The State of Sustainable Ag

Actionable analysis and insights for engaging U.S. row crop farmers to scale the adoption of conservation practices.

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About this Report

Measuring Today's Progress – Growing Tomorrow's Approach

Despite massive investments and collaboration from both the public and private sectors, gaps remain in the pursuit of sustainable production goals across U.S. agriculture.

To empower the organizations working to drive farm-level change more effectively and efficiently, Field To Market: The Alliance for Sustainable Agriculture and Trust In Food collaborated to develop this annual report, based on survey responses from over 500 row-crop farmers.

This report is intended to provide a snapshot of the state of sustainable agricultural production over the past year and deliver actionable insights for driving improved progress in years to come. The insights in this report are derived from analyses of self-reported farmer trends examined through the lens of the human dimensions that affect farm-level management.

Photo Credit: Lance Cheung, USDA

Report Partners

Trust In Food is a purpose-driven division of Farm Journal dedicated to mainstreaming and accelerating the transition to more sustainable and regenerative ag practices, making every dollar invested in conservation agriculture more impactful. We bring business intelligence to agricultural production behavior change: helping farmers understand, want and feel capable of undertaking practice change through data science, social research and strategic communications deployed through the omnichannel Farm Journal platform in collaboration with our partners. Visit trustinfood.com & farmjournal.com to learn more.

Field to Market: The Alliance for Sustainable Agriculture brings together a diverse group of grower organizations; agribusinesses; food, beverage, restaurant and retail companies; conservation groups; universities and public sector partners to focus on defining, measuring and advancing the sustainability of food, feed, fiber and fuel production. Field to Market is comprised of nearly 150 members representing all facets of the U.S. agricultural supply chain, with members employing more than 5 million people and representing combined revenues totaling over $1.5 trillion. Visit fieldtomarket.org to learn more.

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Special Thanks

The authors especially wish to thank all the farmers who took time out of their schedules to generously share their unique perceptions and experiences by completing this survey.

Cover photo: USDA NRCS Oregon

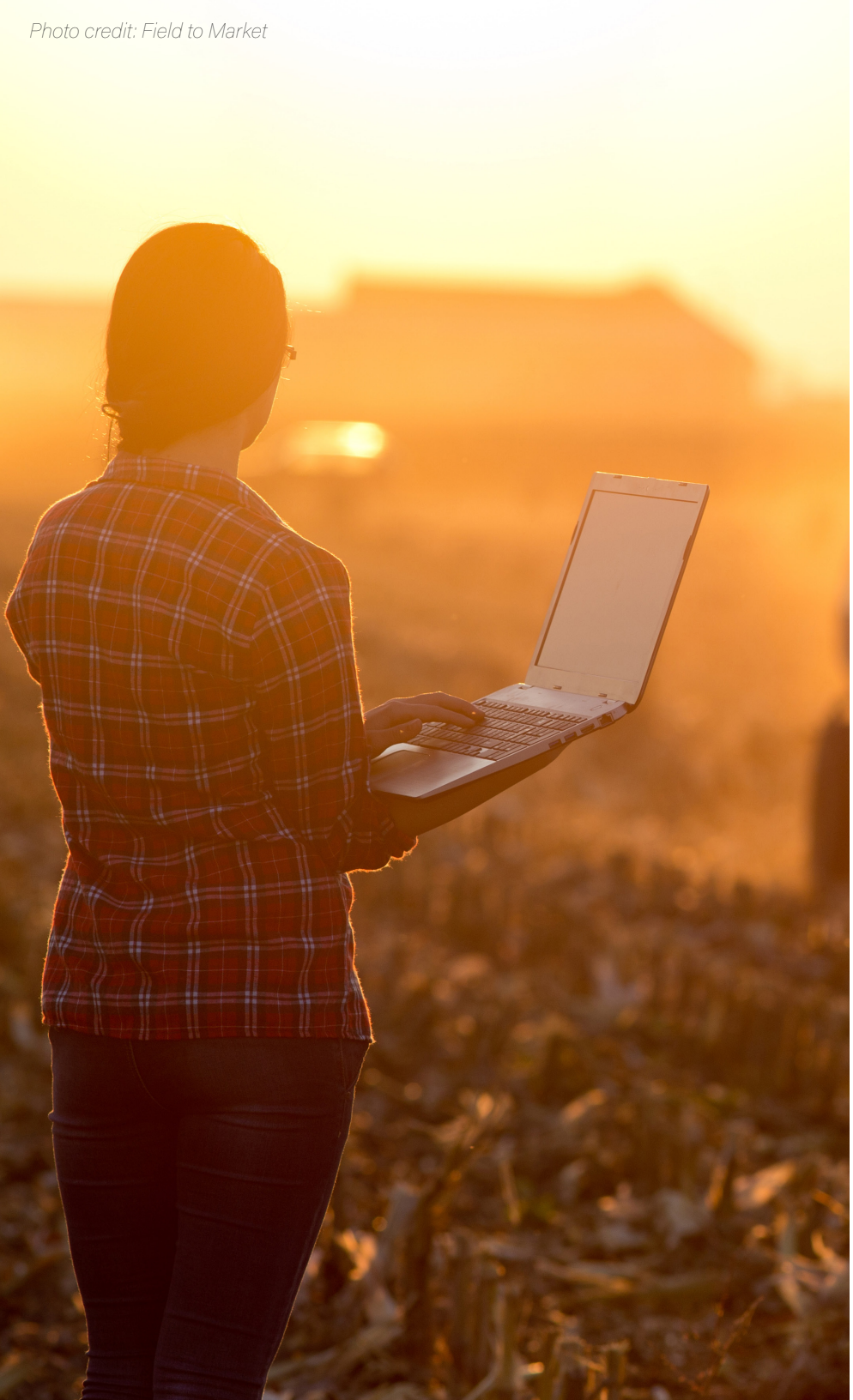

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Table of Contents

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FOREWORD

It is time for a new level of collaboration.

