



LAND VALUE



In this document, we describe the current agricultural land valuation system and highlight opportunities to explicitly link soil health focused management and land value.

For landowners, the value of their land can be a critical factor in deciding how their land is managed. Incorporating soil health and quality into the valuation process can serve as a critical pathway to transition to regenerative agriculture if it leads to increased value. However, currently, changes in soil quality due to management are not factored in land value which means that managers have no incentive to invest resources in practices that increase soil quality. This section provides background on the current land valuation system and briefly describes interventions that could drive the market to change its relationship to the land through financial incentives.

Delta Institute's goal is to promote changes in land management that improve soil and water resources, make the land more resilient to extreme weather conditions, and increase the profitability of farm operations. Landowners care about property values,

however, a typical process for determining how much agricultural land is worth does not account for either soil health benefits, nor the reduced expenses associated with different management systems.

A farmland appraisal report might reference soil productivity as a static number and use it as a way to estimate income from the land to determine its value.

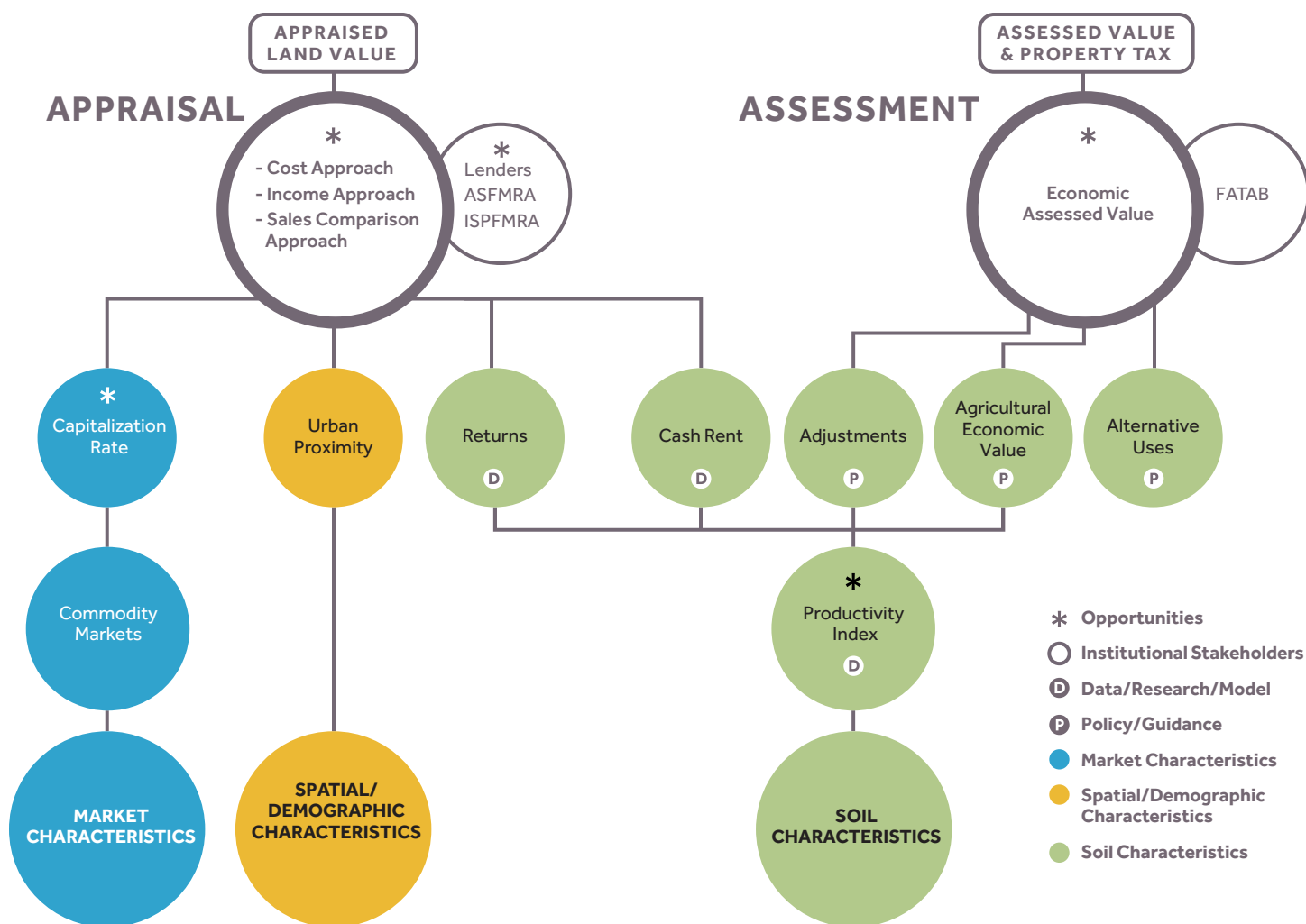
Most commonly, sales comparisons are used to determine the value of the property (6). This approach, while allowing the appraiser to make adjustments based on soil properties, location, and market trends, doesn't capture the increased value of the land resulting from alternative management (such as regenerative agriculture) since there may not be any properties like that qualifying for comparison.

