INCORPORATING SOIL CONSERVATION PRACTICES INTO FARMLAND APPRAISAL IN SOUTHEASTERN MICHIGAN

MEMORANDUM PREPARED FOR FARMLAND BROKERS, APPRAISERS & CONSERVATIONISTS

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TABLE OF CONTENTS

INTRODUCTION

With support from the Fred A. and Barbara M. Erb Family Foundation, Delta Institute engaged landowners, land managers and farmers to understand practical ways to incentivize the use of 'soil health management systems' in Southeastern Michigan to improve water quality in the Great Lakes Basin through the reduction of nutrient loading and runoff. Transitioning from conventional to sustainable agriculture achieves this goal, improves soil health, enhances farmland resilience and profitability.

The adoption of soil health management systems leads to improved soil health on agricultural land. Soil health management systems increase soil organic matter and reduce the need for fertilizers and soil amendments. These changes have a direct impact in reducing the quantity of water runoff and improving the quality of water. Adopting soil health management systems is an effective way of improving the environment of the Great Lakes Basin.

For landowners, management decisions are driven by a variety of factors, such as profitability, stewardship or the desire to efficiently maintain or improve the value of their land – all of which are readily achieved by incorporating soil health management systems. **Incorporating soil health into the farmland valuation process is a potential mechanism to encourage the transition of conventionally managed acres to sustainably managed acres**. However, soil health is not factored into current farmland valuation practices, which mean that landowners and their tenant farmers have fewer incentives to invest resources in strategies that increase soil health. Integrating soil health into land valuation creates a differentiation of farmland value, which may create more equity on a business' balance sheet, influencing investment opportunities and promoting positive environmental outcomes.

> **WHAT'S THE ISSUE? THE EFFECTS OF MANAGEMENT PRACTICES ON SOIL HEALTH ARE NOT FACTORED INTO CURRENT FARMLAND VALUATION PRACTICES.**

The goal of this phase of work, which builds on several previously completed investigations by Delta Institute, is to present action-oriented interventions that may be applied to current farmland valuation practices to directly integrate soil health indicators and associated financial impacts. To that end, the project team previously cultivated relationships with farmland brokers, appraisers and conservationists (further referred to as the *advisory group*) to collaboratively develop intervention concepts that reflect real-world expertise, are feasible and readily elicit support among the practitioners.

The project team conducted interviews with members of the advisory group, many of which participated in multiple rounds of interviews to identify existing practices, barriers and opportunities, and evaluate the intervention concepts described herein. Following several rounds of discussion, Delta convened a workshop with the advisory group to further refine and prioritize intervention concepts and identify a set of actionable next steps.

This document describes current valuation methods and the conceptual models to incorporate soil health and conservation data into practices currently deployed by farmland appraisers and brokers. This document refers to these mechanisms as 'interventions', as they are designed to improve outcomes in a specific situation: how farmland is valued for sales purposes. The document also presents a strategy to further develop and implement the most feasible concepts.

Terminology

- **Sustainable Agriculture:** Farming in ways that provide society's present food, fuel and fiber needs without compromising the ability for current or future generations to meet their needs. Sustainable agriculture improves soil health, biodiversity, water and nutrient retention, profits and livelihoods (USDA, 2007).
- **Soil Health Management Systems:** Agricultural strategies that prioritize the health of soils and prevent soil degradation. Soil health management systems such as reduced tillage and incorporating cover crops with production of cash crops, decrease soil erosion, improve water infiltration, increase soil carbon and reduce costly inputs that have adverse environmental impacts (Soil Health Institute, 2022).
- **Appraisal:** The valuation of property used to determine a selling price typically based on sale prices of similar properties in the area or in the case of farmland, an estimate of future benefits such as rental income or production income (Kenton, 2022).
- **Assessment:** Relative measures of value that indicate how property will be taxed by the government (property taxes).
- **Landowners vs. Operators (e.g., tenant farmers):** Landowners may profit from the value of their land as its value increases, but also from renting their farmland to operators. In this framework, operators typically manage the day-to-day operations and pay rent to the landowners while profiting from the sale of farm produce. Despite separate revenue streams, both landowners and operators profit from the productivity of soils and should prioritize responsible soil management.

Summary

For landowners, the value of their land can be a critical factor in deciding how their land is managed. Incorporating soil health into the valuation process can serve as a critical pathway to transition to sustainable agriculture if it leads to increased value. Managing soils to improve or maintain their health ensures the ecologic and economic sustainability of our food systems. Standardized diagnostic criteria to assess soil health has been developed by the Soil Health Institute.

