Investing in Soil Health via Regenerative FarmLand Investment Trusts: A Policy Analysis and Pilot Recommendations

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Executive Summary

The soils of the United States are a strategic asset. Healthy soils are essential for the maintenance and provision of stable and diverse food supply. Healthy soils provide substantial environmental and other public benefits, ranging from climate change mitigation and resilience, biodiversity, water quality, and many other ecosystem services. As the basis of agricultural production, health soils are the foundation for farmers' and rural communities' economic security.

However, **agricultural practices that preserve soil health are not being adopted at speed or scale.** Status quo, conventional agricultural practices, which rely on tillage, mono-cropping, and synthetic inputs, are unsustainable. The US is losing farmland soil faster than it is being formed, putting at risk food systems, livelihoods, and environmental stability. Farmland stakeholders' interests are not sufficiently aligned with the conversion from conventional agricultural practices to regenerative agricultural practices. Where available, the current incentives to better align these stakeholders' interests are inadequate or incomplete to facilitate the rapid adoption of regenerative practices on a national scale.

Research Questions

Given the existing landscape of policy tools and financial incentives, how can private equity financing facilitate the adoption of regenerative agricultural practices rapidly and at scale? More specifically, **is it possible to design a new, voluntary private investment vehicle—a so-called FarmLand Investment Trust (FLIT)—whose focus is on both achieving investor returns and on enhancing soil health?** The proposed FLIT model seeks to create market-based incentives that ultimately better align stakeholder incentives to facilitate the widespread adoption of regenerative agricultural practices for healthy soils. Given these objectives, this report seeks to analyze the following research questions:

1. Which type of measurement, reporting and verification (MRV) framework should be used to document and verify regenerative outcomes in a market-based FLIT model?

2. What structure should the private investment vehicle take (alongside possible government incentives) to best align stakeholder incentives and achieve positive economic and environmental outcomes? Relatedly, how should this structure be piloted?

Key Findings

The FLIT should utilize a practices-based framework while also using easily deployed modeling techniques to estimate outcomes where possible. Despite tradeoffs with producer flexibility, concerns regarding the ease of implementation, risk distributions, and equity considerations for producers together strongly support a practice-based MRV framework.

The **FLIT's financial and organizational structure should be based on a private equity investment model**. This model is preferred given the current primacy of debt financing in the agricultural industry, operational challenges associated with Real Estate Investment Trusts (REITs), and the greater relative flexibility of private equity investment management structures. The private equity structure will require strong structural and legal guardrails in the form of investment restrictions and some kind of affirmative easement—a so-called "working lands easement"[1]—to appropriately and effectively balance the interests of

[1] "Working lands easement" is a working title for the purposes of this report. See also Larson, Anna., 2021 for more information about easements vis-à-vis a FarmLand Investment Trust.

producers, non-producers (e.g., investors, landlords, etc.), and beneficiaries of soil health outcomes. Producers working as FLIT land operators must have the option to build "sweat equity" in the private investment vehicle.

Given the limited data availability of farm-level agricultural practices and finances, **a pilot program to simulate a FarmLand Investment Trust is needed** to adequately address outstanding design, particularly the desirability and/or need for possible government incentives to enhance the profitability or uptake of a FLIT. A pilot program could critically inform any subsequent recommendations for policy changes (as relevant), pitches to (non-impact) private investors, and the types of structural guardrails that are needed in a FLIT.

Recommendations for Pilot Design

Diverse stakeholders in the agricultural industry interviewed for this research project were receptive to the idea of a FLIT. Some stakeholders expressed skepticism regarding the feasibility of specific aspects of design and/or implementation (e.g., legal considerations). Others expressed receptivity as being contingent on the protection of certain stakeholder interests (e.g., ability of producers to build equity), but no stakeholders outright rejected the theoretical feasibility of a FLIT. However, the uncertainties surrounding specific legal and financial structures, sufficient profitability concerns, and other considerations point to the need for a pilot program. The recommendations for the design of the proposed FLIT pilot include the following:

1. Finance the pilot using philanthropic funding (minimum $10 million)
2. Aim to source pilot program land from non-operator landowners(NOLs). Aim to source farmland that is diverse in size and crop types
3. Target landless new and young farmers as the primary FLIT operators
4. Hire experienced and established third-party consultant(s) to oversee and implement MRV frameworks
5. Use the pilot program to test and inform the specific private equity model and distribution waterfall as well as whether or not a government-mediated financial benefit is necessary
6. Do not incorporate new CRP, EQIP or other government program activities on farms under the management of a FLIT pilot in order to separately assess the pilot's outcomes from other government programs
7. Do not incorporate new ecosystem services payments regimes on farms under the management of a FLIT pilot in order to separately assess the pilot's outcomes from other income streams
8. Consider limiting the scope of the pilot to a particular region (e.g., California) or specific crop types (e.g., commodity crop-based rotations) to reduce operational challenges
9. Fund and operate a FLIT pilot for at least 3-5 years
10. Partner with soil science researchers, academics, and policy experts to conduct rigorous evaluations of environmental, social, and economic outcomes during the life of the pilot program

Introduction

The United States faces a soil health crisis. Farmland soil is being degraded and eroded at unsustainable rates, a trend which threatens farms, farmers, and the nation's food supply. Although soil can erode naturally due to forces such as water and wind, the present soil health crisis is accelerated by unsustainable and intensive cultivation practices that deplete soils. Yet we are not without tools to combat this crisis. Centuries of science and producer-acquired knowledge show that the adoption of regenerative agricultural practices, which focus on enhancing the health of the soil and holistic ecosystem management, can reverse this trajectory and rebuild our nation's soil health. The rapid and widespread adoption of these practices can not only improve the long-run health of America's farmland assets, but it can also create substantial public benefits such as water security and climate stability.

But do we have enough tools or the right kinds of tools? While we have established soil health management practices and techniques, policy supports and expertise, and continually improving scientific knowledge in this area, the actual adoption of these practices remains minimal. Of the nearly 400 million acres of cropland in the United States,[i] only about 15.4 million acres had seeded cover crops in 2017.[ii] In the Midwest, farmers use cover crops on less than 10% of the total acres of commodity cropland (corn, soybean, and cotton) where the practice is feasible.[iii] This failure to scale persists despite numerous public and private sector programs designed to encourage the adoption of soil health practices. As a nation we are dependent on the long-term quality and preservation of soils, but they are owned by landowners, mainly private entities, who must respond to a variety of market dynamics, often at the expense of soil health. We lack sufficient incentives to influence markets and better align the national interest in soil health with the business and social interests of those who control and manage US cropland.

In this context, Project 2030 has proposed a new tool, a voluntary financial incentive, that would be designed to aggregate and direct new private sources of capital to the task of restoring soil health. Drawing from lessons in Real Estate Investment Trusts (REITs) and federal tax credits driving private investment in wind and solar industries, can a new private investment structure—a so-called FarmLand Investment Trust (FLIT)—realign incentives and put private capital to use to produce returns on investments and the adoption of healthy soil practices?

This report was one of several analyses commissioned by Project 2030 to assess different aspects the potential feasibility, design, and implications of the proposed FarmLand Investment Trust (FLIT). This report, *Investing in Soil Health via Regenerative FarmLand Investment Trusts: A Policy Analysis and Pilot Recommendations,* primarily assesses aspects of a FLIT's potential design, including the desired outcomes; possible measurement, reporting, and verification (MRV) frameworks; and the benefits of the proposed structure of the FLIT.[iv]

I. Background

The Soil Health Crisis

The soils of the United States are a strategic asset. Not only are healthy soils essential to maintain a stable and diverse food supply to feed the country (and indeed much of the world), but the environmental benefits that healthy soils provide—ranging from climate change mitigation and resilience, biodiversity, water quality, and other ecosystem services—are substantial. Farmers' livelihoods and rural communities—and the millions employed in the agricultural industry—depend on healthy soils as the basis of agricultural production and economic success. The preservation and maintenance of healthy soils is a national security concern.

However, soil health is not a new concern for the United States. The most severe environmental disaster in the history of the United States was a soil health crisis. In the 1930s, the Midwest and Southern Great Plains regions of the United States experienced drought, widespread crop failures, and dust storms in what has become known as the Dust Bowl. In the years leading up to the drought in 1931, perverse federal land policies and commodity price cycles combined with the expansion of wholly unsustainable and soil-depleting farming practices to create an environmental cataclysm. The Dust Bowl was a prolonged environmentally and economically devastating crisis, lasting about a decade.

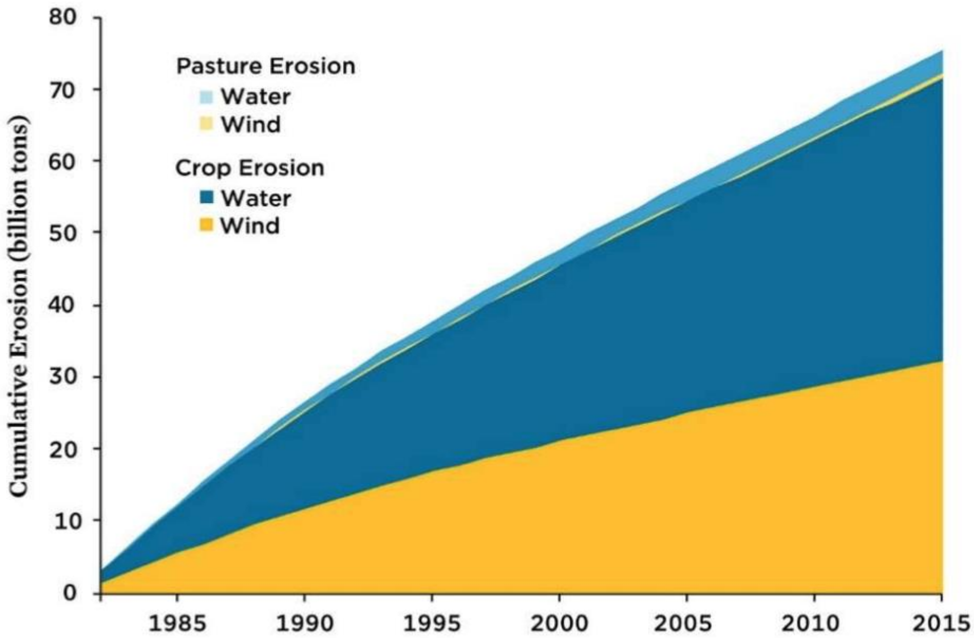
It is difficult to comprehend the scale and suffering of the Dust Bowl, which coincided with the Great Depression. Nearly 100 million acres of land—primarily in Oklahoma, Texas, Kansas, and Colorado—were transformed into ecological dead zones.[v] By 1936, Americans farmers were losing $25 million a day. More than 500,000 families were left homeless by the Dust Bowl. An unknown number of people and livestock died from starvation, malnutrition, or complications from dust inhalation. Approximately 2.5 million people, many of them destitute refugees, left the Dust Bowl states during the 1930s in one of the largest mass migrations in US history.[vi] In many cases, it took decades for soils and rural populations in Dust Bowl states to recover from this disaster.[vii] By one estimate, the Dust Bowl cost the United States an estimated $7.4 billion per year in today's dollars in damages and lost productivity.[viii]

Although the Dust Bowl occurred nearly a century ago, the United States is again facing a crisis of soil health. US cropland is experiencing high rates of soil erosion and land degradation as a result of unsustainable agricultural practices throughout much of the United States. See Figure 1.1 for historical rates of soil erosion. If current soil erosion rates continue, US croplands will lose an additional 28 billion tons of soil by 2035 and 148 billion tons of soil by 2100.[2] Given the slow rate at which soil is formed, it would take more than 300 years to replace this additional amount of lost soil.

Soil is a precious and finite resource, and its depletion is costly. The USDA estimates that the annual cost of erosion from agriculture is about $44 billion per year, which is $247 in costs per hectare of cropland and pasture.[ix] These significant costs include lost productivity, soil erosion, and sedimentation and eutrophication of water reservoirs. Lost farm income due to soil erosion is estimated to be $100 million per year in the United States.[x]

[2] Note: 28 billion tons and 148 billion tons are equivalent to an additional 0.5 inches and nearly 3 inches in lost farmland topsoil. DeLonge, Marcia and Karen Perry Stillerman. "Eroding the Future: How Soil Loss Threatens Farming and Our Food Supply." Union of Concerned Scientists. December 2020. https://www.ucsusa.org/sites/default/files/2021-02/eroding-the-future-dec-2020.pdf

Figure 1.1: Eroded Soil on Croplands and Pasturelands in the United States from 1982-2015



This graph represents **cumulative** *soil lost due to water and wind erosion on croplands and pasturelands. Notes: Data from Alaska were not available, and data from Hawaii and the Caribbean Islands were excluded for this figure. Soil erosion data are from 1982, 1987, 1992, 1997, 2002, 2007, 2012, and 2015. Losses between reported periods were linearly interpolated. Data on these metrics was not collected prior to the 1980s. Data Source: NRCS and CSSM 2018. Source: DeLonge and Perry Stillerman (2020).*

Adding to these concerns, scientists predict that "climate change will increase the chances for extreme, Dust Bowl-type weather, which could have devastating consequences for today's US farming systems."[xi] Climate-driven accelerations of soil erosion and depletion increase the risks and threats posted to agriculture and food production. To reverse the trajectory of this soil health crisis, the United States must rapidly regenerate its healthy soils and there is no time to waste.

What Does It Mean to Be "Regenerative?"

Before analyzing the substance of regenerative agriculture, it is important to acknowledge and briefly discuss the challenges of identifying so-called regenerative agriculture. Although this report uses the term "regenerative" agriculture, this term can be vague given there multiple and overlapping definitions of what this term does (or does not) mean in terms of on-farm practices and management. Additionally, the use of the term "regenerative" can be problematic for certain stakeholders in US agriculture.[3]

[3] For a more complete discussion of producer stakeholders and attitudes regarding the term "regenerative", see analysis by Mudd, Karina., 2021.

Terminology: A Crowded Field and Moving Target

Although it is not a new concept, "regenerative agriculture" is a relatively newer term for some in the agricultural industry. According to a recent review of peer-reviewed literature, "terms like 'sustainable agriculture', 'climate-smart agriculture' and 'agroecology' are widely used in academic literature [but not] 'regenerative' agriculture."'[xii] While not widely used in the scientific literature, this same review found over 40,000 mentions of "regenerative agriculture" in so-called gray literature, albeit with a wide range of definitions for the term. The authors of this literature review group the types of regenerative agriculture definitions into three (not necessarily mutually exclusive) categories:

1. Regenerative agriculture as a set of practices,
2. Regenerative organic agriculture (avoidance of synthetic fertilizer and pesticides), and/or
3. Regenerative agriculture as farming that enhances in which the focus is on going beyond the reduction of negative impacts to ensure that agriculture has a positive environmental effect

The set of practices that are widely and generally agreed to be associated with definitions of regenerative agriculture include the following activities. These practices also align with understood principles of soil health.

- Abandoning tillage
- Eliminating bare soil
- Fostering plant diversity
- Integrating livestock and cropping operations[4]
- Encouraging water percolation into the soil

Some additional practices which are sometimes but lesser associated with definitions of regenerative agriculture include the following:

- Add green manures
- Add compost

Some practitioners and regenerative specialists also define regenerative agriculture by the prohibition or avoidance of synthetic fertilizer and pesticides. In combination with other pro-active soil health practices listed above, the prohibition of artificial inputs is often referred to as "organic regenerative agriculture" in order to differentiate from regenerative agriculture in which inputs are technically allowed to be used but only on a minimal basis.

The following Table 1.2 maps the range of specific practices to some well-known definitions of regenerative agriculture. Although different stakeholders may be using the same term (e.g., "regenerative agriculture"), they may practically mean different things in terms of farm management, and in particular, the same term may encompass certain on-farm practices for one group but not another. Unsurprisingly, there is consistent

[4] For specific crops, it is not feasible to practically or safely (e.g., from a food safety perspective) integrate livestock into cropping operations, but many regenerative agricultural advocates agree this is preferable where feasible. Multiple Stakeholder Interviewees, 2021. Personal communications.

agreement vis-à-vis activities that promote soil health, but there is greater deviation as to which practices are necessary versus optional in order to be classified as regenerative agriculture. Notably, Project Drawdown,[xiii] which focuses on the use of regenerative agriculture with the primary aim of reducing global greenhouse gas emissions, incorporates the addition of non-chemical inputs into its definition.

Table 1.2: Mapping Specific Practices Against Different Definitions of Regenerative Agriculture

Practice	Brown (2016)	Regenerative agriculture		Regenerative organic agriculture
		CSU (2017)	Drawdown (2017)[a]	Rodale Institute (2018)
Minimise tillage	✓	✓	✓	✓
Minimise bare ground	✓	✓	✓	✓
Foster plant diversity	✓	✓	✓	✓
Increase water percolation	✓	✓		
Integrate crops and animals	✓	✓		Optional
Add green manures			✓	
Add compost			✓	
Avoid synthetic fertilizers and pesticides	✓	Minimise	✓	✓

Legend: ✓ means includes; a blank space indicates no data

[a]: Four of the six to be present

Source: Burgess, et al., 2019.

A slightly different understanding of regenerative agriculture defines it as a farming system which explicitly enhances the farm ecosystem. In contrast to the idea of sustainable agriculture as a farming system which "does no harm," this enhancement conceptualization of regenerative agriculture envisions a farming system that continually regenerates and improves the environment. Some definitions formally (and many practitioners informally) apply the enhancement of the farm ecosystem to not only biological environment but also the social and human environment, including the enhancement of human communities.[xiv] For example, given the potentially harmful effects of repeatedly exposing producers and farm workers to synthetic chemical inputs or potential risks posed to consumers who eat food sprayed by these substances, some regenerative agriculture specialists argue that enhancing the farm's workers and end consumers necessitates the prohibition of synthetic inputs. The Regenerative Organic Certification (ROC), which is being developed by the Rodale Institute and builds on the USDA established organic certification, prohibits the use of synthetic inputs and is organized around three pillars: soil health, animal welfare, and social fairness.

The following Table 1.3 adopted from Burgess, et al. (2019) provides examples of several regenerative agricultural definitions that emphasize enhancement along environmental and/or social dimensions.

Table 1.3: Selected Definitions of Regenerative Agriculture Focused on Enhancement[5]

Definitions of regenerative agriculture	Reference
• Farming and grazing practices that, among other benefits, reverse climate change by rebuilding soil organic matter and restoring degraded soil biodiversity – resulting in carbon drawdown and an improved water cycle.	California State University (2017)
• Regenerative agriculture actively builds the "system", or resource base, it utilises.	Modified from Inwood (2012)
• A system of farming principles and practices that increases biodiversity, enriches soils, improves watersheds, and enhances ecosystem services.	Terra Genesis (2017)
• "Built on biological principles, regenerative agriculture seeks to concurrently enhance productivity and environmental management".	Sherwood and Uphoff (2000)
• "For the system to be regenerative there must be an increase in both biodiversity and quantity of biomass"	Rhodes (2017)
• "Any system of agriculture that continuously improves the cycles on which it relies, including the human…, the biological…, and the economic community."	Kevin Boyer quoted by Reguzzonia (2018)
• Agriculture that protects and intentionally enhances natural resources and farm communities.	General Mills (2018)

Source: Burgess, et al., 2019.

It is these enhancement-focused definitions of regenerative agriculture that aim to link demonstrated positive environmental outcomes (e.g., reduced carbon emissions, reduced soil erosion, improved water cycle, etc.) to farming systems. As one report noted, "The eventual success of regenerative agriculture systems does not rest on their promise, but on their capacity to deliver on the ground."[xv] For many advocates of regenerative agriculture, it is the outcomes that are the most important. To measure outcomes over time, as well as inform farm management decisions, many regenerative farmers, including several interviewed for this analysis, rely on the use of repeated soil and related environmental tests. There are growing initiatives and efforts to establish protocols to measure and trade agricultural ecosystem services, including carbon credits, but these remain nascent with widely variable protocols. Where ecosystem services cannot be measured with certainty, producers, nonprofits, and agricultural companies can and do use modeling to estimate ecosystem services.

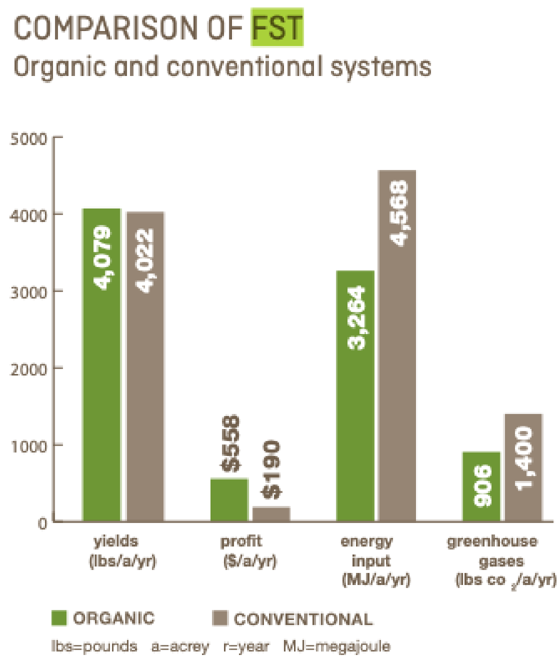
Benefits of Regenerative Agriculture

As described above, the definition of regenerative agriculture remains in flux. Academic studies which seek to understand the adoption of "regenerative practices" and their links to specific benefits and outcome thresholds are accumulating, but they remain limited. In many instances, the science of regenerative agriculture is not complete, in part due to still-developing science linking practices to ecosystem services outcomes.[xvi] Where detailed data on the outcomes of regenerative agriculture exist, they are often proprietary, and therefore inaccessible, or these data are not necessarily comparable due to differing definitions and/or differing baselines.