Although the drivers and motivations related to making land management decisions differ for landowners depending on demographics, ownership class, and a number of other cultural factors, all landowners care about the value of their land (7).



Delta Institute set out to better understand the entities, processes, and relationships of the land valuation system in the agricultural sector including policies, institutions, and processes that are connected to land valuation. The land valuation system map is shown in the figure below and described in the following pages. It focuses on two processes, appraisal and assessment. Each node in the map depicts key actors, policies, and information flows determining how much land is worth. The opportunities to incorporate linkages to soil health are also highlighted. An [interactive map](#) detailing opportunities for interventions and system descriptions is also available.

CURRENT LAND VALUATION SYSTEM



Trends in sales of comparable properties, capitalization rates, and commodity prices impact land value. They are important to consider though may be outside of the immediate control of the local real estate market.

Much of the land valuation process and appraisal rests on finding comparable land sales and properties in the vicinity. Therefore, it is important to understand how location and associated land uses in the area impact land value.

Physical, chemical, and biological properties of the soil have a direct impact on its productivity and the associated income that can be derived from the land. Soil characteristics, therefore, play an important role in land valuation process.



APPRAISALS

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 3 approaches - cost, income, and comparables. 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.

Cost approach: Based on estimating how much it would cost to construct an equally desirable substitute property. While this approach is most applicable to physical structures, like barns or outbuildings, it is less relevant for soils.

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. Collecting income data is time intensive and is typically based on rental income. Capitalization rates are hard to determine.

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 value of particular improvements or features of the property (e.g. dwelling, grain bin, tile drainage). This is a cyclical process that amounts to a slow moving average of land values in the area. Currently, improvements that are typically considered are structural in nature.

Few operations in Illinois have adopted conservation or soil health management systems, 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 Illinois, agricultural land is assessed based on its use value, the Agricultural Economic Value (AEV). Then, the Equalized Assessed Value (EAV) is calculated from the AEV for cropland, pasture, and other types of agricultural land as follows:

$$\begin{aligned} \text{EAV}_{\text{cropland}} &= \frac{\text{AEV}}{3} \\ \text{EAV}_{\text{pasture}} &= \frac{\text{EAV}_{\text{cropland}}}{3} \\ \text{EAV}_{\text{other farmland}} &= \frac{\text{EAV}_{\text{cropland}}}{6} \end{aligned}$$

The amount of property taxes paid by the landowner (or expected amount based county averages) is also used in the expense column of the income appraisal approach to determine the net income.

Increased land value due to improved management may lead to higher property taxes and create a disincentive for conservation. This can be avoided by also including tax credits for land owners who implement conservation practices. 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 Illinois Society of Professional Farm Managers and Rural Appraisers collects, analyzes, and aggregates data annually and provides info to members on trends in land sales and leases across the state. In addition, banks often conduct appraisals internally along with applications for operating loans. Engaging lending institutions, farm managers, and appraisers to then work with them on developing and implementing strategies that incorporate soil health focused management into land valuation will be critical.