Currently, changes in soil health due to management practices are not factored in land value and landowners have little incentive to invest resources in practices that increase soil health. A farmland appraisal report might reference soil productivity as a static number and use it to estimate income from the land to determine its value. Most commonly, sales comparisons are used to determine the value of the property. This approach, while allowing the appraiser to adjust based on soil properties such as texture (sand, silt and clay content), location and market trends, does not account for soil health as a differentiator when assigning value to land using soil health-focused management practices as there may not be any local properties that qualify for valuation comparison.

To incorporate measurements of soil health into the farmland appraisal process – thereby incentivizing the adoption of soil health management systems on farmland – the project team offers two distinct interventions:

1. Use a standardized *Soil Health Index* to measure the relationship between soil health and value. A parcels assessment would include soil health as an indicator of value alongside the current factors for associating value during the appraisal process.

2. Adjust a parcel's sales price or valuation using comparable properties that have been managed with soil health management systems. Using this method, practitioners would adjust base price by comparing properties in a specific geography that have been identified as having met established management standards with expected improvements to soil health.

About Delta Institute

Established in 1998, Delta Institute collaborates with communities to solve complex environmental challenges throughout the Midwest. We address Midwestern environmental, economic, and climate challenges today, so that our home and region are more resilient, equitable, and innovative tomorrow.

Through our Resilience Agriculture program, Delta Institute supports 1,000 farmers as they transition to sustainable and regenerative practices, thus improving the environment, mitigating the impacts of climate change, and strengthening a farmer's bottom line. We forecast that by 2025, one million Midwestern agricultural acres will successfully transition to conservation focused farming practices, so our region's primary economic driver can be more environmentally and financially sound.

Our work takes us to population centers like Chicago, St. Louis, and Detroit; to mid-sized cities such as Gary and South Bend, Indiana; to Great Lakes coastal towns like Michigan City, Indiana and Muskegon, Michigan; and to rural communities and watersheds with tens of thousands of acres of farmland and waterways across our region. It's quite likely that you—or someone you know—lives, works, or passes through a community that Delta has helped since our founding.

Delta Institute maintains an annual Platinum Seal of Transparency from Guidestar.

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SOIL HEALTH INDICATORS & SOIL HEALTH MANAGEMENT SYSTEMS

Soil Health Indicators

Healthy soils provide food, fuel and fiber and deliver crucial ecosystem services, such as water storage and filtration, nutrient cycling and decomposition. The capacity for soils to support life and provide ecosystems services is dependent on their inherent physical (texture), chemical (minerology) and biological (microbial communities) properties. These properties also determine a soil's "type" (e.g., *sandy clay loam*) and offer insight into the soil's baseline agricultural productivity. ***Soil health*** is the overall functionality of soils dependent on these inherent characteristics and management. Soil health is diagnosed by measuring ***soil health indicators*** – a standardized criteria of essential soil physical, chemical and biological properties (Stewart et al., 2018). To assess soil health on farmland, the Soil Health Institute measures the following four soil health indicators:

1. ***Soil aggregate stability***: "Soil aggregates are formed through physical and chemical interactions between mineral particles and organic matter. Improved aggregation provides benefits of reduced erodibility, enhanced water retention, and greater habitat for microbes and larger soil organisms. Aggregates also play a role in organic carbon storage by physically protecting organic matter."
2. ***Organic Carbon (or Soil Organic Matter, SOM) stock***: "SOM is an essential component of high–functioning soils, as it builds soil structure, improves water retention, releases plant–available nutrients via decomposition, and sequesters carbon from the atmosphere. Quantifying the organic carbon associated with SOM provides both a soil health indicator and an estimate of carbon storage.
3. ***Microbial respiration***: "Soil nutrient cycling depends on a vibrant soil microbial community. Microbial respiration has been positively correlated with nitrogen mineralization rates in the lab and in the field."
4. ***Water-holding capacity***: "Soil's capacity to hold water and deliver it to plant roots is related to both inherent soil properties (namely texture) and management-sensitive soil properties, including organic carbon and soil structure."

Soil Type

One of the most important soil characteristics to know for each parcel is soil texture. Soil textures vary and are determined by soil particle size, ranging from fine clays and silts to coarser sand. Soil texture also affects its ability to retain water and plant-available nutrients. A lower "productivity index" score on a parcel may not be indicative of poor management, but a product of this inherent soil characteristic. Because of this, it is recommended to do multiple soil health tests on parcels with different soil textures to capture this variation. Most labs will also ask for this information. Data is available through a web-based tool developed by the US Department of Agriculture - Natural Resource Conservation Service (USDA-NRCS) called Web Soil Survey.