Amy Skoczlas Cole
Executive Vice President,
Trust In Food

Rod Snyder
President,
Field to Market

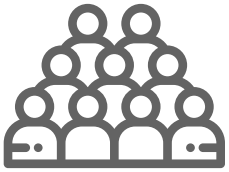
U.S. farmers today are operating during one of the most challenging periods in history. Crop production has been upended by the intensifying climate crisis, with uncharacteristic seasonal variability and extreme weather events leading to record breaking prevent plant acres in 2019 at almost 20 million. At the same time, trade disputes across the global economy have come to a head, disrupting numerous markets that farmers rely upon. Compounding this run of difficult days for agriculture, is the emergence of the COVID-19 pandemic which has depressed economies and significantly stressed U.S. food, fuel and fiber supply chains.

Against this backdrop, consumer interest in health and wellness, paired with widespread expectations of environmental and social responsibility, remains stronger than ever. The last few years have also seen increased attention to the opportunity that agriculture presents as part of a solution set to address rising greenhouse gas emissions.

The agricultural industry, now more than ever, must work together collaboratively to rise to this moment. But, as this report attests, farmers are unable to seize the opportunity of increased attention and consumer interest, when faced with the more pressing challenge of simply sustaining their operations. This is a massive, missed opportunity. Farmers consistently report they consider themselves stewards of the land. A vast majority are already incorporating conservation agriculture practices, and most indicate that they are willing to make additional changes, but the economic uncertainty of the industry, paired with the risk of making change, creates a burden that few farmers will be able to overcome alone. The primary theme of this report is the fact farmers often feel alone in bearing the risk and cost on the journey of conservation adoption.

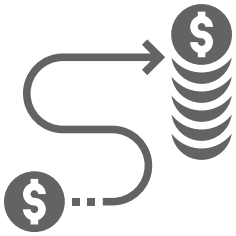
We therefore conclude that to accelerate the transition to more environmentally and socially beneficial agricultural practices, it will require a new level of collaboration and action across the entire food and agriculture value chain. It calls for an approach that places farmers at the forefront of solutions, sharing in both the risk and the reward of pursuing conservation practices to achieve desired environmental outcomes.

KEY FINDINGS



Wide Range of Adoption

Of the 500+ farmers who participated in this survey, nearly all of them are currently implementing to some extent, or have tried, at least one conservation practice.

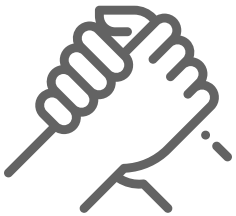


Farmers Perceive Financial Benefit in Conservation

62% believe implementing conservation practices typically improves a farming operation's profitability in the long-term.

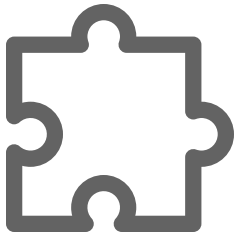
Change may be Secure

83% respond they have no plans to scale back on any of their currently implemented conservation practices.



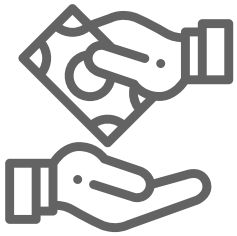
Farmers are Willing to Change if Supported

54% of farmers say they will only change their production practices if provided with a price premium or cost-share program; only **5%** say they will refuse and find another way to market their harvest.



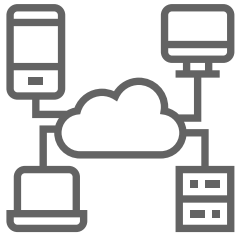
Financial Compensation is Critical Yet Missing Link

74% respond they believe farmers should receive monetary incentives for utilizing certain production practices that benefit the public good; Only **30%** believe they are fairly compensated today for the conservation practices they use.



Farmers Receive Limited Marketplace Benefits

Only **15%** have received better market access or additional revenue as a result of implemented conservation farming practices.



Challenging Growth Forecast for Reporting Platforms

59% claim they have no plans to begin using a sustainability platform to collect farm-level data in the next three years.

Scaling Conservation Practices

Tim Smith of Eagle Grove, Iowa inspects his prairie strips installed to control nutrient runoff and prevent soil erosion into nearby streams. In these prairie strips, he seeded a multitude of native grasses and forbs creating upland game bird habitat. Photo Credit: Field to Market

Wide range of adoption rates, significant gaps

A critical component for programs designed to advance sustainable agriculture by encouraging increased adoption rates of conservation practices is to understand farmers' current level of investment — of both time and money — into such practices. There is a suite of universally applicable conservation practices that proactively build resilience and improve outcomes across diverse cropping systems and landscapes; simultaneously, there is a smaller subset of practices that are deployed responsively based on site-specific natural resource concerns that may not be relevant for all farmers.

To this end, our survey queried farmers regarding the current levels at which they have adopted specific conservation practices, which either proactively *[FIGURE 1.1]* or responsively *[FIGURE 1.2]* address natural resource concerns. Of the 500+ respondents who participated in this survey, nearly all of them are currently implementing to some extent, or have tried, at least one conservation practice.

At-a-Glance: Adoption of proactive conservation practices to resource concerns

- Over 80% incorporate conservation crop rotations into their operation
- Over 70% use integrated pest management strategies
- Over 70% of farmers use no-till and over 60% use other conservation tillage practices
- Over 60% have participated in NRCS conservation planning
- Over 50% have wildlife, including pollinators, habitat protection
- Over 50% plant cover crops (single or multispecies)
- Around 40% have subsurface drainage water management structures to some extent
- Over 30% are using 4R Nutrient Stewardship practices to some degree
- Over 15% are using field strip cropping to any degree

At-a-Glance: Adoption of responsive conservation practices to site-specific resource concerns

- Over 70% have grassed waterways
- Over 50% use field borders
- Almost half, 49%, are using filter strips to some degree
- Over 40% have vegetative barriers/windbreaks installed
- Over 30% have water and sediment control basins installed
- Over 25% are using riparian herbaceous cover/stream habitat management practices

The results of our survey indicate a significant number of farmers have strong implementation levels for several of the conservation practices that proactively build environmental resilience. But there remains room for improvement across most practices, in both activating farmers to adopt the practice at any level and to motivating them to apply the practice to all their eligible acres.

