The Role of the Banking and Financing Sector in Encouraging Conservation Practices and Transitions to Organic Production

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Foreword

Historically, the banking sector has not explicitly considered the correlation between conservation practices, organic production and risk in their basic underwriting practices. As interest in conservation practices and organic production grows, agricultural lenders have opportunities to create loan products that help farmers wanting to adopt these practices. Recognizing the benefits of conservation or organic practices in credit risk ratings, underwriting processes, and other valuations can bring significant benefits to the market, producers, and the environment.

This paper was written by Josh Woodard, PhD, Ag-Analytics; Bruce Sherrick, University of Illinois at Urbana-Champaign; Jonathan Coppess, University of Illinois at Urbana-Champaign; and David Muth, Jr., Alternative Equity Advisors, with support from AGree. Based on over 25 interviews with industry leaders and practitioners and their own deep knowledge, the authors provide perspectives – and recommendations – about how banks and investors can support farmers’ transition to organic production or adoption of conservation practices.

AGree offers this paper to foster productive dialogue. While the concepts discussed in this paper are intended to enrich AGree’s and others’ discussions on the role of the banking and finance sectors in food and agriculture, they do not represent official AGree positions.

We hope you find this paper to be a helpful resource.

Sincerely,

Deborah M. Atwood

Executive Director, AGree
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Executive Summary

The purpose of this paper is to ascertain what, if any, incentive programs or approaches could be developed in the banking or investment sectors to facilitate farmers’ transitions to organic production or their adoption of conservation practices. These incentives could be targeted toward the positive capture of externalities by growers, landowners, and/or the agricultural banking and financing system—either directly or indirectly or from informational and operational standpoints—by effectively leveraging data analytics, interest rate reduction programs, structured financing, guarantee funds, and a host of other options. This paper is based on a review of a range of possible market interventions, as well as interviews with key market players at the intersection of conservation and banking.

Lending considerations regarding transitions to organic production are very different from those for the adoption of conservation practices. Organic certification programs are well established in the market through the U.S. Department of Agriculture (USDA), and large consumer premiums on organic goods are predictable and drive incentives in the organic space, though there is a difficult three-year transition period during which farmers must wait to receive organic premiums. As USDA organic certification is well established, banks generally—but not always fully—understand the expected price premiums on organic production and the timeframes involved.

No such widely adopted standard or market premium exists for “conservation-friendly” production in the consumer market. Thus, the adoption of conservation practices must either reduce farm-level yield risk or reduce costs, to be economically viable and appealing to both banks and growers. A variety of government programs are in place to promote conservation practices and related investments, but these do not always dovetail well with other programs; concerns remain in this realm as the USDA implements changes in the most recent Farm Bill. Nevertheless, despite extensive research on the environmental and potential economic benefits of different conservation practices, these benefits must convert into reduced cash flow risk, improvements in efficiency or asset value, or price premiums in order to be captured in a manner that can benefit farmers and landowners or be taken into consideration by lenders and investors. Important informational gaps remain to be closed in this respect.

Due to the difficulties associated with conservation practice adoption in terms of incentive alignment, monetization of benefits, and demonstration of long-run profitability at scale, important conservation practices are typically excluded or ignored in the pricing and structuring of loans, rental arrangements, and insurance contracts, and in the assessment of risk and appraisal of values associated with the use of these practices. While soil type, elevation, growing days, topography and drainage, and legal/physical access are factors typically considered by appraisers in assessments of value, there is little evidence that tillage or cover crop use, for example, are typically considered. Oftentimes appraisers may not even have access to yield data histories. With these points in mind, we considered several possible financial interventions that could possibly promote, enable, or eliminate informational gaps surrounding conservation practice adoption within the financial sector, including but not limited to the below.

Interest Rate Subsidies

The merits of interest rate subsidy programs for operating and term loans were considered. Market participants generally viewed interest rate subsidies on operating loans with skepticism, at least in isolation. While interest rate subsidies on operating credit may be able to scale if broadly adopted, the cost per unit to impact behavior could be expensive, and their effectiveness was seen as limited and highly uncertain alone. Tracking and verification would require leveraging the requisite systems to capture and process data affordably using precision agriculture and remote sensing. The use of these kinds of objective and automated metrics in bank credit rating and
The pilot should focus on a smaller number of producer segments for major conservation practices that can be efficiently measured—for example, cover crops in corn/soybean systems, bioreactors, buffer strips, and edge-of-field practices in conjunction with properly designed tile and drainage. The program could include a focus on young and beginning farmers, but we would not suggest it be exclusive to them. We believe the design and implementation of the program should include an eye toward the collection of data throughout, to demonstrate the value of conservation practices to operators, landowners, land managers, and bankers. Thus, the program should be combined with other efforts to create standards and operational metrics and platforms related to conservation adoption.

While the effectiveness of the direct, financial-economic incentive impacts of interest rate subsidies relative to other possible intervention pathways could be debated, important learning could result from the introduction of pilot programs via improved familiarity and experience from joint experimentation by banks, growers, and landowners. An important aspect of any pilot would be sound technical assistance, as well as tracking, monitoring, and evaluation to demonstrate return-on-investment impact to the landowner as well as documentation of environmental benefits. The setup would heavily engage the landowner, grower, analytics provider, bank, and land manager.

Careful attention should be given to the potential roles and incentives of extant market participants. For example, the distinction between land managers, farm operators, and landowners should be carefully considered in structuring any such pilots, particularly in regions where rental arrangements account for upward of 60 percent of the land farmed. Oftentimes the future benefits of conservation practices are uncertain or risky (even if promising), and the role of the landowner and land manager versus the operator is not always fully taken into consideration. This is particularly important given that most land is leased on one-year terms. Thus, investments in practices such as cover crops, buffer strips, and bioreactors are likely to be best suited for the landowner to make, not the operator (at least not alone). The land manager should also be actively considered in these transactions given the crucial role they play. The life of these investments, or the period over which they may begin to pay off, is also typically greater than one year; thus, consideration should be given to the appropriate term of any such proposed interventions. For example, the case could be made for intermediate-term loan facilities for investments in tile and drainage coupled with revolving lines of credit for practices like cover crops, whereby the conditions of the facility require associated conservation investments such as in bioreactors or buffer strips.

Small-scale pilots should be conducted before attempting larger, direct intervention programs. Such pilots should be coupled with technical assistance, educational, and analytical programs to have a reasonable level of success and potential for long-run changes in how the market treats and values the adoption of conservation practices.
**Loan Guarantee Programs**

Interviewees generally viewed with skepticism the concept of loan guarantee programs as a means of promoting conservation practice adoption. Such programs would likely face many of the same monitoring, underwriting, tracking, standards, and verification issues as interest rate subsidies and other possible pilot programs, especially in the absence of consortia or institutions for promoting the standardization of underwriting system capacity using emerging agricultural technologies. Interviewees cited these concerns as a primary reason why existing conservation loan guarantee programs have perhaps not been successful and have had low market demand. There is a case to be made that demand-side stimuli such as interest rate subsidies may have a more immediate and noticeable impact than supply-side interventions such as loan guarantees.

**Resources, Institutions, and Standards to Facilitate On-Field Data and Analytics**

Interviewees were generally enthusiastic about, and recognized the need for, emerging standards and operational metrics and platforms for measuring the financial and economic impacts of conservation practices. Such standards, metrics, and platforms could be used by banks for rating, underwriting, and monitoring loans. For example, despite a wide array of precision agriculture data being collected and generated by farms, and the widespread availability of remotely sensed data, there is quite little in the market in terms of operational analytics and sound metrics and systems for integrating such data for use by banks or insurance companies. There is not fundamentally a data gap (though gaps still exist), and the cloud-based systems to transmit and store the data securely certainly exist; however, there is a profound analytics gap. Interviewees recognized a need to invest in this ag tech ecosystem either in the form of institutes to create standards, or companies to deliver and process these metrics for banks, investors, and insurance companies. Such investments would likely have long-run impacts and staying power even after any subsidized investments have ceased.

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**Introduction**

Meridian Institute requested that Professor Joshua Woodard in his capacity as the CEO of Woodard Risk Management Consulting, Inc., and CEO of Ag-Analytics Technology Company, LLC, Professors Bruce Sherrick and Jonathan Coppess (University of Illinois) in their personal capacities, and Dr. David Muth Jr. of Alternative Equity Advisors, LLC, (an affiliate of Peoples Company) prepare a white paper examining potential interventions the banking sector could implement to encourage farmers to adopt conservation practices and transition to organic production on working lands. The authors conducted more than 25 interviews with industry leaders and practitioners in the agricultural banking and conservation sectors, as well as other agency and industry experts with knowledge of conservation, organics, and banking.

Overarching themes that emerged by considering points of influence and intersections between the supply of financial capital, on the one hand, and conservation improvements in agriculture, on the other, revolved around the use of financial interventions such as guarantee funds and the subsidization of interest rates, as well as better leveraging of emerging technologies in the data analytics space and Internet of Things (IoT) systems in agriculture. Additionally, the development of data standards related to conservation and sustainability outcomes, and the integration of these into extant originating, underwriting, and monitoring frameworks in the agricultural financing and rental markets, may be key to alignment in the future. We also considered related other factors and possibilities, including farmland investment markets, insurance, and regulatory frameworks.