The USDA-NRCS uses soil maps to subdivide land into *Major Land Resource Areas* (MLRAs) with 'similar soils, climate, and vegetation or crop types' (USDA-NRCS, Agriculture Handbook, 2006). MLRAs inform regional and national agricultural decision-making and guide efforts to

implement natural resource conservation programs across political boundaries. Knowledge of a parcel's soil type(s) and MLRA are crucial to assessing farmland soil health.

Soil Health Management Systems

Beyond inherent physical, chemical and biological properties, the productivity and health of farmland soils is affected by management. ***Soil health management systems*** are on-farm strategies that prioritize soil health by reducing soil disturbance, promoting thriving and diverse soil biota, keeping living roots in the soil year-round and ensuring the soil is covered year-round. Managing soils to improve or maintain their health ensures the ecologic and economic sustainability of our food systems.

To be sure, management strategies differ across soil types and production goals – there is no "one size fits all" approach. For example, cropping systems like corn and soybeans are managed differently than cotton or orchards due to different tillage requirements and amount of living cover. In other words, "understanding what levels of soil health are attainable for different soil types requires distinguishing between natural variability (inherent properties) and the effects of management." (Soil Health Institute, 2022). To improve soil health on farmland, the Soil Health Institute recommends the following five soil health management systems:

1. Soil cover (e.g., cover crops in rotation with cash crops)
2. Minimal soil disturbance (e.g., no till, reduced tillage)
3. Plant diversity (e.g., implementing polycultures or crop rotations)
4. Continuous living roots (e.g., including perennials such as trees, shrubs or perennial crops)
5. Livestock integration (e.g., rotational grazing, silvopasture)

Land that is managed using these strategies will have greater soil health (as measured by soil health indicators) than conventionally managed land (Kibblewhite et al., 2018).

An Overview of Farmland Appraisal in Michigan

Appraisal is a key process used for determining property value during a sale. Appraisals may be conducted by third party independent appraisers, as well as internally by lenders, or real estate departments within farm management companies. The process used for determining property value typically consists of three approaches: cost, income capitalization and sales comparison. Reconciliation of the three estimates with "appropriate" weight assigned to them is based on availability of data and comparables to derive the final value of a farmland parcel in the appraisal. Previously, Delta Institute and Michigan State University interviewed Michigan appraisers and agricultural extension staff to learn about how soil health is incorporated into the farmland appraisal process.

Cost Approach

Based on estimating the cost to construct an equally desirable substitute property. While this approach is most applicable to physical structures, like barns or outbuildings, it currently does not account for the costs associated with soil health management systems.

Income Capitalization Approach

Based on the idea that present value is indicated by future benefits such as rental income (leases) or production income (owner-operators). The capitalization of net income can be based

on direct (single year) or yield (future set period) capitalization. According to interviews with Michigan appraisers and MSU extension staff, appraisers assess soil productivity with the National Commodity Crop Productivity Index (NCCPI) developed by the US Department of Agriculture. The NCCPI, "uses natural relationships of soil, landscape and climate factors to model the response of commodity crops in soil map units. The value of ranges is from 0 to 100, 100 being the best." (NCCPI User Guide v3.0, USDA, 2022). According to research by MSU, the average NCCPI of Michigan farmland is 41 (Gammans & Cheu, 2022).

Furthermore, MSU researchers found that, "*productive soil types are valued higher in the* [real estate] *market and to incorporate this productivity the NCCPI is commonly used in the appraisal process. When the NCCPI is considered to be outdated, local factors or judgment of regional appraisers can also be taken into account. In addition, soil composition and topography are considered crucial factors in the appraisal process*." Sample appraisals showed that appraisers both qualitatively describe soils and ascribe values to "soil quality/production" as either "Above Average, Average, Below Average or N/A" (Figure 1).

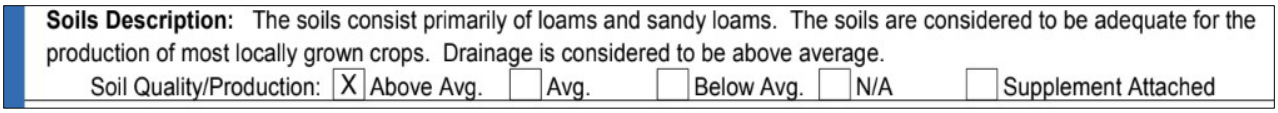

Soils Description: The soils consist primarily of loams and sandy loams. The soils are considered to be adequate for the production of most locally grown crops. Drainage is considered to be above average.
Soil Quality/Production: [X] Above Avg. [ ] Avg. [ ] Below Avg. [ ] N/A [ ] Supplement Attached

Figure 1: Sample appraisal showing qualitative description and comparative values of soils on a property.