[5] There are many other definitions of regenerative agricultural beyond these identified here. For example, a companion analysis by Larson, 2021 proposes the following definition: "Regenerative agriculture involves a shift in mindset that prioritizes stewardship. Regenerative agriculture takes a systems-based approach to farming, and is a set of principles that are applied in local contexts. It encompasses both specific practices, like cover cropping and conservation tillage, and desired outcomes, like cleaner water and air. In considering the whole farm system, regenerative agriculture should also consider power, access, compensation, and equity."

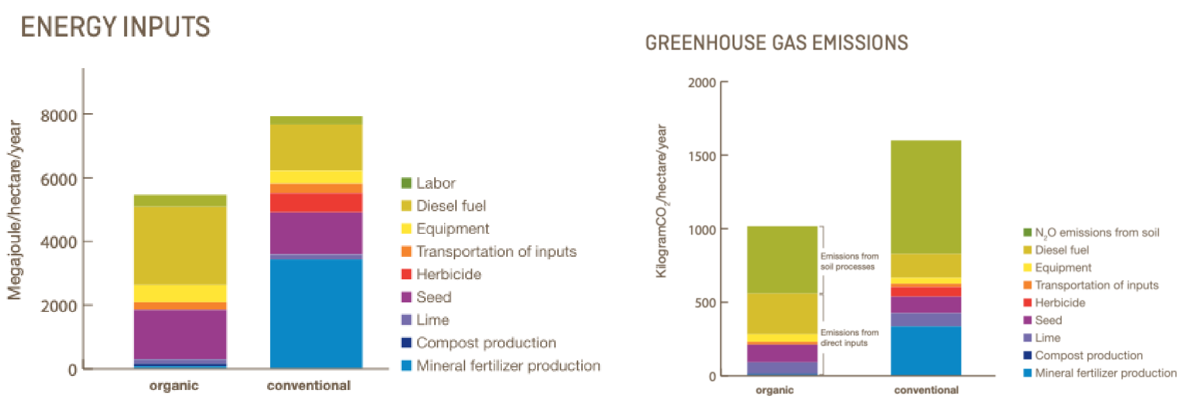
Given these challenges, some of the fullest data on outcomes comes from studies and analyses of other, adjacent agricultural systems that are similar but not necessarily identical to regenerative agriculture. The benefits of regenerative agriculture can be proxied from analyses of organic agriculture (and/or "regenerative organic agriculture") or conservation agriculture,[xvii] both of which are better represented in the agricultural academic literature. For example, useful longitudinal data comes from the Rodale Institute's Farm Systems Trials (FSTs), which are designed to rigorously test and compare the carbon sequestration potential, total carbon footprint, yields, and profitability of conventional versus regenerative organic farming systems. Their data indicate that organic regenerative systems generate similar yields with less intensive inputs required, resulting in fewer greenhouse gas emissions and more profit (see Figure 1.4).[xviii] Figure 1.5 further breaks down the differences in energy inputs between conventional and regenerative organic farming systems.

Figure 1.4: Comparison of Key Outcomes from the Rodale Institute's Farm Systems Trials (2008-2010)



Note: FST = Farm Systems Trial. Source: The Rodale Institute

Figure 1.5: Comparison and Breakdown of Energy Inputs and Greenhouse Gas Emissions from Rodale Institute's Farm Systems Trials (2008-2010)[xix]



Note: in both organic and conventiaonal systems, the hightest overall GHG emissions were caused by soil processes fueld by nitrogen in mineral fertilizer, compost and crop residues. Source: The Rodale Institute

In a meta-analysis comparison of the impact of no-tillage agriculture[6] relative to conventional tillage agriculture, Burgess, et al. (2019) identify the following environmental impacts, as well as the degree of

[6] No-tillage agriculture can be considered a sub-type of conservation agriculture.

confidence in these assessments based on the academic literature. Table 1.6 below outlines the main impacts.

Table 1.6: Impacts of No-tillage Agriculture (NT) Versus Conventional Tillage (CT) Agriculture

Statement	Confidence	Effect
Soil carbon: NT, relative to CT, increases soil carbon in surface layers	Well established	Benefit
NT and CT result in similar levels of soil carbon below 20 cm	Well established	Similar
Biodiversity: NT, relative to CT, increased diversity in surface layers but decreased it at depth	Established but incomplete	Similar
Yields: NT and CT result in similar mean yields of oilseed and cotton	Well established	Similar
NT and CT results in similar mean yields of maize and wheat under dry unirrigated conditions	Well established	Similar
NT, compared to CT, reduces mean yields of root crops	Well established	Disadvantage
NT, compared to CT, reduces mean yields of maize and wheat when there is no or minimal drought stress	Well established	Disadvantage
Other: NT and CT have similar greenhouse gas emissions per unit food	Unresolved	
NT, relative to CT, reduces fuel costs	Well established	Benefit
NT, relative to CT, increases farm profitability	Inconclusive	
References reviewed for no-tillage: Alluvione et al. (2009); Bayer et al. (2015); Blanco-Canqui and Lal (2008); Doran (1980); Drawdown (2017); Fernandez (2016); Haddaway et al. (2017); Halvorson and Grosso (2009); Huggins and Reganold (2008); Hutchinson et al. (2007); Mathew et al. (2012); Metay et al. (2009); Passianoto et al. (2003); Pittelkow et al. (2015); Potter et al. (1997); Robertson et al. (2000); Roldan et al. (2004); Smith et al. (1998); Tuomisto et al. (2013); VandenBygaart et al. (2003); West and Post (2012)		

Source: Burgess, et al., 2019.

The authors highlight a key point with regards to the economic outcomes: "We did not find clear evidence of the effect of conservation agriculture on farm profitability (Inconclusive), but the combination of similar yields with reduced costs means that it is financially profitable in some places."[xx] While greater profitability is possible—which case studies and interviews with producers for this report corroborate[xxi]—this outcome is not guaranteed and is highly context specific. Appendix A provides a table assessing the confidence of the main environmental and economic effects of nine regenerative-adjacent agricultural systems compared to more conventional counterfactuals or baselines (see Table A.1).

Attitudes Towards and Usage of "Regenerative" and Alternative Terms

In addition to the spectrum of definitions applied to "regenerative agriculture," it is important to briefly note the spectrum of alternative, adjacent or related terms other than "regenerative" that used to describe similar agricultural systems. Various stakeholders in US agriculture do not prefer (or even reject) the usage of the term "regenerative" for a range of reasons, which can further complicate attempts to identify shared meaning when it comes to on-farm practices. The USDA provides a list of more than 45 different terms related to "sustainable agriculture" noting that "some terms defy definition."[xxii] Terms such as agroecological farming, climate-smart agriculture, good agricultural practices (GAP), holistic management, alternative farming, integrated food and farming systems (IFFS), and other terms often overlap with the intent or practices generally espoused by regenerative agriculture but do so incompletely.

It is important to consider these complications surrounding the meaning and usage (or not) of the term regenerative by different communities across the United States. Even if there is shared meaning or understanding of the types of on-farm practices to be utilized or outcomes targeted, attempts to scale regenerative agricultural practices across US farmland may meet resistance based on the terminology in use, depending on the community being engaged. For example, many producers, particularly in politically conservative regions of the United States are resistant to adopting so-called "climate-smart" practices. However, according to a regenerative agricultural specialist and industry association representatives advising such producers, these producers are far more receptive to the same practices if pitched as "soil stewardship" or similar.[xxiii] Representatives from a major commodity producer industry association noted that their members are only just beginning to come around to the term "sustainable" in agriculture and that using the word "regenerative" would not likely have much traction among these commodity producers.[xxiv]

In contrast, the Biden Administration and representatives at the USDA frequently choose to refer to "climate-smart agricultural and forestry practices."[xxv,xxvi] In California, the CDFA largely uses terminology linked to "soil" (such as in the name of its flagship initiative, "The Healthy Soils Program") or by the specific outcomes it seeks to achieve with these practices (e.g., "soil management practices that sequester carbon, reduce atmospheric greenhouse gases (GHG) and improve soil health.")[xxvii] However, the usage of climate-centric language by these two Democratic administrations reflects these policymakers' and officials' top priorities to achieving greenhouse gas emissions reduction objectives via the expansion of regenerative agricultural practices. For example, the Healthy Soils Program is primarily funded from California's cap and trade proceeds, or California Climate Investments (CCI), which are deployed to help the state achieve its climate targets.[xxviii]

Members of Indigenous communities may also take issue with the term "regenerative agriculture." The Indigenous producers and agricultural specialists interviewed for this analysis noted that regenerative in its current usage seems like a new or fashionable term to describe types of farming practices which Indigenous communities have been using for centuries. Despite the fact that Indigenous people's land stewardship and traditions of holistic land management form a basis for regenerative agricultural knowledge, Indigenous communities' contributions are rarely acknowledged. A preferred, adjacent term often used by Indigenous producers is "traditional ecological knowledge (TEK)."[xxix] The U.S. Fish & Wildlife Service National Native American Programs describes TEK as describing:

> …The knowledge held by Indigenous cultures about their immediate environment and the cultural practices that build on that knowledge. [TEK] includes an intimate and detailed knowledge of plants, animals, and natural phenomena, the development and use of appropriate technologies… and a holistic knowledge, or 'world view' which parallels the scientific discipline of ecology.[xxx]

Indigenous agricultural specialists and producers often talk about the need to "decolonize regenerative agriculture" and redefine it in a way that is inclusive for Indigenous peoples. As explained by Director of Programs: Agriculture and Food Systems for the First Nations Development Institute A-dae Romero-Briones of the Cochiti/Kiowa, "At the heart of the concept of regeneration is wanting to renew and correct some of the missteps that have taken us to the point of environmental damage and degradation… so [properly defined] regenerative agriculture is one that includes a true history of land and the environment and people's health that starts prior to [colonial] contact."[xxxi] Given collective traditions and Indigenous peoples' sacred connection to land, Indigenous producers are more likely to extend the concept of ecosystem enhancement beyond environmental dimensions to include enhancement of human and community welfare in their conceptualization of regenerative agriculture (regardless of the specific terminology used). In addition, Indigenous agricultural specialists interviewed criticized that some native agricultural practices which have regenerative and cultural value to tribes are not necessarily explicitly recognized as regenerative.[xxxii]

For non-agricultural specialists and uninformed consumers, there is a very wide spectrum of familiarity with what it means to be regenerative. There is also a wide range of the relative importance placed on agriculture (or resulting food) being regenerative.[xxxiii] Some investors investing in farmland care about soil health and environmental outcomes, but do not necessarily use the term "regenerative." Others may not care about the details of the on-farm practices so long as the operation is certified organic, or alternatively, so long as the returns are sufficient. Impact investors—such as those investing in regenerative agricultural fund Iroquois Valley—are far more likely to understand the nuances of and care about regenerative agricultural practices. While consumers in the US are more familiar with the organic certification, this same level of familiarity and importance is not found with regenerative products. However, experts largely attribute this to the lack of a widespread regenerative certification standard.[xxxiv]

The understanding of and the different attitudes that producers and agricultural communities in the United States have towards regenerative agriculture—both as a term and as a concept implying a set of on-farm management principles, practices, and outcomes—is not a strictly intellectual exercise. The depth of understanding has implications for these different stakeholders' receptivity towards the goal of converting conventionally managed farmland to regenerative management. There are different levels of understanding and different levels of acceptance of regenerative agriculture. Even where there may be receptivity, there may not be working-level comfort or familiarity with the specific activities that are required to achieve regenerative agriculture as part of a farm operation. These attitudes will have significant implications for any effort or initiative that seeks to rapidly spread the adoption of regenerative practices at scale, particularly given the low levels of adoption at present. These complexities add to the separate challenges of measurement, reporting, and verification (MRV) for regenerative agricultural practices and outcomes due to variable definitions and understandings (for more, see Section IV "Measurement, Reporting, and Verification Framework.")[xxxv]

Agriculture in the United States

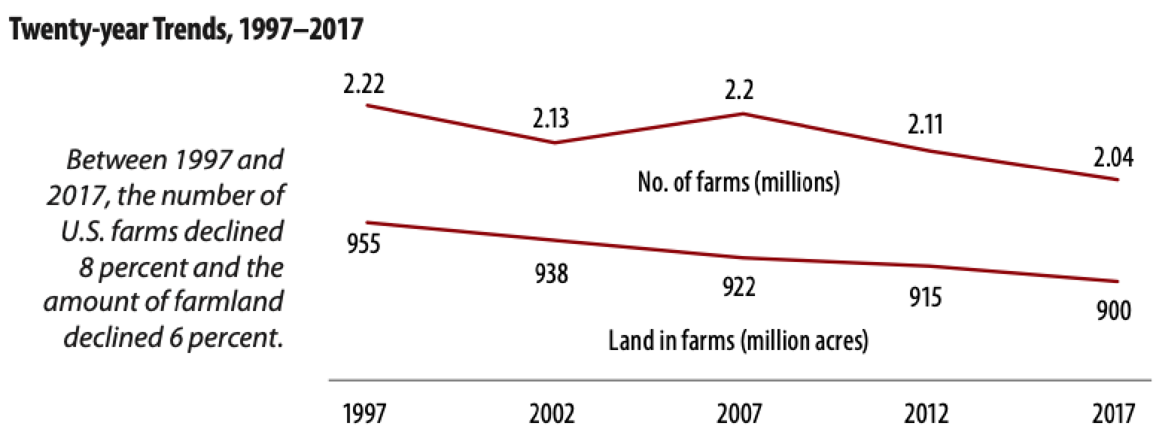
How widespread are regenerative agricultural practices in the United States? What are the relevant trends that influence the adoption of conservation and other regenerative practices? This section provides an overview of the US agricultural industry, including details about producers, farms, farmland, and other descriptive statistics that are relevant to this analysis.

Every five years, the USDA's National Agricultural Statistical Service (NASS) conducts the US Census of Agriculture in order to capture nationally representative data about the US agricultural industry. The most recent Census of Agriculture was conducted in 2017, and the next census will be conducted in 2022. Unless otherwise noted, much of the baseline statistics provided in this section come from the most recent 2017 census.

Farmland and Farmers in the United States

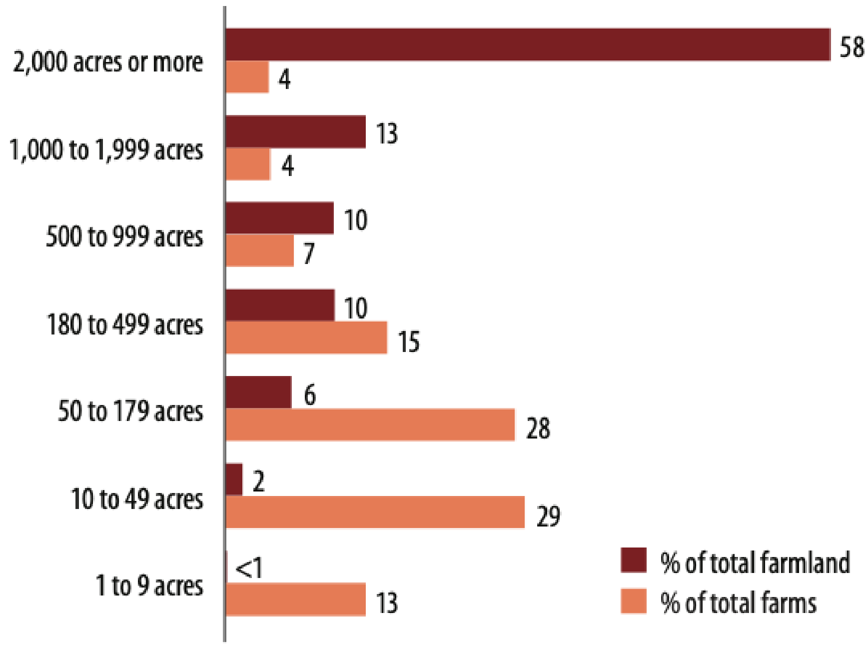
In 2017, the United States had 2,042,220 farms which accounted for 900.2 million acres of land—or 40% of all U.S. land. The USDA defines a farm as "any place from which $1000 or more agricultural products were produced and sold, or normally would have been sold, during the census year," so this accounting of farmland encompasses both cropland, pastureland, and woodland land use.[xxxvi] Both the total number of farms and the amount of lands comprising farms in the United States have continued to decline in recent years (see Figure 1.7). The average size of a farm in the United States, which has also been declining in recent years, was 441 acres in 2017. The majority (57%) of farms in the United States were 10 to 179 acres in size. Farms of this size range, however, only control 8% of total US farmland acreage. The 4% of farms that are 2,000 acres or greater in size controlled 58% of all farmland as of 2017, which is indicative of the trends of farmland consolidation widely noted by agricultural industry experts interviewed.[xxxvii,xxxviii] (See Figures 1.8 and 1.9)

Figure 1.7: Twenty-year Trends in Number of Farms and Land in Farms in the US



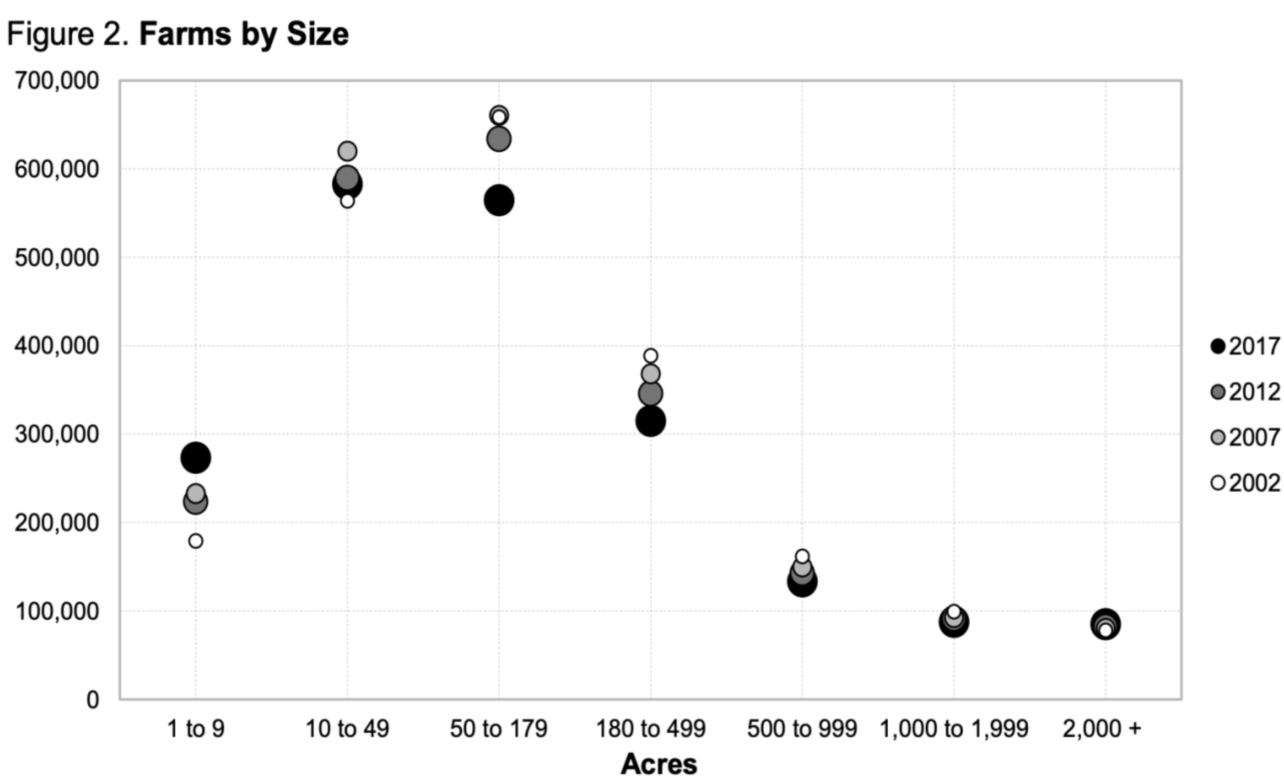
Source: USDA NASS

Figure 1.8: Farms and Land by Size of Farm in 2017



Source: USDA NASS

Figure 1.9: Farms by Size 2001-2017



Source: USDA NASS

Tables 1.10 and 1.11 breakdown US agricultural land use by type and by agricultural product specialization. While the US has over 900 million acres in agricultural use, only 396 million acres (44%) of this land is in cropland. In its definition of cropland, the USDA includes five subcategories: harvested cropland, crop failure, cultivated summer fallow, cropland used only for pasture, and idle cropland. Of the 396 million acres of cropland in the US, the vast majority—320 million acres—is harvested cropland, which is the primary focus of this analysis.[xxxix] The greatest share of farmland and percent of total farms specialize in cattle and dairy (44% of farmland use and 34% of US farms). Oilseeds and grains production constitute a third of all farmland use, which account for 16% of farms (see Table 1.11).