While all conservation practices address critical natural resource concerns, a suite of mainstay conservation practices provide proactive benefits that are critical to a farm's long-term sustainability. These often serve as the core focus of traditional conservation planning and continuous improvement programs. Other conservation practices are typically intended to responsively address site-specific natural resource concerns and as such could be more selectively adopted.

It is important to consider that indeed every farming operation is unique and not every conservation practice is applicable universally. Lower awareness and adoption rates, especially for some of the responsive practices, could be dependent upon any number of factors, including where the farmer is located, the site-specific natural resource concerns facing their farm, and their farm's specific agronomic system. An example of this is 4R Nutrient Management, which is significantly more likely to be unheard of or deemed inapplicable to their operation by farmers from the Southeast and Southwest regions, compared to the Midwest and Mid-Atlantic where there are mandatory nutrient loss reduction strategies in place.

If you build [conservation practices] into your land's 'investment portfolio' – it can pay.

Open-ended question response to:
"Why do you implement the conservation practices you do?"

Figure 1.1

For each of the following conservation farming practices, please select the choice that best describes how it relates to your operation for the 2019 season.

Current adoption rates across all respondents (n = 537)							
	Currently use on all of my acres it is applicable to	***Currently use on some of my acres it is applicable to***	***Not currently using but will likely try it in the future***	***Tried before but have discontinued using it***	***Not likely to try***	***Never heard of it***	***Not applicable to my farm***
Conservation crop rotation	55%	28%	5%	1%	3%	3%	4%
Integrated pest management activities	45%	26%	9%	1%	7%	7%	6%
100% no-till	33%	34%	7%	8%	11%	0%	8%
Conservation tillage	46%	32%	5%	3%	5%	1%	7%
Conservation planning with NRCS	35%	29%	10%	4%	9%	5%	7%
Wildlife & pollinators habitat protection	13%	40%	13%	1%	14%	4%	15%
Cover crops	17%	34%	17%	7%	12%	2%	11%
Drainage water management structures on subsurface systems	14%	26%	9%	0%	13%	4%	34%
4R Nutrient Stewardship use	21%	13%	10%	1%	6%	42%	7%
Field strip cropping	6%	10%	8%	2%	25%	6%	42%

Figure 1.2

For each of the following conservation farming practices, please select the choice that best describes how it relates to your operation for the 2019 season.

Current adoption rates across all respondents (n = 537)							
	Currently use on all of my acres it is applicable to	***Currently use on some of my acres it is applicable to***	***Not currently using but will likely try it in the future***	***Tried before but have discontinued using it***	***Not likely to try***	***Never heard of it***	***Not applicable to my farm***
Grassed waterways	38%	38%	3%	1%	3%	1%	15%
Field borders	18%	36%	7%	1%	12%	5%	21%
Filter strips	16%	33%	10%	1%	8%	4%	27%
Vegetative barrier / windbreaks	9%	33%	6%	1%	15%	3%	34%
Water and sediment control basins	11%	23%	10%	0%	12%	5%	38%
Riparian herbaceous cover / stream habitat management	9%	18%	7%	1%	10%	13%	42%

Cultivating Progress: Key Insights

There Is No Silver Bullet
Continuous improvement strategies must be tailored to drive farmer understanding while being responsive to local context, including natural resource concerns.

While significant numbers of farmers report partial or complete adoption on many practices, significant gaps in adoption remain. At the same time, many farmers report some practices do not apply to their operation or that they have never heard of them. This creates a fragmented adoption landscape – with some farmers doing all they can, others doing only some of what they could and others not taking any action (for one reason or another). This dispersed landscape exists on a per-practice, per-farmer level; each farmer and each practice have their own unique adoption trends. Silver bullet, one-size-fits-all approaches that broadly and generically promote conservation practices (i.e. those less customized to local contexts and trends), might be ineffective.

- Organizations implementing continuous improvement programs should prioritize learning more about the unique perceptions and local natural resources context of the farmer group(s) they wish to activate, in addition to simply analyzing their adoption levels alone. Continuous improvement programs should seek to first identify the farmer's reasons for their current adoption/non-adoption levels on a per-practice basis. If a practice is believed by the farmer to not be applicable to their operation, but in fact could be important in addressing site-specific natural resource concerns, dig deeper to understand why the farmer holds that perception, what is driving it and how it can potentially be reversed.
- With this heightened level of understanding, organizations across the value chain can tailor continuous improvement strategies to more effectively enable them to meet farmers where they are on their sustainability journey.
    - For example, many of the Incubation Projects enrolled in Field to Market's Continuous Improvement Accelerator are focused on increasing farmers' level of understanding and awareness of how specific stewardship and conservation practices influence a given sustainability outcome. Given that a significant number of farmers surveyed had never heard of 4R Nutrient Stewardship, more Incubation Projects focusing on the benefits of the 4Rs might be worthwhile for meeting both state nutrient loss reduction strategies as well as ambitious Scope 3 greenhouse gas reduction targets set by downstream companies.

Significant, yet conditional, recognition of benefits

After providing their adoption levels for the list of conservation practices, farmers were asked whether the use of each practice provides environmental benefits, financial benefits or both simultaneously.

When it comes to changing practices, a key step in the decision-making process for farmers is believing the new practice will provide some sort of value. When asked what benefits they see with each conservation practice, the majority of farmers ascribe at least one type of benefit to each practice *[FIGURE 2.1; & 2.2]*. No more than 6% of farmers respond that any one practice is neither financially nor environmentally beneficial. Farmers view many of the practices to provide both environmental and financial benefit. Notably, farmers are extremely reluctant to ascribe only financial benefit to any of the practices. The majority of farmers believe the conservation practices listed to provide either environmental benefit alone, or both an environmental and financial benefit.