**Approach**

The authors generated a list of possible topics, approaches, and interventions, with the intent to highlight potential priority areas for further exploration. To develop an assessment of market understanding and
status, we conducted interviews with representatives of a diverse mix of institutions in the agricultural lending and investment space, including private lenders, Farm Credit System actors, private equity firms, institutional investors, and relevant government agencies.

A critical backdrop against which any planned intervention in the banking and conservation space must be viewed is that the potential for the capture of conservation benefits typically does not accrue to the banking system or the grower/operator under current market, information, and regulatory structures. It is also uncertain if the adoption of conservation practices or related interventions will have the effect of increased asset values through time, or of the mitigation (or capture) of negative (or positive) externalities elsewhere.

Based on the interviews, the authors identified topics related to three main possible courses of action:

1. Special programs and subsidies (e.g., interest rate reductions and guarantee provisions);

2. Regulatory frameworks that encourage improvement or mitigation of damage; and

3. Technological investments in resources, institutions, and standards to facilitate the broad adoption of on-field data and analytics to drive operational underwriting systems and contracts.

The authors focused on the role of Farm Credit System institutions, cooperative banks, and commercial banks, but also explored the role of nonbank financing institutions through additional interviews.

**Background**

Historically, the banking sector has not generally considered the correlation between conservation practices and risk in their basic loan underwriting practices, at least not explicitly. In the absence of operational information streams, banks may view the adoption of certain practices as a risk rather than a benefit. The reasons may include, but not be limited to, the lack of data and analytics to substantiate the positive benefits in an operational and consistent manner; low market awareness about the potential risk-reduction benefits of conservation practices; and the lack of integration of tools to facilitate the assessment and monitoring of conservation outcomes within the market toolset that most institutions use for originating and servicing ag-financial investments or loans. In addition, banks generally are reluctant to involve themselves in prescriptive farm management decisions.

The key barriers are that (1) conservation is a cost for which there is often no realized (or at least no recognized) market value, benefit, or premium, to either farmers or lenders; (2) conservation decisions are not inherently the types of farm management decisions that banks are traditionally involved in, nor do banks have that expertise; and (3) there are difficulties in measuring and monitoring conservation activities as well as uncertainty regarding their long- and short-run impacts on yield and yield risk; and (4) in rental contexts (i.e., 60 percent of the market) alignment between the lender, landowner, and grower is not always direct and in sync as it regards promoting conservation investment, particularly since most leases are for one year. That said, there are potential benefits to be had for the market, and for the environment, if the benefits of conservation practices were to be better recognized in credit risk ratings, underwriting processes, appraisals, and other assessments and valuations.

Banks and insurers will likely have to recognize the positive impacts of conservation practice adoption if the rest of the market is to recognize them adequately. If there does exist bottom-line profit impacts to farmers from the adoption of conservation practices, then these need to be demonstrated at scale. While the case studies and small-scale scientific trials of conservation practice adoption conducted to date are suggestive and helpful, these approaches are not operational as a basis for broad market action, nor do they provide enough evidence to farmers, banks, insurance companies, and investors regarding bottom-line impact. Large-scale demonstrations and analytics systems are needed that can reliably measure, quantify, and predict such positive
impacts. The U.S. Department of Agriculture (USDA) and the academic sector have historically been reluctant to engage in this type of inquiry, often, ironically, citing lack of data (see e.g., the Federal Crop Insurance Program), or in other cases generally dismissing the importance of such systems and associated modeling and operational demonstrations as “unscientific.” If it is the case that there are positive bottom-line impacts (e.g., improved productivity, improved cash flow, less risk) from adopting conservation practices, then the lack of recognition and action by market participants is a market failure. Such market failures can potentially occur for structural, informational, as well as cultural/behavioral reasons.

On the other hand, if there are no real and current positive bottom-line profit impacts at the farm level large enough to offset the costs of conservation practice adoption (but there are positive environmental externalities), then this type of market failure could be addressable via many different channels, such as subsidies and/or taxation/regulation, and/or training and education. If conservation practice adoption is strictly unprofitable for the farmer, then the likely feasibility, effectiveness, and advisability of interventions via the banking sector may ultimately be quite limited. However, if bottom-line benefits do exist, then it is more a matter of demonstrating it and operationalizing it with the differing incentives and market realities in mind.

A real-life example of using precision data analytics. Precision data used for infield financial analysis can identify where environmentally sensitive and consistently unprofitable acres can be transitioned to conservation practices, resulting in simultaneously improved profitability and environmental performance.
An overarching theme that arose in our interviews was that a prerequisite for any direct financial intervention is that it must be possible to track, monitor, rate, and underwrite farm conservation activities in operational financial origination systems in an efficient manner, and that clear metrics must be established that can be used by and among banks, investors, insurance companies, and others. To date, the technical ecosystem and apparatus that would be required to ingest, process, and transmit such data and metrics “from the tractor to the bank”—to allow lenders to use them in their underwriting, credit rating, appraisals, and other systems—is severely lacking due to a lack of operational analytics and a variety of data silos, and since most technology companies do not have bona fide financial modeling or risk rating expertise.

Despite the fact that the equipment used to farm most of the land in the United States has long had sensors that record most of the critical activities occurring on the field (e.g., conservation practice use, seeding activities, fertilizer and pesticide applications, tillage activities, and harvested production) at sub-meter resolution, it is rare that the data are utilized in any aspect of a bank’s underwriting or monitoring systems. A few cases are beginning to emerge in which the electronic monitoring of production efficiency is considered in agricultural insurance applications via farm management software (e.g., Ag-Analytics via the John Deere Operations Center), but there are no known versions related to recognizing conservation practices in lending that actually result in useful financial metrics.

Many bankers noted that having access to systems to process the data from farm equipment at a large scale, and being able to combine that with other data such as satellite data to create field histories and calculate financial health indicators, would have great promise for driving the adoption of conservation practices and allowing banks to recognize the positive impacts of those practices in a manner that could actually be utilized in operational underwriting systems. Currently, no IT service providers in the lending space are creating such metrics for banks in wide adoption. However, there are emerging efforts in the agricultural insurance space to create scalable metrics using agricultural IoT data.
Introduction

Conservation Practices, Risk, and Farm Management

Apart from financial instruments such as crop insurance and production contracts, farmers rely heavily on farm management practices and technological adoption to manage and mitigate risk stemming from natural resource use (or overuse) on the farm. Farmers adopt a suite of practices, either through their own financing or by participating in federal cost-share programs. The Natural Resources Conservation Service (NRCS), the agency primarily responsible for providing cost-share assistance through programs such as the Environmental Quality Incentives Program (EQIP) and the Conservation Stewardship Program, allows farmers to voluntarily participate in the adoption of the most suitable management practices that would address resource concerns on a particular farm and minimize risk in production. Among those practices are conservation tillage, residue management practices, crop rotation, cover crops, integrated pest management, and nutrient management practices. Several of these management practices can have benefits over multiple years and/or multiple benefits through mitigation of primary resource concerns; however, some farmers tend to not implement those management practices as long-term strategies, and revert to traditional methods after a certain number of years, usually after the program requirements are met. One of the primary reasons behind such decisions is often financial. In such cases, it is highly likely that the farmer, although interested, might have a limited ability or incentive to continue adoption unless there is a bottom-line profit incentive. In addition, market forces that define input prices and commodity prices can influence decision-making regarding additional investments on the farm with respect to conservation adoption. Given such limitations, insurance tools that accommodate and/or recognize conservation implementation as part of Good Farming Practices can ameliorate not just adoption hurdles but also promote natural resource conservation.

These applications have the potential to be scaled and developed to serve the ag-banking sector. In fact, one interviewee with 20 years’ experience in ag-lending and conservation suggested that they would invest virtually exclusively in developing an ecosystem of operational data analytics platforms and metrics for use by banks and that this would push the needle in the conservation/lending space.

Banking issues related to farmers’ transition to organic growing practices are in stark contrast to those for the adoption of conservation practices. Regarding the transition to organic, the financing problem that occurs during the three-year transition period before producers can begin to receive a premium for their organic products (the so-called “three-year valley of death”) is well established. Many modes have arisen in both the banking sector and the private-equity sector to enable these transitions. In the case of organics, certification by the USDA is well established and recognized in the market, and there is a large consumer premium placed on organic goods that provides incentives to drive the transition to organic. Regarding the adoption of conservation practices, however, no market premium typically exists on the resulting agricultural production, and the adoption of conservation practices is typically not adequately tracked nor long-run impacts quantified. Several interviewees also pointed out that organic production does not necessarily imply the same positive environmental externalities that common conservation practices presumably do, especially those targeting soil health improvement.
As a result of the difficulties in incentive alignment, and in monetizing benefits and demonstrating long-run profitability, important conservation practices are typically excluded or ignored in the pricing and structuring of loans, rental arrangements, and insurance contracts, and in the assessment of risk and appraisal of values associated with the use of these practices. This fact can lead to adverse selection and implicit lending penalties against those who invest in their soils to reduce environmental damage. Analogs exist in the current rules and rates in the largest direct subsidy program as well (i.e., Federal Crop Insurance), which ignores the risk-reducing benefits of conservation practices; this only reinforces the dynamic. Emphasis on yield maximization, for example, as opposed to cost savings on inputs, can lead to disincentives for the adoption of conservation practices that otherwise would benefit both the farmer and the environment directly (and financial institutions indirectly) over time.

