

SOIL HEALTH AND CARBON SEQUESTRATION INDICATORS FOR BC SOILS

Summary of a Survey and Literature Reviews

This purpose of this paper is to engage the reader in a discussion on suitable indicators of soil health and carbon sequestration for inclusion in a common soil health and carbon sequestration assessment protocol. The protocol will determine soil properties that need to be measured and the exact methods to assess soil health and carbon sequestration in relevant province-supported projects.

All indicators have strengths and limitations. However, the implementation of a soil health assessment protocol is more likely to be successful if indicators are meaningful and methods practical. This paper discusses those characteristics for the commonly proposed indicators based on literature review, a survey among a small group of professionals that are involved in relevant work, and personal experience of the author.

The online survey gave the participant a list of 42 soil properties (or group of properties) that have been associated in literature as indicators of soil health and/or carbon sequestration. The participants were then asked to assign each of these properties to one of three categories:

(A) Tier 1. Should be included the protocol and is sufficiently practical (easy to conduct, does not require special equipment)

(B) Tier 2. Should be included in the protocol but requires special equipment or special skillsets, or

(C) Should not be included (for different reasons).

The result of the survey is summarized in following tables.

Indicator	Votes	Votes %	Indicator	Votes	Votes %
SOIL STRUCTURE	14	78%	POTENTIALLY MINERALIZABLE NITROGEN	14	78%
SOIL PH	13	72%	SOIL FERTILITY: MICRONUTRIENTS	13	72%
SOIL EC	12	67%	CATION EXCHANGE CAPACITY	13	72%
BULK DENSITY	12	67%	BASE SATURATION	12	67%
PENETRATION RESISTANCE	10	56%	PARTICLE ORGANIC MATTER	12	67%
DEPTH OF "A" HORIZON	10	56%	SOIL FERTILITY: MACRONUTRIENTS	11	61%
TOTAL ORGANIC C	9	50%	REACTIVE CARBON	11	61%
SOIL ORGANIC MATTER	8	44%	HOT WATER EXTRACTABLE CARBON	11	61%
ODOUR	8	44%	HOT WATER EXTRACTABLE NITROGEN	11	61%
SOIL INFILTRATION	8	44%	SODIUM ADSORPTION RATIO	10	56%
			MICROBIAL BIOMASS	9	50%

TABLE 1 (left side) Tier 1 Indicator

TABLE 2 (right side) Tier 2 Indicator

In many cases, the selected indicators align with the author's preferred choices. However, there are a few exceptions when the author's conclusions differ, mainly for practical reasons. Based on the information in this report and the survey, the author proposes the following soil health indicators:

INDICATOR	RATIONALE	Tier 1	Tier 2	“NO”
Total carbon (dry combustion, corrected)*	Carbon sequestration, SHI indicator	50%	39%	0%
Soil organic matter	Widely available, link to the past	44%	33%	6%
(Re) Active carbon (tbd: POx-C, carbon mineralization potential*)	Indicator of carbon that may not stay	11%	61%	1%
Macronutrient, pH, EC	Need to be tested anyways	17%	61%	6%
Aggregate stability in field: portable rainfall simulator*	Aggregate stability is <u>the</u> indicator of soil health; method easy but practicality needs to be tested			
Aggregate stability in lab: Eijkelkamp wet aggregate test*	Same rationale as above; method is off-the shelf and could be deployed in many labs; big question is transport of samples from field to lab!	78%	6%	11%
Plant available water	Very relevant for grower, good indicator	11%	39%	22%
Bulk density	Needed for correction carbon and soil nutrient concentrations (depth equivalent)	67%	28%	0%

TABLE 3 Proposed soil health indicators with rationale for their adoption. Column 3 – 5 (Tier 1, 2, and “No”) show the results of the survey. Indicators with an * are recommended by the Soil Health Institute as part of a minimal suite of three measurements to assess soil health.

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