Most farmers ascribe some sort of beneficial value to each of the practices, but up to 15% of farmers say they are unsure about any single practice's benefit(s). While this might seem like an insignificant amount of farmers, it compounds the potential impact of limited adoption and lack of perceived benefits. With such large gaps to be closed in driving conservation practice transitions, attention should be paid to even the smallest of challenging data points, as their compounding effects can significantly impact outcomes.

Similarly, many farmers might be incompletely recognizing the value of certain practices, creating unnecessary barriers to change. For example, 16% of farmers do not ascribe any financial benefit to 100% no-till; yet according to USDA, no-till can provide thousands of dollars in savings across labor, equipment and fuel costs per year.

Figure 2.1

For each of the following conservation farming practices, please select the option that you believe best describes it.

(farmers who replied they had never heard of a practice or it is not applicable to their operation were not asked to describe the practice's benefit; as such not all percentages will total 100%)

Perceived value of conservation practices across all respondents (n = 537)					
	***Both* economically and environmentally beneficial**	***Economically beneficial***	***Environmentally beneficial***	***Neither economically or environmentally beneficial***	***Unsure about this practice***
Conservation crop rotation	67%	5%	13%	2%	5%
Integrated pest management activities	55%	6%	13%	2%	11%
100% no-till	55%	5%	16%	6%	9%
Conservation tillage	67%	7%	11%	2%	4%
Conservation planning with NRCS	42%	3%	22%	6%	13%
Wildlife & pollinators habitat protection	24%	1%	40%	4%	11%
Cover crops	39%	2%	26%	4%	15%
Drainage water management structures on subsurface systems	31%	3%	16%	2%	9%
4R Nutrient Stewardship use	29%	2%	7%	3%	9%
Field strip cropping	17%	2%	14%	4%	15%

Figure 2.2

For each of the following conservation farming practices, please select the option that you believe best describes it.

(farmers who replied they had never heard of a practice or it is not applicable to their operation were not asked to describe the practice's benefit; as such not all percentages will total 100%)

Perceived value of conservation practices across all respondents (n = 537)					
	***Both* economically and environmentally beneficial**	***Economically beneficial***	***Environmentally beneficial***	***Neither economically or environmentally beneficial***	***Unsure about this practice***
Grassed waterways	48%	2%	29%	1%	1%
Field borders	26%	3%	30%	5%	10%
Filter strips	23%	1%	34%	1%	5%
Vegetative barrier / windbreaks	24%	1%	26%	4%	8%
Water and sediment control basins	24%	1%	24%	2%	5%
Riparian herbaceous cover / stream habitat management	14%	1%	23%	2%	6%

Cultivating Progress: Key Insights

The Value Conservation Practices Provide Must Be Understood
Continuous improvement strategies should be designed to ensure farmers hold a robust understanding of the beneficial value that implementing conservation practices can provide.

Implementing a change in any farming system requires the acceptance and mitigation of both risk and cost for the farmer. If farmers are to be expected to change their production methods and adopt increased levels of conservation practices, especially during such tumultuous times as these, they must clearly recognize and understand the value in adopting the proposed conservation practice(s). While a significant number of farmers believe there to be beneficial value in the conservation practices, many remain uncertain or might not recognize the full potential value the practice(s) in question provide. Compounding all these issues, the potential benefits of conservation practices – both environmental and financial – can take years to be fully realized, may depend on external factors such as weather and trade and are site specific as to their level and scale.

- Organizations promoting conservation practices should work to first ensure they fully understand the locally realized benefits of the practices they are promoting, along with the external factors that could affect these benefits. This includes not only the advancement of the theoretical understanding of potential benefits, but perhaps most importantly, the real-world benefits from practice application in local contexts. Once this is accomplished, continuous improvement programs can be custom-built to grow farmers' understanding of these benefits, ensuring that they recognize the full range of potential positive outcomes as well as any attached constraints.
- When farmers recognize and understand the full suite of benefits that could be afforded to them through implementing a new practice, they are more likely to develop an openness to change. Farmers must accept risk and investment costs when deciding to make farm-level changes; without a clear path to demonstrable benefit, there is a limited case for change absent strategies to support farmers in sharing in the risk and cost.

Change may be secure, given little discontinuation of practices

To realize the full impact (both on-farm and more broadly) of conservation practices, they must be implemented continuously over the long term. But in some cases, discontinuing a practice might be unavoidable for some farmers due to extreme weather, market forces, and other unforeseen external factors.

However, responses to our survey show significantly low attrition rates for each of the practices, with no more than 8% of farmers claiming to have discontinued any practice after trying it *[FIGURE 1.1 & 1.2]*. Additionally, when asked about their plans over the next three years related to conservation practices, over 80% of farmers state that they currently have no plans to scale back on a practice due to either financial or agronomic reasons *[FIGURE 3.1 & 3.2]*. This is further supported by the strong association between implementation rates and perceived economic and environmental benefits; practices with higher implementation rates tend to be the ones farmers also perceive to be simultaneously environmentally and economically beneficial (and vice versa).

Figure 3.1

As you look toward the future, when, if ever, will you consider scaling back on one or more conservation farming practice – due to financial issues?