Interviewees are acutely aware of the difference in impact between the equity holder and the debt provider when an investment improves the asset value but does nothing to improve profitability or liquidity. This suggests that the development of better market instruments that span debt or create equity appreciation rights to the debt supplier could have a substantial impact. It also suggests that more focus should be allocated to the landowner perhaps, versus only the operator/nonlandowner farmer.

**Appraisals**

Interviewees indicated that there is a general recognition that potential positive, long-run soil health impacts are not captured in land appraisals, for both technical and structural reasons. The lack of recognition of soil health improvements potentially hampers the banking sector’s ability to reflect the positive impacts of conservation practices. While none of our interviewees suggested that landowners do not care about potential appreciation impacts on their land from adopting conservation practices (e.g., perhaps if they are not planning to sell), the reason that these are not tracked and quantified (and reflected in rental rates or appraisals) is due to the difficulty in measuring, monitoring, and tracking such detailed records over long periods and converting those into valuation metrics. Several interviewees noted that while theoretically all such information could be captured, analyzed, and packaged into metrics to inform real-time valuations of rental agreements and appraisals, this is not currently the state of the industry but should be possible with the emergence of machine learning and IoT by agricultural analytics platform providers.

Regarding appraisals—which are required for the financing of land mortgages—interviewees suggested that banks and appraisers do not always consider the use of conservation practices and the potential flow-through

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**IoT** is a common abbreviation for Internet of Things, which refers to the constellation of computing devices embedded in everyday objects (e.g., smartphones, or even tractors) which are connected to the internet, enabling them to send and receive data in real time. In industrial and commercial agricultural applications, an increasing amount of data is being generated and linked to centralized networks. For example, tractors and combines are typically equipped with sensors for measuring a multitude of metrics in real time, including fertilizer applications, harvested production, and many others at the sub-meter scale. Some farm equipment has long had on-board measurement sensors. For example, yield monitors—which generate maps of harvested production within a field—have been in the market for more than 20 years. However, historically many of these data were never saved, analyzed, or even removed from the data disks on the harvester. Today, farm equipment is typically linked to the internet, and the data are stored off-premises in “the cloud” for easy access and analysis. New and better sensors have also been developed, allowing for more accurate measurement of an ever-expanding number of variables at greater resolution.
benefits of improved soil health on land valuations. Appraisers cited lack of information in some of these situations, and there was mostly consensus that banks do not consider this fully in their underwriting and monitoring systems. Only one nonindustry market participant expressed the opinion that these factors are already fully captured; however, our discussions with actual certified licensed appraisers, brokers, bankers, and others in the nonprofit/nongovernmental sector revealed the opposite conclusions and perceptions. While there is widespread recognition that there would be benefits to the market in moving in this direction, it most certainly is not the conventional practice currently. However, there seems to be some confusion, particularly on the part of nonindustry market participants, about conservation practices being factored into underwriting decisions.

The situation is very different in organic production. For example, within Farm Service Agency (FSA) Farm Loan Programs, producers of organic crops base cash flow statements for loans on market data for organic pricing premiums and their own historic sales experience. Conservation practices are among the factors used by licensed appraisers who specialize in agricultural lands when appraising land for purchase or for use as security. However, there was some recognition that not all financial institutions and associated programs were particularly well equipped to effectively deal with this in all cases. In crop insurance, for example, there are particularly widespread impressions that the price levels set by the USDA for organics are deflated, and that lenders are not all particularly well suited for organic investments. Some interviewees went so far as to suggest that instead of debt channels, a better mode for promoting the transition to organic practices was through equity markets alone.

Generally, appraisers are interested in the potential to be able to reconstruct conservation practice histories for individual fields in an operational manner and to map objective metrics into their appraisal and rating systems. Bankers also responded that this would not be unhelpful, but they did not like the idea of allocating their own management capacity for the specific and isolated purpose of capturing changes in asset values per se—as there was a perception, right or wrong, that this would make them an equity player and expose them to perception/political risk with little value. Moreover, nonmonetized asset appreciation is not a meaningful source of repayment capacity. However, they did view the prospect of being able to more accurately evaluate land values for collateral evaluation purposes—via more accurate appraisals—positively. There certainly was perceived value in the ability to track and better rate asset values in their portfolio.

As a practical matter, each bank would not likely rebuild its own end-to-end analytics and data collection systems, but rather would depend on an ecosystem of service providers for the development and processing of such analytics streams. This could be accomplished by incorporating new data analytics and IoT approaches in conjunction with historical precision agriculture and satellite data—though no such product or service is widely available for use by appraisers or banks. If farmers or landowners knew that certain conservation activities that are currently not factored positively into appraisals could increase their land values in the market (i.e., if the market believes these practices will lead to increases in future yields or lower risk due to better soil health, or if identifying and putting land out of production were demonstrated as profitable, thereby increasing the overall profitability of the field), this certainly could lead to positive incentives to invest in these types of conservation activities.

Insurance

Interviewees also recognized that conservation practices are not well accommodated by the crop insurance program. Organics, on the other hand, are well established in terms of insurability in the crop insurance program, and producers are able to ensure higher prices associated with organic production. However, it was noted that there could be improvements in the pricing of organics in the crop insurance program that could be enabled by new platforms for gathering organic market price data at scale. New private platforms are emerging to fill this role.
Special Programs and Subsidies

Historically, interventions within the banking and financing markets by government institutions usually revolve around methods of taxation, regulation, or subsidization. Nonprofit institutions likewise often focus on these modes of impact, whether it be advocating or lobbying for taxation or regulation or for direct provision of subsidies for targeted activities that align with their public objectives.

Typical policy levers include the subsidization of interest rates for certain types of loans, the provision of subsidized loan guarantees to lenders in target markets, and targeted investments in specific-purpose production resources. In this section, we identify and outline examples of specific applications at the nexus of ag-banking and conservation.

Subsidization of Interest Rates on Loans Related to Conservation or Organic Production

We explored the idea of subsidizing interest expenses on operating loans or term loans to fund the use of conservation practices that otherwise would not be competitive for funding in the market. Interviewees from the banking sector were understandably skeptical about the likely utility of subsidizing operating loans in isolation, though some noted that the practice might be useful as part of a broader strategy.

While interest rate subsidies may be able to scale if broadly adopted, the cost per unit to impact behavior at scale could be limited unless well designed. Tracking and verification would also be difficult and expensive if done manually. Moreover, not every farmer/operator uses borrowed capital to facilitate capital investments or for operating cash flow requirements, and thus the coverage could be incomplete, with demand potentially driven by other financial outcomes, particularly in light of the fact that most land is rented. Additionally, the most sensitive areas or parcels of land on which the greatest impacts from conservation practice investments would be realized may actually be viewed as less bankable and riskier due to their specific conditions that lead to the highest valued potential improvements. In other words, the riskiest land may benefit most from investments in condition-improving practices, but they may be even less interesting from a lender’s point of view, if additional investment is required to upgrade the conditions that lead to repayment capacity in the future. However, the flip side is that these properties also have the largest opportunity to realize improvements in profitability and environmental impact. This Catch-22 feature is especially important and highly apparent to lenders in that they will have an incentive to focus on the least complex, least risky, and most homogenous loan products, particularly when there is difficulty capturing the potential increase in asset value that could accumulate under conservation-based improvements.

The lenders we interviewed were also skeptical about whether the subsidization of operating or term loans would indeed be the most efficient mechanism to use if the goal is to drive the adoption of conservation practices or a transition to organic production systems. One lender stated that this would be, in their opinion, an expensive way to subsidize conservation practices and suggested that a direct dollar per acre subsidy (not including the bank) would be far more efficient. An adjacent set of comments was also made suggesting that the subsidy level could be computed so it is equivalent to a reduction in the interest rate.

We interpret all of this to mean that there needs to be a bona fide reason that a loan would need to be procured in the first place, and such a loan should be targeted to the appropriate player (i.e., not necessarily the operator) for a viable investment that is going to, with high probability, both (a) lead to increases in yield, productivity, and/or profitability, and/or lower risk, and (b) lead to improved environmental outcomes. The investment in conservation practices should also dovetail with and fully leverage any existing government conservation programs.
In general, lenders are more indifferent with respect to the source of repayment (i.e., which practices are utilized, per se), than they are on its certainty and transferability. To lenders, crop insurance is key and substitutes for an equity cushion in underwriting. There were strong beliefs expressed that better insurance at the farm level (e.g., more accommodative of conservation practices) simplifies the entire problem.