Here, we see that soil productivity – quantified by the NCCPI and evaluated by appraisers – is linked to the value of farmland. Therefore, opportunities may exist for appraisers to evaluate *soil health* as a separate metric to be included in farmland appraisal.

Sales Comparison Approach

Appraisers identify 5-10 comparable properties sold in the vicinity and determine the value of the land based on those sales. Adjustments can be made by looking at pairs of properties to estimate the value of improvements or features of the property (e.g., dwelling, grain bin, tile drainage, irrigation). This is a cyclical process that amounts to a slow-moving average of land values in the area. Currently, improvements typically considered are structural in nature.

The comparison approach, while allowing the appraiser to adjust based on inherent soil properties such as texture (clay, silt and sand content), location and market trends, does not capture the increased value of the land resulting from sustainable management since there may not be any properties like that for comparison. Furthermore, few operations in Michigan have adopted conservation or Soil Health Management Systems (Gammans & Cheu, 2022), and there is no good database of comparable parcels and adjustments based on soil improvements related to conservation focused management.

Assessments

The productivity of the land and its associated value is also used to assess the taxes paid on the property. In Michigan, parcels have both a capped taxable value and a "true cash value" or State Equalized Value (SEV). Township assessors determine a parcel's SEV based on an estimated 50% of the market value of farmland based on annual comparative sales. Assessments are then reviewed by County Equalization Directors, who adjust based on sales

data. Increased land value due to soil health management systems may lead to higher property taxes and create a disincentive for conservation. This can be avoided by also including tax credits for landowners who implement conservation practices, such as Michigan's Farmland and Open Space Preservation program (PA 116). More broadly, assessment and appraisal values should be decoupled to avoid increasing taxes for healthier soils.

Institutional Stakeholders

Key players within the land valuation system represent the financial sector and professional trade organizations in the field of rural land management. National organizations such as American Society of Farm Managers and Rural Appraisers (ASFMRA) and the Appraisal Institute create guidelines for and certify appraisers. At the state level, the Michigan Society of Professional Farm Managers and Rural Appraisers offer resources and continuing education to its members. Michigan State University Extension conducts an annual survey and publishes reports on land values and lease rates across the state. Farm managers often also offer land brokerage services and conduct valuation as part of helping a client sell a property. In addition, banks often conduct appraisals internally along with applications for operating loans.

There is an opportunity to amend, update, or develop new guidelines that give appraisers the technical ability and tools to integrate the connections more fully between soil health, management and land value. AFSMRA offers continuing education credits, and a soil health focused curriculum could be developed for their membership. An example can be taken from the green building industry where the US Department of Energy convened an industry-wide working group that created an "appraisal toolkit" that helps appraisers integrate the characteristics of green buildings into their appraisals. **The same is needed for landowners utilizing soil health management systems and, more broadly, sustainable agriculture.**

With data and technology improving, valuation in appraisals can become a potential driver for increasing adoption of soil health management systems by conventional farmers. As consumer demand for sustainable agriculture grows, rural appraisers need to be prepared to value soil health and/or associated practices properly for both sale valuation and loan and investment underwriting. There are three potential opportunities to link soil health to land value. They include improving data and methodologies in valuation indices to modify new appraisals, providing education to appraisers and underwriters to adopt new valuation approaches and shifting the culture of appraisers, investors, and lenders to include long term benefits in underwriting as opposed to just focusing on market turnover and commodity prices in valuation.

Current Valuation Process

1. Determine property boundaries and create a detailed map of the parcel. This map is used to assess what proportion of the parcel is tillable and how the shape of the parcel and its topography will impact how easily the land can be farmed. See Figure 2.
2. Identify soil types on the parcel and expected average yield across crop types for the parcel. See Figure 3.

    Determine the parcel's price per acre based on the typical price/average rental rate within the applicable land class (productivity range), gross and net income, tax liability, local and general market conditions as well as capitalization rate.

Adjust the sales price per acre according to comparable sales and additional factors such drainage conditions, existing or needed improvements and existing conservation practices. It's

important to note that buyers are more likely than sellers to prioritize this information to negotiate discounts based on the additional costs associated with these factors.

Figure 2: Aerial map of a parcel's property boundaries. (Photo credit: Value Midwest, 05-23-2019.)