Table 1.10: Agricultural Land Use in the United States in 2017

	acres (mil)	% of total
Permanent pasture	401	45
Cropland	396	44
Harvested	*320*	*36*
Woodland	73	8
Other	30	3
Total	900	100

Source: USDA NASS

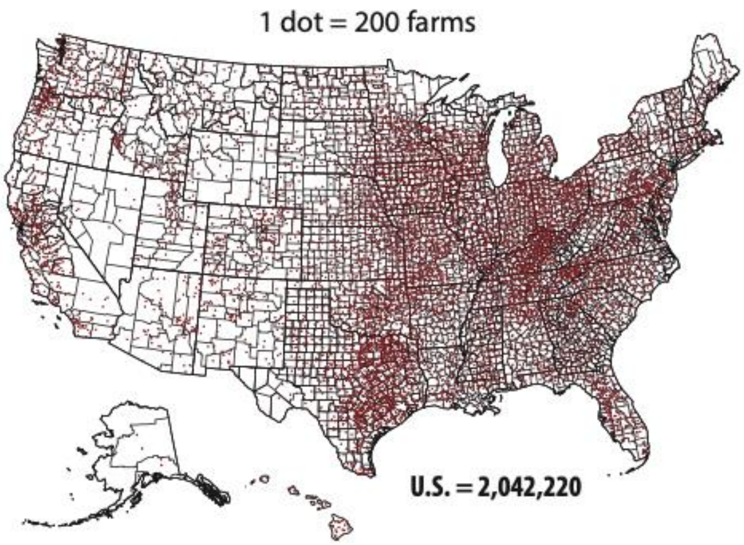
Table 1.11: Farm Product Specialization in the United States in 2017

	% of farmland	% of farms
Oilseeds and grains	30	16
Specialty crops (fruits, vegetables, nursery)	3	9
Other crops	13	22
Cattle and dairy	44	34
Hogs and pigs	1	1
Poultry and eggs	1	2
Sheep and goats	2	5
Other animals	6	11

Source: USDA NASS. Note: Farm specialization refers to the North American Industry Classification System (NAICS).

Two out of every five acres of land in the United States are farmland.[xl] However, the geographic distribution of farms across the United States varies significantly. Figure 1.12 provides a map of the locations of US farms across the country as well as a list of the states with the greatest number of farms. Figure 1.13 demonstrates the concentration of farmland by county, particularly in the central United States. In many counties between North Dakota and Texas, 70% or more of county land is used for agriculture (see Figure 1.13).[xli]

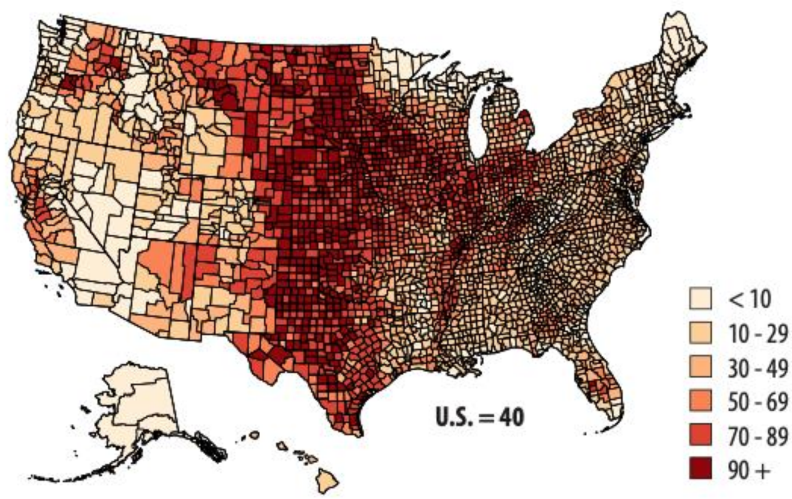
Figure 1.12: US Farms (Left) and Select States with the Greatest Number of Farms (Right) in 2017



Top States	no. of farms
Texas	248,416
Missouri	95,320
Iowa	86,104
Oklahoma	78,531
Ohio	77,805
Kentucky	75,966
Illinois	72,651
California	70,521
Tennessee	69,983
Minnesota	68,822

Source: *Source: USDA NASS, 2017 Census of Agriculture*

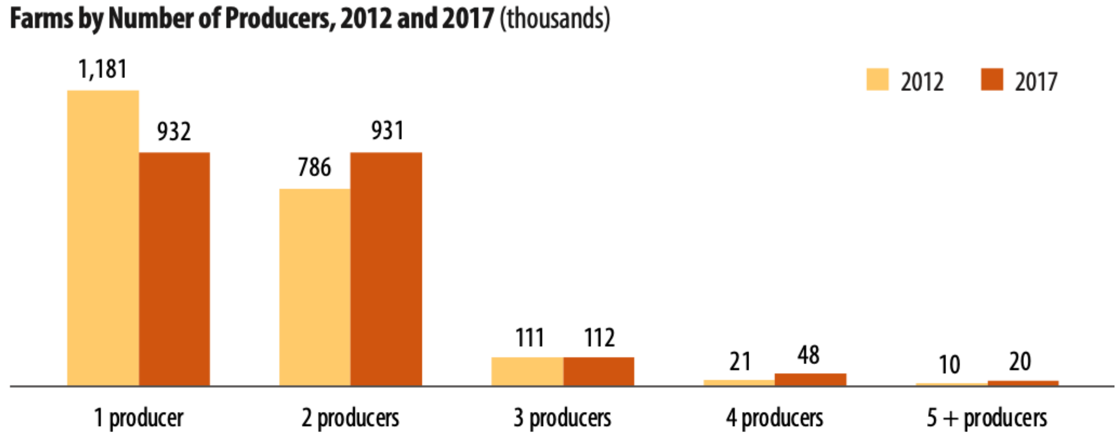
Figure 1.13: Farmland as a Percent of Land Area by County in 2017



Source: *Source: USDA NASS, 2017 Census of Agriculture*

On the more than 2.04 million farms in the United States, the total number of producers in that year was 3.4 million. Producers are defined by the USDA as someone involved in the decision-making of a farm operation (as opposed to hired or seasonal farm labor). The majority of farms (54%) have more than one producer involved in a farm's decision-making.[xlii] Between 2012 and 2017, the total number of producers in the United States increased by 7%. Notably, the number of farms with two or more producers per farm operation increased whereas the number of farms with a single producer declined (see Figure 1.14).

Figure 1.14: Farms by Number of Producers, 2012 and 2017 (in Thousands)



Source: USDA NASS, 2017 Census of Agriculture

Table 1.15 provides a snapshot of US producers as of 2017. It is important to note that US producers are overwhelmingly white—95.4% of producers identify as white. The next largest racial categories for producers—Black and Indigenous producers—both comprised less than 2% each of all producers in the United States in 2017. Historically, Black and Indigenous producers used to represent a much higher share of producers in the United States. Factors including but not limited to outright land theft, unfair agricultural lending practices, and racial discrimination have contributed to the attenuation of minority farmers in the US agricultural industry over the last century and inequal access to resources that continued today. As a result, farmers of color may be referred to as "socially disadvantaged farmers." This categorization sometimes also includes gender given the underrepresentation of female producers in the industry.[7] As of 2017, 36% of all producers were female. Between 2012 and 2017, however, female producers increased as a share of US producers by nearly 27% (see Table 1.16). Increases of that magnitude were not seen among non-white producers.

US producers tend to be older and have more experience in farming. More than a third of all US producers are 65 years or older in age. The average age of US farm producers in 2017 was 57.5 years, which was an increase of 1.2 years since the census in 2012.[xliii] Remarkably, the average US producer has been farming *on their current farm* for 21.3 years.[xliv] Overall, seventy-three percent of producers in 2017 had 11 years or more of experience in farming in general. Figure 1.17 reveals that the average age of producers also varies significantly by region. On average, US producers are younger in the Midwestern states and older in the south and southwestern states. Multiple stakeholders in US agriculture continue to raise concerns regarding the anticipated large transfer of land from retiring producers in the coming decades.

[7] In a summary of the debt forgiveness for socially disadvantaged farmers under the American Rescue Plan Act of 2021, which "contains a provision to pay socially disadvantaged farmers 120% of their outstanding FSA direct loans, FSA guaranteed loans, and Farm Storage Facility Loans (made by the Commodity Credit Corporation)," the Congressional Research Service also notes: "The provision uses a definition of *socially disadvantaged farmer* that includes racial and ethnic minorities (7 U.S.C. §2279(a)); this definition is narrower than the one used for targeting socially disadvantaged farmers in the farm loan programs, which also includes gender (7 U.S.C. §2003)." Monkey, Jim. "Agricultural Credit: Institutions and Issues R46768." *Congressional Research Service.* 22 April 2021. https://crsreports.congress.gov/product/pdf/RS/RS21977

Table 1.15: Snapshot of US Producers in 2017

U.S. total = 3,399,834	% of total
Male	64
Female	36
Age <35	8
Age 35-64	58
Age 65+	34
10 years or less farming	27
11 years or more farming	73
Lived on their farm	74
Did not work off farm	39
Worked off farm 1 to 199 days	21
Worked off farm 200+ days	40
Primary occupation farming	42
Primary occupation other than farming	58
With military service	11
Hispanic	3
American Indian/Alaska Native	1.7
Asian	0.6
Black	1.3
Native Hawaiian/Pacific Islander	0.1
White	95.4
More than one race	0.8

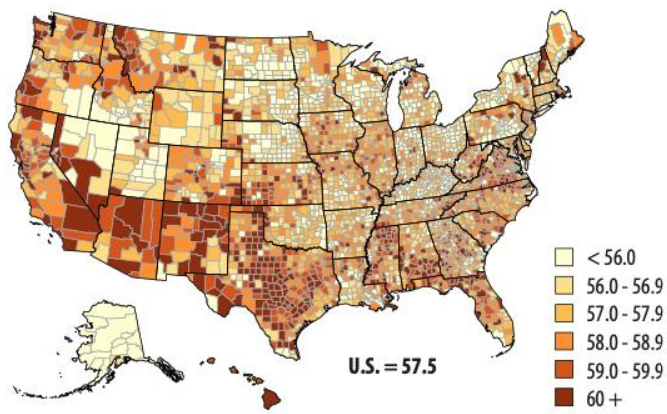
Source: USDA NASS, 2017 Census of Agriculture.

Table 1.16: Changing Gender Profile of US Producers

	2012	2017	% change
	(millions)		
All	3.18	3.40	+6.9
Male	2.21	2.17	-1.7
Female	0.97	1.23	+26.6

Source: USDA NASS, 2017 Census of Agriculture.

Figure 1.17: Average Age of Producers by County in 2017



Source: USDA NASS, 2017 Census of Agriculture.

Twenty-seven percent of US producers are so-called "beginning producers" (also called "new" producers), or those individuals which have 10 years or less of experience in farming. Compared to the national average age of 57.5 years, the average age of beginning producers in the United States was 46.3 years.[xlv] Compared to national averages, beginning producers' farms are smaller both in terms of acreage and sales.[xlvi] In some states, however, beginning producers represent a greater share of producers compared to the national average. In Alaska, 46% of all producers in that state have 10 years or less of experience in farming (See Table 1.18). Beginning farmers face numerous barriers to entry in farming, including unique barriers to begin regenerative farming.[xlvii] The primary barrier cited by numerous experts is a lack of access to farmland.

Table 1.18: Beginning Producers in the United States

Top States	%
Alaska	46
Georgia	33
Maine	33
Hawaii	32
Florida	31
Rhode Island	31
West Virginia	31
New Hampshire	31
Colorado	31

Source: USDA NASS, 2017 Census of Agriculture.

Farmland Ownership in the United States

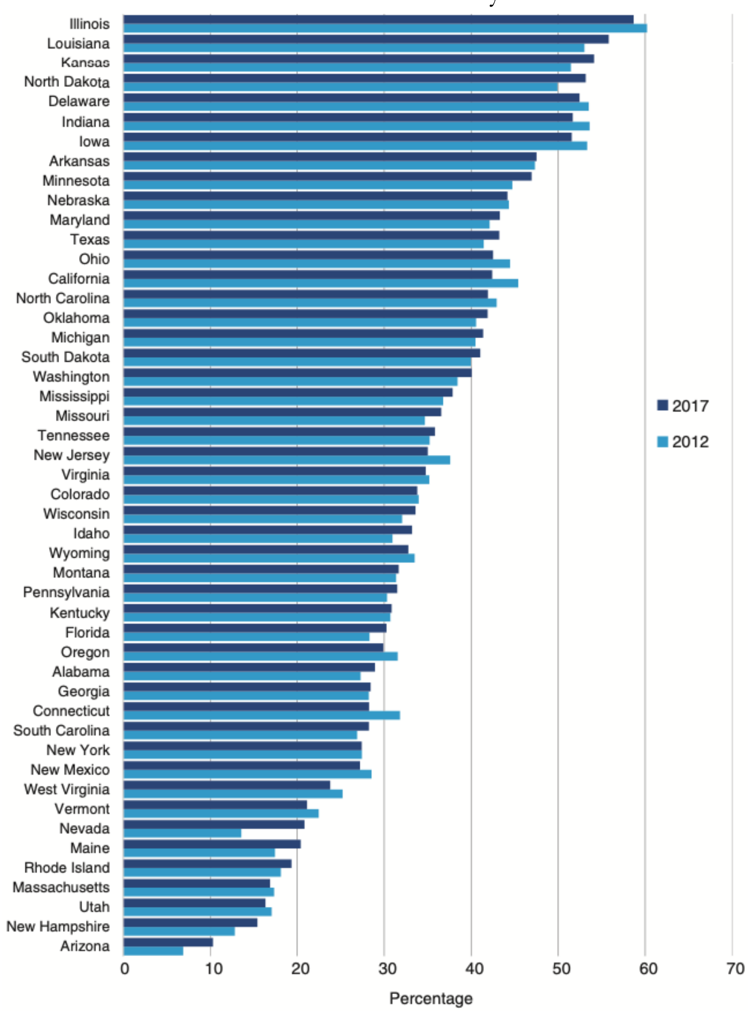
Another essential dimension of US agriculture to consider is farmland ownership[xlviii] (see Table 1.19). In the United States, only 34% of farmland acreage is owned by producers who own all the land that they farm. Sixty-nine percent of all US producers are these so-called full owners, whereby producer status and ownership status are one in the same. Twenty-four percent of producers both rent and own some farmland, and farms that are operated by part owners represented the majority (56%) of all farmland acreage. Seven percent of farmers exclusively rent the land they farm as tenants. However, the share of farmland acres that is rented varies significantly across states (See Figure 1.20). All in all, 40% of all US farmland by acreage is rented from others.[xlix]

Title 1.19: Farmland Ownership in the United States

	% of farms	% of farmland	Average size acres	Average size dollars
Full owners	69	34	220	100,738
Part owners	24	56	1,020	418,884
Tenants	7	10	620	285,606

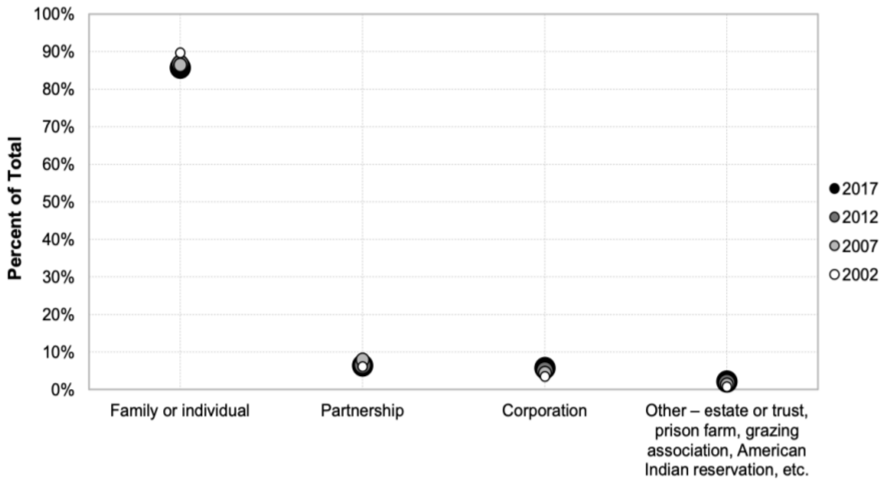
Source: USDA NASS, 2017 Census of Agriculture

Figure 1.20: Share of Total Rented Acres by State in 2012 and 2017[1]



Note: Total acres Rented as share of operated acres in that year. Source: USDA ERS

Figure 1.21: US Farms by Legal Status, Percent of Total (2002-2017)[l]



Source: USDA NASS, 2017 Census of Agriculture

Farmers and individuals retain legal ownership over most farms. However, the share of farms that are being owned via partnerships, corporations, or other legal statuses has been growing in recent years (See Figure 1.21). Importantly, the majority of US farmland that is rented out—80% by acreage—is owned by non-operator landlords (NOLs).[li] Non-operator landlords are owners who themselves do not operator farms. A subset of NOLs are so-called absent landlords, or non-operator landlords who do not live in the area near the rented farm.

Conservation Practices on US Farmland

Despite the effectiveness of various conservation agricultural practices and opportunities for cost sharing, the adoption of these practices across US farmland is very low. Precise data on rates of adoption of conservation practices and other regenerative practices are incomplete. For example, the USDA only began collecting data on selected practices in 2012.[8] Additionally, self-reported data can pose validity concerns given the challenge of differing definitions of practices across producers. Table 1.22 provides an overview the of available data on conservation practices from the USDA National Agricultural Statistical Service by year. As noted by the report authors, "While practices such as no-till and conservation tillage are becoming more common, cover crop planting was practiced on just 15.4 million acres (less than 4 percent of cropland) as of 2017. Other valuable practices… are even less commonly used."[lii] While limited data would indicate that these rates of adoption appear to be increasing on a national level, the use of these practices are still far too rare on US cropland given the scale of the soil health and climate crises.

[8] Comparisons between 2012 and 2017 census data, while useful, should be considered in context given there are only two-point estimates for this national data.

Table 1.22: Overview of Key Management Practices on US Agricultural Lands[liii]

	Thousands of Farm/Ranch Operations			Millions of Acres	
	2007	2011-2012	2016-2017	2011-2012	2016-2017
Organic	20.4	9.0	14.2	3.6	5.0
Cropland	1,685.3	1,551.7	1,475.6	389.7	389.7
Conventional Tillage	-	405.7	264.9	389.7	80.0
Conservation Tillage	-	195.7	217.1	105.7	97.8
No-Till	-	278.3	279.4	76.6	104.5
Cover Crop Planting	-	133.1	153.4	96.5	15.4
Agroforestry	-	-	30.9	10.3	-
Rotational or Management-Intensive Grazing	388.9	288.7	265.2	-	-
Conservation Methods	503.9	-	-	-	-

Note: Data shown here are from the US Census of Agriculture, which has limited information on adoption rates of conservation agricultural practices. Data on organic operations and croplands are from 2011 and 2016 rather than 2012 and 2017, respectively. Organic data represent farms meeting National Organic Program standards in 2007, and US Department of Agriculture organic certified farms thereafter. In 2008, the census question on conservation methods asked, "At any time during 2007, did this operation… use conservation methods such as no-till or limited tilling, filtering runoff to remove chemicals, fencing animals from streams, etc.?" Sources: NASS 2007, NASS 2020.

There is also considerable variation in the rates of adoption of conservation practices in the United States. Although cover cropping by acreage increased 50% (from 10.3 million acres in 2012 to 15.4 million acres in 2017, see Table 1.22) between the last two censuses, very few states with large agricultural production had more than 10% of potential cropland utilizing winter cover crops in 2017 (see Figure 1.23). Nine states[9] had planted cover crops on more than 20% of available cropland.[liv] In terms of the rates of adoption, the number of new farm operations with cover crops increased by 15.2% from 2012 to 2017 to a total of 153,402 farms in 2017.[lv] Compared to the rate of adoption *by farm*, the rate of adoption of cover crop *acres* per farm grew faster—at an average rate of 8.4% a year compounded annually—indicating that farmers continued to expand cover cropping once started.[10] Notably, larger farms had faster rates of adoption, with farms greater than 200 acres increasing cover crop acreage by 68% over the same period.[lvi]

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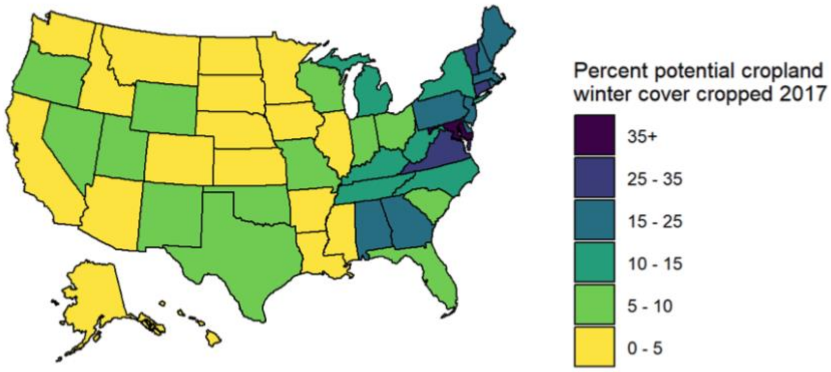
[9] MD, CT, VT, VA, PA, DE, RI, NH, and MA

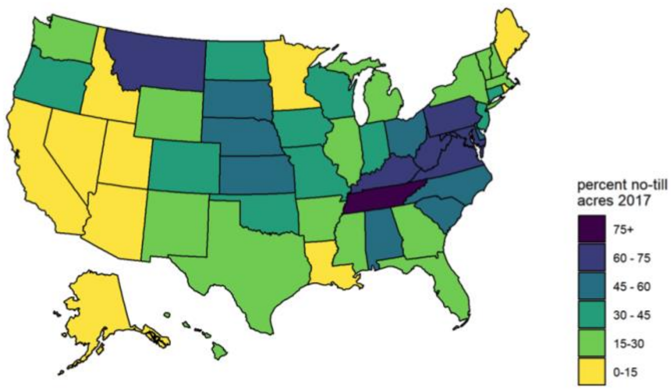
[10] Note: If this growth rate continues, the US could expect 21 million and 40.5 million cover crop acres by 2022 and 2029 respectively. LaRose, Joseph and Rob Myers. "Progress Report: Adoption of Soil Health Systems Based on Data from the 2017 U.S. Census of Agriculture." *Soil Health Institute.* May 2019. https://soilhealthinstitute.org/wp-content/uploads/2019/07/Soil-Health-Adoption-Overview_2017-Census-Report_FINAL.pdf.

