NRCS CONSERVATION INNOVATION GRANT

Final Performance Report

Grantee Name: Soil and Water Conservation Society
Project Title: Advancing Precision Nutrient and Soil Health Management with Retailer Cooperatives
Agreement Number: NR203A750013G019
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Project Start Date: 6-11-2020
Project End Date: 3-31-2024

1. Project Summary:

Through the project, the Soil and Water Conservation Society (SWCS) and Truterra (formerly Land O'Lakes SUSTAIN) aimed to accelerate the adoption of precision zone nutrient management and cover crop practices in Iowa, Kansas, and Nebraska. Our organizations collaborated to support agricultural retailers in engaging 36 producers in on-farm trials, demonstrating the agronomic, environmental, and economic benefits of these conservation practices. Over three growing seasons, the project encompassed 4,289 acres dedicated to zone nutrient management and 2,006 acres for cover crop management, totaling 6,295 acres, split between check and trial acres.

Over three years of trials, fields with cover crops showed significant environmental improvements, including reduced sheet and rill erosion, decreased wind erosion, enhanced soil quality, and lower net greenhouse gas emissions by over 300 lbs per acre annually. Cover crops also proved effective for weed management. Corn yields increased slightly, and while soybean yields were variable, the overall profitability was higher due to increased corn yields offsetting the costs of cover crop seeds, application, and termination. Growers anticipate long-term benefits in soil health and profitability with continued cover crop management, but survey results also indicated that cover crop management may have been more challenging than they originally anticipated. Retailer surveys showed a slight decrease in the likelihood of recommending cover crops after participating in the trial.

In contrast, the nutrient zone management (ZNM) trials resulted in higher corn and soybean yields and increased profitability, despite the additional costs of nutrient management services and higher nitrogen application rates. Over 93% of producers indicated they would continue using and expanding ZNM practices, with a growing understanding that ZNM can enhance crop yields, profitability, and input efficiency. Retailers were more inclined to recommend and offer ZNM services after participating in the trial.

This data can help NRCS promote cover crop CTA and cost-share programs, facilitating access to carbon markets and additional climate-smart agriculture funding. Collaborations with local co-ops have already increased enrollment in NRCS programs, highlighting the potential for expanding client bases and achieving conservation goals.

2. Project Goal and Objectives:

Key goals of this project include addressing producer questions directly on their land, providing realistic outcomes considering their schedules and pressures; conducting trials on large test areas to offer substantial and reliable data; reducing the risk associated with investing in conservation services by demonstrating their economic, environmental, and social benefits; engaging producers in on-farm trials to provide firsthand experience with conservation practices; increasing producer knowledge and understanding of conservation techniques; integrating conservation management programs into the services offered by agricultural retailers; and accelerating the adoption of conservation practices by familiarizing both retailers and farmers with NRCS support and cost-share services.

Deliverables

1. Completion of On-Farm Trials: 48 producers will complete 54 on-farm trials over three growing seasons. Retailers will submit producer names and trial details to SWCS, who will then submit the information to NRCS for EQIP eligibility review.

Milestones

1.1	By May 30, 2020 SWCS and Truterra will meet with agricultural retailers to review the project and provide directions on next steps, including producer recruitment.
1.2	By June 30, 2020 retailers will supply producer names for the cover crop trials to SWCS. SWCS will submit farmer information to NRCS to review EQIP eligibility.
1.3	By September 30, 2020 retailers will supply producer names for zone nutrient management trials to SWCS. SWCS will submit farmer information to NRCS to review EQIP eligibility.
1.4	By September 30, 2020 SWCS will share producer and trial information with NRCS.
1.5	Throughout the project SWCS and Truterra will have quarterly communications with retailers to assure project deliverables.

2. Information Sharing: Agronomic, environmental, and economic data generated from the trials will be shared with NRCS. Retailers will gather and submit data to SWCS for reporting and verbally report progress during regular team calls.