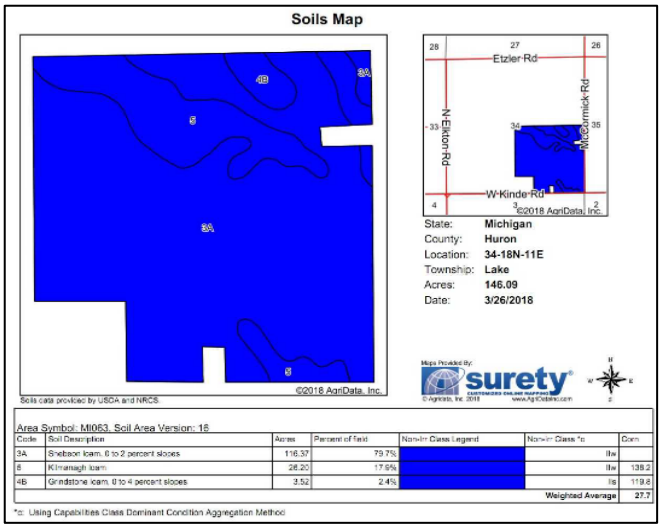


Figure 3: Soils map of parcel provided by USDA and NRCS. (Photo credit: Value Midwest, 05-23-2019.)

Constraints

The effort to incorporate soil health into current valuation practices is constrained by a few influential factors. The concepts described in the following section account for these constraints and have been evaluated by the advisory group according to how feasibly a particular concept could be implemented under these conditions. It is important to note that while various constraints were identified around data collection, the advisory group conducted its evaluation with the assumption that this constraint could be overcome given sufficient effort and resources.

The following constraints were identified as being present under the current, baseline valuation process:

1. There are no standardized adjustments for soil health management systems and other improvements (e.g., drainage systems) that might be present. In most cases, the location of any present improvements is the most influential factor when adjusting in this category.
2. Data collection efforts to determine rental rates in SE Michigan are met with very low response rates which makes it difficult to accurately calculate averages over time.
3. Data is scarce for soil health, crop yields, and cost/benefit analysis of implementing soil health management systems.

INTERVENTION CONCEPTS

The two interventions described in this section were prioritized by the advisory group for further development from a larger pool of suggested conceptual models. These interventions were also previously selected for further development by the project team, partners, and practitioners based on their validity, reliability, effectiveness, usability and feasibility.

Soil Health Index

Create a categorically unique, standardized *soil health index* for farmland appraisal. Using this method, assessment criteria would be developed by a third-party organization that is perceived as objective and credible by market actors and practitioners – such as university agricultural extensions or independent soil testing institutions – to evaluate the soil health of the parcel. Parcels would be assessed by the current appraisal process and would include soil health as a factor that determines the final appraisal.

To implement this intervention, a standardized soil health index would need to be created that places value to the soil health of parcels. Recently, the Soil Health Institute released their roster of soil health indicators to be used to diagnose soil health at scale. The four soil health indicators described in the Soil Health Institute's roster are simple and affordable to measure. On the next page, Figure 4 shows how this intervention could be applied in the second step of the valuation process.

This approach was prioritized by the advisory group for further development and prototyping based on the shared opinion that a new index, reflecting soil health indicators, is likely to be more readily adopted by practitioners than other proposed intervention concepts.