Figure 1.23: Reported Percent of Available Cropland Planted to Cover Crops by State in 2017[lvii]



Note: Cropland is based on 2017 Census of Agriculture data, with "available cropland" equating total cropland reported in the Census (396.4 million acres) minus pastured cropland, hay land and haylage acres, and CRP/WRP acres (those categories total 93.6 million acres) minus harvested winter wheat acres (26.2 million acres). Source: Soil Health Institute.

Figure 1.24: Reported Percent of Each State with No-Tillage in 2017[lviii]



Note: The 2017 Census of Agriculture asked about whether the following tillage practices were used and on how many acres: no-till, reduced (conservation) tillage, and intensive (conventional) tillage. Source: Soil Health Institute. Based on Census of Agriculture data. Source: Soil Health Institute. Based on Census of Agriculture data.

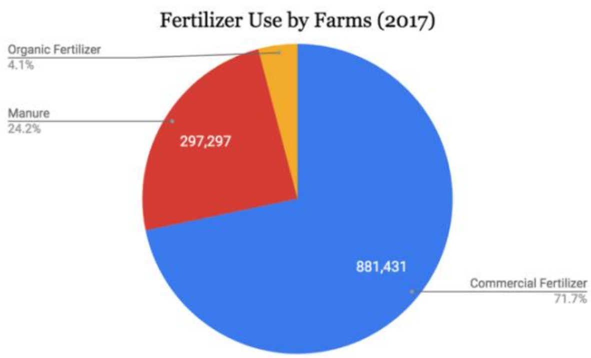
In terms of no-till farming, there is greater adoption of the practice compared to cover cropping, but the rate of growth between 2012 and 2017 was slower. According to census data, of reported tillage acres in the United States, 37%—or 104 million acres—were no-till.[11] Figure 1.24 demonstrates the percentage of no-tillage farming by state in 2017. According to these data, no-till farming acreage in the United States increased 8.3% between 2012 and 2017. Soil Health Institute experts postulate that this slower rate of growth may be due to the fact that no-till farming has a longer history of promotion and a "higher level of acceptance to begin with" compared to cover cropping.[lix] For example, several states report no-till as a percent of acreage that are quite high, including Tennessee which reports 78.6% of its reported tillage acres are no-till.

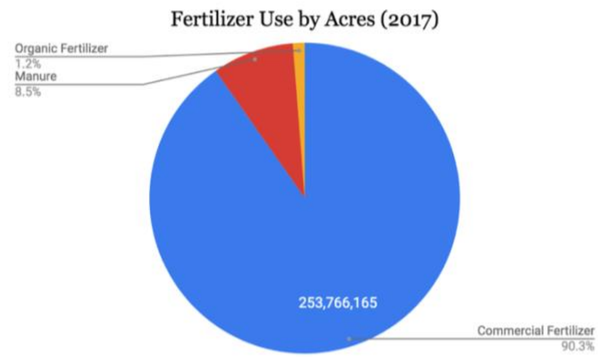
Another practice which is possible to assess using Census data is the use of fertilizer by farms and by acreage. Between 2012 and 2017, the number of farms using commercial fertilizer stayed about the same (880,000 farms), and the number of farms using

[11] Note: No-till includes both continuous no-till and rotational no-till. LaRose, Joseph and Rob Myers. "Progress Report: Adoption of Soil Health Systems Based on Data from the 2017 U.S. Census of Agriculture." *Soil Health Institute.* May 2019. https://soilhealthinstitute.org/wp-content/uploads/2019/07/Soil-Health-Adoption-Overview_2017-Census-Report_FINAL.pdf Other estimates indicate that these survey data may reflect overly high estimates of the adoption of conservation practices.

manure for fertilizer increased by 8%.[lx] The most recent census was the first time that the USDA collected data on the use of organic fertilizer, which was in use by 4.1% of farms using fertilizer representing use on 1.2% of fertilized acres.

Figure 1.25: Fertilizer Use by Farms (Left) and by Acres (Right) in 2017





Source: National Sustainable Agriculture Coalition, based on US Census of Agriculture data.

As seen in Table 1.22, the practice of rotational grazing decreased by 8% nationally from 2012 to 2017. Rotational grazing, or management intensive grazing, involves containing and strategically moving livestock through pasture in order to improve soil, plant and animal health. As of 2017, about 265,000 farm operations used rotational grazing. Between the most recent census years, only three states—Arizona, Hawaii, and Maryland—saw increases in the number of farm operations using rotational grazing.[lxi]

The final practice for which it is possible to compare 2012 and 2017 adoption estimates is conservation easements.[12] A conservation easement is "a voluntary, legal agreement that permanently limits uses of the land in order to protect its conservation values. Also known as a conservation restriction or conservation agreement, a conservation easement is one option to protect a property for future generations."[lxii] The USDA, through the Agricultural Conservation Easement Program (ACEP) and Wetlands Reserve Program (WRP) of the NRCS, "provides financial assistance for partners to purchase agricultural [and wetland] land easements that protect the agricultural land use and conservation values of land" while allowing farmers and ranchers to continue their agricultural work.[lxiii] These easements can be in permanent easements (in perpetuity), 30-year easements (expire after 30 years), term easements (maximum duration allowable under state laws), or 30-year contracts (required for enrolling of tribal land).[lxiv]

As of 2017, the average size of a conservation easement was 243 acres, which represents a 40% increase from 2012. According to the Census, 53,920 farms were operating under a conservation easement (including both non-federal and federal easements), which was a decrease of 29% between 2012 and 2017.[lxv] However, this decrease may be due to the high number of very large farms (greater than 2,000 acres or more) with easements, which grew by 78.6% between 2012 and 2017.[lxvi]

Easements are an important legal tool not only to promote improved land stewardship but also to protect and limit land use. By limiting the rights associated with a particular piece of land, such as development rights, easements can uniquely keep land in private ownership while still protecting conservation value. Easements are legally binding agreements between a landowner and a land trust (or government agency) to

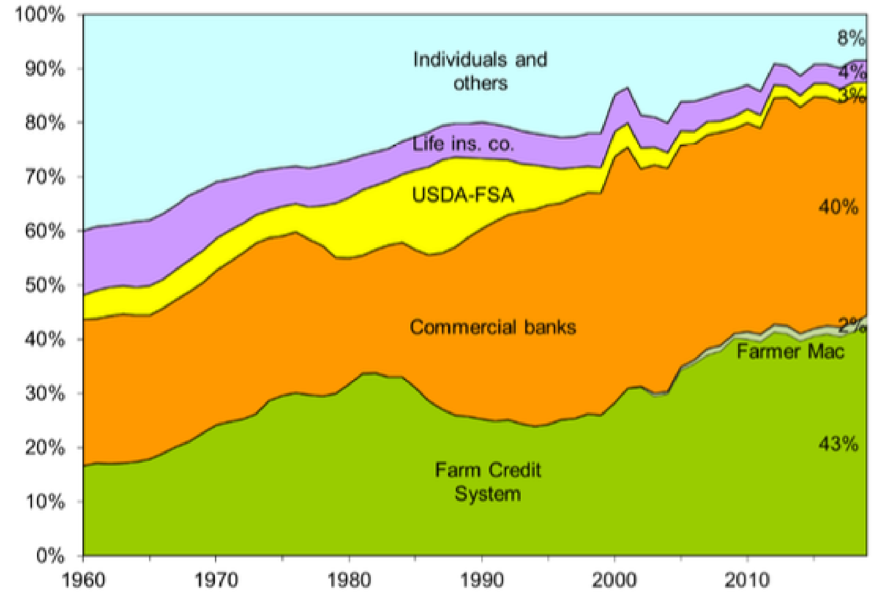
[12] Generally, easements are a non-possessionary interest in land owned by another person or entity that entitles the interest holder to a specific limited use or enjoyment of the land.

whom the landowner transfers away a specific set of rights of her rights via the easement document. Easement restrictions get recorded as deed restrictions and follow the land rather than the landowner. Generally, nonprofit land trusts are the purchasers/recipients and the holders of conservation easements in the United States. However, federal or subnational governments can also purchase easements and often have an interest in doing so to preserve access and/or nature on privately held land.[lxvii] When it comes to farmland, "easements protect … farmland from new development, ensuring that those properties can be farmed or ranched in perpetuity."[lxviii]

Since easements restrict the market-based options tied to a piece of farmland, conservation easements (or similar) generally reduce the market value of farmland. This can have the added benefit of making farmland more affordable for producers to purchase or own (given lower property taxes owed). Although easements are generally associated with adding land use restrictions to a property, it is also possible to create affirmative easements, which require landowners or those accessing the land to comply with proactive activities (such as farm organically, etc.). In both cases, there needs to be a pre-determined mechanism for the easement holder (or an easement monitor) to ensure the landowner is adhering to the terms of an easement.[lxix]

Farm Economics

Figure 1.26: Market Shares by Lender of Total Farm Debt, 1960-2019[lxx]

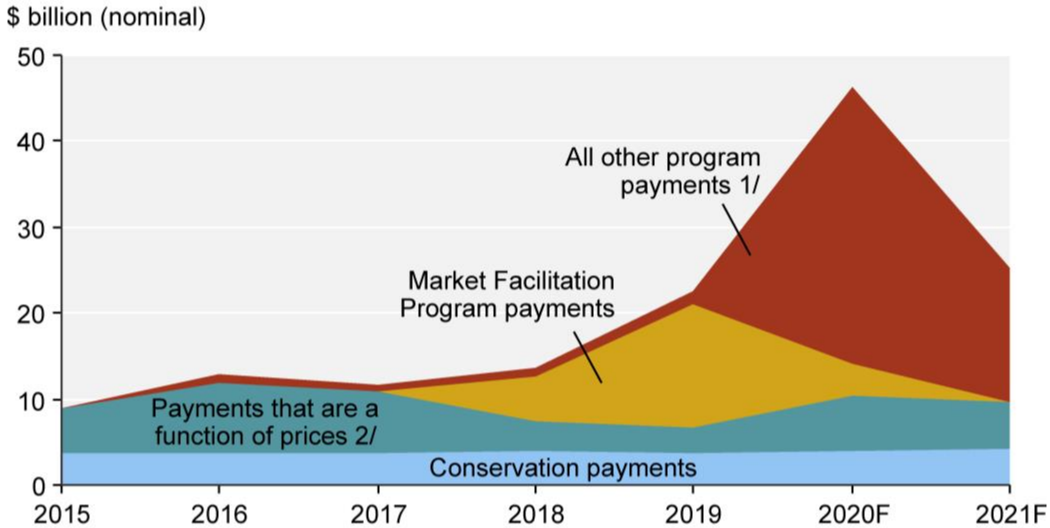


Notes: Percentage on the right are for 2019. FSA = Farm Service Agency. Shares in the graph are for direct loans. Guarantees are not shown (FSA guarantees about 5% of farm loans that are included in the shares of commercial banks and the Farm Credit System.) Source: Congressional Research Service(CRS) using USDA, ERS as of February 5, 2011.

As an industry, farming is defined by its high levels of economic variability as well as the significant and various forms of government supports it receives. By the end of 2020, farm sector assets totaled $3.1 trillion, but farm debt also reached historic levels—$432 billion.[lxxi] The USDA estimates that about 30% of US farms have farm debt.[lxxii] Most farm credit in the United States is provided by a combination of the Farm Credit Service (FCS) and commercial banks (see Figure 1.26). Since 2018, more net farm income has come from the United States government, particularly in the form Market Facilitation Program payments (trade war relief aid payments) and pandemic assistance. Figure 1.27 provides a breakdown of the categories and amounts of direct government payments to farmers in recent years.

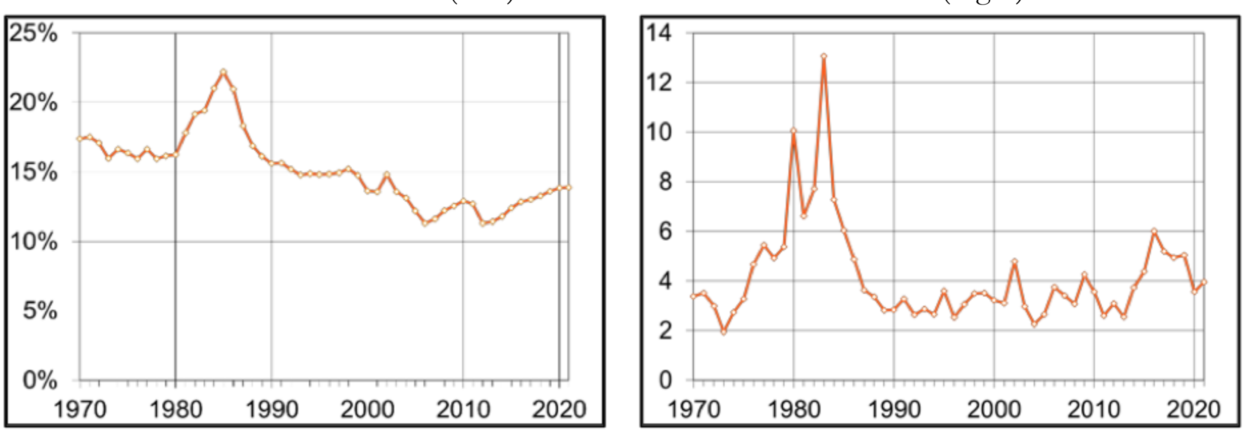
Farm debt-to-asset and farm debt-to-income ratios also provide a snapshot of the leverage in the US agricultural industry. The debt-to-asset ratio, which is an indicator of financial risk, has been increasing slowly in recent years, but remains well below the levels seen during the farm debt crisis in the 1980s (see Figure 1.28). The debt-to-income ratio, which indicates the number of years of current income that would be needed to cover debt, has been more variable. From 2013-2016, the farm debt-to-income ratio reached levels not seen since the 1980s, in part due to the lower farm incomes, trade disruptions, and the onset of the Covid-19 pandemic. However, the substantial increase in direct government payments to producers in 2020 has lowered the ratio to be closer to the 10-year average.[lxxiii] Despite an increase in direct government payments, these supports do not always offset the income variability experienced by farms. Since 2000, net farm income in the United States has been particularly variable (see Figure 1.28).

Figure 1.27: Direct Government Payments to Farm Producers, 2015-2021F[lxxiv]



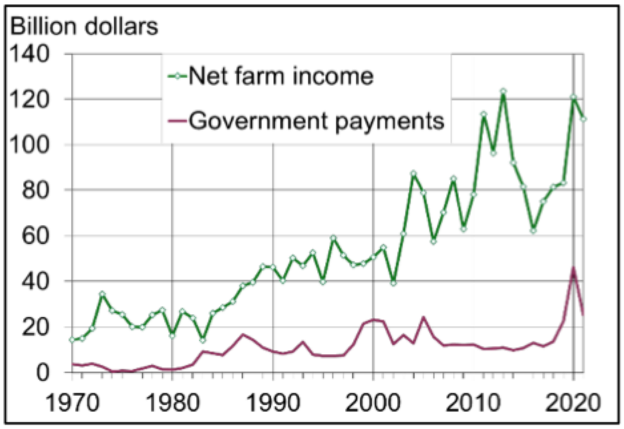
Notes: F = forecast for 2021. 1) "All other program payments" includes supplemental and ad hoc disaster assistance, which in 2020 and 2021 includes payments from the Coronavirus Food Assistance Program and the Paycheck Protection Program, and in 2021 also includes payments under the Consolidated Appropriations Act, 2021. 2) Includes Price Loss Coverage, Agricultural Risks Coverage, loan deficiency payments (excluding grazeout payments), marketing loan gains, certificate exchange gains, and dairy payments. Source: USDA, ERS, Farm Income and Wealth Statistics. Data as of February 5, 2021

Figure 1.28: Farm Debt-to-Asset Ratio (Left) and Farm Debt-to-Income Ratio (Right)



Note: 2021 is forecast as of February 5, 2021. Source: CRS, using ERS data.

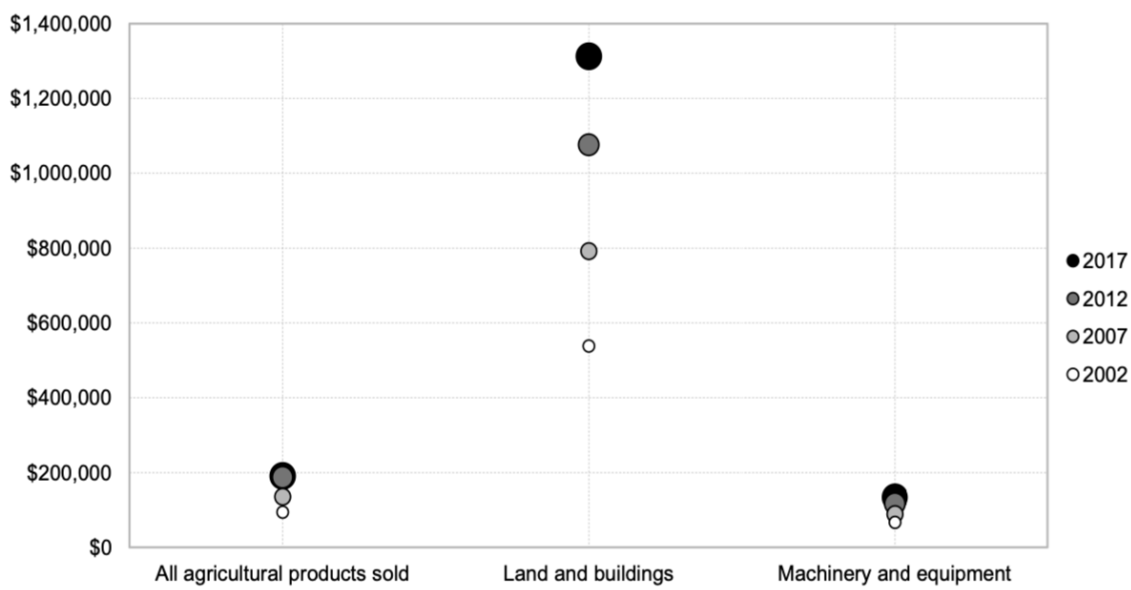
Figure 1.29: Net Farm Income and Government Payments



Note: 2021 is forecast as of February 5, 2021. Source: CRS, using ERS data.

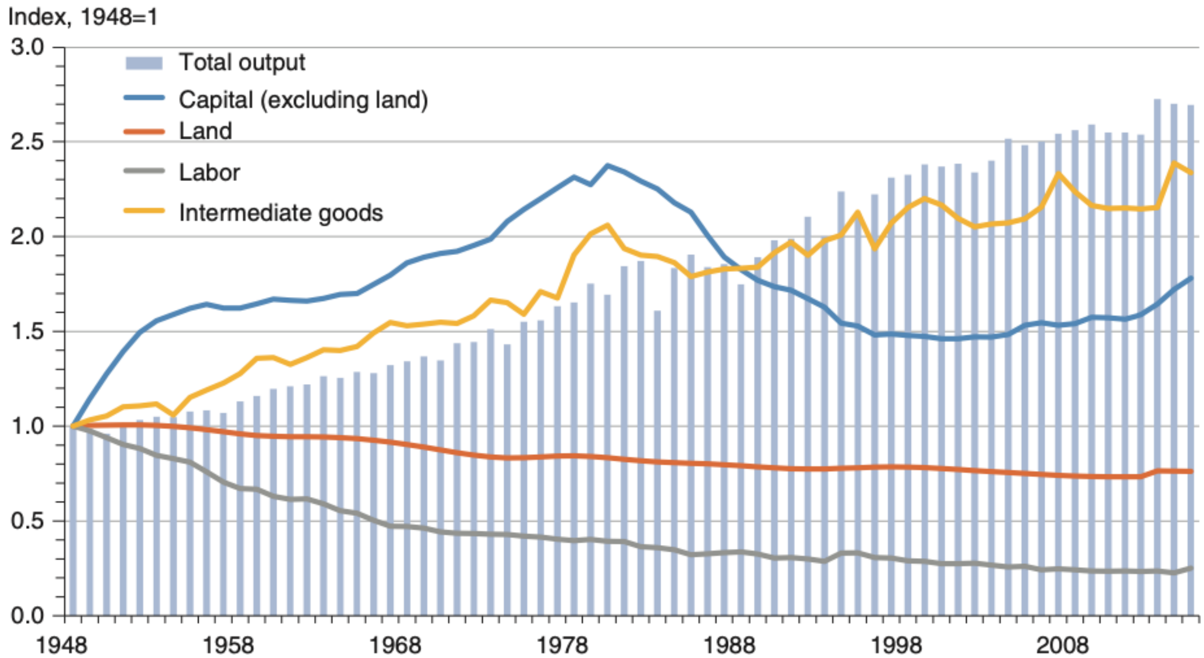
Both farm assets and farm debt are concentrated in real estate. While real estate accounts for 82% of total farm assets in 2020, the next largest asset category (machinery and vehicles) was only about 9%.[lxxvi] Of the $432 billion in farm debt in 2020, 64% was real estate debt. The increase in the real estate values of farms on average, and what that means for farmers looking to buy, sell, or bequeath farmland, is essential to farm economics and producers' financial decision-making. The higher costs of acquiring access or ownership of land has been a particular challenge for beginning producers.[lxxvii] Figure 1.30 demonstrates the rise in the average market value per farm in the United States in recent decades. In some cases, this market value is increases as a result of the farmland's potential for other, more lucrative uses other than agriculture. There is often enormous pressure on urban or peri-urban farmland owners to sell their land to housing developers rather than keep it in agriculture.