For the assessment process, another key institutional stakeholder is the Farmland Assessment Technical Advisory Board (FATAB). FATAB is a five-person appointed panel created to advise in and provide technical information in the calculation of agricultural economic value as well as to publish its estimates of gross income and production costs.

MANAGEMENT

Management of the land impacts biological and chemical characteristics of the soil, which are dynamic, and in turn, affect soil health and productivity. Managing for soil health, i.e. improved soil function, is a matter of maintaining a suitable environment for the

myriad of living organisms that comprise the soil food web. Key principles of soil health management are: disturbing the soil as little as possible; growing as many different species of plants as practical; keeping living plants in the soil as often as possible; and keeping the soil covered. With changes in management, soils can be either degraded or improved, and those changes are rarely, if ever, captured by soil databases and related indices (7).

Many farmers get their soil tested to determine available nutrients, organic matter, pH, and more, using recently available soil-health focused tests. Given availability of such soil tests, it is possible to create a more dynamic representation of soils in national and state databases. Additionally, given that land value is connected to the productivity defined by these databases, creating the needed feedback-loops between these systems should be a priority.

Prior to highlighting interventions and opportunities for action that can be explored to link soil health and land value, the sections below describe components of the current land valuation system and key factors that drive the valuation processes. The nodes on the map capture high level factors (e.g. soil characteristics, markets, and demographics) that influence agricultural property values as well as specific policy frameworks and data sets that serve as inputs to determine the value of the land.



SOIL CHARACTERISTICS

Physical, chemical, and biological properties of the soil have a direct impact on its productivity and the associated income that can be derived from the land. Soil properties and associated classifications, therefore, play an important role in land valuation process. Currently, soil classifications are taken to be static properties. USDA - The Natural Resources Conservation Service Web Soil Survey tool provides information about soils for 95% of nation's counties online. Such information serves as a basis for numerous other parameters associated with soil productivity.

Productivity index (PI)

In Illinois, soil properties are used to determine productivity indices that are used in land appraisals and property tax assessments. The productivity indices are documented in [Bulletin 810](#) and [Bulletin 811](#) for average and optimum management, respectively. Bulletin 810 shows the average 1990s yields of various grain, forage, and tree crops for Illinois soil types under an average level of management. Productivity indices are given for the various soils. The bulletin also outlines a method of adjusting both yields and productivity indices for slope and erosion. In Bulletin 811, for the optimum level of management, the crop yields that were achieved by the top 16% of farmers in Illinois in the 1990s are used. These 10-year average crop yields under an optimum level of management for most soils are taken to equal approximately 1 standard deviation (SD) above mean crop yields of all farmers in Illinois.

Today's productivity indices are based on historical averages and don't allow for adjustments based on current management systems and associated changes in soil characteristics.



MARKET CHARACTERISTICS

Market dynamics are important drivers of land value - trends in sales, comparable properties, capitalization rates, and commodity prices impact what a buyer or an investor would be willing to pay for the land. Many of these factors are outside of the immediate control of the local real estate market, however, they are important to consider.

Commodity prices

Trends in commodity prices provide signals to institutions in the agricultural and real estate sectors that inform projections for cash rent rates. Commodity prices also go into determining revenue from crops grown and associated income from the land, which is a variable that goes into determining land value.

Capitalization rate (related to market conditions)

Defined as net operating income divided by the property asset value, the capitalization rate is used in the income approach of the appraisal process to estimate the property value. The capitalization rate is a reflection of current commodity markets and market cash rental rates. The capitalization rate is indicative of the return on the investment. A typical capitalization rate can be somewhere between 3-6%.



SPATIAL AND DEMOGRAPHIC CHARACTERISTICS

Location of the land along with demographic characteristics of the area influence the value of the land. Much of the land valuation process and appraisal rests on finding comparable land sales and properties in the vicinity. Therefore, it's important to understand and consider how location and associated land uses in the area impact land value.