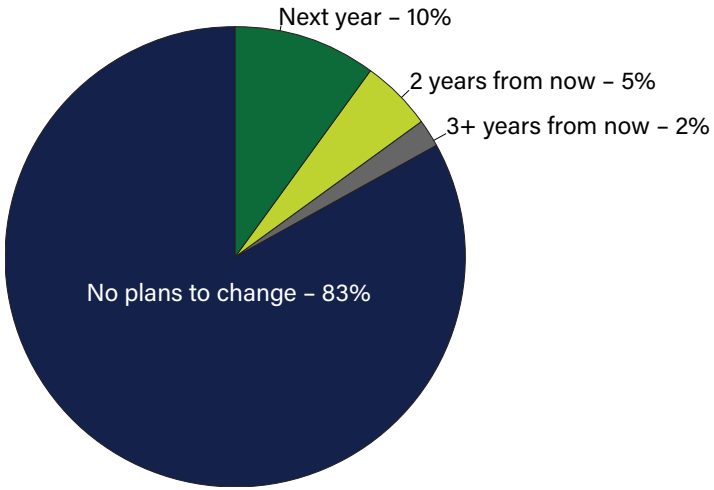
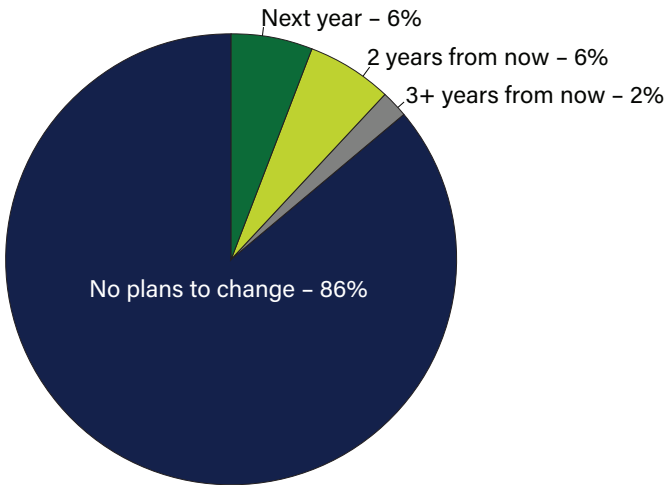


Figure 3.2

As you look toward the future, when, if ever, will you consider scaling back on one or more conservation farming practices – due to agronomic or environmental issues?



Cultivating Progress: Key Insights

Photo Credit: USDA NRCS Arkansas

Use Farmer Success Stories to Inspire Others Toward Change
Highlighting the benefits provided by sustained adoption of conservation practices using success stories and case studies could be an effective tool for change.

While every operation will have its own nuanced externalities to consider, the data point to a critical takeaway: Once farmers have adopted a practice, they are unlikely to entirely discontinue that practice. This is especially important to consider, given some practices can take years to provide a return on initial investment and/or environmental benefit. If farmers are not rejecting conservation practices at significant rates, then they could be prone to continuous adoption (even if only at a partial level).

- Our research shows ag retailers/crop consultants, other farmers and university Extension systems are the most trusted sources of information for farmers. Organizations implementing continuous improvement programs should collaborate with these groups to highlight the stories of farmers who successfully adopt conservation practices and position them as catalytic case studies to energize those who still need to implement management changes. Focusing on the farmer's choice to continue with the practice over many years could prove beneficial in helping to promote the practice to other farmers.

Market Economics and Supply Chain Relationships

Andy Jobman of Gothenburg, Nebraska planning for his operation's future with his partners. Photo Credit: Nebraska Corn Growers Association

Limited business case for conservation practices

Another critical driver in the behavior change process is that the farmer feels capable (financially, technically and otherwise) of making the change. Adopting new conservation practices or scaling those currently employed involves shouldering risk and upfront capital investment for the farmer, risk that may persist and costs that may not be recouped for years. These risks and investment costs associated with change exist even in the most sterile of environments; in a tumultuous economic period with added volatility from the climate crisis, these are compounded.

Further research is needed to better understand the issues around market forces, but the current data does provide some clarity. Farmers (generally) do not feel financially empowered or enabled by the marketplace to implement conservation practices. They believe they should be supported financially by the marketplace in order to make management changes and adopt or scale conservation practices; however, they also believe they are not currently supported in this manner, despite being willing to consider change if supported.

Almost three-quarters (74%) hold to the belief that farmers should receive financial incentives for implementing conservation practices that benefit the public good, yet few have actually seen any financial benefits for doing so *[FIGURE 4]*. Only 15% report they have received better market access or revenue opportunities because of the conservation practices they implement *[FIGURE 5]*. Just 30% believe they are fairly compensated today for the conservation practices they are implementing *[FIGURE 6]*.

More than half of farmers (62%) believe implementing conservation practices typically improves a farming operation's profitability in the long run *[FIGURE 7]*. But it is important to understand that this perception may be in relation to improved operational efficiencies which conservation practices can provide and not a result of market forces. Consider this in parallel with: (1) the significant rates at which farmers ascribe financial benefit to conservation practices *[FIGURE 2.1 & 2.2]* and (2) the 83% who report they do not plan to scale back on practice implementation because of financial reasons *[FIGURE 3.1]*. Through this lens, the data suggest that most financial benefit farmers ascribe to and receive from implementing conservation practices, comes from areas other than expanded business opportunities from the marketplace.

This creates a contrasting situation, not without tension and nuance, that calls for further research to be better understood. On the one hand, more than half of farmers perceive there to be long-term

value provided to their operation's financial health by implementing conservation practices. On the other hand, almost three-quarters of farmers believe they should be financially compensated for implementing conservation practices, while only a small portion have been.

The entire value chain, from farmer to end consumer and every organization along the way must collaborate to reach a consensus understanding on several key issues if meaningful progress is to be made.

- Is it enough that farm operations (potentially) receive long-term financial benefits from implementing conservation practices, in the form of operational efficiencies? Or should financial premiums across the marketplace be linked to conservation practice implementation?
- Where additional profit is being generated at the consumer level for goods produced via farm operations employing conservation practices, should farmers (who enable that increased profit to begin with, by shouldering the risk and cost) not have an equitable share?

Several additional critical research findings should be considered. Describing what level of challenge their access to the funding required to adopt new or scale current conservation practices would be, 36% say it would provide a major challenge while 41% say it would provide a minor challenge; only 22% say it would be no challenge at all. Additionally, when asked how likely direct payment from a private company would motivate them to adopt new or scale current conservation practices, 41% say it would be very or extremely likely to motivate them; only 23% say it would be not very or not at all likely motivate them.

When farmers are asked to respond to a hypothetical situation — a supply chain company requesting the farmer change their production practices in order to do business with them — more than half (54%) say they would only make the changes if provided with financial support for doing so *[FIGURE 8]*. Less than one-third (31%) say they would consider making the changes, without support. Outright aversion to the request and uncertainty ranked the lowest; only 5% say they would refuse and find another market for their harvest and 9% say they do not know how they would respond.