Figure 1.30: Average Market Value per Farm[lxxv]



Source: USDA NASS, 2017 Census of Agriculture.

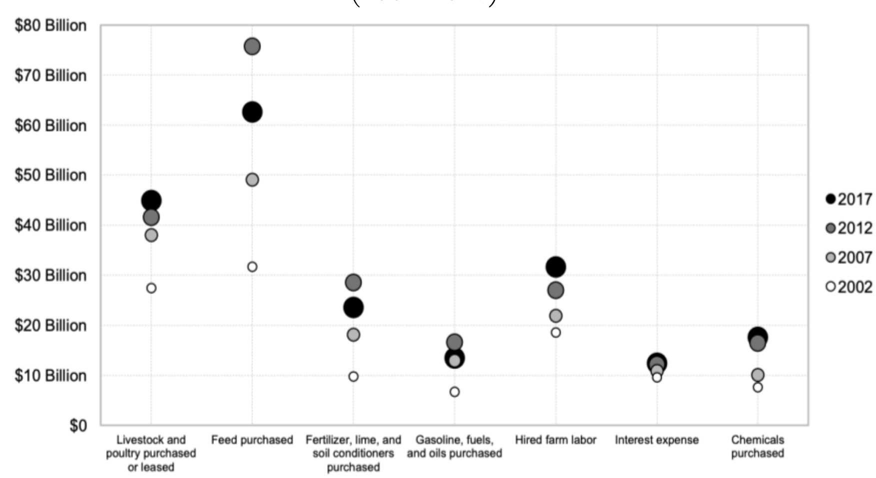
Figure 1.31: Composition of Farm Inputs Has Changed Over Time



Note: Data are expressed with an index that is calculated relative to the data in 1948, where data in 1948 are set to equal 1. Intermediate goods include feed and seed, energy use, fertilizer and lime, pesticides, purchased services, and other materials used. Source: USDA, Economic Research Service, "Agricultural Productivity in the U.S." series.

Another trend affecting farm financials is the rising costs and changing mix of production inputs. The increase in the use of intermediate goods—including fertilizer, pesticides, fuel, etc.—"largely reflects the increasing substitution of those inputs for land and labor."[lxxix] Figure 1.31 provides historical trends as an index value. Figure 1.32 provides farm production expenses in aggregate dollar values and Figure 1.33 provides farm production expenses as a percent of total

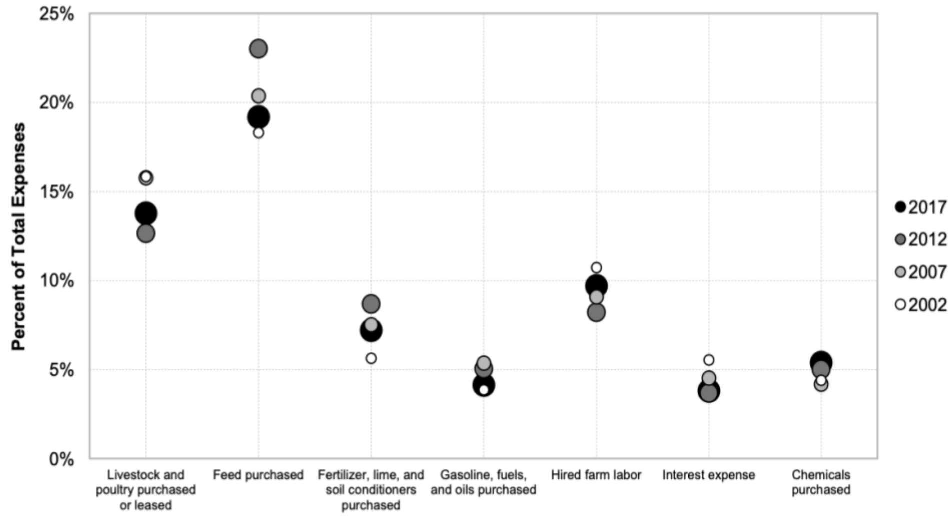
Figure 1.32: Selected Farm Production Expenses in Total Dollars (2002-2017)[lxxviii]



Source: USDA NASS, 2017 Census of Agriculture.

expenses based on the most recent Census of Agriculture data. Farmers interviewed for this analysis corroborated these data and expressed the difficulties which increasing input costs, particularly for fertilizer and pesticides, posed for farm operations and how these trends have contributed to the consolidation of farm operations due to the economic pressures to achieve efficiencies of scale.[lxxxi]

Figure 1.33: Selected Farm Production Expenses as a Percent of Total Expenses(2002-2017)[lxxx]

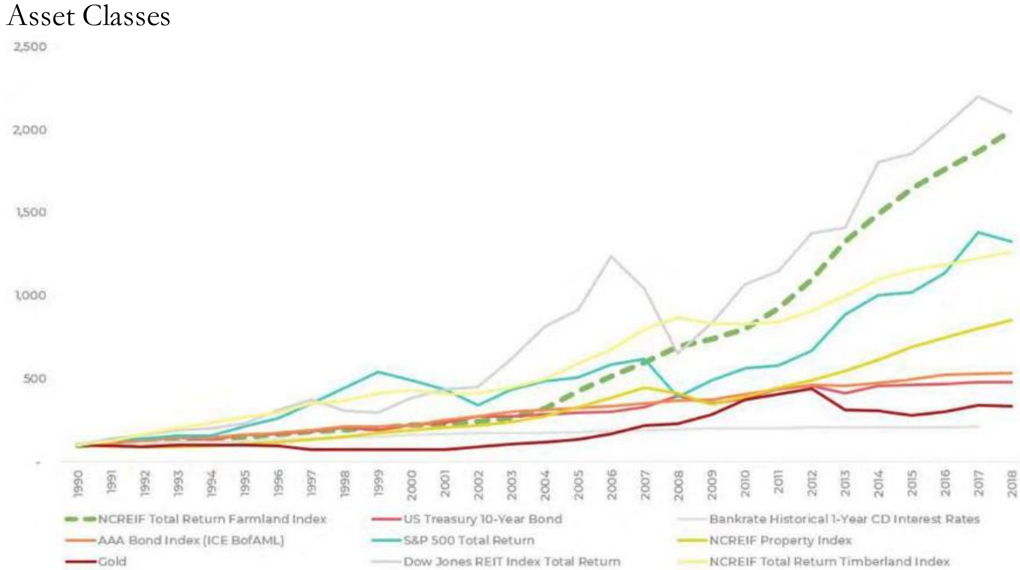


Source: USDA NASS, 2017 Census of Agriculture.

Investment in Farmland

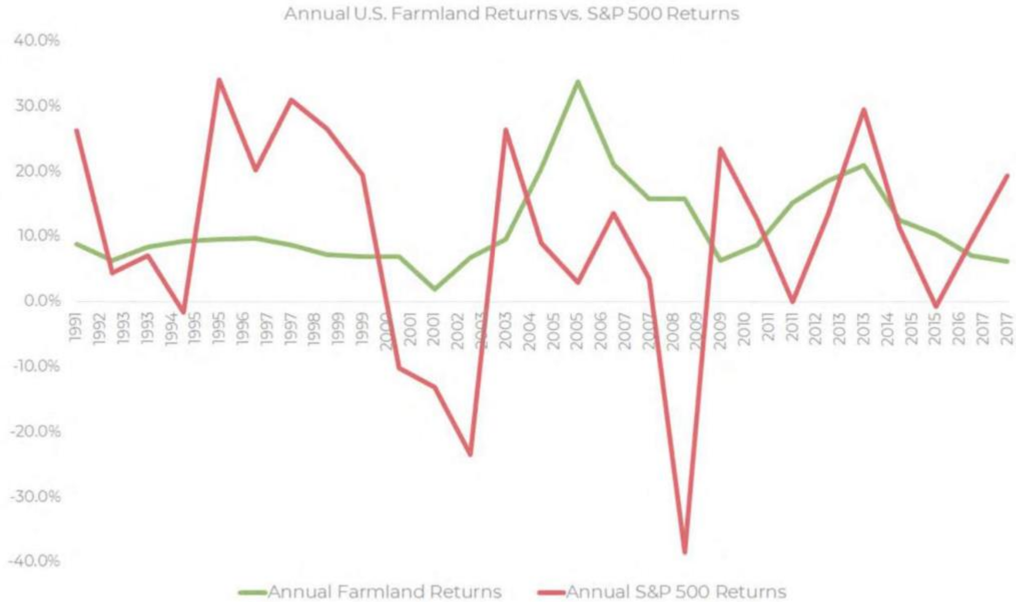
The final background topic covers (private) farmland investment. As a target of investment, farmland is regularly touted as a good investment option for investors looking to diversify their portfolios with alternative or real assets. As an investment, farmland has performed very well relative to alternative investments (see Figure 1.34). Proponents of farmland investment highlight its historical performance, stability, diversification, and its ability to serve as an inflation hedge as the reasons why farmland is a good investment option. Farmland has averaged approximately 10% total annual returns (a combination of both income and price appreciation) from 1992 to 2018.[lxxxii] Farmland also has low volatility and uncorrelated returns compared to the stock market and most other traditional asset classes (see Figures 1.35 and 1.36). The NCREIF Farmland Index reported zero negative return years in the last 20 years.[lxxxiii]

Figure 1.34: Farmland Investment Outpaces Most Cumulative Returns on Major Asset Classes



Note: Calculations assume reinvestment of dividends. Source: AcreTrader, data according to NCREIF, Bloomberg, and AreTrader calculations.

Figure 1.35: Annual US Farmland Returns versus the S&P 500 Returns



Note: Calculations assume reinvestment of dividends. Source: AcreTrader

Figure: 1.36: Correlations Between Farmland and Other Major Asset Classes

Correlation Across Major Asset Classes (1992 - 2020)

Market Indexes	Farmland	US Stocks	US Bonds	Real Estate	US REITs
Farmland	1.00				
US Stocks	-0.05	1.00			
US Bonds	-0.28	0.06	1.00		
Private Real Estate	0.45	0.16	-0.10	1.00	
US REITs	-0.01	0.43	0.18	0.10	1.00

Data are based on annual total returns from January 1, 1992 through December 31, 2020. Asset classes are represented by the following indexes: stocks - S&P 500; bonds - Bloomberg Barclays U.S. Aggregate Index; privately held U.S. farmland - NCREIF Farmland Index; privately held U.S. commercial real estate - NCREIF Real Estate Index; publicly traded U.S. real estate investment trusts - FTSE Nareit U.S. Real Estate Index. Indexes are unmanaged and unavailable for direct investment.

Source: FarmTogether

Despite these investment benefits, historically there have been relatively few means by which to invest in farmland, apart from buying it outright as an individual or family. Direct investment in farmland can be challenging given the operational risks in farming, difficulties in assessing the value and potential profitability of farmland, and the need for larger financial reserves to achieve economies of scale.[lxxxiv] In recent years, however, there have been more and newer ways to invest in farmland as a real estate asset. As one farmland investment firm noted, "In 2005, there were fewer than 20 farmland funds operating around the world. By early 2020, the number of farmland funds had reached 166, with an aggregated [assets under management] of $38 billion."[lxxxv]

Some of the newest ways in which to invest in farmland are so-called "Technology Driven Factional Ownership Platforms," which include the likes of AcreTrader, FarmTogether, and Steward. These companies allow accredited investors[13] fractional equity ownership of individual farms via web-based investment platforms. In contrast to these newer platforms focusing on equity investment, there are also

The greater ease and opportunities to invest in farmland are contributing to the increase in non-operator landlords (see "Farmland Ownership in the United States" in Section I) and the continued consolidation (and financialization) of US farmland. This year, it became publicly known that the largest owner of farmland in the United States is not a large agricultural corporation but technology billionaire Bill Gates. According to reports, Bill Gates' owns a cumulative 268,984 acres of farmland—600 times the size of an average American farm in 2017—across 19 states via his investment advisory.[lxxxvi]

These investment trends, which are making farms both bigger and fewer, continue to provoke strong concerns and fears in some circles. "As farmland becomes more expensive and more farmers lease land from investors, it reduces the wealth that these small farmers can build for themselves, especially women and people of color."[lxxxvii] Many producers, academics, and producer associations interviewed for this report shared these fears and the potential negative effects for producers, especially family farms.[lxxxviii]

[13] Accredited investors are individuals or investment entities meeting certain income ($200,000 per person) and/or net worth thresholds ($1 million) who are legally allowed to invest in a wider range of private funds and other securities not registered with the Securities and Exchange Commission (SEC). For more information see the US SEC at https://www.investor.gov/introduction-investing/investing-basics/glossary/accredited-investors

II. Analysis Framework

Policy Problem

The soil health crisis in the United States has many facets. However, this report adopts the primary problem definition that **regenerative agricultural practices are not being adopted at speed or scale.** Although regenerative agriculture can is largely viewed as a spectrum or "a journey" by many practitioners, science indicates that adopting regenerative practices (the more the better) can improve the health of farmland soil, improve ecosystem services benefits, reduce emissions and/or sequester more carbon, reduce farmers' reliance on expensive and harmful chemical inputs, and improve related outcomes for rural communities.

Research Questions

In the context of this policy problem framing, and a broader landscape of existing policy tools and financial incentives to increase regenerative practices, this report aims to assess the potential role for private equity financing (rather than debt) in regenerative agriculture. Specifically, how can private equity financing facilitate the adoption of regenerative agricultural practices at speed and at scale? More specifically, **is it possible to design a new, voluntary investment vehicle—a so-called FarmLand Investment Trust or FLIT—whose focus is on both achieving investor returns and on enhancing soil health?** To date, existing incentives and vehicles have failed to deliver both of these objectives at scale. A FLIT aims to create market-based incentives that ultimately better align stakeholder incentives to facilitate the widespread adoption of regenerative agricultural practices for health. Given this framing and these objectives, this report seeks to address to critical questions that underpin feasibility. These research questions include:

1. Which type of measurement, reporting and verification (MRV) framework should be used to document and verify regenerative outcomes in a market-based FLIT model?

2. What structure should the private investment vehicle take (alongside possible government incentives) to best align stakeholder incentives and achieve positive economic and environmental outcomes? Relatedly, how should this structure be piloted?

Methodology & Evidence

This analysis in this report is primarily based on qualitative interviews and desk research. The list below summarizes the types of evidence and data used in this report:

- Qualitative interviews with key stakeholders and industry experts
- Literature reviews
- Case studies
- Government reports and survey data

The stakeholder interviews were especially integral to this report given the complexities and rapid developments surrounding regenerative agriculture in the United States. Between February and May 2021, **more than 75 individuals were interviewed (at least once) as part of this research project**. The list below summarizes the categories representing the types of stakeholders who were interviewed as part of this project. This version of the report does not identify by name the individuals or organizations interviewed in order to maintain the privacy and confidentiality of these interviews, many of which were sensitive in nature. However, the report author and collaborators made a concerted effort to obtain as many diverse interviews across these categories to reflect the diversity of opinions, expertise, and experience in the agricultural industry.

Categories of Stakeholders Interviewed:

- Individual Producers
- Private Sector (Agricultural) Companies
- Government Representatives or Policymakers
- Academics or Content Experts
- Producer Associations
- Legal and/or Investment Professionals

Methodological, Data, and Other Limitations

Unfortunately, there were several limitations that constrained this policy analysis. The first limitation was the **unavailability of relevant financial data**. Initially, this report sought to provide evidence on the economic outcomes of the conversion from conventional to regenerative agriculture in order to better inform the structure and returns of a novel investment vehicle. However, there is a lack of broad, consistently defined, and comparable longitudinal economic/financial data that exists at the farm-level. This is in large part due to the heterogeneity of farm operations—including crop types and record-keeping practices—but it is also due to the proprietary nature of farm financial data in general. Where farm-level financial data publicly exists, it is often limited to a single or small number of farmers (usually as part of a case study) and lacks comparability to other data. Where larger, more consistently defined financial data exists, it is typically not publicly available, often owned by private sector entities.

In addition to the lack of necessary farm financial data, there is **limited data on the *conversion* of US farmland from conventional agricultural practices to regenerative agricultural practices.** The ultimate objective of the Farmland Investment Trust vehicle is to facilitate this conversion of US farmland, yet there are limited case studies that provide robust data on the outcomes (environmental or economic) of this conversion at the farm level to inform the FLIT design (as compared to a comparison). In particular, sufficiently representative farm-level financial data detailing the benefits and costs of transitioning from conventional to regenerative agricultural practices has been difficult to obtain. The absence of this data hindered the ability of this report to make specific recommendations on the level of government financial incentives or benefits; however, general data and information on these topics are included where available.[14]

Due to Covid-19 restrictions and public safety concerns, it was **not possible to conduct any on-farm site visits or in-person interviews.** Farming is a hands-on industry and numerous stakeholders emphasized the importance of "getting out in the field" to properly understand the challenges and complexities of regenerative agriculture in practice.[lxxxix] All interviews conducted for this report were completed via phone, video conference, or via email communications between January and May 2021. Subsequent phases of this research project should aim to include in-person site visits of farming operations.

Time was also a limitation in the preparation of this report. Despite the fact that there were over 75 interviews conducted by the author and research collaborators, several key interviews were not possible to arrange due to lack of response and/or time constraints. In particular, it is unfortunate that it was not possible to interview experts directly associated with or producers using the newly launched Leading Harvest Farmland Management Standard. [15] Moreover, most interviewees were not able to be interviewed more than once, which is also a limitation given the fact that the understanding and proposed design of FLIT continued to evolve substantially throughout the course of the interviews conducted. Where possible, it will be important to seek follow-up feedback from those interviewed as well as from other stakeholders who could not be interviewed for this report.

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[14] Notably, the report author and project collaborators remain in active discussions with an agricultural consulting firm that specializes in regenerative agriculture to acquire anonymized, longitudinal farm-level data on soil health and a limited number of economic outcomes (e.g., cost of chemical inputs per acre, yield, etc.). Should these data or other datasets at the farm-level become available, they can be incorporated into this analysis.

[15] The Leading Harvest Farmland Management Standard addresses 13 sustainability principles as part of a comprehensive farm management sustainability assurance program designed with private sector investors and conservation experts. See: https://www.leadingharvest.org/standard

Finally, there is **limited information regarding recent policy and industry announcements** that could impact the viability of a FLIT. For example, President Biden's Executive Order on the climate crisis directs the Secretary of Agriculture to pursue a number of policies and initiatives aimed at increasing the adoption of conservation and climate-smart agriculture practices as well as providing employment, training, and economic opportunities in the agricultural industry related to these goals.[xc] Furthermore, the Emergency Debt Relief for Farmers of Color Act of 2021, passed as part of the covid-19 American Rescue Plan package, allocates $4 billion in debt forgiveness in farm loans for socially disadvantaged farmers.[xci,xcii] This debt relief and related provisions will have implications for farm financials of minority farmers at a national scale in the coming years, potentially impacting efforts to engage with these producers as part of a FLIT pilot program. On the industry side, in April 2021, beverage giant PepsiCo announced that it would "spread regenerative farming practices across 7 million acres, approximately equal to its entire agricultural footprint" with an aim to "eliminate at least 3 million tons of greenhouse gas emissions (GHG)" by 2030.[16] This announcement follows earlier commitments by other consumer goods and agricultural companies such as General Mills, Danone, Stonyfield, and Cargill.[17] However, there is limited comparable information regarding how these companies intend to define and implement regenerative in their own supply chain contexts.

[16] PepsiCo. "PepsiCo Announces 2030 Goal to Scale Regenerative Farming Practices Across 7 Million Acres, Equivalent to Entire Agricultural Footprint." Press Release. 20 April 2021. https://www.pepsico.com/news/press-release/pepsico-announces-2030-goal-to-scale-regenerative-farming-practices-across-7-mil04202021

[17] Wilcox, Meg. "For food companies, shifting to regenerative ag practices is complicated." *GreenBiz*. 18 March 2021. https://www.greenbiz.com/article/food-companies-shifting-regenerative-ag-practices-complicated

III. Objectives of a FarmLand Investment Trust

Given the research questions that frame this analysis, it is important to outline the objectives which a proposed FarmLand Investment Trust (FLIT) seeks to achieve. These objectives include the following:

1. Rapidly scale the adoption of regenerative agricultural practices on US farmland
2. Improve soil health as well as other ecosystem services and environmental outcomes
3. Improve economic and social outcomes for farmers, investors, and rural communities

The following section includes a discussion of each of these objectives as well as proposed, indicative metrics by which it would be possible to measure progress against each of the objectives. Some of the metrics, while listed under one objective, may be useful for measuring progress against multiple objectives. Final outcomes metrics would be determined as part of the final design of a FLIT pilot program (see Section VI.)