Urban proximity

Proximity to urban centers impacts land value because there is often development pressure. Also, being close to densely populated areas could be an access point for markets and infrastructure needed to process and sell crops.

After soil productivity, distance to Chicago is the second leading determinant of farmland prices in Illinois. Similar effect is noted for land near St. Louis. However, starting in 2006 valuation influence from proximity to St. Louis began to diminish (8).

DATA USED IN LAND VALUATION PROCESS

Cash rent (function of PI)

Cash rent is used to estimate farm income in the appraisal process. Cash rent is the most common lease payment arrangement in Illinois. Annually, University of Illinois Extension provides projections for average cash rent rates, which are empirically linked to the productivity index. The formula is derived by relating previous year's average county cash rent values to county average productivity index and adjusted based for expected market trends and geography.

Returns (function of PI)

While typically cash rent is used to determine income derived from the land, returns based on production data (soil types, commodity prices, yields, etc.) can also be used. However, the data, if available, is based on county averages or typical crop budgets and doesn't reflect actual profitability of the land and differences in input costs and revenue based on different management practices.

Agricultural Economic Value (AEV) (function of PI)

Specified by the Property Tax Code of Illinois, the AEV is defined as the difference between gross income and production costs divided by the capitalization rate, r . Illinois sets the rate to be the 5 year average of Federal Land Bank mortgage interest rate. This calculated capitalization rate is utilized in the assessment process.

Adjustment factors (function of PI)

Adjustment factors allow for modifications of the PI of the assessed land based on the following: slope and erosion (adjust the PI that goes into determining value); flooding (adjust PI based on Bulletin 810 recommendations, site specific, recomputed annually); drainage district assessments; soil inclusions, droughty soil, and ponding (accounted for in long-term yield averages), that are only used in unusual conditions.

Alternative uses (related to management)

If the parcel/field includes land for other than agricultural use as defined in the Property Tax Code, the following alternative uses can be added and used in the determination of the assessed value. These include: roads; waterways (creeks, streams, rivers, drainage ditches, ponds, borrow pits); grassed waterways and windbreaks; power lines; lanes and non-dedicated roads; land under an approved forestry management plan; vegetative filter strips (assessed as 1/6 of PI of cropland, except in Cook County); Christmas tree production; land in the Conservation Reserve Program or the Conservation Reserve Enhancement Program; horse boarding and training facilities; tree nurseries; greenhouse property; wildlife farming; fish farming; compost sites; and sewage sludge disposal sites.

STRATEGIES FOR ACTION

Delta's investigation into the main land valuation mechanisms revealed multiple, interconnected variables. Our research and community engagement around land value highlighted nine opportunities that could re-align the ways that land is valued and transacted that would do a better job at internalizing soil health and provide incentives for building, instead of degrading soil. Additionally, we identified the critical stakeholders that could influence these changes.

The interventions can be grouped into two main categories, technical and social. The agricultural land market is still a marketplace that brings together buyers and sellers around transactions of land, and is in need of updated data and models to better integrate soil health into these transactions. Targeted engagement, relationship, and trust building will also be needed to shift the dynamics of the system.

With a fuller understanding of how agricultural land is valued, we are able to identify strategies for explicitly incorporating soil health's contributions to land value. The recommendations for action and opportunities are outlined in the following pages and identified on the system map.



Updating Appraisal Guidelines & Educating Appraisers

Institutions such as the Appraisal Institute and ASFMRA publish guidelines that certified appraisers use in their valuation of rural property. There is an opportunity to amend, update, or develop new guidelines that give appraisers the technical ability and tools to more fully integrate the connections between underlying soil characteristics, management, and land value. ASFMRA 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 soil health focused agriculture.



Opportunity: Engagement with local, regional, and national land valuation professionals to understand how to include soil health factors into land valuation.

Outcome: Individual trust building relationships will be critical, as will regional gatherings, and the preparation and distribution of a toolkit that helps appraisal professionals adapt current processes to ones that incorporate soil health explicitly.