Of those who have received better market access and/or revenue opportunities from a supply chain organization as a result of conservation practices *[FIGURE 5]*, over half (54%) of the farmers are reporting that the customers they work with do not discuss conservation practices or expectations around sustainable agriculture with them directly. This highlights a need for more commodity merchandisers and ingredient processors to directly engage their farmer customers, alongside downstream companies and ultimately consumers, to build relationships and information flows around the benefits of implementing locally relevant conservation practices.

Figure 4

Do you believe farmers should receive monetary incentives for utilizing certain production practices that benefit the public good (e.g. price premiums, ecosystem service credits, pay for performance, etc.)?

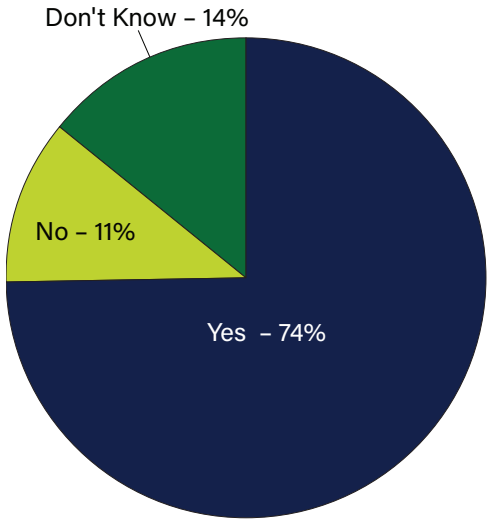


Figure 5

Have you experienced better market access and/or better revenue opportunities because of any conservation farming practices you've implemented?

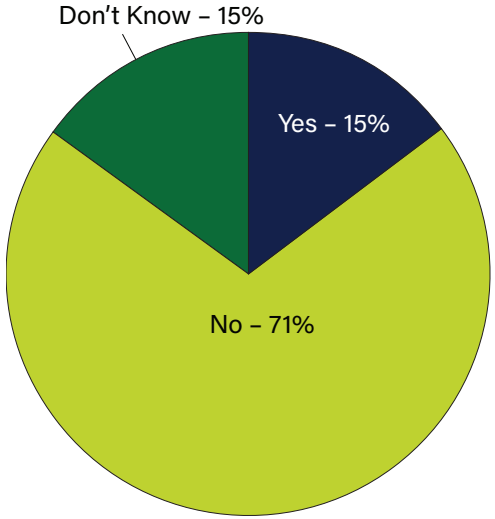


Figure 6

Do you believe you are fairly compensated financially for the conservation and sustainability practices you utilize on your farm?

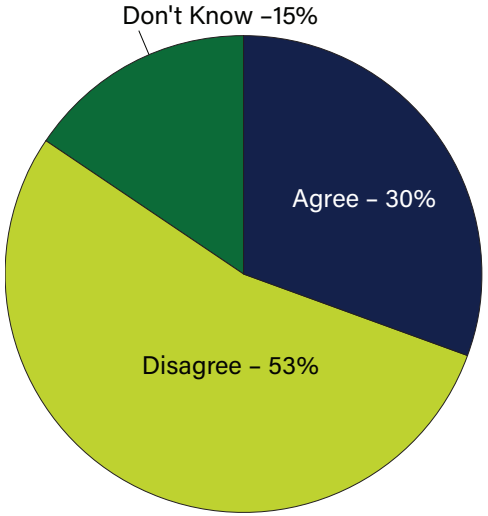


Figure 7

Do you agree that implementing conservation practices typically improves a farming operation's profitability in the long-term?

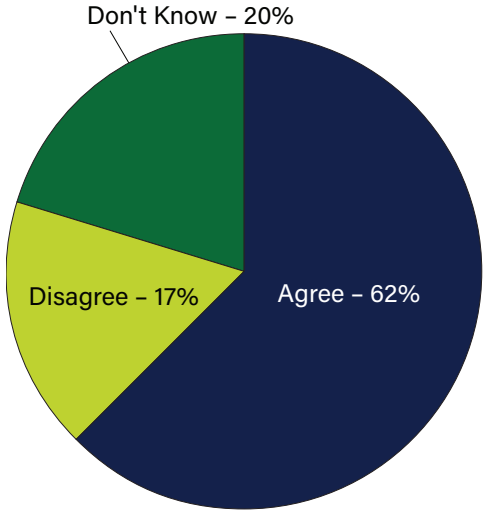
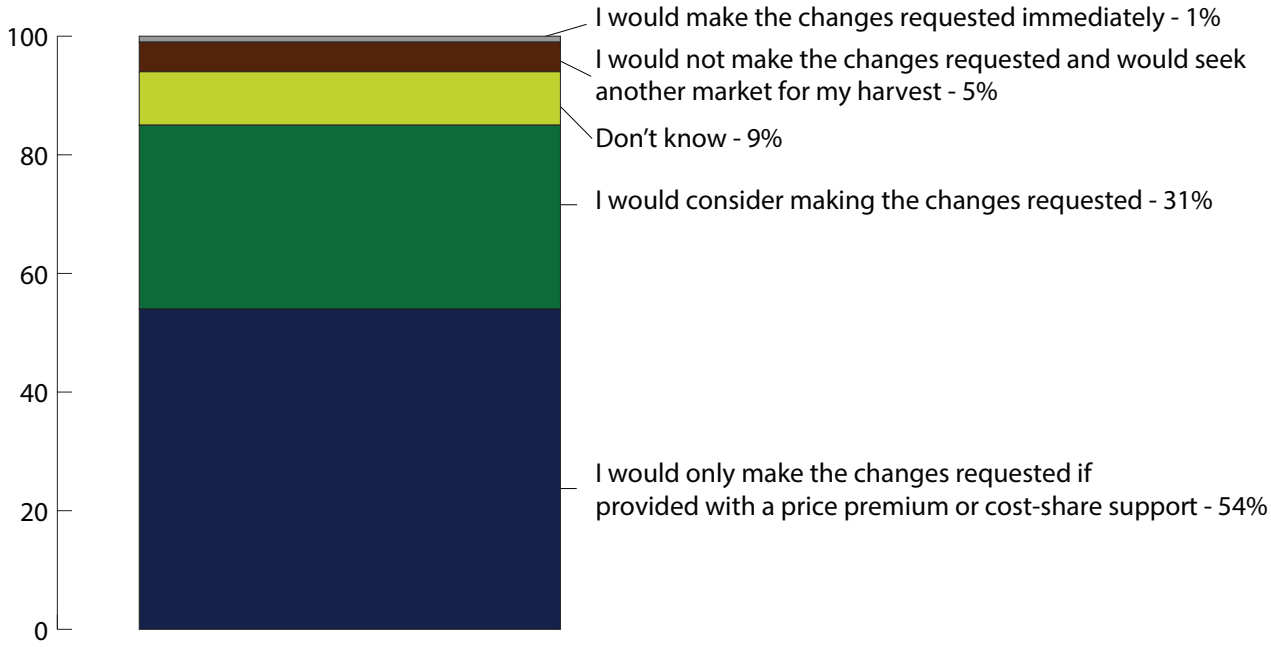