Objective 1: Rapidly Scale the Adoption of Regenerative Agricultural Practices on US Farmland

The goal of a FarmLand Investment Trust is primarily to facilitate the adoption of regenerative agriculture on US farmland rapidly and at scale. At what scale and at what pace? Given the severity and urgency of the soil health crisis in the United States, Project 2030 has proposed a target of increasing the amount of regeneratively farmed cropland[xciii] in the US by 100 million acres by 2030.[18] This is an ambitious target. Taking the limited example of US farmland applying cover crops, if continued, current rates of adoption will only result in a total acreage of approximately 40.5 billion acres by 2029.[xciv]

What metrics might be used to assess progress against this objective? Proposed, indicative Metrics for Objective 1 include:

1.1 Acreage of US cropland under the management of a FLIT per year[19]

1.2 FLIT-managed cropland acres incorporating regenerative practices (as a share of total FLIT acreage) per year. These could include acreage using cover crops, rotational grazing, no- or reduced-tillage farming, no synthetic inputs, organic amendments, and conservation easements, etc.[20]

These metrics would need to be measured by the FLIT itself, although these metrics could be easily measured over time given initial data obtained via the acquisition process (and appraisals of the cropland) as

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[18] From Larson, Anna., 2021: "The average cropland acre in the U.S. was worth $4,100 in 2020, meaning 100 million acres of cropland is worth approximately $410 billion.[18] However, there are additional costs involved in finding, purchasing, making capital improvements to, and managing farmland. One existing fund solicited $9,700 in equity per acre of cropland purchased and managed, which translates to about $970 billion for 100 million acres. In order for regenerative private investment vehicles to scale to include 100 million acres of cropland by 2030, somewhere between $410 billion and $970 billion worth of private capital would need to be invested."

[19] This metric would also entail the assessment of non-cropland under management, such as land used for buffers or set aside for conservation purposes (e.g., easements). Depending on the design of the FLIT, land may or may not need to be legally owned by the private investment entity. Under some designs, it would be theoretically possible to have the FLIT control land via a long-term lease.

[20] Note: this list of practices can be expanded to include those practices (and implementation information) which are needed as inputs to estimate environmental outcomes (Objective 2) via modeling techniques

well as via farmland management plans and detailing progress as part of the transition of the cropland to regenerative management practices.

Objective 2: Improve Soil Health as Well as Other Ecosystem Services and Environmental Outcomes

The ultimate motivation behind the large-scale conversion to regenerative agriculture is to replace the ecological, climate, and environmental harms caused by conventional agricultural practices with ecosystem and environmental benefits. A partial list of these types of targeted outcomes could include: improved soil health, reduced greenhouse gas emissions, increased carbon sequestration, reduced chemical pollution of soils and water, improved water quality and availability, improved soil (and farmland) biodiversity, improved resilience to climate change and disaster events such as floods or droughts, reduced erosion, improved air quality, and improved nutritiousness of crops produced. Not all of these outcomes will be able to be measured directly or with sufficient accuracy; it is likely that some of these must be proxied or estimated based on modeling techniques.

Proposed, indicative Metrics for Objective 2:

2.1 Type(s) and volume(s) of crop inputs applied over time, particularly artificial chemical inputs (e.g., fertilizer, insecticide, fungicide) as compared to organic amendments (e.g., compost)
2.2 Periodic measures of soil microbial activity and chemical matter (including organic carbon) over time (e.g., as measured by the Haney Test,[21] Phospholipid Fatty Acid (PLFA)[xcv] tests, and Total Nutrient Extraction (TNE)[xcvi] tests)
2.3 Periodic measures of farmland soil's Aggregate Stability, which measures how well soil aggregates or crumbs hold together under rainfall, to reflect water infiltration[xcvii]
2.4 Water quality testing (e.g., testing chemical composition of water runoff)
2.5 Other metrics TBD[22]

The preliminary proposed measures of soil health are well established, easily accessed by commercial labs around the country, and widely used by conservation and regenerative farmers alike to inform their cropland management.[23] However, they remain snapshots in time without clear thresholds necessarily, so these tests should be used to measure progress over time against a baseline for a specific field.

[21] The Haney Test is a widely used soil health test used by producers that evaluates several soil health indicators, including soil respiration, water-soluble organic carbon, organic nitrogen, and more. The soil health score obtained from the Haney test can be used to compare soil health in a specific location over time. See more at: https://agcrops.osu.edu/newsletter/corn-newsletter/2019-07/haney-test-soil-health and https://www.extension.purdue.edu/extmedia/AY/AY-366-W.pdf for details. The Haney test costs about $65 per test without laboratory interpretation: https://midwestlabs.com/get-started/our-industries/agriculture.aspx

[22] Depending on the specific farmland or other considerations, other metrics could also include various measures of biodiversity such as insect surveys or bird surveys, among other types of tests. Other soil health tests may be needed to inform farm management decisions and practices rather than inform the progress of conversion from conventional to regenerative agriculture.

[23] According to Understanding Ag, LLC, these two tests together "establish baseline data and determine the current status of soil fertility and soil biology." They recommend at least 20 core samples per field, which are then mixed and tested. Source: Understanding Ag, LLC., n.d. "Soil Test Collection Protocol."

Objective 3: Improve Social and Economic Outcomes for Farmers, Investors, and Rural Communities

Regenerative agriculture advocates for a holistic view of the farm ecosystem, including the producers and consumers who are part of these systems. Any initiative that aims to scale regenerative agriculture must also seek to improve social and economic outcomes for farmers and rural communities. A partial list of these types of outcomes could include: improved profitability and/or economic resources for farmers; increased economic resilience of farm operations; reduced risks or more equitably shared risks for farmers; positive returns for investors; increased returns for so-called ESG investments; improved ability of farmers to access farmland and/or employment on farms; improved producer health and/or safety; more equitable access to farmland and economic resources for socially disadvantaged farmers; and increased employment and/or economic activity in rural or farming communities; and increased community access to healthy and nutritious food.

Proposed, possible Metrics for Objective 3:

- **3.1 Profit margins per acre of cropland under FLIT management**[24]
- 3.2 Producer demographic information: this could include the number of producers employed (full-time or temporarily), producer demographic information (namely membership in a socially disadvantaged group), and years of farming experience[xcviii]
- 3.3 Sources of farm income (for FLIT and separately for operator producer households); Government sources of farm income, if any, should be counted separately, where possible[25]
- 3.4 Total private investment raised and deployed under a FLIT
- 3.5 Total investor returns on an annual basis or over the lifetime of the investment entity (if a target end date fund), including the estimated value of producer-owned equity (via "sweat equity") over time, if applicable
- 3.6 Prices (or rental rates) per acre of FLIT-managed farmland
- 3.7 Status of farmland access and/or ownership over time, including easements created, if applicable
- 3.8 Other metrics TBD[xcix]

In considering the economic outcomes of a FLIT on farmers and nearby communities in addition to the economic outcomes (returns) for private investors, it will be important to measure some economic metrics beyond the life of a FLIT entity, if the investment vehicle has a target end date. For example, even if the fund only holds farmland for a specified term, it is important to track outcomes regarding the ownership status and price (or rental rates) of that farmland following the FLIT's term. For example, some private sector agricultural investment vehicles tract tenant renewal options. Even if the land leaves FLIT ownership or management, newly regenerative agricultural farmland is a priority to keep in agricultural use. Additionally, it's important to measure producer outcomes. For example, following participation in a FLIT, would producers be more likely to continue tenancy with the FLIT, gain ownership of farmland, or realize a different form of farmland non-ownership access?

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[24] This is a critical metric for measurement in the success of a FLIT. Many farmers interviewed for this analysis use this metric to indicate they can be profitable even if their yields are reduced under regenerative agricultural management. Even if yields are reduced, it is possible to increase yields by decreasing input costs (particularly for fertilizer and pesticides) on a per acre basis.

[25] In general, it is easier to separate direct government payments to farms rather than enumerate net farm income due to indirect government payments such as commodity price supports.

IV. Measurement, Reporting, and Verification Framework

MRV Alternatives: Outcomes-based vs. Practices-based MRV?

The following section seeks to answer the first research question of this report: Which type of measurement, reporting, and verification (MRV) framework should be used to document and verify regenerative agriculture outcomes in a market-based private investment entity? Defining what constitutes regenerative agriculture is a significant challenge that complicates efforts to scale it. How does one classify which farmland operations are regenerative when there are competing and sometimes inconsistent definitions of what it means to be "regenerative?"[c] Moreover, given regenerative agriculture refers to a holistic, systems approach to farmland management, is it reasonable to classify specific practices—or even the sum of a collection of individual practices applied—as regenerative? The tension between using an outcomes-based approach versus a practices-based approach to measure, report, and verify regenerative agriculture strikes at the heart of the disagreements over what regenerative means.

This analysis considers the following three alternative MRV options for a use by a private investment entity. Notably, given greater certainty in how to measure economic outcomes, this assessment is focused on the MRV framework for the environmental dimensions of regenerative agriculture.

Option 1: Outcomes-based Approach

An outcomes-based approach would aim to classify regenerative agriculture primarily by measuring realized environmental outcomes. Under such a regime, regenerative farms who reach or exceed pre-established thresholds of key indicators above a baseline measure could be designated and/or certified as regenerative operations. This approach would rely heavily on soil tests and other laboratory tests taken at regular intervals in order to establish baselines and measure progress against the regenerative indicators.[ci]

Option 2: Practices-based Approach

Under a practices-based approach, regenerative farms that can prove that they have adopted recognized practices sufficiently would be designated as regenerative. Rather than classify regenerative based on specific (environmental) outcomes, a regenerative agricultural standard would identify specific practices that support principles that are generally associated with desired ecosystem services such as soil health and conservation, among others. For example, under a principal to maintain soil health, examples of relevant practices would include employing no- or minimal tillage, nutrient management, and using crop rotations. Under conservation principles, practices such as maintaining riparian forest buffers or wetland restoration where applicable would qualify. This approach would require farms to provide relevant evidence of activities rather than evidence of improved outcomes measured over time.

Option 3: Combined Approach: Practice-based Verification with *Outcomes Modeling*

A third, combination approach would enable farms to be verified as regenerative using a practice-based approach (identical to Option 2) with the added element of incorporating outcomes modeling as part of the standard. There are a number of publicly available modeling tools such as COMET Planner / COMET Farm that can estimate key outcomes (e.g., greenhouse gas emissions) on the basis of implementation details of conservation practices. Depending on the types of models used, some additional soil health or other field testing may be needed.

Given the understanding of regenerative agriculture as something that aims for continual improvement of the ecosystem, it is important to note that all three MRV approaches summarized below would incorporate the goal of continual improvement over time. As some regenerative producers and producer association representatives have noted, any standard would require farms with different starting points along the "ladder of regenerative agriculture" to "find a rung." This is particularly important given how few operations in the US adopt regenerative agricultural practices (See Section I).

Assessment Criteria for an MRV Framework

How can the three MRV options outlined above be assessed? The following section outlines the assessment criteria for the MRV framework for regenerative agriculture for use by a private investment vehicle.[26]

1. **Efficacy: Does the Given Approach Achieve the Objectives of an MRV Framework for Regenerative Agriculture?**

Determining which approach is most effective involves the consideration of several considerations. Primarily, will a given MRV approach capture the right kind of data to meaningfully measure progress along both environmental *and* economic outcomes? Can a given approach reliably inform decision-making by the producer and/or owner of the farmland to facilitate continual improvement? Importantly, can the approach withstand the scrutiny of external stakeholders, including any potential claims of "greenwashing" by a private investment vehicle?

2. **Efficiency / Feasibility:[27] Can the Given Approach Be Practically and Efficiently Implemented?**

Under this criterion, is it feasible or practical to implement a given MRV option? What barriers to appropriate implementation exist? If technically feasible, are there costs and benefits (including secondary consequences or perverse incentives) that may occur under a given design framework? Given MRV frameworks require resources, what are the overall costs and benefits of a given approach?

3. **Equity: Who Gains and Who Loses Under the Given MRV Framework?**

Finally, does a given MRV framework, if implemented, create differing distributional outcomes (e.g., incentives, access to resources, etc.)? Is the distributional outcome fair? This is an especially important consideration given differing power and resource dynamics within the agricultural industry. For example, how might a given MRV framework affect producers vis-à-vis investors? How might a given framework affect producers growing different crops or operating farms with different scales?

[26] It is notable that relative assessments along these criteria could differ if the entity implementing the initiative was, for example, a state or federal government agency.
[27] Efficiency and feasibility are combined as criteria in this policy analysis. This selection was made because, in the context of assessing an assessment (MRV) framework, issues of efficiency and feasibility in implementation are closely intertwined.

Analysis and Recommendation for an MRV Framework

The following section provides a *relative assessment* for each of the above criteria and brief explanations of the primary reasons for the relative levels assigned. These relative assessments were especially informed by interviews with producers and other experts, particularly those with MRV and regenerative management implementation experience and expertise.

Analysis

Table 4.1: MRV Framework Efficacy Assessment

MRV Alternative	Efficacy Rating	Rationale
Option 1: Outcomes-based Approach	Low	This framework aims to measure of targeted outcomes directly Current outcomes-based frameworks, particularly soil carbon offset markets and other ecosystem services markets, remain nascent and struggle to establish frameworks that escape accusations of "greenwashing" or "double counting."[cii] Most are not available to be reliably implemented at scale, particularly while protocols remain under development.[ciii] Certain soil health indicators remain difficult to comparably interpret in abstract, making them difficult to compare across regions without additional context.[civ] Regenerative specialists also strongly emphasize the importance of context in converting to regenerative agricultural management.[cv] Although the USDA continues to support efforts to advance soil science needed for outcomes-based frameworks, it does not rely on this type of framework to implement NRCS programs at scale.[28]
Option 2: Practices-based Approach	Medium	Practice-based measures are easier to measure, report, and verify on an acreage basis. However, measure of the practices is an indirect measure of key environmental outcomes targeted by a FLIT. Practices are easier for producers or other actors involved in farm management (e.g., FLIT managers, investors, etc.) to interpret

[28] Efficacy of a framework does not rely on the use of this framework by the US government, but historical use of a framework type by the US government provides support to the fact that the framework can be implemented at scale. Further, transparent use of one framework by the US government (and provision of public longitudinal data) can reduce the fears of some critics that a framework is tantamount to "greenwashing."

		The USDA measures and reports on conservation practices and uses this approach to implement conservation cost-share programs (as well as organic certification, indirectly) at the national scale[29]
Option 3: Combination Approach of Practices-based with Outcomes Modeling	**High**	The same pros and cons for Option 2 above exist for Option 3. However, the addition of outcomes-based modeling provides additional information and tools (using well-established techniques, protocols, interpretations, and uncertainties/limitations) with which to more reliably interpret progress and inform farm management practices. Adding the modeling component, particularly if the FLIT is working with academic experts to use their techniques and is transparently sharing its modeling results, can combat claims of "greenwashing." The USDA uses COMET Planner to estimate key outcomes at a national scale, including agricultural carbon emissions.[cvi] CDFA uses this approach to implement its Healthy Soils Program.

Source: Analysis by author.

As noted in Table 4.1, Option 3: Combination Approach of Practices-based with Outcomes Modeling performs the best in the assessment of efficacy.

[29] See Table 1.22.

Table 4.2: MRV Framework Efficiency/Feasibility Assessment

MRV Alternative	Efficiency/ Feasibility Criterion	Rationale
Option 1: Outcomes-based Approach	Low	This approach is substantially more costly to implement than practice-based approaches given the high number/frequency of soil and other laboratory-grade field tests and labor inputs required.[cvii] Yet-to-be-fully-settled soil science and the absence of well-established outcomes-verified soil health frameworks are a significant barrier to implementation in the near term. In particular, there remains concerns about establishing appropriate baselines for soil health, particularly to establish additionality of outcomes. Certain soil health indicators remain difficult or impossible to interpret in abstract, making them difficult or impractical to assess or compare across farm operations. If actors are incentivized to reach or exceed certain soil test thresholds, perverse incentives to strategically time or place field tests in order to achieve desired results can occur.[cviii]
Option 2: Practices-based Approach	Medium	Measuring and reporting conservation practices by acreage (e.g., cover cropping, no-tillage) is the most well-established approach and has fewer barriers to implementation. Practice-based approach is less costly to implement given less labor/laboratory-intensive data collection is required compared to Option 1. This approach could be implemented immediately and avoids concerns around differing baselines or additionality (where relevant). There are some disagreements regarding the measure and verification of some practices where producers' definitions differ (e.g., "no-till" versus "never-till), however, these differences are less problematic than outcomes-based measurement concerns. The USDA measures and reports on conservation practices and uses this approach to implement conservation cost-share programs at the national scale.

		There are potentially perverse incentives to overstate adoption of practices if field-based MRV systems are not included in the framework. Technological advancement may make remote-sensing, such as verification of cover cropping, may be possible in the near term, potentially reducing costs.
Option 3: Combination Approach of Practices-based with Outcomes Modeling	**High**	The same pros and cons for Option 2 above largely exist for same for Option 3. However, the addition of outcomes-based modeling makes a combination approach more costly than Option 2 (in terms of data collection, labor and modeling analysis), but less costly than Option 1.[cix] The combination of practices-based MRV with outcomes modeling is also well-established, particularly given use by independent producers, academics, and government agencies. The modeling component of this approach could also be implemented immediately and does not have significant barriers to implementation. It is possible to supplement practices-based data with soil testing (less frequently than Option 1), to improve the model, if desired. The inclusion of modeling provides additional information by which to compare and contextualize practices-based MRV, potentially reducing some perverse incentives.

Source: Analysis by author.

As noted in Table 4.2, Option 3: Combination Approach of Practices-based with Outcomes Modeling performs the best in the assessment of efficiency/feasibility.

Table 4.3: MRV Framework Equity Assessment

MRV Alternative	Equity Criterion	Rationale
Option 1: Outcomes-based Approach	Low	Given baseline and other implementation difficulties, certain soil health indicators may be more or less difficult to implement for different types of crops. This could potentially result in the MRV framework incentivizing the FLIT to select certain farm operations or towards farm operations of a certain scale (and producers which operate certain farms).[cx] Farm operations with less reliable (or more costly) access to soil testing[cxi] may be disadvantaged given the need to rely on laboratory testing under and outcomes-based approach. This labor intensive and costly approach will necessitate the diversion of more (in relative terms) of the FLIT's income to commercial soil laboratories (and/or consultants) for testing and interpretation. This will mean less funds will be available as returns to producers and investors. Most significantly, this approach places most of the risk achieving regenerative agricultural environmental outcomes on the producer. This is an unfair approach given that specific thresholds for regenerative outcomes remain imprecise. For example, severe weather events, which could independently lower soil health outcomes, could result in producers receiving no "credit" for their efforts to adopt regenerative practices under this framework.
Option 2: Practices-based Approach	Medium	Practices-based MRV frameworks are less likely than Option 1 to bias farms with certain crops and/or farms of a certain scale (and their associated producers), particularly if practices are reported as a percentage of an operation's cropland. This framework does not require reliance or expenditures for expensive and frequent commercial soil testing and laboratories (although farm management plans will likely continue to use tests for decision-making). This approach provides a better balance in terms of outcomes risks than Option 1. It is fairer if producers operating FLIT-managed farmland to get credit for the effort and time they put in to design and adopt practices (e.g., cover cropping, holistic pest management, etc.) than on the outcomes of soil (or other) testing which as a single snapshot can be imprecise.

Option 3: Combination Approach of Practices-based with Outcomes Modeling	Medium	Again, the pros and cons associated with Option 2 are largely the same for Option 3. However, working with academic partners to model outcomes, the combination approach can generate more information for investors and producers to assist with their decision-making. This approach would likely require the diversion of additional FLIT resources to complete outcomes modeling (and perhaps some soil testing) compared to Option 2. Estimated modeling outcomes for FLIT-managed land could serve as an important positive externality to academics and other community stakeholders through the provision of knowledge around regenerative agriculture[cxii]

Source: Analysis by author.

As noted in Table 4.2, Option 2: Practices-based approach and Option 3: Combination Approach of Practices-based with Outcomes Modeling are tied for best performance in the assessment of equity.

Recommendation

As the above results indicate, the combination approach incorporating practices-based MRV alongside outcomes modeling is the preferred alternative for an MRV framework for a FLIT. It ranks highest or equivalently high to the other alternatives on all three criteria and avoids significant negative externalities, particularly vis-à-vis producers' equity. Although it is not the easiest or least costly MRV option to implement, it is still capable of being implemented practically and quickly, which is an important consideration for an initiative which is primarily whose goal is to achieving rapid scale.

However, this assessment assumes that the results of the MRV framework and regenerative agricultural outcomes modeling efforts are made available to external stakeholders (as would likely be the case for a pilot program). If the FLIT vehicle opted not to share its MRV results (as some private investment entities prefer to do) , this could potentially change this framework assessment along these criteria as currently defined.