Many interviewees expressed that the details of an interest rate subsidy program could be difficult to optimally design. For example, how much should producers be subsidized? How much should they be allowed to borrow, and for what? How will it be efficiently tracked? Interviewees generally noted that such a program could become very difficult to administer in the absence of clear and well-established market metrics for monitoring and pricing (i.e., assessment of bank financial risk). Interviewees also pointed out that operating loans (which are most likely to lend themselves to an interest rate subsidy program) directly compete with vendor financing, which is heavily used and often provides other hidden rewards from the vendor.

Farmers noted that the implementation of certain investments (e.g., edge of field or in-field buffering) do not typically increase profitability, even though they are useful for mitigating downstream externalities. These should be perhaps coupled with associated investments that do have bottom-line impacts, such as tiling and drainage. Further, the adoption of mitigation technologies does not typically directly increase the value of the asset. Therefore, subsidizing interest rates for the financing of these types of practices has only specialized appeal unless coupled with a bottom-line impact investment. Some related technologies (e.g., tile, field leveling, or squaring) can improve manageability and returns, but do not always count toward conservation compliance standards even when improved outcomes occur. The only “capture” exists in improved yield outcomes, improved nutrient management, and greater “farmability.” It was not clear to most interviewees how subsidization of interest rates on operating loans might relate to those practices. However, to others it was very clear that opportunities exist around facilitating landowners in making these types of investments via debt markets.

Although interviewees did not entirely rule out interest rate subsidies as being a potentially valuable intervention as part of a portfolio of interventions, several critical gaps remain to properly pilot, design, and develop such an intervention, and the outcomes are not likely to be easy to predict in the absence of specific pilots.

Interestingly, one interviewee pointed out that they do not explicitly go to great lengths to monitor conservation or explicitly lend into (or not) conservation activities, and they mainly see farmers adopting conservation practices when they are participating in an NRCS or other government program and taking advantage of those programs from a revenue (not risk) point of view. Indeed, the risk-reduction impacts of an entire market adopting conservation practices should be evident at the aggregate market level, but the benefits are more difficult to observe or substantiate among other “noise” in individual cases, particularly in the short run.
On the other hand, there are some arguably “conservation-oriented” practices that have become common on a broad scale, such as no-till and conservation tillage. One of the interviewees pointed out that that farmers do not necessarily view these practices from a conservation viewpoint, but rather from the viewpoint that there is a demonstrated long-run cost/benefit advantage.

Some interviewees also noted that perhaps while the financial incentive of an interest rate subsidy program may not provide a large impact or change in behavior, there may be real value in such a program by virtue of developing lines of communication between farmers and lenders on conservation-specific lending activities via such a pilot. As banks are not typically accustomed to collecting or analyzing this information when determining risk rates or interest rates or in their internal credit rating systems, such a program could prove to have value if viewed within the context of a theory of change that allows lenders to become more accustomed to considering these factors when assessing risk. In that context, providing a subsidy to a single lender or small group of lenders may be effective for incentivizing them to participate. One interviewee also suggested creating a working group of farmers and lenders to help design and participate in a pilot program.

It may also be useful to consider a coordinated arrangement with third-party lenders to provide supplemental or “top-off” loans on operating credit for conservation practice adoption. While riskier, quasi-insurance models with loan forgiveness mechanisms conditioned on certain events or problems experienced by a farmer that were unexpected but not insured causes of loss by crop insurance could also be developed. Another model would be to consider lending to a third party that pools cover crop seed purchases for a discount and then sells the seed at a discounted rate to farmers; operating loan models that help cover some of the timing challenges (e.g., when cover crop costs come late in the season before harvest and possibly other costs for booking fertilizer or seed), where a later payback could allow farmer to market grain in response, could also be attractive.

Some interviewees did express that there may be specific loan programs that could be beneficial. For example, many NRCS programs require the producer to make an upfront investment and be reimbursed later. Bridge loan programs could hold promise in this space, particularly risk-contingent loans that could be forgiven in the event they are not reimbursed by the NRCS. However, the underwriting and monitoring of such loans to prevent moral hazard could be difficult and costly. Anecdotally, some interviewees said that they have heard banks are not interested in providing this type of bridge funding and are often confused or uninformed on new practices.

As it regards transitioning to organic production, similar views were expressed regarding arranging for multi-year bridge loans during the three-year “valley of death,” either through direct loans and/or loan guarantees. However, other interviewees felt that this risk was better addressed through equity rather than debt markets in the case of organics, but that there is already some lending happening in this context.

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**Interest Rate Subsidy Pilot**

Based on our interviews, the following suggestions were made for any pilot that is developed.

First, the amounts should not be trivial, and careful thought should be put to who should be taking the loan. Second, it is important to collect data and perform analytics during the pilot to build the case for a market premium or other value. Third, considering a program in conjunction with a land manager would likely be advisable. And finally, longer-term (e.g., three- to five-year) loans coordinated with rental agreements for conservation adoption on leased land could also help improve the relevance of such a program, if the goal is to recognize long-term benefits.
Others argued that it is primarily an education issue and that banks do not yet fully understand the three-year cycle involved in the transition to organics. It was additionally noted that there could be potential in green bonds or other conservation-oriented equity funds, but that it is easy for investors to get bogged down in the details, particularly when it is not clear which metrics are most important.

There was also concern expressed about the fact that, in the conservation space, many nebulous terms are used (e.g., green, regenerative, conservation, sustainable) and that these mean different things in different sectors, and even in particular production systems there is no easy definition to point to regarding what should establish the bar for a potential certification. Several interviewees pointed out that it perhaps makes sense to start with broad practices in high-volume markets (e.g., cover crops in corn/soybean systems) and focus on developing sufficiently accurate proxies (i.e., “good enough” as opposed to perfect) based on measurable activities, and then collect and quantify those impacts for broad consumption by financial institutions—as opposed to focusing as a first pass on very detailed and complicated definitions or standards in multiple markets/production systems. Instead of structuring a very detailed program that requires onerous manual measurement of activities or a set of activities for a wide number of practices for a wide universe of specialized crops out of the gate—which might result in hyper-accurate metrics but unrealistic economics in measurement—focus instead on one or two practices for one or two major crops where the focus is on automation and efficiency in measurement/monitoring and gradual improvements. Under the latter, while the proxies may not be as accurate, the feasibility and scalability improve dramatically.

From a purely objective, nonbehavioral, financial-economic perspective, the most effective program might likely be direct cash subsidization (cost share or annual payments), but this is expensive, and the USDA occupies that space. One thing that conservation policy does not account for is the financial or profit margin issue. That is, some years a farmer might not need as much assistance (if prices or revenues are particularly good or marketing strategies are effective, etc.), but in other years that assistance is much more necessary, such as in low price environments in the early years of a down cycle. Risk-linked loans that provide partial forgiveness in low price years or an extension of the loan payback period in those years could have promise. These approaches (known as risk-contingent loans) have been tested in developing countries in nonconservation-oriented programs with some success, but the structuring of such a program would need to be carefully thought out and planned before application in U.S. markets.

It would also be advisable to consider if such loans should be structured in a way that is explicitly coordinated with existing assistance programs (e.g., EQIP, which covers only a portion of the cost). That said, there was no strong sense among interviewees that interest rate buy-downs as a general and isolated intervention would do much to alter behavior by itself.
Subsidized Loan Guarantee Funds for Conservation Practices or Transitions to Organic Production

Interviewees were also asked about the viability of subsidized loan guarantee funds via commercial banking entities to support operating or term loans tied to investments in specific conservation practices or transitions to organic production. Historically, guarantees are used to create lower capital requirements for lenders, which allows for more profitable investments in what would be viewed as riskier projects. The intent of such programs is to increase the supply of credit in the market. This type of guarantee is distinct from direct guarantees of producer cash flows, as happens within crop insurance programs. The latter is of substantially different value to the primary lender and only of value if assignable in a security interest to the lender.

Interviewees were skeptical about this intervention in the same way they were about the subsidization of interest rates, but they also had deeper concerns. Interviewees did note that guarantee funds could have a role to play in a broadly diversified intervention strategy.

More than one participant noted an existing FSA loan guarantee program for conservation projects in the amount of $150 million for both FY 2017 and FY 2018. In either year, however, not a single dollar of FSA’s Conservation Loan fund was utilized. Most interviewees were not clear why this was the case. One market participant suggested it was due to the fact that FSA programs can be viewed as difficult to administer, requiring onerous paperwork, and that they come with restrictions on behavior that could create risk and operating challenges for farmers. In follow-up interviews, it was confirmed that indeed there has been little interest in these programs. It was suggested that the typical farmer who would qualify for an FSA guarantee would typically be unable to meet the lender’s normal underwriting criteria and thus investment in conservation would likely not be at the top of their list in terms of why they would be seeking an FSA guarantee. However, it is likely that some farmers use borrowed funds backed up by FSA guarantees for some conservation and organic transition activities under the regular FSA program, but these are not tracked by the USDA.