Figure 8

If a food, fuel, or fiber company asked you to change your farming practices in order to do business with them, how would you respond?



We would improve our sustainability if we could afford the equipment and infrastructure to do it. No real profits for 6 years is holding back all progress and most of the innovation I would like to try.

Open-ended question response to:
"Why do you implement the conservation practices you do?"

Cultivating Progress: Key Insights

Lack of Economic Opportunity Provided by Marketplace Limits Change
Farmers must feel financially empowered by the marketplace if they are to accept the risk and cost associated with adopting or scaling conservation practices.

In order to undertake change, and absorb the costs and risks associated with it, farmers must feel financially empowered. Organizations across the value chain should collaborate with the farmers in their supply sheds to identify areas of need related to the market benefits of conservation practices, such as; where are farmers feeling disenfranchised, where do they see opportunity, what risks are associated with the conservation practices downstream organizations are promoting, and how can market benefits (such as financial incentives) help mitigate those, etc. Continuous improvement programs can then be designed to remove the financial barriers that could play a significant role in preventing conservation practice adoption.

- Our research shows farmers believe there to be financial benefit in conservation activities, just not necessarily provided by the marketplace. If this were to change, and farmers feel empowered by the entire supply chain to undertake the risk and cost associated with adopting or scaling conservation, it is likely a significant upward trend in adoption rates will occur. These financial empowerment activities need to be undertaken as part of a holistic approach to evolving strategies specifically designed to catalyze continuous improvement. As it currently stands, there is a limited business case for farmers to change practices, given low market support; if we want to see adoption rates increase, then the market must provide value to the farmer.

Technology Trends in the Near-Term

Soil moisture sensor and variable rate irrigation technology on cotton fields in Batesville, Texas. Photo Credit: Lance Cheung, USDA

Technology adoption, growth trajectory below what is needed

Our report shows high adoption rates for several precision ag practices that can contribute to conservation outcomes; nearly all farmers report using soil sampling technology in the past year (89%) and almost two-thirds (61%) report using yield monitoring and mapping. However, significant gaps in adoption remain; less than half reported using variable-rate technology for field inputs (49%), drift reduction technology (44%), and less than one-quarter (24%) report using tissue sampling *[FIGURE 9]*. Just 5% claim to calculate their operation's carbon footprint, while 7% claim they calculate their operation's soil carbon sequestration levels.

Regarding farm management software and sustainability reporting platforms, nearly two-thirds (65%) report they did not use the technology in the last year. This is supported by previous research undertaken by Trust In Food and The Sustainability Consortium, which found that 62% of farmers in that sample did not use farm management software in the past year while 84% did not use a sustainability reporting platform.

Looking to the future, more than half (59%) say they have no plans to begin using a sustainability reporting platform in the next three years, if ever *[FIGURE 10]*. When asked whether they have plans to utilize more sophisticated equipment and technology in the next 3 years, nearly half (42%) say they do not *[FIGURE 11]*.

These trends present a significant barrier in achieving sustainable agriculture goals across the supply chain. If farmers are not utilizing advanced and connected precision ag methods while collecting and sharing farm-level data, downstream supply chain organizations will struggle to verify production methods. In turn, this makes financially incentivizing conservation practices in the marketplace more difficult for supply chain organizations.

When these data are considered holistically and in conjunction with the limited levels of financial empowerment farmers believe the marketplace provides, a cyclical challenge becomes clear. This must be solved if rapid and/or large scale progress is to be made in driving on-farm conservation. Low technology and reporting platform adoption by farmers means limited supply chain visibility into production. In turn this potentially prevents supply chain organizations from creating the financial opportunity farmers need in order to feel empowered to change, which in turn limits the viability of and business case for change in farmers' eyes — and the cycle persists.

Figure 9

Percent of farmers who utilized precision technologies last year	
Soil sampling	**89%**
Yield monitoring and mapping	**61%**
Autosteer	**56%**
Variable rate technology (field inputs)	**49%**
Drift reduction technology	**44%**
Drone and/or satellite imagery	**31%**
Tissue sampling	**24%**
Soil moisture sensors	**10%**
Variable rate technology (irrigation)	**10%**
None	**5%**
Other	**1%**

Figure 10

As you look toward the future, when, if ever, will you consider using a sustainability platform or program to collect farm-level performance data?