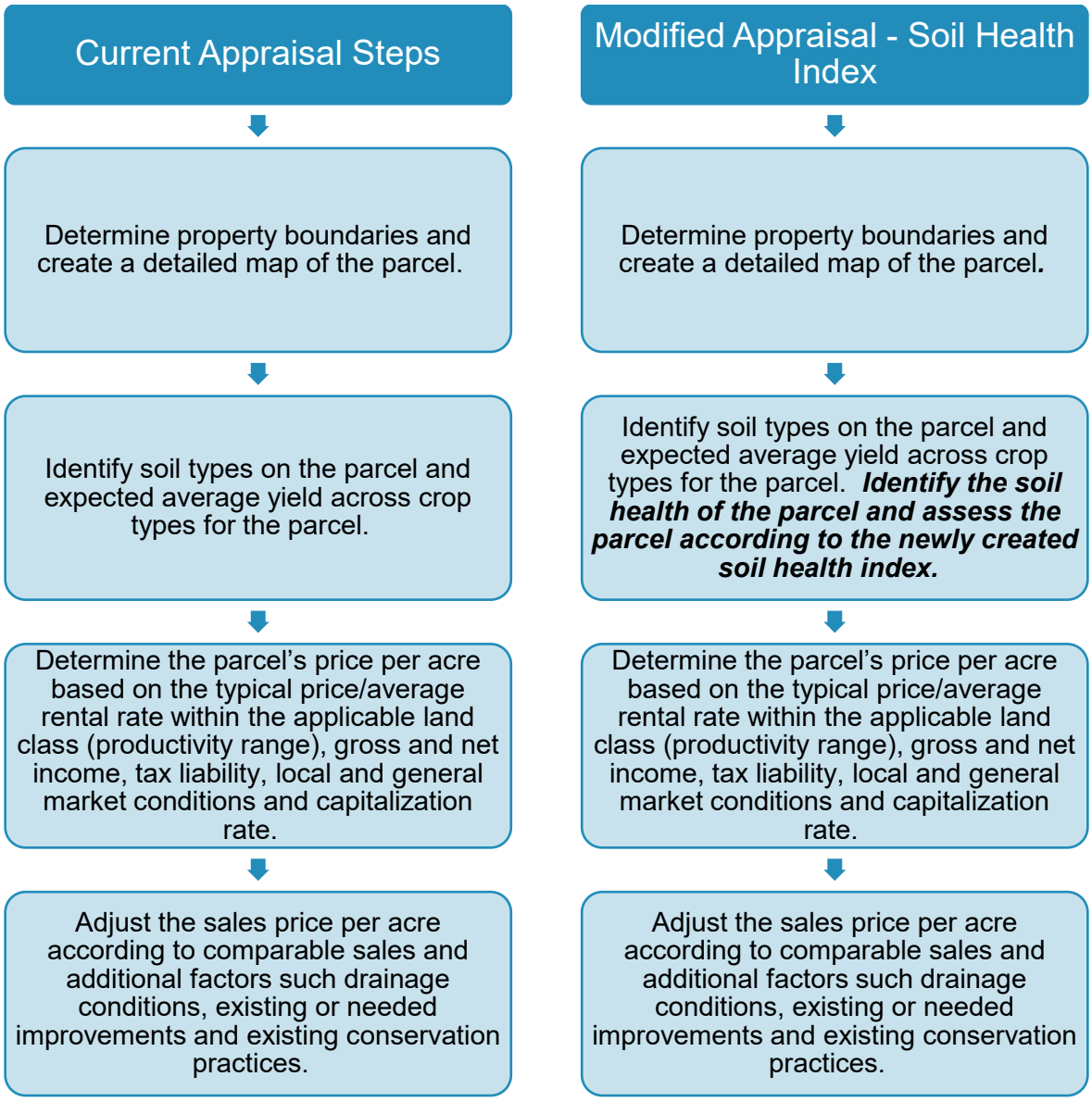


Figure 4: The current appraisal process compared to the modified appraisal process using the soil health index.

Soil Health Comparison

Adjust a parcel's sales price or valuation using comparable properties that have been managed with soil health management systems.

Using this method, practitioners would adjust base price by comparing properties in a specific geography that have been identified as having met established management standards with expected improvements to soil health. These comparable properties would be identified and evaluated by an accredited entity to verify adherence to these best practices for soil health management and/or sustainable agriculture. Additional soil health management practices and

improvements would be included in this evaluation and could be adjusted accordingly. Ultimately, a tool would be created to allow practitioners to search for comparable properties to include in their appraisals and brokerage services. Below, Figure 5 shows how this intervention could be applied in the fourth step of the valuation process.