Although FSAs Conservation Loan program is not widely used, the FSA makes loans for organic and conservation practices under its Direct and Guaranteed Farm Ownership and Operating Loan Programs. These programs offer more favorable rates and terms than the Conservation Loan program; all rates and terms are established by Congress in the Consolidated Farm and Rural Development Act and Farm Bills. Within the Farm Ownership and Operating Loans, the FSA does not individually identify and track loans that include organic and conservation components, but the agency obligates more than $5 billion nationwide through these loans.

Overall, our impression from several hours of conversations with various experts was that there is little interest or perceived practicality in promoting conservation via government or nongovernmental loan guarantee programs due to the anticipated regulatory and other complexities that would likely result. Also, when given an option between a direct loan program and a conservation guarantee fund, many interviewees expressed strong beliefs that direct loan or risk management interventions to farmers were a more viable entry point (increasing demand for credit), and that there would not be enough traction for guarantee or lender side incentives (which increase the supply of credit).

Similar issues were raised over whether there are more efficient channels to funnel subsidies if the goal is to change farmer behavior with respect to conservation practices. For example, bankers generally were of the viewpoint that guaranteeing at the farm level (with cash flows directly, i.e., crop insurance) is much more attractive to both farmers and lenders than guaranteeing at the loan level (i.e., a traditional guarantee fund), since the latter requires a default in order to trigger risk compensation to the bank—which leads to greater all-around economic costs from...
liquidating the farm. Thus, while the bank may be more incentivized to lend into a risky market if there are subsidized loan guarantees (i.e., increasing the supply of credit), from an economic perspective a more efficient mechanism is to simply provide insurance and risk management to the farm directly in order to avoid the costs of bankruptcy and increase the demand for credit for the activity. The latter arguably leads to lower system costs and more efficient outcomes when put head to head, provided the activities can be monitored and do not lead to moral hazard from the provisioning of insurance. For example, one banker brought up the 2012 drought in the Midwest. The banker reported that many of their borrowers would have gone bankrupt in the absence of insurance, but since the market was adequately insured, defaults were low. In this case, there would have been little benefit in weeding out uncompetitive producers since the drought affected everyone (and thus would not have provided a good “Darwinian” signal to trigger “efficient” bankruptcies). If loan guarantees had been in place instead of insurance, the 2012 drought could have been a catastrophic economic disaster, leading to profound dislocation of resources in agriculture, which would likely have reverberated in the market for years to come (and led to lower investments in conservation over time). Instead, most farmers continued in a fairly efficient manner.

Also, bankers typically evaluate historical metrics for farmers that are purely financial in nature within a market or underwriting class (i.e., debt to asset, cash flow), and then establish underwriting guidelines around the sub-market. In order for banks to be willing to condition their forward-looking assessments (e.g., credit risk, rate loadings, appraisals) on conservation practice use—and anticipated improvements in soil health from conservation—convenient and easily measurable data and metrics on a wide scale are needed.

Loan guarantee programs may also face many of the same monitoring, underwriting, tracking, standards, and verification issues as interest rate subsidies, especially in the absence of consortiums or institutions for promoting the standardization of underwriting system capacity using agricultural technology. Guarantees and even the funding of new technologies are often tied to the technology suppliers, with commonly cited historical examples including automation in dairy, the adoption of no-till planter systems, and nitrogen location technologies.
Farmland Investment Markets and Innovative Investment Structures

We asked interviewees about the potential for farmland investment markets and innovative investment structures to create incentives for sustainably oriented production systems or transitions to organic production. The current lack of widely operational equity markets in the farmland sector could materialize as a significant advantage in the rapid adoption of conservation or organic, if such a structure could be created. A “Sustainable Farming Fund” could have very broad appeal and could generate more retail farm equity potential. Several interviewees came back to the point that it would be important to have a set of measurable, well-understood metrics and standards around which to structure any such program. Also, this type of program would almost undoubtedly need to be seeded by an institutional investor at scale who could assemble a collection of farm-level investments and sell shares of the assets. A Sustainable Farm ETF would be the idea, and the conduit back to financing investments at the farm level in best management practices would thus be a financial markets solution to convert initial debt to tradeable shares with more equity-like features. This idea seems widely supported, but also widely noted to require a scale that may be unable to be developed by a single lender in any single location.

Many interviewees expressed that it is important to standardize the definition of “sustainable” and to control, to some extent, the verification of the standards. Many experts talk about the lack of true solid definitions for terms such as “sustainable” and “conservation” when it comes to standardization, making it difficult to recognize sustainable and conservation practice efforts by farmers and the investment community. Traditional banking channels have less ability to track or capture the benefit to the investment banker and thus have not served this market. Conservation or “green” certification standards could be highly valuable if controlled by investment channels.

Increasingly, institutional landowners are directly reflecting substantially elevated sustainability, conservation, and responsibility requirements in their leases. Historically, they were less motivated if these practices did not increase return on equity. Institutional landowners also now show increased sensitivity to “headline risk.” Investors have environmental, social, and corporate governance requirements and increasing demand to be ahead of the agricultural community at large in moving toward best management practices, active nutrient management, and monitoring practices. One particularly forward-looking group is represented in Agriculture Capital (Equilibrium funded), which invests in and promotes conversion to organic and sustainable regenerative production systems as their key theme. They have shown an ability to create and maintain value in both the sustainability channel and the organic channel. The natural movement from venture, to private equity, to institutional and retail investment products may or may not happen through time following this example, but Agriculture Capital offers at least one case in which that theme has successfully converted substantial investments.

Over time, investments in technology (to support underwriting and monitoring capacity by the entire capital stack from venture capital to investors to banks) regarding conservation efforts could lead to lower system risk, lower production risk, and higher productivity, though how much and in what specific cases is uncertain and largely undefined under current conditions.

Emerging Financial Markets in Agriculture

While there is not yet a broadly tradeable equity market in agriculture, two farmland REITs have emerged, representing an important innovation toward equity extension in agriculture and the ability for both debt and equity suppliers to benefit from asset value increases. In one particularly interesting case, Farmland Partners Inc. created and sold a shared-appreciation preferred stock security in which part of the interest rate paid is based on the appreciation of the underlying assets.
Rental Arrangements and Land Leasing Markets

An important idea emerged from the interviews regarding particularly promising opportunities for financing conservation improvements made by tenants. Valuations in rental markets primarily utilize lagging indicators of historical performance in reflecting benefits of past conservation practice use, but they do not typically utilize information on conservation practice use directly. Investments in conservation practices could be used to create offsets or credits to rental payments. Use of the tenant “rental” payment in the form of a conservation investment could directly improve incentives for renters to invest in asset-value-improving activities and could improve eligibility for other programs. Also, importantly, it creates a tax management opportunity to convert what would have been recognized as current income into a capital gain with options to delay or accelerate recognition. This feature could be emphasized again in cases that likely favor institutional investors with the ability to create differential securities with returns patterns matched to the preferences of their investors. As the “financialization” of agriculture accelerates, this is a theme that deserves additional attention.

Technologies already exist for the verification of improvements such as cation exchange capacity, conductivity, and organic matter, but these are not typically employed in traditional cash rental control markets because of cost and potentially misaligned incentives. Investments in asset-value-improving technologies or practices could be conceived as a “loan payment system” wherein the lender (or landlord) is partially repaid via the increased value of the asset.

Shared appreciation loans can be difficult to structure, but some analogs do exist. Lack of norms in the industry and standards to point to make these programs difficult in the current environment. Most interviewees identified the lack of operational and verifiable standards as a key issue that needs to be addressed. However, some interviewees mentioned that some such rental provisions are starting to emerge, but there is not yet a standard.

Conservation Compliance and Federal Loan Programs

The Food Security Act of 1985, as amended, requires producers participating in most programs administered by the Farm Service Agency and the Natural Resources Conservation Service to abide by certain conditions on any land owned or farmed that is highly erodible or that is considered a wetland. Producers who are not in compliance with the highly erodible land conservation and wetland conservation provisions are not eligible to receive benefits for most programs administered by the FSA and NRCS. If a producer received program benefits and is later found to be noncompliant, the producer may be required to refund all benefits received and/or may be assessed a penalty. Highly erodible land is any land that can erode at excessive rates because of its soil properties and/or is designated by field and based on the proportion of the total field acreage that contains highly erodible soils. A wetland is an area that has a predominance of hydric soils (wet soils) or is inundated or saturated by surface or groundwater (hydrology) at a frequency and duration enough to support a prevalence of hydrophytic (water tolerant) vegetation typically adapted for life in saturated soil conditions and under normal circumstances supports a prevalence of such vegetation, except that this term does not include lands in Alaska identified as having a high potential for agricultural development and a predominance of permafrost soils. To be in compliance with the highly erodible land conservation and wetland conservation provisions, producers must agree that they will not produce an agricultural commodity on highly erodible land without a conservation system; plant an agricultural commodity on a converted wetland;}
In our observation, based on several interviewer comments, there seems to be a large opportunity in the institutional track (both in organics and in conservation/sustainability) that seems natural for such investments, yet these institutions have the least need for subsidized loan products or guarantees. A Sustainable Ag Fund or Organic Fund could have great promise in facilitating both transitions to organic and/or wide-scale conservation adoption in certain ways that the banking sector through debt instruments would likely not be able to replicate. Coupled with informational standards and key pieces in the analytic ecosystems, such interventions could hold great promise.