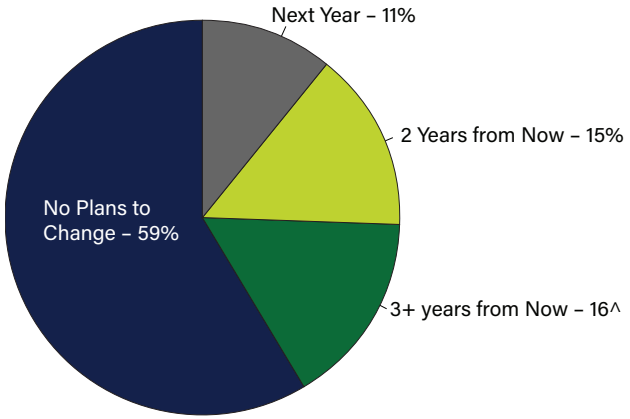
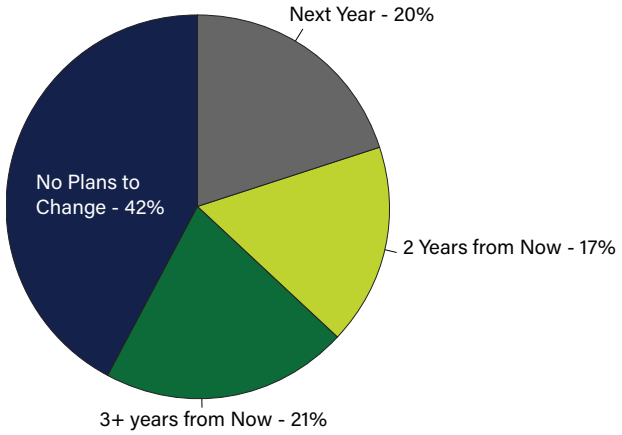


Figure 11

As you look toward the future, when, if ever, will you consider utilizing more sophisticated equipment and technology?



Cultivating Progress: Key Insights

Technology Adoption Limits Change, Drives Repeating Cycle of Barriers
Farmers must be empowered, motivated and activated to adopt advanced technology and software solutions.

While many farmers plan to adopt advanced technologies that support precision agriculture and will begin exploring their sustainability performance over the next three years, there remains a significant number of farmers who plan to maintain the status quo [FIGURE 9]. It is important that organizations promoting technology and sustainability platforms ensure their approach to activation helps the farmer understand the implications of adoption — on farm and across the supply chain.

- By creating financial opportunity tied to conservation practices and linking that to the use of sophisticated technology/sustainability platforms, supply chain organizations can enhance farmer activation. An example of this is the Precision Conservation Management Innovation Project, which helps farmers advance conservation efforts on their operation by presenting data-driven sustainability insights and opportunities for improved profitability and productivity in a personalized, one-on-one setting. This project's approach goes beyond evaluating sustainability performance, to pair the understanding of improving environmental outcomes with a connection back to fundamental financial indicators of productivity and profitability of the farm's operation. Project partners recognize that more tangible economic incentives can be the key to unlocking behavior change which scales environmental benefits.

Concluding Insights

Cover crops emerging through corn stubble. Photo Credit: Lance Cheung, USDA

Plenty of opportunity for evolution

This report presents findings based on farmer-informed data on current implementation rates, perspectives on the benefits related to the practices implemented, and how they view their share of the financial benefits of increasing the number of acres managed using conservation practices.

The key takeaway from this report is that farmers are open and willing to undertake any number of conservation practices, sometimes without financial support if immediate cost savings can be realized. Row crop farmers tell us they are willing to do the work, but they do not feel that they can, or should, individually shoulder the burden of the agronomic and financial risk associated with adopting new practices.

Achieving the next level of scale in the adoption of conservation practices will therefore require the value chain to implement new and innovative approaches that appropriately recognize and share the cost and inherent risk associated with change.

Recent research from Field to Market and the University of Illinois shows weakening farm financial health indicators will bear significant influence on the types of conservation practices farmers will undertake in the future. Any management decisions that have immediate positive profit implications are likely to have priority. On the other hand, practices that reduce immediate profitability are less likely to be adopted, particularly if those practices are perceived to negatively affect yields or bear the burden of up-front capital investment.

Now more than ever, the value chain should consider creative financing mechanisms that support farmers in transitioning to conservation practices that will deliver more sustainable outcomes. A ripe opportunity exists for evolving the approach to catalyzing continuous improvement, underscoring the need for bottom-up transformation of food systems that empowers farmers to accelerate change. Chief among these new approaches should be innovative financial mechanisms that bridge the resource gap and help farmers de-risk adoption of conservation practices while simultaneously adapting to a warming and increasingly unpredictable world.

The key insights here present opportunities for organizations across the value chain who engage with farmers and rely upon scaling on-the-ground change to prioritize putting farmers at the forefront of building more climate-resilient agriculture and food systems than exist today. By bringing more farmers into the solutions development process and ensuring their needs are understood, the value chain can collectively begin to scale conservation adoption in a meaningful way.

Appendix

Low-energy precision application (LEPA) center pivots irrigate Glen Schur's cotton fields in Plainview, Texas. Because the nozzle remains close to the soil, LEPA systems lose less water to evaporation than traditional spray-irrigation systems, which allow more than 90 percent of the water pumped to be used by the crop. Photo Credit: Texas Alliance for Water Conservation

Research Sample Design & Demographics

This report is based on survey responses from 537 farmers, representing operations that produce barley, corn, cotton, potatoes, rice, soy, sugar beets, and wheat across all USDA production regions. Data was weighted on total acres farmed to align with the 2017 USDA Census of Agriculture. All farmers in this sample came from Farm Journal's network of farmers across the U.S. Survey completion was incentivized with a chance to win an electronic gift card. Only digital survey methods were employed to collect data, as such the sample skews toward those more technologically inclined.

Please note: farmers were allowed to skip questions and certain question groups had response parameters that limited who answered the question, as such the total sample size for each question can vary. Unless otherwise stated, all questions referenced the 2019 growing and marketing seasons.

Respondents produce a variety of row crops:

- 5% grow Barley
- 92% grow Corn
- 4% grow Cotton
- 1% grow Potatoes
- 1% grow Rice
- 75% grow Soy
- 1% grow Sugar Beets
- 24% grow Wheat

Farm operation acreage ranges across the sample are diverse:

- 36% farm between 180-499 acres
- 24% farm between 500-999 acres
- 20% farm between 1,000-1,999 acres
- 20% farm more than 2,000+ acres

Respondents are significantly diversified; 51% produce both row crops and livestock.

The State of Sustainable Ag

Actionable analysis and insights for engaging U.S. row crop farmers to scale the adoption of conservation practices.

Photo Credit: Jason Johnson, Iowa NRCS

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