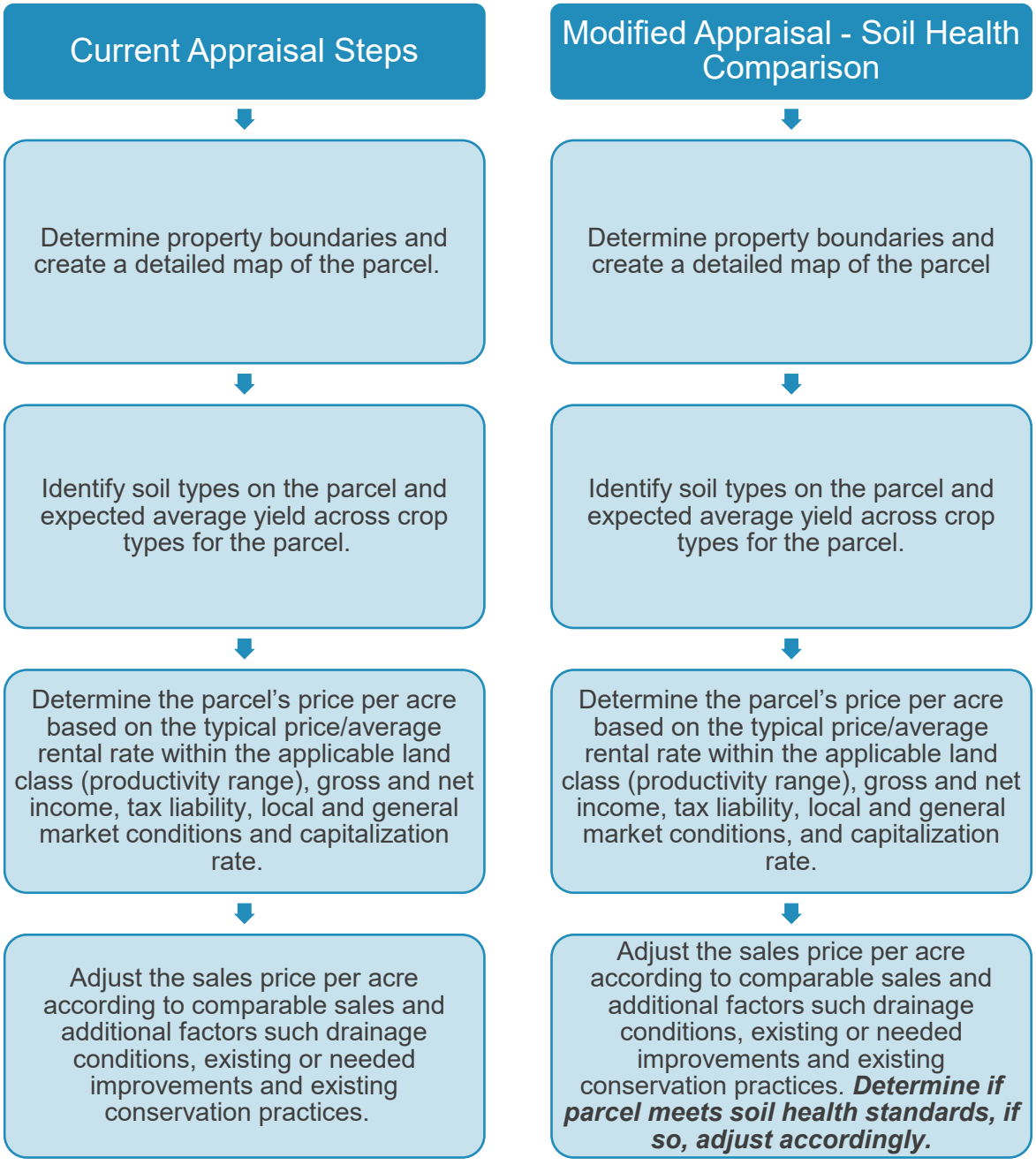


Figure 5: The current appraisal process compared to the modified appraisal process using soil health comparison.

MOVING FORWARD

From the outset, this project sought to develop solutions with active participation from the practitioners in the agricultural real estate sector to ensure that the following interventions can be reasonably integrated and adopted by the community:

1. The development of a novel Soil Health Index to be used in the income capitalization approach of appraisal; and
2. The establishment of an inventory of properties practicing soil health management systems that can be used in the comparison approach.

These two interventions represent the outcomes from our first phase of work. The main strength of the Soil Health Index (Intervention 1) is that it will signal the development of a new approach and a way of thinking about land value in the context of soil health. Adaptation of the comparison approach (Intervention 2) is prioritized due to its wide use and acceptance among practitioners as well as the need for alignment between soil health appraised properties and properties used for comparison. Because there are very few if any soil health appraised properties to base comparisons on, developing an inventory of such properties by way of simulated appraisals will be a critical first step.