V. FarmLand Investment Trust Structure

The following section seeks to answer the second research question of this report: What structure should the private investment vehicle take to best align stakeholder incentives and achieve positive economic and environmental outcomes. (And relatedly, how should this structure be piloted?[30]) While there are several (relatively new) private investment entities that operate in the organic and/or regenerative agricultural space,[cxiii] there is currently no investment vehicle whose purpose is to increase regenerative agriculture adoption that also achieves that goal at scale.[31] Given the competing interests and priorities among the different stakeholders who must come together in a FLIT model,[cxiv] this question of structure is paramount.

Given there are no real-world examples of a FLIT, these proposed FLIT structure models are drawn from other private investment models. What lessons from other forms of private investment can be learned or applied in the context of regenerative agricultural investment? What are the benefits or limitations of one structure over another? What kind of structure would facilitate a FLIT to sufficiently attract both private investors and individual producers as operators? Which structure would enable the rapidly scaling of operations? These are just some of the questions considered as part of the assessment of the following two alternatives for the FLIT structure.

REITs: Background and Key Considerations

A REIT can be defined as "a company that owns, operates or finances income-producing real estate. Modeled after mutual funds, REITs historically provided investors of all types regular income streams, diversification and long-term capital appreciation."[cxv] Investors can purchase stock in equity REITs, mortgage REITs, or hybrid REITs. Equity REITs own properties in a variety of real estate sectors such as retail, office buildings, or residential buildings. An estimated 145 million Americans own REITs through their retirement accounts or other investment funds.[cxvi]

REITs are attractive investment vehicles in part because they provide a number of unique benefits to investors. They have a low correlation with other asset classes which makes them a useful diversification tool. They historically have provided competitive total returns with steady dividend income and long-term capital appreciation. Most REITs trade on major stock exchanges—thus providing investors with liquidity—and are available to individual investors. However, Public Non-listed REITs (PLNRs) and private REITs also exist.

The US Congress amended the tax code to create REITs in 1960:

> …To make investments in large-scale, income-producing real estate accessible to average investors. Congress decided that a way for average investors to invest in large-scale commercial properties was the same way they invest in other industries--through the purchase of equity… stockholders of a REIT earn a pro-rata share of the economic benefits that are derived from the production of income through commercial real estate ownership.[cxvii]

Since their creation in1960s, REITs have grown significantly in terms of their size and market acceptance. Moreover, REITs have historically performed well, leading to their use in over 12 sectors. For example, 3%

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[30] See Section VI "Recommendations and Considerations for Pilot Design."
[31] See Section III "Objectives of a FarmLand Investment Trust."

of REITs are Timberland REITs, which "own and manage timberland real estate and specialize in harvesting and selling timber."[cxviii] Other REIT sectors include retail, infrastructure, health care, lodging, and data centers.[cxix]

In order to quality as a REIT (and receive the associated tax benefits), a company must meet the following, specific criteria, some of which is directly related to organizational structure. Under US financial regulations, a REIT must:[cxx]

- Be an entity that is taxable as a corporation;
- Be managed by a board of directors or trustees;
- Have shares that are fully transferable;
- Have a minimum of 100 shareholders;
- Have no more than 50% of its shares held by fewer than five or fewer individuals during the last half of a taxable year (the closely held prohibition test);[32]
- Invest at least 75% of its total assets in real estate assets;
- Derive at least 75% of gross income from rents from real property or interest on mortgages financing real property;
- Have no more than 25% of assets consist of stock in taxable REIT subsidiaries; and
- Pay at least 90% of its taxable income in the form of shareholder dividends on an annual basis.
- File annually with the Securities and Exchange Commission (SEC)[cxxi]

Despite these regulations, REITs can take still take several forms. REITs can operate as open-ended funds or as target date funds with a specific investment term. Approximately 90% of REITs are equity REITs, in which the REIT company mostly owns and operates income-producing real estate. REITs generally must acquire and develop their properties primarily for its own portfolio rather than for the purpose of reselling the properties once they are developed. In contrast, mortgage REITs "mostly lend money to real estate owners and operators or extend credit indirectly through the acquisition of loans or mortgage-backed securities."[cxxii]

Because REIT shares represent fractional ownership, which is an important distinction from other forms of corporate securities. REIT securities "provide one with a guaranteed share of the taxable income of the Trust," meaning that investors receive dividends (or potentially capital gains losses, if the REIT preforms poorly) based on their ownership of shares.[cxxiii] Investors of REITs also have more control compared to other investment vehicles or securities in that they elect REIT directors.

While REITs generally have low growth profiles (since only 10% or less of their income can be reinvested in the company by definition), REITs offer important tax advantages that are attractive for certain investors, particularly fixed-income investors such as retirees. REITs are considered a type of "pass through" corporation, which sometimes allows for special tax treatment of a REIT's real-estate-based income streams. For the purposes of taxation, dividend distributions are allocated to ordinary income, capital gains, or return of capital, each of which implies different tax rates for the investor. The maximum 15% capital

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[32] A subset of REITs includes so-called captive real estate investment trusts. These are REITs with controlling ownership by a single company. These vehicles are largely used as a tax mitigation strategy and take the form of subsidiaries. The same regulations and benefits apply to captive REITs, however they require additional federal and/or reporting due to inherent advantages these vehicles can create. See: Kenton, Will, 2021. Captive Real Estate Investment Trust." *Investopedia.* https://www.investopedia.com/terms/c/captive-real-estate-investment-trust.asp

gains rate generally applies to the sale of tradable REIT stock. However, a REIT's dividends to investors will qualify for a lower tax rate when one of the following scenarios occurs:[cxxiv]

- The individual investor/taxpayer qualifies for a lower scheduled income tax rate;
- When a REIT makes a capital gains distribution or a return of capital distribution;
- When a REIT distributes dividends from a taxable REIT subsidiary; and
- When a REIT pays corporate taxes and retains earnings (when permitted).

As previously noted, farmland REITs exist, but they remain relatively rare. At present, there are currently two publicly listed farmland REITs. These include Gladstone Land Corporation (LAND) and Farmland Partners (FPI). There are only a few private farmland REITs, including Iroquois Valley Farmland REIT, PBC, which is the only REIT vehicle specifically focused on the management of regenerative farmland specifically.

The first publicly listed farmland REIT, Gladstone Land, was founded in 1997 and went public in 2013. The company now has a total portfolio of more than $911 million (as of 2020).[cxxv] Gladstone Land's portfolio consists of 115 farms (90,000 acres with over 45 different types of specialty crops grown) in ten states.[cxxvi] As an equity REIT, Gladstone owns the farmland in its portfolio and earns investor income from the rent it receives from tenant farmers. the company has a 100% occupancy rate with more than 70 unrelated, third-party tenants. Operating as a perpetual fund, the companies lease terms vary, with current weighted average remaining lease terms at 6.6 years (excluding tenant renewal options). On the investor side, Gladstone Land REIT pays out 94.7.4% of its earnings as a dividend, which is $0.54 per share annually and which has been growing nearly 1% each year.[cxxvii] Its current dividend yield is 2.25%, although it has ranged from 2.7% to 8.98% since 2013. The company has appreciated 66% in the past year, providing respectable returns for its investors.[cxxviii] Historically, its dividend yields have largely stayed within the 3-4% range.[cxxix] According to company materials, the goal of the company is to "build the premier farmland real estate company focused on ownership of high-quality farms and farm-related properties that are leased on a triple net basis to good tenants,"[cxxx] but there is little to no information about the environmental dimensions of its investments or operations of its farmland portfolio on its website.

By comparison, the second publicly listed REIT, Farmland Partners (FPI) is a smaller, with a $400 million portfolio and 150,000 acres of land in 16 states. Unlike Gladstone Land's focus on specialty crops, FPI primarily focuses on row and commercial crops such as corn and soy. FPI currently has a dividend yield of 1.5% but the REIT is only up about 3% in value since its inception in 2014. (However, it is currently suing an anonymous group over an alleged disinformation attack in 2018 that lowered the stock price.) Like Gladstone Land, FPI does not list any environment-specific goals on its website nor does it provide information regarding environmental practices or investment due diligence.[cxxxi]

In contrast, Iroquois Valley Farmland REIT, PBC is an organic farmland finance company whose goal is "to make organic culture the norm, not the exception in America to benefit health of the soil and of future generations."[cxxxii] Iroquois Valley's primary investment offering is for REIT Equity Shares, which are available to non-accredited investors and have a five-year redemption cycle. Annualized returns are currently 1.76% (with investor liquidity locked for the first five years), and annualized returns are 9.31% since inception.[cxxxiii] Unlike the publicly listed REITs, the primary Iroquois Valley REIT investment vehicle is limited to accredited investors. For smaller, private REITs, the regulatory requirement to have at least 100 shareholders can be more challenging to maintain than publicly traded REITs. The costs of initial investments in private REITs ($10,000 or more) are generally higher than publicly traded REITs, and there is generally less transparency and investment liquidity, although this varies by company.

According to experts and individuals with knowledge of Iroquois Valley's operations, expanding REIT investment opportunities to non-accredited investors requires substantial financial and legal resources in order to comply with the additional SEC regulations. For Iroquois and other private REITs, this tradeoff is generally not worth the effort. The difficulty of the paperwork and filings required have also been corroborated by other financial professionals, including other specialty REITs.[cxxxiv] A representative of a specialty REIT that is also uniquely operating as a public benefit corporation half joked, "we practically spend all our money on accountants and lawyers."[cxxxv] From an investor perspective, high costs of maintaining complex regulatory compliance can create the potential for high management and transaction fees. Several other financial experts discouraged REITs as a vehicle for a FLIT on this basis. As one noted, "the tax benefits aren't worth the effort [and complexity]." [cxxxvi]

Private Equity Funds: Background and Key Considerations

Private equity funds are "an alternative investment class and consists of capital that is not listed on a public exchange." Private equity is composed of funds and investors that directly invest in private companies."[cxxxvii] Institutional as well as (usually high-net worth) individuals provide the private capital for a private equity fund. Real estate private equity is a sub-category of private equity that usually invests in commercial real estate, including agricultural lands.

Unlike REITs, private equity funds are generally leaner, more flexible, and more efficient in terms of management structure and company size. Compared to REITs, private equity funds have higher growth potential since there is not a restriction to distribute 90% of taxable income back to investors. These sentiments were corroborated by financial experts interviewed for this analysis.[cxxxviii] "Private equity real estate funds are designed to be large enough to take advantage of real estate investment opportunities but small enough not to require an army of employees and brokers to manage."[cxxxix]

A company that is similar to this model in the US agricultural industry would be Farmland LP, which is "a leading investment fund that generates returns by converting conventional commercial farmland to [organic farmland]. Founded in 2009, [Farmland LP] manage[s] over 15,000 acres and more than $175 million in assets."[cxl] Farmland LP targets farmland regions that are poised for asset appreciation in the long term and seeks to produce higher crop premiums in the long term after converting conventional farmland to regenerative organic farmland.

FLIT Structure Alternatives: REIT Model or Private Equity Fund Model?

Following the previous overview of key details of REITs, private equity funds, and easements, the following section summarizes the proposed structural elements of each model as they could apply to a FarmLand Investment Trust. Where major management and/or operational sub-options existed for a given FLIT structure model, some design selections were made to better facilitate comparisons between Option 1 and Option 2. However, the options describing these proposed models do not reflect all of the structure- and management-related choices that are potentially relevant to this assessment.

Option 1: Real Estate Investment Trust (REIT) Model

Under a REIT model, a proposed FLIT would operate as a private REIT and only source investment from accredited investors (at least initially if not indefinitely). As a hybrid REIT, the FLIT's income could derive both from FLIT-owned farmland that is rented out to tenant farmers and from mortgage payments from farmland owners who receive lending from the FLIT. The FLIT would remain subject to all relevant SEC and IRS regulations, and it would aim to disburse at least the 90% of its taxable income to its investors. It is recommended that a FLIT under a REIT model operate as an open-ended index fund rather than a so-called "finite life REIT."[cxli] This model also proposes internal management of the FLIT.[cxlii] This model is most similar to the real-world example of the Iroquois Valley REIT, RBC. However, a FLIT REIT would differ in that it would 1) modify its real estate holdings to target the purchase of conventional farmland for the purpose of converting it do regenerative farmland management and 2) actively seek to incorporate so-called working lands easements to land under FLIT (if possible).

Option 2: Private Equity Fund Model

In comparison, a private equity fund model FLIT would purchase and manage the farmland assets it targets for conversion from conventional to regenerative agricultural management. The FLIT fund would source private investment to purchase farmland real estate assets from so-called limited investors or lenders. Individual investors would likely also be accredited investors, but this model would also enable the FLIT to seek debt financing in addition to equity financing, if needed. The fund would not distribute annual dividends, but profits (likely over a longer time horizon) would be distributed between limited partners and general partners, with general partners (and possible others) capable of receiving "sweat equity" or carried interest equity ownership in the fund. The private equity FLIT model also envisions the use of a so-called working lands easement, or affirmative conservation easement, to restrict the appreciation of farmland real estate assets.

Assessment Criteria for the FLIT Structure

How can the previous FLIT structure alternatives be assessed? This section proposes the following criteria to assess the structural model of the FarmLand Investment Trust vehicle:

1. **Efficacy: Which Structure is More Likely to Achieve the Objectives of the FLIT?**

Under this criterion, which structural model will better facilitate a FLIT's ability to scale regenerative agriculture and simultaneously create positive economic and environmental returns? Can a given model enable the FLIT to attract sufficient private investment and producers as farmland operators? Additional considerations under the umbrella of efficacy include the ease of management structure and the transactional costs of doing business associated with each structure (including providing necessary tax and investor-related paperwork). Does a given structure imply restrictions that limit the FLIT's ability to operate effectively in the agricultural industry, including the FLITs interactions with government programs? How does the structure affect stakeholder incentives?

2. **Equity: Who Loses and Who Gains Under the Given FLIT Structure?**

Once again equity is a key criterion to assess alternative FLIT structures. The structure of a private investment vehicle fundamentally determines which risks and which rights (including rights to income and decision-making authorities) via its structure and founding documents. How does a given FLIT structure allocate these risks and rights among investors, producers, and other external stakeholders? How does the structure affect stakeholder incentives and benefits?

3. **Legality / Feasibility: Which Structure is More Likely to Be Legal and Feasible to Implement?**

Finally, is a given FLIT structure legal or practically feasible? Can this new vehicle be created in a way that does not run afoul of federal or state laws governing farmland land management and farmland investment? Given outstanding design details of the FLIT, this analysis should not be considered a comprehensive legal review, but it does reflect analyses and discussions with several legal experts with expertise in farmland and/or private investment, most of whom are barred in the state of California and have familiarity with California state laws on these topics.

Analysis and Recommendation for FLIT Structure

The following section provides a *relative assessment* for each of the above criteria of the two structural models considered and brief explanations of the primary reasons for the relative levels assigned. These relative assessments were especially informed by the views of and interviews with experts, particularly those with agricultural investment, finance, and legal expertise.

Analysis

Table 5.1: FLIT Structure Efficacy Assessment

MRV Alternative	Efficacy Rating	Rationale
Option 1: Real Estate Investment Trust (REIT) Model	Low	Real-world examples of private agricultural REITs (e.g., Iroquois Valley) indicate that such this model would not likely facilitate either rapid expansion or scale. For example, producers indicate that Iroquois Valley continues to move much slower compared to commercial competitors, causing them to lose the ability to source land from interested organic farmers. REITs in general are slower growing investment vehicles. Farmland REITs with larger scale (e.g., Gladstone Land and FPI) are publicly listed, and both took a decade or more to reach their current market capitalization. REITs' requirements to annually return 90% of taxable income to investors would limit the resources needed provide up-front capital investments in farms to transition them to regenerative agricultural practices in the beginning of the investment cycle. By design, REITs are intended to earn a large share of their profits from the appreciation and sale of real estate asset, but a FLIT aims to create investor returns without incorporating asset appreciation. Private REITs are limited to accredited investors only, limiting potential scale.
Option 2: Private Equity Fund Model	Medium	A private equity fund model is more capable of rapid growth potential by design and in practice. This model is capable of raising substantial funds while remaining a private (non-listed) investment vehicle. A private equity fund generally retains more of its income and/or profits and does not disperse profits via dividends A private equity fund has greater flexibility in terms of options for management and operational design. There are

		fewer regulatory limitations to a private equity fund model's design and implementation compared to a REIT model. A private equity fund has more flexibility to determine profit distributions (including use of carried interest equity mechanisms) on a time frame better suited to an investment in regenerative agriculture. A private equity fund can potentially incorporate both equity investment and debt financing into its model. While a private equity fund will likely also be limited to accredited investors on an individual basis, this model also generally attracts institutional investors traditionally. Private equity funds are a more common investment vehicle, particularly given the regulatory challenges of a REIT. As such, there are more examples of unique management arrangements in private equity, including those which practically align investor and non-investor stakeholder interests.

*Note: * = assumes private, non-publicly listed REIT, see Option 1 details. Source: Analysis by author.*

As noted in Table 5.1, Option 2: Private Equity Fund Model performs the best in the assessment of efficacy.

Table 5.2: FLIT Structure Equity Assessment

MRV Alternative	Equity Rating	Rationale
Option 1: Real Estate Investment Trust (REIT) Model	Low	Given rules generally limiting REITs to a 1:1 ratio of shares to fractional ownership rights, this model *does not* allow for the building of so-called "sweat equity" (or carried interest equity mechanisms) by non-investing operators. Primarily, limitations on this dimension and other aspects of flexibility in FLIT management and operation reduce Option 1's equity rating. Investors are generally on equal footing with other investors on the basis of shares in a REIT model
Option 2: Private Equity Fund Model	Medium	Private equity importantly *does* allow for the creation of "sweat equity" mechanisms for fund managers others. The proposed design for a Private Equity Fund Model proposes the provision of carried interest equity ownership to producer operators. If achieved this increases the equity for producers and their ability to share in the fund's financial success. Ownership of a private equity fund is retained by the general partners, but ownership does not need to be fractional on a 1:1 basis. *It is possible to have widely unequal equity ownership or management authorities (e.g., board member selection, veto power in some decisions, etc.) built into structure of the private equity fund. This has the potential to increase and/or decrease equity among stakeholders, depending on how these authorities are structured. This flexibility can also support the formation of potentially beneficial guardrails in the fund's structure.*

Source: Analysis by author.

As noted in Table 5.1, Option 2: Private Equity Fund Model performs the best in the assessment of equity. However, this remains a very preliminary assessment subject to revision based on the details of the fund's structure.

Table 5.1: FLIT Structure Legality/Feasibility Assessment

MRV Alternative	Legality/ Feasibility Rating	Rationale
Option 1: Real Estate Investment Trust (REIT) Model	Medium	Farmland REITs are heavily regulated but still legal. The details of Option 1 proposed here should be legal. However, the complex and time intensive processes by which REITs are created and managed make their implementation difficult but not impossible. As a newer private REIT investing in regenerative agriculture, it is possible that a FLIT would end up competing in a small niche with Iroquois Valley REIT for investors (and general investor awareness) rather than be additive given strong similarities between this model and Iroquois Valley's. Corporate ownership of farmland is limited in several US states, potentially restricting scale
Option 2: Private Equity Fund Model	Medium	Private equity models are also legal, if complex in design and structure. A full assessment of legality will depend on the final specifics of a FLIT's design. Although most private equity funds are closed-ended (e.g., have an end date), it is possible to create an open-ended private equity fund with no fixed investment term.[cxliii] Corporate ownership of farmland is limited in several US states, potentially restricting scale.

Source: Analysis by author.

As noted in Table 5.1, both the REIT and Private Equity Fund FLIT structure models perform equally well on the legality/feasibility criterion. However, the rationales provided in this relative assessment remain vague given a high-level structure proposed rather than a detailed charter or incorporation plan. A more precise assessment of legality requires more specifics than the scope of this analysis allows.

Recommendation

As the above results indicate, the private equity fund model is the preferred structure for a FLIT given the above criteria. It ranks highest or equivalently high to the REIT model alternatives across all three criteria. This model remains less onerous to create and administer and has greater potential to scale and build int equity to the structure. However, the assessments of the private equity fund model across these criteria is less certain than previous assessment. This analysis should be revisited once finer details of the private equity are available and during/after any potential FLIT pilot program.

VI. Recommendations and Considerations for Pilot Design

The following section outlines recommendations and related considerations for the design of a potential FarmLand Investment Trust (FLIT) pilot program. Continuing and extending the analyses from Sections IV and V, the preliminary pilot recommendations are subject to additional refinement, particularly given the need to consult legal and financial experts on the specific design of a private equity investment entity.

Proposal 1: Finance the pilot using philanthropic funding (minimum $10 million)

Ideally, any pilot program mimics the proposed real-world program as closely as possible to ensure that outcomes are comparable. In the case of a private equity financing structure, a real-world FLIT would source and deploy private investors' capital and would have obligations to their investors. However, for several practical reasons, it would be preferable to source and deploy philanthropic capital rather than private capital for a FLIT pilot program.

Firstly, it is not guaranteed that a FLIT will work as ideally intended, and absent the appropriate structural guardrails, there are potentially harmful externalities for farmers (and private investors) that should be avoided.[33] While this report suggests that a FLIT could potentially be a useful tool to convert farmland to regenerative management using private equity investment, many stakeholders have emphasized the fact that the success or failure of such a model (and their own acceptance of it) requires getting the finer details and specifics of the vehicle structure and management correct because there are many legal, contractual, and incentive alignment pitfalls to avoid.[cxliv] Philanthropic funding could allow more flexibility in the operation of the program in order to ensure guardrails are included (and modified midstream, if needed) and negative externalities are avoided.