Milestones

2.1	By May 30, 2020 a comprehensive list of measurements needed will be shared with the participating retailers.
2.2	By June 30, 2020 SWCS will generate a reporting template and share it with the agricultural retailers.
2.3	By June 30, 2020 SWCS will generate a survey for farmer participants and retailers to complete. A survey will be generated and completed each year of the project. The survey will assess barriers to conservation adoption.
2.4	By May 30, 2021 retailers will enter trial results into the Truterra Insights Engine. Summaries and aggregated information will be shared with SWCS.
2.5	By June 30, 2021 retailers will share first year trial results with SWCS and Truterra. SWCS, in turn, will share aggregated results with NRCS.

3. Project Background:

The future of agricultural conservation lies in precision techniques, particularly at the subfield level. Precision agriculture tools help farmers optimize production and maximize efficiency, while precision conservation tools aid in reducing waste in production systems. This waste includes lost topsoil and organic matter, excess fertilizers and irrigation water, and misplaced chemicals. Despite technological advancements, progress in reducing soil loss from US cropland has stalled, and nutrient management practices have not scaled sufficiently, contributing to water quality issues and harmful algal blooms. With adverse weather increasingly impacting crop yields, the expertise of agricultural advisors, scientific organizations, key government agencies like NRCS, and innovative producers is crucial for moving forward.

Precision agriculture technologies, such as GPS-guided machinery and variable rate technology, emerged in the late 1990s but have low adoption rates among US producers. Financial risks and resource demands are barriers to broader adoption, emphasizing the need for demonstrating economic benefits. Engaging agricultural retailers to promote precision nutrient management can help reach more producers, leveraging their trusted relationships. The NRCS supports precision techniques through various programs that offer economic and environmental benefits, such as reduced fertilizer use and improved water quality. Innovative precision management techniques are necessary to address increasing climate risks and environmental stress, helping producers save costs, improve resilience, and enhance soil health.

4. Project Methods:

We implemented the deliverables of this project through on-farm demonstration trials. The trial design involves four cooperatives conducting a total of 41 trials with 36 producers across Kansas, Nebraska, and Iowa. Each trial included a demonstration and a control field, focusing on cover crop and zone nutrient management strategies.

- American Plains (Kansas): Cover crop trials and Zone nutrient management trials
- Frontier Cooperative (Nebraska): Cover crop trials and Zone nutrient management trials
- Great Bend Cooperative (Kansas): Zone nutrient management trials
- Heartland Cooperative (Iowa): Cover crop trials and Zone nutrient management trials

Retailers established nutrient management zones, conduct soil and tissue testing, and employ precision strategies such as split rate/variable rate application of nitrogen and nutrient stabilizers. Data on yield and return-on-investment will be collected to guide future decisions. In addition to the quantitative data outlined above, SWCS also conducted pre and post project surveys and interviews of participants to understand the behavioral impacts of the project. Surveys and interviews assessed participant perceptions of the economic and environmental impacts of zone management and cover crops, their likelihood to adopt these practices in the future and across more acres, their likelihood to adopt other conservation practices, their motivations and barriers to adoption, and their perceptions of partnering with NRCS or applying for NRCS funding.

5. Project Results:

1. Completion of On-Farm Trials: Over the three growing seasons, 36 producers enrolled 82 fields into on-farm trials for Zone Nutrient Management (ZNM) and Cover Crops (CC). These number can be compared to the goal of 48 producers and 54 on-farm trials. Retailers submitted producer names and trial details to SWCS, and all names of farmers were submitted to NRCS through past semi-annual reports.Milestone 1.1 (Due: May 30, 2020): The SWCS Team and the Truterra Team met with retailers at a project kickoff meeting, held in Kansas City, MO in Spring 2020. Following the kickoff meeting the SWCS Team commenced project management by convening regular project meetings and generating trial planning, data reporting, expense reporting, and other resource documents and providing them to retailers. The Truterra Team organized the project kickoff meeting by booking lodging and meeting spaces. Truterra team members also provided advice and expertise related to conservation practice deployment in a trial setting.