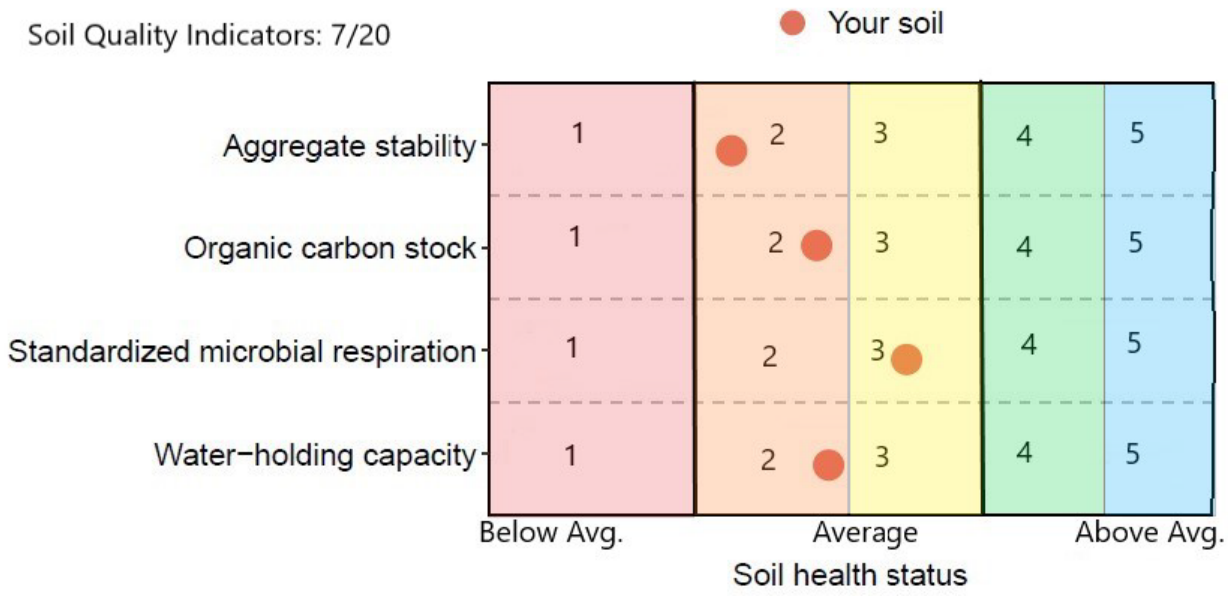
The ultimate goal of this project is to create a novel appraisal methodology of **Soil Health Land Valuation**. To this end, Delta's next phase of work in Michigan will be to

1. Develop a place-based methodology for calculating soil health land valuation in Michigan that incentivizes the adoption of soil health management systems.
2. Build capacity with Michigan appraisers about soil health characteristics, soil health testing, and soil health management systems and its relationship with land value.
3. Create a user-facing systems map of soil health testing facilities in Michigan, including an asset and gap analysis, understanding barriers and opportunities for scaling soil health testing throughout Michigan.

Delta Institute plans to convene soil health scientists and appraisers in a series of workshops to establish consensus around soil health characteristics, testing procedures, management systems, and interpretating testing to advance previously developed interventions to create a place-based methodology for Soil Health Land Valuation. Once refined, the project team will partner with 3 farmers in either Hillsdale, Lenawee, Monroe, and Washtenaw counties in either 1 or more *Major Land Resource Area* (see, "Soil Type" section) to test the intervention. The project team will work with soil scientists and appraisers to develop a curriculum for continuing education for Michigan Realtors and Appraisers on how to facilitate soil health testing and implement the placed-based methodology for calculating Soil Health Land Valuation. The project team will then create a Michigan Soil Health Testing Guide by identifying soil health testing organizations in Michigan and researching their capacities, barriers, and opportunities for scaling soil health testing in Michigan.

APPENDIX

Below is an example of how appraisers may assess soil health indicators and soil health management systems on-farm to calculate a Soil Health Index (Intervention Concept 1: Soil Health Index).



Soil Health Management System	Yes	No	Score
Soil cover (e.g., cover crops in rotation with cash crops)	Yes		+ 1
Minimal soil disturbance (e.g., reduced tillage)		No	n/a
Plant diversity (e.g., implementing polycultures or crop rotations)	Yes		+ 1
Continuous living roots (e.g., including perennials such as trees, shrubs or perennial crops)	Yes		+ 1
Livestock integration (e.g., rotational grazing, silvopasture)		No	n/a
Total score			+ 3

Soil Quality Indicators score	Soil Health Management Systems score	Soil Health Index
7	3	10/20

REFERENCES

- Gammans, M., & Cheu, S., (2022) *Integrating soil health into land valuation in Southeast Michigan: Final Report*

- Kenton, W. (2022, July 22). *Appraisal definition. Investopedia.*

- Kibblewhite, M. G., Ritz, K., and Swift, M. J. (2008). *Soil health in agricultural systems*. Philosophical Transactions of the Royal Society B: Biological Sciences, 363(1492), 685-701.

- Soil Health Institute. (2022). *Dr. Archie Flanders: Identifying Costs and Benefits of Soil Health Management Systems*.

- Stewart, R.D., Jian, J., Gyawali, A.J., Thomason, W.E., Badgley, B.D., Reiter, M.S., and Strickland, M.S. (2018). *What we talk about when we talk about soil health.* Agricultural and Environmental Letters. https://doi.org/10.2134/ael2018.06.0033

- USDA, National Agricultural Library. (2007). *Sustainable Agriculture: Definitions and Terms*.

- USDA, NRCS. (2006). *Land Resource Regions and Major Land Resource Areas of the United States, the Caribbean, and the Pacific Basin - Agriculture Handbook 296.* Third Edition.

- USDA, NRCS. (2022). *User Guide for the National Commodity Crop Productivity Index (NCCPI) Version 3.0.*