Sales Comparison Database

One of the biggest hindrances to incorporating soil health into land value is that farmers using these management practices are spatially disconnected, therefore when using the 'sales comparison' approach, any value that might be added on that farm would be negated by other farms that are engaging in more risky and (possibly) less profitable farming practices.

A database of farms using soil-health building conservation practices could be built, correcting for external factors (such as distance to urban areas), and be used to compare parcels to other parcels that are also using these techniques.



Opportunity: The analytics available from such an approach will allow for a broad evaluation of farms using similar practices and be able to make the case that in the absence of nearby comparable farms, such a database could be used as a proxy.

Outcome: Database containing management, respective soil health parameters from farmers, and geographic information for integration into the sales comparison approach of the appraisal.



Productivity Index - Soil Health and Dynamic Soil Mapping

While variants of the productivity index (PI) exist for average and optimum management, there is an opportunity to create a new management class that incorporates the management principles of soil health.

Soil classifications and related productivity indices that are used in national and state-wide assessments of agricultural land, such as the National Commodity Crop Productivity Index (NCCPI), built on the Soil Survey Geographic Database (SSURGO), and the Illinois specific Productivity Index (PI) are based on soil samples that are rarely updated.

With changes in management, soils can be degraded or regenerated, and those changes are rarely, if ever, captured by the soil databases and related indices. On the other hand, farmers get their soils tested to assess available nutrients, organic matter, pH and more recently a battery of soil-health focused parameters.

Given these soil tests, it is possible to create a more dynamic representation of soils in national and state databases, and given that land value is connected to the productivity defined by these databases, creating the needed feedback loops between these systems should be a priority.



Opportunity: Data products like this are prepared at a national level, at a state level, and by private agricultural companies. There are opportunities to work across all these providers to update their methodologies and incorporate more management specific information that is available from satellite data into their products.

Outcome: Revised datasets on productivity potential that are direct inputs to the appraisal process.



Integrating Soil Health Data into Illinois Land Value Reporting

The Illinois Society of Professional Farm Managers and Rural Appraisers reports annually on the state of rural farmland markets. The richness of these reports could be increased with the inclusion of state-wide data that related changes in land value to other state-wide issues of importance, such as indicators relating to the Illinois Nutrient Reduction Strategy, and the usage of conservation cropping practices, such as no-till, cover crops, and diversification.



Opportunity: The information provided to date only tells part of the story that is focused on short-term gains at the cost of long-term sustainability. While this is a hard message to tell to the agricultural community, it is important to highlight that there are also opportunities to shift management practices, increase profitability, and improve environmental outcomes.

Outcome: Systematic data collection and incorporation of information about management and respective soil health parameters from farmers into written and presented materials from this and other aligned professional organizations.

Lending Eligibility

Given current appraisal methodologies, a farmer who uses soil health management systems to improve soil on their farm is unlikely to receive a significantly different appraisal than a farmer that doesn't. Building soil should be considered as both, a form of farm equity and a way to reduce many agriculturally-related risks. Farm financial ratios used in loan underwriting adequately incorporate farmland value and the equity that could be contributed by soil health, but they inadequately account for the changes in risk profile that the farms have, especially as related to resilience to extreme events.

Lenders and underwriters need the tools and education to incorporate both risk and value into their decision-making frameworks.



Opportunity: Engagement with the banking sector to illustrate the effects of soil health not only on farm profitability and land value, but also on the resilience of soil health focused farms to extreme events. New actuarially sound data will be needed to make progress on financial underwriting standards, but education for the sector will be imperative while those data are developed.

Outcome: Strategic engagement with agricultural banks and the identification of opportunities within the banking sector where the differentiated risks and returns, as related to both land value and overall farm profitability, can be integrated into financial decision making.



