 42 | 104 | 223 |
| WCFA | 9 | 15 | 20 | 28 | 44 | 72 | 37 | 59 | 92 |
| Other | 25 | 58 | 108 | 17 | 36 | 52 | 42 | 94 | 160 |
| Total | 138 | 384 | 606 | 193 | 329 | 691 | 331 | 713 | 1297 |

Methodology

- Association staff were trained in CARA's Soil Health Sampling Protocol and collection of site information by Dr. Yamily Zavala
- Each association received a Soil Health Sampling Kit which included the tools for site evaluations (compaction and infiltration measurements) as well as soil collection
- Additional supplies have been provided as required.
- GPS coordinates were recorded for each site
- Site history is being documented
- Parameters that have been analyzed:
 - Physical (on-site):
 - compaction (penetrometer on site)
 - infiltration
 - Physical (on-site or at CARA Lab):
 - wet aggregation stability (Cornell University protocol)
 - bulk density (by weight/volume measurement)
 - texture (Bouyoucos hydrometer method)
 - Biological (CARA Lab Food Soil Web protocol except as noted)
 - active carbon (Cornell University protocol)

- C:N ratio, TC, TOC (U of A)
- soil microbial respiration (Cornell University protocol)
- active & total bacteria
- active & total fungi
- nematode functional groups
- protozoa functional groups
- Chemical (commercial labs)
 - complete fertility assessment, including macro and micro nutrients, organic matter, pH, EC, etc.
- All information is being entered into a data base
- Information related to specific sites is being shared with the cooperating producers by association staff
- Management activities will be documented and linked to changes in soil health indicators

Environmental Significance

Development of a benchmark data base is very important in order to better understand soil health limitations and apply appropriate management strategies. Improvements in soil health can result in higher production potential and will strengthen the resiliency of the farm's systems to cope with issues related to climate change.

Target Audience

Farmers and ranchers from across Alberta will receive information on specific soils within their operations which they can use to help guide their management decisions. Because soils and the associated management systems can be very site specific, the information will have much more value than generalizations often promoted at agronomic events.

A broader audience will receive information on Soil Health Benchmarks at regional or provincial extension events. Participants at these events would include a broad representation of local producers. Information on the project has also been shared in several farm industry publications.