We aimed to implement 54 trials with 48 producers, but due to weather conditions and personnel changes with the retailers, the total number of trials was 17% fewer for Cover Crop trials and 28% fewer for Zone Nutrient Management trials. The attrition did not impact the findings of the project but helped us understand the different factors to consider when designing and developing the project team for cost-share projects with retailers.

Work Products for Entire Project: Milestone 1.1

Work Product ID	Date Submitted	Work Product Description
1.1a	01-10-2021	Kickoff Meeting Presentation
1.1b	01-10-2021	Budget for Zone Nutrient Management Trials
1.1c	01-10-2021	Budget for Cover Crop Management Trials
1.1d	01-10-2021	3-year calendar for Zone Nutrient Management Trials
1.1e	01-10-2021	3-year calendar for Cover Crop Management Trials
1.1f	01-10-2021	Participant Eligibility FAQs
1.1g	01-10-2021	EQIP Eligibility, Data Security, and Coding Instructions

Milestone 1.2 (Due: June 30, 2020): The SWCS Team generated retailer-specific grower eligibility verification sheets with password protection to ensure the security of grower personal data. Retailers commenced grower recruitment following the kick-off meeting and began submitting grower names to SWCS for the Cover Crop Trials on May 1, 2020.

Work Products for Entire Project: Milestone 1.2

Work Product ID	Date Submitted	Work Product Description
1.2a	01-10-2021	Cover Crop Trial Grower Participant Verification Sheet
1.2b	01-10-2021	FSA Eligibility Instructions

Milestone 1.3 (Due: September 30, 2020): The SWCS Team generated retailer-specific grower eligibility verification sheets with password protection to ensure the security of grower personal

data. Retailers commenced grower recruitment following the kick-off meeting and began submitting grower names to SWCS for the Zone Nutrient Management Trials on May 1, 2020.

Work Products for Entire Project: Milestone 1.3

Work Product ID	Date Submitted	Work Product Description
1.3a	01-10-2021	Zone Nutrient Management Trial Grower Participant Verification Sheet

Milestone 1.4 (Due: September 30, 2020): The SWCS Team shared producer and trial information with NRCS staff in Iowa, Kansas, and Nebraska via the EQIP verification process. Information sharing occurred regularly and as needed by the retailers during the reporting period. Producer information included personal and business information. Trial information included trial type, trial plot size in acres, and unique grower ID numbers for each trial. To ensure data security on all such communications, SWCS assigned each grower an anonymous Grower ID number and created password-protected files to convey all shared information.

The SWCS Team applied to and was accepted by the National CIG team to present orally at the 2022 CIG Showcase, to be held in-person, at the Soil & Water Conservation Society's International Annual Conference, in Denver, Colorado, from July 31 to August 3. The oral presentation included remarks from SWCS team member Joe Otto, Truterra team member Spencer Herbert. The project's NRCS Technical Contact, Denise Troxell, was in attendance and provided guidance to SWCS during the presentation planning.

Work Products for Entire Project: Milestone 1.4

Work Product ID	Date Submitted	Work Product Description
1.4a	01-10-2021	See Work Products 1.2a and 1.3a

Milestone 1.5 (Due: March 31, 2024): Beginning on March 19, 2020, the SWCS Team initiated regular project team check-in calls with the Truterra Team and the retailers, held every six weeks, totaling 32 meetings. The Truterra Team supported the SWCS Team by keeping retailers informed of deadlines and outstanding needs. These calls became essential for communication as the COVID-19 Health Crisis eliminated travel and face-to-face meetings. An important outcome of these calls was the development of a new conservation professional network tailored to agricultural retailers. Initially, retailers listened quietly but soon began actively engaging, asking questions, and sharing advice about their experiences. This cultural shift towards collaboration among competitors is a significant achievement that will be closely monitored.