Regulatory and Legislative Frameworks

Reviewing current policies illustrates a key point raised in the interviews—that conservation subsidy programs all make some form of direct cash assistance to the farmer or landowner for conservation. For example, the Environmental Quality Incentives Program provides cost-share assistance on specific practices adopted by farmers. Similarly, the Conservation Stewardship Program operates through five-year contracts that make annual payments for conservation across the acres under the operational control of a given farmer. These programs spend billions in federal funds each fiscal year on conservation practice adoption. In comparison, the USDA undertakes very little lending activity for conservation. There are conservation compliance requirements for certain farm programs (e.g., crop insurance, FSA loans), but views are mixed on these compliance requirements in the market—from those who view them as onerous and overly rigid, to those who view them as too low of a bar.

Several conduits for both direct and guaranteed USDA loans already exist and are well understood and utilized by both the primary and secondary markets. The success and viability of these programs vary wildly, however, with certain programs perennially oversubscribed and others with frankly dismal histories. These programs include ownership, operation, guaranteed, subsidized, and even rural electric and cooperative subsidy programs. The potential to modify or create new programs or requirements within existing government loan conduits has some attractive potential, but these modifications would have to be targeted and likely would require very long government administrative or legislative processes.

We explored a range of potentially relevant government programs and the success and lessons learned from such programs. The Farm Service Agency is one of the primary lending arms at the USDA, and it makes billions in low-interest farm operating loans, as well as farm ownership loans; eligibility requires hardship, such as the inability to get private credit. The FSA also provides loan guarantees, backstopping private loans to beginning, traditionally underserved, and other more risky borrowers.
Emerging Agriculture Technologies

Investments in agricultural technologies accelerated sharply in 2011 and have generally remained strong since, with each year since 2015 seeing private equity and venture capital investment totals over $1 billion. Ag tech investments have largely been focused on precision agriculture and predictive analytics, farm management software, irrigation and water management, and data acquisition through robotics, drones, and next-generation sensors. Additional investment categories have included biotechnology, market traceability, and next-generation farming concepts. The ag tech development focus has been largely driven toward production economics, with sustainability and conservation outcomes delivering secondary benefits through improved efficiencies. More recently, ag tech activities that target market and subsidy premiums through improved environmental performance have been emerging. These activities are critical for operationalizing banking and finance engagement in conservation and sustainability.

Real-time performance data and improved data analytics will define the relationship between management investments and market valued outcomes in agricultural production systems. Additionally, low-cost, high-throughput methods to determine soil health will provide a basis for market signals in ag land equity markets. These emerging ag tech outcomes will provide the necessary basis to connect consumers with the food production characteristics needed to enhance market value. The banking and finance sector can in turn quantify the transactional impacts needed to implement conservation-focused programs within their portfolios.

bidders. Existing loan programs (such as FSA Direct Conservation Loans) are very small in volume and have not been provided with funding by Congress since 2011. The Guarantee Conservation Loan Program also has not had uptake. As noted previously, despite $150 million available in both FY 2017 and FY 2018 via the FSA Guarantee Conservation Loan program, not a single dollar was underwritten. There simply does not appear to be any demand for the program in its current form. In general, the guarantees on the Conservation Guarantee program are at a lower level than existing FSA guarantee programs. Many conservation activities are likely already guaranteed under the existing program, but that is not tracked, as noted earlier. Typically, those borrowers in good standing would not seek guarantees of this type. FSA guarantees are assessed the same percentage fee, and the percentage of the FSA fees do not vary; however, any interest rate charged on a guaranteed loan is determined by the lender. Thus, those growers able to invest in conservation practices would not be likely candidates for such a program.

Finally, the FSA operates price-supporting loans for select commodities. While these lending programs exist and are well understood and utilized, they notably do not involve conservation practice adoption in any meaningful way. The potential to modify requirements within existing government loan programs is minimal and would likely require Congressional action.

The Importance of Data, Analytics, and Technology for Creating Standards

Interviewees indicated that there is strong potential for using data and technology to track conservation adoption and impacts over time. There was general recognition that data and technology will lead to better outcomes in the long term as both farmers and bankers become better educated and accustomed to understanding the bottom-line benefits. However, there was also recognition that wide access to these analytics and systems is lacking, and simply facilitating the adoption of better metrics by lenders and other suppliers of financial capital is critical.
As noted previously, only farm financial health metrics are typically used in underwriting decisions regarding agriculture. These metrics look at the different kinds of cash flows, debt, and other financial indicators—but none of them consider environmental health, management, or risk very effectively.

The development of metrics for the standardization of conservation practices will require the identification of the major environmental indicators that are to be most impacted in the field, and most felt by the producer. The consensus among interviewees was that soil quality, water use/quality, and biodiversity are the primary indicators that can demonstrate the use of conservation agriculture practices and have the most potential in market valuation.

The key is then to determine how these benefits convert into quantitative, market-based values that are easily accepted and understood by banks, lenders, appraisers, insurance companies, and ultimately producers. Practices such as cover cropping and crop rotations work to mitigate environmental degradation by increasing organic matter in the soil (thus increasing the quality of the soil overall) and diversifying the field by way of planting different varieties of crops (straying from monoculture). The mitigation of environmental degradation will naturally lead to a decrease in the inputs needed to maintain the profitability of the crops, as fewer herbicides and pesticides will be required for healthier crops. An increase in soil quality leads to better productivity of the land due to increased water infiltration and nutrient uptake; these improvements, in turn, will produce higher yields and thus increase profit for the producer down the line, presumably.

However, it is important to note that these benefits are not immediately felt by farmers and require expenditures, which many interviewees agreed was a major deterrent to farmers adopting conservation practices. The trick then lies in determining how to put a market value on the notion of acknowledging that engaging in conservation practices will increase the productivity of the land down the line, thus

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**Analytics and Ag Policy**

Farmers in the United States plant more than 170 million acres of corn and soybeans annually, more than any other country in the world. Importantly, precision agriculture techniques have evolved through time to the point that much of the tillage, planting, nutrient placement, pesticide usage, and harvest monitoring is done with a means to associate location, activities, and yield outcomes. The rapid advancements in other georeferenced technologies, along with imagery, soils mapping, and weather data, offer unprecedented advantages compared to historic small-scale experiments and plot trials focused on prospecting technologies. A focus on data-driven conservation and policy design is critical if higher yields and better conservation are to be matched with habitat protection and conservation. However, a set of deep-seeded and strongly held concerns about data privacy and the distribution of the benefits that could occur from expanding the usage of broad-scale producer input and output data has both slowed and at the same time informed the policies that could potentially benefit most from data integration. While researchers and policy makers previously relied on costly and time-consuming surveys for data capture at the farm level, today analysts can access data at scale directly from real production systems, with detailed information on practices, yield, field applications and seeding information, coupled with local soil, weather, and other remotely sensed and visually imaged data layers that has not been possible previously. Despite leaps in hardware and measurement technology, there still exist large analytical gaps in the use of these data streams. Currently, agricultural banks and insurance companies do not typically utilize these data and analytics in their underwriting and rating systems despite there being large potential for gains in efficiency.
increasing profitability and reducing cash flow risk for the farmer. Furthermore, value can be recognized in identifying conservation practices as a public good that aids in food security, environmental well-being, and economic stimulus. Once demonstrated by large-scale data, the economic and risk reduction value of conservation practices can be more properly quantified and captured by the various players, leading to easier lending procedures.

Integration of Internet of Things’ data into underwriting systems could prove difficult. However, very broad-scale adoption of land-related metadata is already occurring. It would be possible to include conservation “data layers” in data modernization efforts at relatively low cost. It is unlikely this could be done through government programs, but there is a significant opportunity in the private sector or through standards-setting consortiums or certification organizations (e.g., similar to Fair Trade USA).

Improvements in soil health that result from certain conservation practices are not immediate, and in the early years of adoption can lead to higher risk of loss or difficulty in management. The banking system could potentially derive lending products to facilitate these longer-run production improvements, but this remains somewhat difficult in practice, and nearly none of these decisions are automated or rely on widely integrated data and analytics. Virtually all interviewees expressed or seconded these viewpoints.

Institutes and/or service providers that could deliver technical market capacity to small and large lenders could significantly improve banks’ ability to track, monitor, price, and ultimately facilitate lending to farmers using conservation practices. Oftentimes, the inability of a bank to observe, price, predict, and process such information for incorporation into their product structures and loan offerings stymies their ability or interest in making such offers. Many banks simply do not have the technical capacity to implement analysis of IoT system data. Indeed, virtually no banks (small or large) operationalize such approaches in their contracts or underwriting systems.