While a pilot program has the potential to provide meaningful returns for pilot investors, the primary purpose of the pilot is not to provide returns. Rather, the primary purpose of a pilot program would be to practically test the theory of change that underpins a proposed FLIT. Investing in a theory of change is more of a philanthropic exercise than a market-based one. There are many yet unanswered questions regarding the design of the FLIT. As a learning exercise, the pilot program will seek to substantially inform any real-world design and implementation of a FLIT. However, it will likely be easier to source sufficient capital from philanthropists interested in innovating and improving soil health outcomes than private investment seeking returns for a new investment vehicle with complicated structures and management.

In terms of the amount of philanthropic capital, $10 million should be considered a *minimum* amount needed. Given the aim of a FLIT to facilitate the conversion of $100 million cropland acres, a pilot program should attempt to be a meaningful size. Even if every dollar raised went to finance the purchase of FLIT land assets and nothing else (an unlikely scenario), given the average price of land, $10 million on average would only finance less than 2,500 acres of cropland.[34] If a FLIT pilot were to be run exclusively in California—which has the most expensive farmland values in the country at $12,900[cxlv] per acre of

[33] For example, if a FLIT (pilot) backed by private capital were unprofitable, it might be expected to consolidate or sell underperforming farmland in order to improve its balance sheet. However, a philanthropy-backed pilot could stand to be unprofitable without being forced to terminate leases with (socially disadvantaged farmer) tenants who were willing to accept the risk of serving as operators for a new and unfamiliar private investment vehicle. Additionally, in the long run, it would be advantageous to better understand why a FLIT, or specific farms under a FLIT's management could not be profitable as part of the pilot program.

[34] This is based on the average per acre price of cropland of $4,200 in the United States in 2020.

cropland—$10 million would purchase less than half that amount, or 775 acres of cropland. Given the average size of a US farm was 441 acres, $10 million spent on average-priced California cropland would source less than two average sized American farms.

Proposal 2: Aim to source pilot program land from non-operator landowners (NOLs). Aim to source farmland that is diverse in size and crop types

This analysis proposes that land being managed by a FLIT be sourced from NOLs. Given the primacy of ownership among producers and importance of keeping farmland "in the family" for many owners, it is socially important to avoid becoming a private investment vehicle that largely turns family farmland into corporate farmland. Plus, given the fact that 80% of rented farmland is owned by NOLs, there is available land that avoids this problem. Moreover, given the increase in farmland turnover expected in the coming decades due to the aging producer workforce, there may be increased opportunities to source land from this class of owners.

A key outstanding question regarding the FLIT is whether or not its feasibility and profitability is limited to farms of a certain size or do farms growing specific subsets of crops. The CEO of a large farmland investment company investing in converting non-organic farms to organic operations said that investments were only financially viable if individual farm operations exceed greater than $50 million in size.[cxlvi] Particularly given that regenerative crops do not currently receive a price premium in the market, the profitability will depend on the per-acre profitability margins of farm operations under FLIT management. Sourcing diverse cropland in a pilot—and collecting detailed farm- and crop-specific data on economic outcomes—can inform which types of cropland should be targeted in a real-world FLIT. Sourcing large-, medium-, and small-sized farms for a pilot can similarly reveal whether or not there are limitations regarding farm scale that would affect the viability of a real-world FLIT. Farm operations of different crops and sizes face vastly different management challenges, and the pilot should seek to understand practically how these might affect the FLIT investment vehicle in practice.

Proposal 3: Target landless new and young farmers as the primary FLIT operators

While a FLIT need not restrict the types of producers who participate as farmland operators, it is recommended that a pilot program try to source a substantial portion of its operators who are beginning and young farmers.[35] There are strong equity implications of this choice. Not only are younger farmers more likely to be open to farm regeneratively, they are also less likely to own land or be able to access it easily.[cxlvii] Many young farmers lack savings or capital to access traditional financing, so theoretically, this subgroup would stand to benefit the most from a FLIT model in which farmers can earn "sweat equity." Additionally, new and young farmers may theoretically be more mobile than producers who are established in a particular location or community. New and young farmers, given the stage of their farming careers, may likely be more likely to want to take advantage of tenancy renewal and/or purchase options where they exist as part of the FLIT design.

Proposal 4: Hire experienced and established third-party consultant(s) to oversee and implement MRV frameworks

[35] For a definition of beginning farmers, see Section I: "Agriculture in the United States: Farmland and Farmers in the United States."

There are many producers and other experts who have decades of experience advising farm operations about regenerative farming practices. Given their expertise and establishment in regenerative agriculture, a FLIT pilot program should hire them to serve as third-party consultants to the FLIT and independently oversee the implementation of MRV frameworks in particular. Not only will their farm management expertise facilitate better farm outcomes, but also their credentials will further burnish the independence and robustness of the final result of a FLIT pilot. Hiring an independent entity to oversee MRV will also serve to limit any perverse incentives vis-à-vis regenerative outcomes.

Proposal 5: Use the pilot program to test and inform the specific private equity model and distribution waterfall as well as whether or not a government-mediated financial benefit is necessary

Although this report provides broad recommendations regarding the private equity structure of a FLIT, it remains unclear exactly how equity ownership and the distribution waterfall of profits should be structured. The specifics of these structures have major implications for the profitability of a FLIT and the potential levels of investor returns. However, without more specific financial details informing returns, it is very challenging to assess whether or not government supports or other market incentives are needed for a FLIT to function at scale. The realized investor (philanthropy) returns from a pilot program could inform whether or not a FLIT would be sufficiently profitable—and sufficiently attractive to investors—without additional government supports. Finally, the more data from a pilot program indicating the returns investors are likely to see, the more likely a real-world FLIT will be able to target the correct categories of investors and source sufficient financing.

Proposal 6: Do not incorporate new CRP, EQIP or other government program activities on farms under the management of a FLIT pilot in order to separately assess the pilot's outcomes from other government programs

There are many governmental or grant programs available that subsidize the adoption of regenerative practices, but these programs should be reserved for a real-world, post-pilot FLIT (where presumably participation in these programs would only serve to increase the profitability of a FLIT). Although it is not the recommendation of this report that farmland already participating in CRP, EQIP, or related NRCS (or similar state) programs should be *excluded* from a FLIT vehicle, it is preferable that farmland under the management of a FLIT pilot not apply for *new* program funding of this kind for several reasons.

It is preferable—in order to better understand the kind of government supports potentially needed for this design (see Proposal 5 above)—that government intervention variables are limited during the pilot. Given the program and/or policy changes as well, it is preferable to measure outcomes across farms consistently. Moreover, applying for these programs can take considerable time and effort, which is not ideal for a relatively short FLIT pilot program.

Also, a profitable pilot program achieved absent additional government supports will also better reflect the type of farmland which a FLIT aims to include post-pilot. A FLIT pilot ideally wants to source and assess outcomes on land that will match its real-world target farmland: conventionally managed farmland that is less likely to participate in conservation cost-share programs. Lastly, a profitable pilot program achieved without direct government supports will provide a stronger and more compelling narrative in favor of the FLIT design.

Proposal 7: Do not incorporate new ecosystem services payments regimes on farms under the management of a FLIT pilot in order to separately assess the pilot's outcomes from other income streams

For similar reasons provided in Proposal 6, payments from ecosystems services markets should be avoided during the pilot in order to collect and analyze a more consistent and less complicated dataset informing the conversion of land from conventional to regenerative. Additionally, ecosystem services payments may complicate MRV efforts given different and separate outcomes verification protocols. Following a successful pilot, a real-world FLIT could certainly take advantage of these income streams if feasible and profitable.

Proposal 8: Consider limiting the scope of the pilot to a particular region (e.g., California) or specific crop types (e.g., commodity crop-based rotations) to reduce operational challenges

This proposal may be at odds with recommendations of Proposal 2. However, it may be important to consider limiting a FLIT pilot program in order to achieve more targeted results given likely limited pilot funding and political consideration.

Compared to other states, for example, California has more stringent and more numerous regulations that apply to farm management. For example, California is the only state to regulate groundwater extraction to prevent groundwater overdraft. As a result, California is one of the most expensive places in the country to operate a farm, particularly given high farmland market values. Thus, if the pilot can work here, logic would suggest that a FLIT may even be more profitable in other places.

However, there might be a case to be made for other regions as a focus. If forced to choose specific crops or regions in which to focus the expansion of regenerative agriculture, what should be the priority? Should commodity crops representing the most acreage be prioritized in order to better facilitate scale? Or should areas where environmental and/or economic outcomes such as soil erosion, lowest adoption of conservation practices, or producer economic stresses are most concentrated?

These tradeoffs should be considered. However, they may need to be informed by ongoing discussions with policymakers regarding their own priorities, particularly if a subsequent government supports to a FLIT require a FLIT pilot program to target a specific geography or population.

Proposal 9: Fund and operate a FLIT pilot for at least 3-5 years

Most regenerative agricultural experts and literature reviews indicate that the economic transition from conventional to regenerative agriculture can be completed in 3-5 years. This time window is also sufficient to begin to realize many of the important economic and ecosystems services benefits associated with regenerative agricultural management. In addition, if developed quickly, this pilot program could produce preliminary results to share with policymakers and inform discussions with stakeholders prior to the next Farm Bill.

Proposal 10: Partner with soil science researchers, academics, and policy experts to conduct rigorous evaluations of environmental, social, and economic outcomes during the life of the pilot program

Lastly, it is the strong recommendation of this report that any pilot program for a FarmLand Investment Trust be developed and implemented in close collaboration with academics and other content experts. Beyond the inclusion of expert consultants to oversee independent MRV of regenerative environmental outcomes, a FLIT pilot program that partners with researchers can facilitate the improved understanding of other dimensions of regenerative agriculture, such as farm economics and producer attitudes and barriers. Parallel program evaluations, supported by philanthropic resources and measuring a full spectrum of potential FLIT outcomes could be informative for research and policy well beyond the scope of the FLIT pilot.

VII. Final Thoughts

This report represents a preliminary analysis regarding the possible design of a FarmLand Investment Trust, or FLIT. In a testament to the independent nature of the policy analysis, the final analysis recommends results both for the proposed measurement, verification, and reporting (MRV) framework and for the investment structure of a FLIT which do not reflect the initial framework and structure proposed by Project 2030. Despite these more surprising results, this report also contends that a FarmLand Investment Trust is theoretically feasible and warrants further investigation and design, namely in the form of a multi-year pilot program (see Section IV "Recommendations and Considerations for a Pilot Design.")

The urgency and current interest in unlocking the right mix of incentives to rapidly scale regenerative agricultural practices in the United States is high. As noted in Section II "Methodology and Evidence," there are a number of initiatives and legislative proposals that seek to advance "market-based" regenerative agriculture and/or climate goals under consideration in the U.S. Congress, and the strong focus on climate policy in several states and at the national level may provide a critical policy window in the months to come.[cxlviii] Importantly, the current farm bill will expire in 2023. In the design and development of a FLIT pilot program, it will be particularly important to remain aware of and engaged in these policy proposals and other agriculture-related initiatives undertaken by the new administration and states. There may be several potential opportunities for mutually beneficial collaborations between a FLIT pilot program and government agencies, particularly given overlaps between regenerative agriculture, climate resilience, and the importance of rural infrastructure investment.

If readers have any questions regarding this analysis, please feel free to send questions or comments to the author via email at molly.mcgregor@berkeley.edu. It is anticipated that subsequent versions of this report will be made public and feedback is welcome.

VIII. Appendices

Appendix A: Selected Additional Tables and Figures

Table A.1: Indicative Main Effects of Regenerative-like Agricultural Systems on Environmental and Economic Outcomes, With Illustrative References

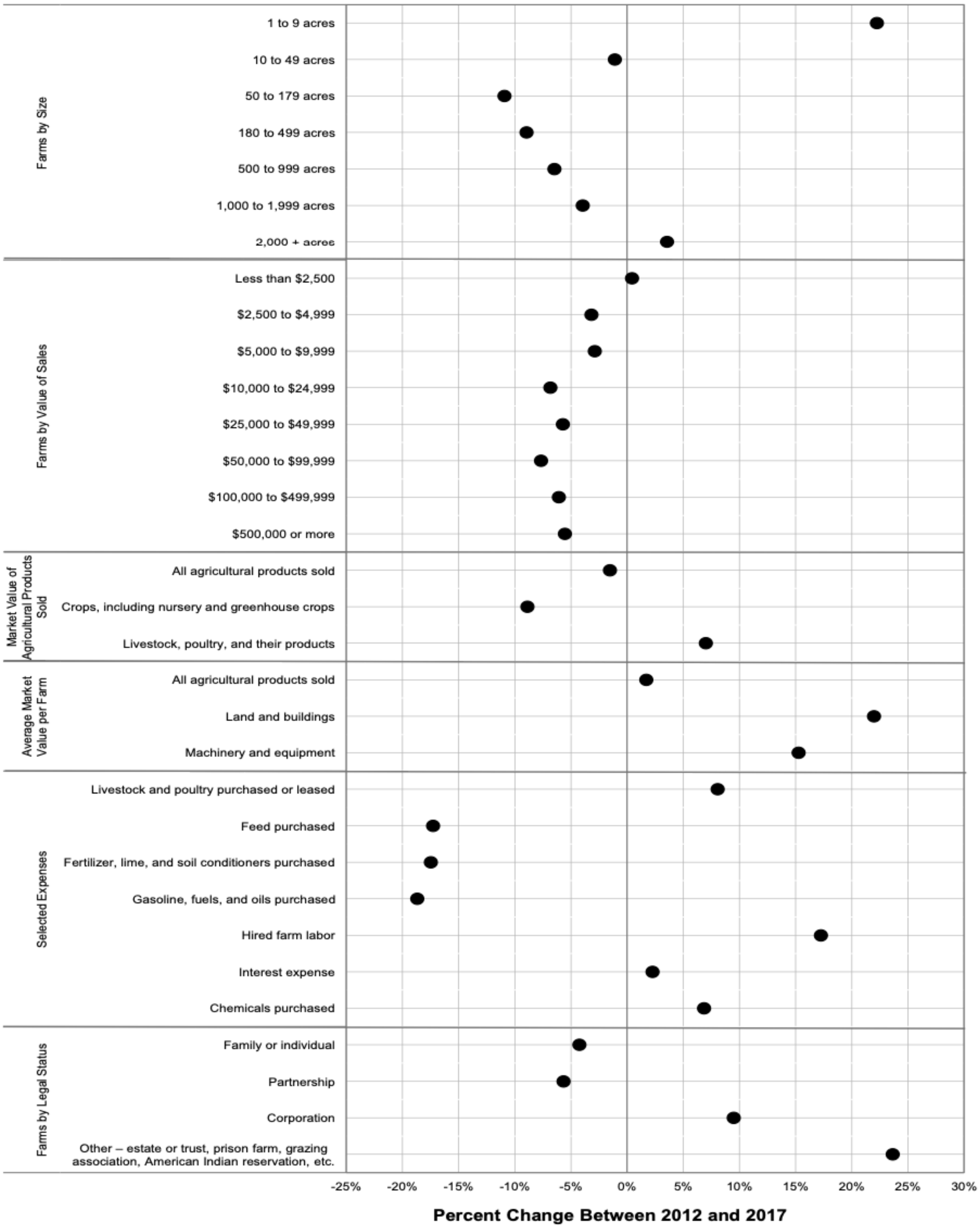
Regenerative Intervention	Counterfactual or baseline	Soil carbon	On-farm biodiversity	Mean crop, grass or livestock yield	Input costs	Tree carbon and products
Conservation agriculture	Crop production with intensive tillage	1.09 (Haddaway et al. 2017)	~1.00 (Doran 1980)	0.86-1.01 (Pittelkow et al. 2015)	Lower (Huggins and Reganold 2008)	0
Regenerative organic (e.g. organic crop production with organic amendments)	Crop production with fertilizers and/or agrochemicals	1.07-1.09 (Mondelaers et al. 2009; Tuomisto et al. 2012)	1.30-1.50 (Bengtsson et al. 2005)	0.48-0.92 (Clark & Tilman 2017; Cooper et al. 2016)	Lower to higher (LaCanne and Lundgren 2018; Crowder and Reganold 2015)	0
	Crop production with no amendments or fertilizers	1.07-1.09 (Mondelaers et al. 2009; Tuomisto et al. 2012)	Inconclusive	1.01-1.07 (Hijbeek et al. 2017)	Higher (Crowder and Reganold 2015)	0
Tree crops	Annual crop production	1.18 (Guo and Gifford 2002)	Higher (Simon et al. 2010)	0.75-1.60 (Bidogeza et al. 2015)	Inconclusive	Higher
Tree intercropping	Annual crop production	1.16 (Kim et al. 2016)	1.37 (Torralba et al. 2016)	0.42-1.00[a] (Garcia de Jalon et al. 2018a)	Lower to higher (Garcia de Jalon et al. 2018b)	Higher
Multistrata agroforestry	Monoculture permanent crops	1.57 (Zake et al. 2015)	Higher (De Beenhouwer et al.2013)	Variable (Niether et al. 2019)	Inconclusive	Higher
Silvopasture	Grassland	1.00-1.18 (Upson et al., 2013; Seddaiu et al. 2018)	1.21 (Torralba et al. 2016)	0.77-1.18[a] (Seddaiu et al. 2018) (Torralba et al. 2016)	Similar to higher (Garcia de Jalon et al. 2018b)	Higher
Multi-paddock Grassland	Grassland; continuously grazed	0.99-1.50 (Sanderman et al. 2015; Teague et al. 2011)	Inconclusive	0.98-1.00[b] (Hawkins 2017) (Derner and Hart 2007)	Higher (Hawkins 2017)	0
Grassland receiving organic fertiliser but not synthetic fertilizer	Grassland: receiving synthetic fertilizer	1.20 (Kidd et al. 2015)	Higher (Mueller et al. 2014)	0.70-1.50 (Mueller et al. 2014) (Kidd et al. 2015)	Inconclusive	0
	Grassland: receiving no fertilizer	1.30 (Gravuer et al. 2019)	0.94 (Gravuer et al. 2019)	1.98 (Gravuer et al. 2019)	Inconclusive	0
Rewilding and abandonment of agriculture	Crop and grazing systems	Higher (Conant et al. 2001)	Variable (Rey Benayas et al. 2007) (Lasanta et al. 2015)	0.11-0.80 (Cerqueira et al. 2015) (derived from Spencer 2017)	Inconclusive	Higher

[a]: Crop and grass yield responses in agroforestry are very sensitive to number of trees per unit area;
[b]: Whilst grass production may be similar; multi-paddock systems may allow higher stocking rates.

Positive effect: | Positive/similar: | Similar or very variable: | Similar or negative: | Negative:

Source: Burgess, et al., 2019.

Figure A.2: Profile of Nation's Agriculture, Percent Change Between 2012 and 2017[cxlix]



Source: USDA, NASS 2017 US Census of Agriculture

Endnotes

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[cvii] Several producers and academic experts interviewed as part of this analysis indicated that the per acre costs of the tests at the high frequency required are still too prohibitively high most farm operations whose soil tests are being paid for by an external entity. For example, General Mills is covering the costs of testing associated with converting its supply chain acreage to regenerative practices.
[cviii] While these actions are not presumed, several producers interviewed noted that it is possible (and relatively easy) to "hack" these some of these tests if producers know the locations from which field soil samples will be drawn. Multiple Stakeholder Interviewees. Personal Communications. 2021.
[cix] Note: many agricultural and environmental outcome models are available for free to use, limiting costs of this component. Costs of (albeit less frequent) soil testing data, if used to supplement the modeling alongside practices data, would still remain.
[cx] For example, given the need to run repeated soil tests per field, smaller farms would incur greater costs on a per acre basis to meet testing thresholds. While it is presumed that all farms already under a FLIT management would have their costs collectively paid for by the FLIT, this equity concern comes into play to the extent that it might make it too costly or infeasible for the FLIT to bring smaller farm operations under its management.
[cxi] Most soil testing must be mailed to one of a few commercial agricultural laboratories, sometimes within a certain number of hours from the time a sample is taken. Farms in places such as rural Alaska or Hawaii may incur significantly more costs to express ship soil samples, depending on the proximity of viable laboratories.

[cxii] Assuming outcomes modeling is made available to non-FLIT stakeholders, information such as water quality tests, chemical tests, or animal biodiversity/habitat assessments could be of interest to academics, local communities near FLIT-managed land, or consumers purchasing food from FLIT-managed farms.
[cxiii] Examples in the United States include rePlant, Iroquois Valley, and Farmland LP.
[cxiv] For more information on challenges and barriers facing different stakeholders in regenerative agriculture, see complementary analyses by Larson, Anna, 2021 as well as by Mudd, Karina, 2021.
[cxv] NAREIT, 2020. "Learn the Basics of REITs and REIT Investing." https://www.reit.com/what-reit/reit-basics
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[cxlii] "In a REIT with an internal management structure, the REIT's own officers and employees manage the portfolio of assets. A REIT with an external management structure usually resembles a private equity style arrangement, in which the external manager receives a flat fee and an incentive fee for managing the REIT's portfolio of assets." *Ibid.*
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