Income Capitalization Approach Reform

Currently, income approach is typically based on rental revenue or average yields for a given soil type and productivity (6). Expenses only incorporate taxes, insurance, and maintenance. However, income should reflect profitability of the land taking into account expenses associated with inputs such as fertilizer, pest control, and fuel. Data shows that cropping systems that implement soil building management practices observe increased net income because their input costs are reduced even if crop yield may decrease. Detailed data from landowners and potentially their tenants would be needed to determine the net income in this way.



Opportunity: As the agricultural industry shifts from a focus on yield maximization (at great environmental cost) to one of profit maximization, the enhanced profitability potential of soil health focused farms can be gathered and compiled to demonstrate the effects on land value from the income capitalization approach.

Outcome: Data about management and respective soil health parameters from farmers would be analyzed to demonstrate the viability of this approach.

Capitalization Rate Adjustment

Integrating the change in risk of an agricultural operation due to improvements in soil health can be reflected in several places on the balance sheet, but when investments in farmland are considered, the discount rate that is chosen poorly reflects the changes in risk and resiliency of improved soil health. In considering investments in agricultural land, the discounted cash flow analysis is commonly used. The discount rate chosen in that analysis does not currently reflect management effects on soil and the potential long-term impacts of poor management.

Investment professionals are in need of appropriate tools to assess investments in agricultural land and the effects of management on the degradation or regeneration of soils and its implications on investment decisions.



Opportunity: Identification and development of new data and models that illustrate the opportunity to change the discount rate for soil health focused farms and their long-term ability to maintain (or increase) value.

Outcome: New discounted cash flow models that are built with soil health focused correction factors and appraisal guidelines that use these updated discount rates in the income capitalization approach of the appraisal.



Tax Credits

Currently property taxes for agricultural land are assessed based on its agricultural economic value, which is a function of static productivity index values for a given soil type, its respective net income, and the capitalization rate. Illinois can create tax incentives to encourage practices that improve soil health and build soil carbon.

New York State is advancing legislation that could be used as a model for Illinois. The policy would provide tax credits for farmers for sequestering carbon on their farms.



Opportunity: An updated productivity index (see above) would be needed to change the way land is taxed. The provision of public goods (clean water, stored carbon, biodiversity) and associated quantification could also be used to develop tax incentives.

Outcome: Engaging the relevant tax authorities or legislative processes about the steps to incorporate such changes into tax laws, and the further provision of data, constituent support, and model law changes that could be put into effect.

Property Assessed Conservation Agriculture Financing

Incorporating lessons learned from the energy sector, novel financing strategies can be applied to the agricultural space to help finance upfront costs to transition to more soil-health focused management systems.

As an example, Property Assessed Clean Energy (PACE) financing is a tool that can be used to finance building energy efficiency upgrades, where the loans for improvements are repaid through annual property tax bills. Bonds are used to securitize the loans for sale to investors. A similar approach can be utilized in agriculture.



Opportunity: This innovative financial structure is used in several states to promote energy efficiency and renewable energy generation. There have been controversies in several states, which has slowed the adoption of this approach.

Outcome: Careful study of existing PACE financing models and engagement with PACE financing professionals to gauge the applicability of this model to the transition to a more soil health focused agricultural system.



RECOMMENDATIONS FOR ACTION

- Update Appraisal Guidelines & Educate Appraisers
- Develop a Sales Comparison Database
- Create a Dynamic Productivity Index
- Integrate Soil Health Data Into Illinois Land Value Reporting
- Utilize Lending Eligibility Criteria
- Reform Income Capitalization Approach
- Integrate Risk Adjustment into Discount Rates
- Provide Tax Incentives
- Adapt Pace-Type Financing Models

Land value, especially if linked to soil health, can be an important factor in driving management decisions that would result in improvements in soil health and the value of the land. The current system that determines how land is valued is complex with many interconnected variables and actors, yet does not explicitly connect soil health to value. After our analysis and research, we identified opportunities that focus on ways to catalyze change in this system from multiple perspectives, including working with stakeholders within the financial sector as well as policy makers. Delta Institute is starting to work with partners on implementing some of the recommended strategies listed above.