Similar issues exist among institutional investors, and for the same reasons. However, their willingness to adopt farm activity tracking and ledger systems seems to be relatively high compared to banks. Likewise, it is often difficult for landlords to structure rental agreements to incentivize conservation practice adoption due to lack of access to, or inability to employ, data. Simply put, even though these technologies (e.g., yield monitors, precision ag equipment) exist, most financial institutions have not incorporated the resulting data streams into their underwriting and verification systems in any meaningful way.

A sentiment recognized by a fair number of key players is that the farm data and information that is used by banks, lenders, appraisers, and crop insurance companies is likely inaccurate or outdated. Interviewees noted that if there is inadequate data for lenders to look at in a particular case, they will view that proposition as higher risk and will likely not be willing to lend. Currently, there are little to no data on the relationships between conservation practices and their financial and risk outcomes on the farm at scale. Advancements in precision agriculture, remote sensing, artificial intelligence, and data warehousing may prove to be solutions to this gap in knowledge.

Institutes or Consortiums to Develop Standards and Practices

It would be a particularly useful for financial institutions to create a “conservation standards and practices” definition and support system to facilitate financial institutions in their pricing, structuring, and provisioning of more conservation-friendly lending
programs. Organizations in other realms (e.g., Fair Trade, the Farm Financial Standards Task Force) have been very successful in developing technical capacity in target markets by making the business processes and practices verifiable and by providing data standards and standard definitions. A similar opportunity exists in the ag banking, financing and conservation space. Some interviewees noted that the deployment of a specific set of standards could be an effective way to brand and create consumer premiums for agricultural products developed using sustainable or conservation-oriented practices.

However, standards and monitoring development is still an impediment. Interviewees noted some emerging cases and efforts, but no strong standards have yet emerged. They also noted that demand for auctions at the farm gate for conservation-friendly production was virtually nonexistent due to a lack of conservation standards to point to and the lack of such standards currently receiving a premium price.

There seemed to be a consensus that creating a brand (similar to USDA certified organic) for conservation practices could effectively drive consumer perceptions and elicit premiums for such production, but interviewees also indicated that there is a long way to go before that is realized. Additionally, it is clear that consumer preferences that can be communicated backstream, or toward producers, are increasingly important. Developing branding or trait definitions related to conservation, sustainability, carbon footprint, and other thematic production system attributes is of potential value. In any case, it is clear that the connection between consumers of food and the characteristics of the production system used are increasingly valued and rapidly dropping in cost to communicate. Attributes related to conservation characteristics are among the features that, if communicable to end consumers, have increasing value along with other information about the production system or product attributes.

A few interviewees also raised the topic of carbon credits as a conduit to incentivize longer-term investment in soil building. However, it is not entirely clear how that might directly play a role in the banking system or what those specific interventions may be, nor were any interviewees able to extensively articulate the same.

Interviewees expressed the need for a better set of standards or norms in the market that banks could rely on and reference in underwriting decisions relating to new or old conservation practices; such standards or norms would be beneficial and could be accomplished through a set of metrics developed by a trade association or delivered by private companies. Having broadly adopted standards would allow banks to calibrate their rating and other systems to recognize the impacts of conservation practice adoption. Large financial institutions would likely benefit most, and most rapidly, from some degree of standardization in this space. They would be expected to be particularly supportive of the development of “standards and practices” protocols.
Contrasting Standards for Organic and Conservation Practices

Some interviewees indicated that despite the longstanding success and prevalence of USDA organic certification, many bankers still do not fully understand what it means to become organic, what the transition entails, and level of understanding by consumers of the organic standard.

While conservation practices are not well defined, organics have a well-established market. There is a group of constituents who feel that the term “organic” has been lost and coopted, and that organic is not synonymous with being a good conservationist. There is currently great interest and many smaller or emerging efforts underway for market participants to create new organic standards. However, interviewees indicated that the broader market of consumers is often not aware or does not care about these distinctions. Some interviewees pointed out that “regenerative” is an emerging term, though there is a long road ahead to create standards and definitions for that term and have them represented in the marketplace. Other examples—such as “bee-friendly,” “local,” “fresh,” “non-GM,” and other efforts to create owned and license-ready brand features—have emerged without clearly defined standards or the force of any regulatory framework. It seems important to consider the value of either creating additional, unregulated standards and brands to promote preferred production characteristics or working toward regularized and possibly regulated standards to create more value in investments in conservation practices and other activities that connect production attributes to consumers’ preferences.

There is also a critical distinction between organic and conservation practices in the marketing space that is relevant to the banking sector. USDA organic certification is well established, and the premiums received after transition are generally understood by banks and reflected in pro forma cash flow projections, values of assets, and other aspects of underwriting. No such standard or market premium exists for “conservation-friendly” production in the consumer market at this point. Thus, both banks and growers are left in a position that the only benefits to capture from conservation must be those that either reduce farm-level yield risk or reduce costs.

Issues in Lending to Organics

Until producers are certifiably organic, they cannot fully receive the higher premiums that organically produced foods garner in the marketplace. During this

Advances in Crop Insurance and Conservation

In the United States, agriculture is subsidized primarily via federal crop insurance. The U.S. crop insurance market is the largest in the world, with around $100 billion in annual liabilities. It is well known that design gaps exist in insurance that penalize conservation practices. Producers report strongly that they are sensitive to the uncovered risks associated with conservation practice use. Ag-Analytics, Meridian Institute, the National Corn Growers Association, several state grower associations, an approved insurance provider and several leading foundations have partnered to develop a Conservation Insurance Endorsement to provide fair and expanded coverage for producers utilizing conservation practices. The Conservation Insurance Endorsement will help farmers manage risk and provide an incentive to strategically manage production risk through continual adoption. A unique strength of the effort is access to the Ag-Analytics platform to quantify the impacts of conservation practices at scale. Historically, performing the data collection needed to create such an endorsement was prevented due to the lack of large-scale data availability at the farm level. Ag-Analytics overcomes this challenge by using new cloud-based solutions to directly and confidentially collect field information.
period, producers sink many costs into transitioning yet are left with very little profit. However, unlike with conservation practice adoption, the fairly predictable price premium that the producer will realize after an organic transition is at least well known to bankers and often verifiable in advance through off-take agreements that can be used to improve the bankability of the associated loan.

Crop Insurance Linkages to Banking, Conservation, and Data Analytics

Federal crop insurance’s ties to conservation outcomes (beyond current eligibility and verification rules) could also be significantly improved with information technology-related investments. One approach is to use technology to provide direct credit and legal assignment to the lender for policies insuring units with desired conservation or sustainability features or for verification potential (such as setback from waterways). Interviewees said they believed it was likely that whatever metrics are adopted for insurance would likely flow through for use by banks as well.

It is also potentially feasible to provide increased coverage or insurance against low-income outcomes during the conversion to conservation practices or installation of related facilities. A major and valid concern of many producers is that existing records tie to yields rather than to economic optimality. Producer practices would be encouraged by improved lending support if event risk were insurable directly, rather than yield outcome alone (for example, field days for split nitrogen application). It has long been recognized that some agricultural lenders either require or consider whether borrowers have crop insurance in making loan decisions. Nevertheless, with few exceptions, very little focus has been placed on investigating the intersections of federal crop insurance and credit risk, and how that, in turn, affects which types of production systems farmers choose to invest in, and for which types banks are willing to lend. Conservation practices of the types envisioned generally improve soil fertility and sequester carbon, but also have complex impacts that vary by soil type and climatology. Improvements in soil organic content also improve water retention and can increase nitrogen content along with nutrient use efficiency. These practices constitute a strategy to mitigate negative climate impacts while improving soil quality and should be reflected in insurance.

The notion of crop insurance as a mechanism to incentivize or discourage certain farming practices could, and perhaps should, be structured as similar to automotive insurance ratings. Evidence of environmental damage done by not using certain practices could parallel the considerations given in automotive insurance ratings based on evidence of poor driving records. If a producer did not engage in conservation practices known to reduce the risk of environmental degradation, crop insurance companies would then consider them a high-risk profile and rate their premiums accordingly. This would require a known demonstration that environmental degradation is, indeed, a risk to the producer. Risks could be qualified, such as lower yield due to poor soil quality as a result of engaging in nonconservation-oriented practices, or contaminant runoff affecting water supplies.

Banking, Data, and Analytics

While advances in precision agriculture have increased farmers’ ability to manage their operations and make use of site-specific data for management via the interlinking and interfacing of various technologies, these practices themselves generate large amounts of data and require large amounts of input data.

Banks and other agricultural financial institutions find it difficult to operationalize these large amounts of data and to apply analytics at scale within their underwriting and monitoring systems. At the very least, it is not clear to traditional players how they would feasibly leverage data from emerging technologies to accrue benefits, especially against well-performing loans that often wane in their provision of updated financial and performance data. Banks likewise find it very difficult to incorporate precision agriculture technologies into their product
offerings to accommodate funding for producers using these practices. Automated data collection and warehousing methods in secure contexts, along with new analytics, hold great promise to increase efficiency (e.g., automated collection from precision ag data and cloud platforms, and machine learning techniques) within these bank and nonbank financing systems.

The potential for agricultural data analytics to drive down transaction costs that constrain learning by financial institutions creates opportunities to catalyze many different types of innovation and pursue a broad range of opportunities. This sentiment was seconded by nearly all interviewees. For example, constructing databases and developing decision support tools can aid the development of multifunctional farm enterprises (i.e., farm businesses that produce a broad range of social, economic, and ecological benefits) and empower not only farmers but also lenders and investors, by allowing them to develop conservation competencies. Program operation and administration (e.g., lending, and even crop insurance) also stand to gain greater efficiencies by relying on automated methods of collection and quality assurance of information.

For instance, it is estimated the government spends hundreds of millions of dollars per year sending claims adjusters out to fields to assess damage and conducting crop production surveys. Virtually all of these activities could be automated at a fraction of that cost while also collecting additional data relevant in tracking environmental impact attributes, soil health indicators, and other measures of changed conditions and factors impacting asset values.
Importantly, private investments in ag tech are targeting similar data collection and automation of management systems and represent a highly complementary business case. Extension of these types of efforts to include activities related to conservation seems natural at the point in time where major innovations and reinvestments in data systems are already occurring. For example, startups such as Ag-Analytics (ag-analytics.org) are developing a variety of new technologies to automate crop insurance underwriting and loss adjustment, and to replace government survey collection by developing out a platform that connects farmers, universities, extension support, researchers, and other agribusiness and financial institutions within a cloud-based platform that provides highly automated acquisition and interpretation of data from a diversity of private and public sources. These types of systems also have the potential to serve a broader financial underwriting space. The following graphic shows the range of connections between conservation agriculture and banking.

**Intersection of Stakeholders Roles and Considerations**

### Stakeholder Concerns

**Producers**
- Cash flow & profitability, volatility of cash flow
- Productivity of the land and effects on yields
- Capture of benefits from conservation practices

**Banks/Financiers**
- How do conservation practices add or take from the risk of lending
- Set of defining metrics on conservation practices to point to
- The likelihood that the producer will be profitable and able to return

**Consumers**
- Value of conservation practices to consumers
- Identifiable way to discern if food was produced via conservation practices
- Extravagant price changes, in relation to value of food produced under conservation practices

**Insurers**
- What is the baseline for farmers engaging conservation practices
- How do conservation practices reduce the risk/loss to the farmer
- Appraisal/adjusters
  - Demonstration of the increased land value due to conservation practices
  - Demonstration of increased productivity of the land

### Intersecting Considerations

1. **The behavior of producers will only change with the proper incentive**
   - Must identify proper incentive – financial, environmental, or both? Requires identifying what is of value to producers.

2. **Lack of financing specifically for conservation practices**
   - Stems from lack of standardization and metrics that can be referenced. Required Metrics on the right is what those could look like.

3. **Lack of understanding by stakeholders of value of conservation practices**
   - First need to understand the benefits of conservation practices; measuring and monitoring can then be used to prove benefits.

4. **Market Values**
   - Once benefits and environmental value of conservation practices are established, can then translate those into market values regarding cash flow, consumer value, and profitability in terms of yield and land value.

4. **Risk Assessment**
   - Evaluation of how conservation practices add to or take away from producers risk.
   - Must consider conservation practices within needs of the public good (non-extendable and non-moral in consumption) + food security, land preservation, environmental conservation

### Required Metrics

**Environmental Issues**
- Toxicity
- Biodiversity loss
- Soil degradation
- WaterShortages
- Pollution

**Impactful Practices**
- Cover Crops
- Low/No Tillage
- Crop Rotation
- Buffer Strips
- Split/Post Nitro Application

**Measurement and Monitoring**
- Satellite imagery, plantings tracking, soil and leaf baseline testing

**Benefits**
- Soil quality testing, water sample testing, data analysis, modeling, benchmarking review

**Metric Initiatives**
- Who will set and monitor such metrics?

**Private**
- Government and policy-makers
- Regulatory initiatives, Advisory Boards
- Examples of this are the EPA Energy Star program, USDA Organic certification, or the UK’s Common Agriculture Policy

**Public**
- Large supply chain actors, corporations, retailers
- For private entities, interests would include protection of brand, building consumer trust, and product differentiation
- Examples of this are Kashi’s Certified Transitional initiative, or Chipotle’s Food With Integrity commitment
Concluding Remarks

There remain significant technical, research, and operational gaps that could preclude or affect the success of certain banking interventions related to the adoption of conservation practices and the conversion to organic. Historically, technology platforms to facilitate the assessment and monitoring of conservation outcomes have not been readily available within the market toolset that most institutions have access to for originating and servicing financial investments in the agricultural production sector. As a result, the adoption of many conservation practices, which might otherwise be beneficial to both borrowers and lenders in the long run, remains low, and their benefits remain uncertain from the perspective of farmers and the financial sector.

Critical technological gaps exist in the underwriting, monitoring, and contracting structures that most of the financing market employs. For example, despite the fact that the equipment used to farm most of the land in the United States has long had sensors, which record at sub-meter resolution most of the critical activities occurring on the field (e.g., conservation practice use, seeding activities, fertilizer and pesticide applications, tillage activities, and harvested production), it is rare if these data are utilized in any aspect of a bank's underwriting, monitoring, or appraisal systems, though a few cases are beginning to emerge outside the United States in which electronic monitoring of production efficiency is considered in lending.

Organic practices and conservation practices also have stark differences in terms of environmental externalities, with a general recognition that organic practices do not necessarily have the same level of positive environmental externalities that might be associated with certain conservation practices. Unlike, organic—which commands a price premium in the consumer market to provide producer incentive, even though it may have no demonstrable environmental benefit—many conservation practices (e.g., saturated buffers) are known or believed to not benefit the producer directly in terms of profit or valuation, but do benefit the conservation of natural resources. Other conservation practices (e.g., cover crops) are believed to have the potential to benefit producers' bottom lines (e.g., through lower costs spent on inputs such as nitrogen fertilizer) and long-run valuations (from improved soil health, which leads to lower risk or increased productivity), but have uncertain or risky benefits and costs that likely do not accrue to the operator.

Lending considerations regarding the transition to organic production include the fact that despite the longstanding success and prevalence of USDA organic certification, there are still significant education gaps for some (but not all) bankers to fully understand what it means to become organic, what transition means, and how buyers must be educated. In addition, various stakeholders have begun creating standards for “regenerative” agriculture. There is some concern that this could create confusion among consumers and that demand for products produced through regenerative agriculture may be low.

Interviewees expressed concern about the efficiency of interest rate subsidies and the difficulty of underwriting and monitoring subsidized loans efficiently, if pursued in isolation. Some interviewees pointed out that well designed and properly managed small pilots would be advisable before scaling to a large program. There was also concern about direct subsidy programs, in that if they were provided purely for financial or economic reasons, producers' behavior could revert to previous practices at the conclusion of the program. That said, there could be value in such pilots from a behavioral and learning perspective by virtue of driving interactions with borrowers and lenders around conservation, which may lead to discoveries and permanent changes in the lending sector's ability and willingness to consider conservation practice adoption in the long run—even if the direct financial-economic case for
such an intervention is more limited initially. Careful thought should be applied to assessing the natural role that a grower/operator, land manager, bank, and/or landowner may play.

There seems to be some consensus in the market that to create incentives for the adoption of conservation practices, the development of better and more standardized metrics and systems to capture, calculate, and transmit those metrics in a manner that is automated, scalable, and efficient would in and of itself serve as a positive driver of conservation practices generally, and would enable banks to embed positive on-farm soil and profitability metrics into their lending practices.

Conservation banking pilots should be coupled with other programs (such as technical, educational, and analytical assistance) to have a reasonable level of success and the potential for long-run changes in how the market assesses and values the adoption of conservation practices. While the effectiveness of direct financial-economic incentive impacts of interest rate subsidies alone is likely to be constrained, important behavioral and operational market changes could result from investments in such pilot programs via improved familiarity and experience from joint experimentation by banks and farmers, and development of the technical apparatus to enable these relationships.

Such pilots may be more likely to lead to long-run behavioral change if the focus is on landowners, but also young and beginning farmers, or in conjunction with other established and targeted recipient programs to take advantage of the additional reporting infrastructures and established conduits. Focusing on a smaller number of producer segments on big issues that can be efficiently measured would likely be more effective initially than implementing highly detailed, expensive, manual, specialized program interventions for a large number of small specialty crops.

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**Endnotes**

1 Credit ratings are often based on cash flow and security margins. FSA Conservation Loan applicants do not have to meet the standard test for credit or for the operation of a family farm requirements that are in place for a FSA Farm Ownership or Operating loan. Since these requirements are not applicable, some farmers may be in a financial position to fund their portion of the conservation costs, after cost-share programs, without loan assistance.
About AGree

AGree drives positive change in the food and agriculture system by connecting and challenging leaders from diverse communities to catalyze action and elevate food and agriculture as a national priority. AGree recognizes the interconnected nature of food and agriculture systems globally and seeks to break down barriers and work across issue areas. Through collaboration and frank discussion, AGree continues to encourage a broad coalition of interests to build trust, find common ground, and develop shared strategies for achieving transformative change.

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