Throughout the reporting period, SWCS provided retailers with resources and technical contacts. Notable meetings included a session with Dr. Rob Myers on cover crop termination on February 24, 2021, and a discussion with Dr. Scott Nelson on variable rate application of P and K on April 7, 2021. These check-in calls served as forums for discussing trial progress, upcoming deadlines, solving problems, and offering additional resources and instruction. The End-of-Year One meeting on February 10, 2021, and the subsequent meeting on February 2, 2022, revealed retailers' need for more assistance with data management. The project concluded Year 3 with an in-person meeting on March 21, 2023, in Kansas City, MO, discussing barriers to conservation practice adoption, field day strategies, and final data entry into the Truterra Insights Engine by

December 15, 2023. Truterra funded much of this meeting, exceeding their nonfederal expense commitments to the project.

The project team gathered for a concluding call on June 3, 2024 to go over results from the on-farm demonstration trials, pre- and post-program retailer and producer surveys, and the business model innovation report. The meeting provided retailers with an opportunity to provide final feedback on the results before reporting to NRCS.

Work Products for Entire Project: Milestone 1.6

Work Product ID	Date Submitted	Work Product Description
1.5a	01-10-2021	Meeting agendas for 2020 Team Meetings (8)
1.5b	07-10-2021	Meeting agendas for Q1-Q2 2021 Team Meetings (4)
1.5c	07-10-2021	End-of-Year One Presentation
1.5d	01-10-2022	Meeting agendas for Q3-Q4 2021 Team Meetings (3)
1.5e	07-10-2022	Meeting agendas for Q1-Q2 2022 Team Meetings (5)
1.5f	07-10-2022	End-of-Year Two Presentation
1.5g	01-10-2023	Meeting agendas for Q3-Q4 2022 Team Meetings (3)
1.5h	07-10-2023	Meeting agendas for Q1-Q2 2023 Team Meetings (5)
1.5i	07-10-2023	End-of-Year Three Presentation
1.5j	01-10-2024	Meeting agendas for Q3-Q4 2024 Team Meetings (4)
1.5k	07-29-2024	End-of-Project Presentation on Project Results and Impacts

2. Information Sharing: Agronomic, environmental, and economic data generated from the trials were shared with NRCS over the course of this project. Retailers gathered and submitted data to SWCS for reporting and verbally report progress during regular team calls.

Milestone 2.1 (Due: May 30, 2020): To share a comprehensive list of measurements needed for the trials, the SWCS Team created a Trial Protocol Sheet resource unique to each trial type. This document was provided to retailers on 5/1/20 and contained a comprehensive list of responsibilities for record keeping and trial activities for both the grower participant and the retailer. Additionally, this document included a Memorandum of Understanding (MOU) statement to assist retailers in formalizing the growers' obligations to provide assistance and cooperation in exchange for the services and products provided throughout the trials.

The Truterra Team guided discussions about data capture and necessary technological requirements. They demonstrated the Truterra Insights Engine's capabilities to manage and track trial data to the SWCS Team and fielded questions about trial data needs. Additionally, the Truterra Team brought in a consultant to further discuss data reporting needs with the SWCS Team and identify necessary changes to adapt the Truterra Insights Engine to the needs of the On-Farm Trials. An important element of the On-Farm Trials has been the Truterra Team's responsiveness to the data needs of the trial. The Truterra Team is actively using this as an opportunity to explore the capabilities of the Truterra Insights Engine, to make entering and tracking conservation data more user-friendly and the results more useful to and representative of the growing number of retailers and growers on the platform. As the Truterra Insights Engine continues to grow its capabilities and its user base, it will have the potential to facilitate conservation decisions across millions of acres.

Work Products for Entire Project: Milestone 2.1

Work Product ID	Date Submitted	Work Product Description
2.1a	01-10-2021	Protocols and MOU for Cover Crop Management Trials
2.1b	01-10-2021	Protocols and MOU for Zone Nutrient Management Trials

Milestone 2.2 (Due: June 30, 2020): To capture and track trial data, the SWCS Team created a reporting template unique to each trial called a Grower Protocol Sheet. This document was initially shared with retailers on 6/3/20 and used for tracking and reporting each growing season thereafter. This document is unique to each retailer, captures all trial activities not entered into the Truterra Insights Engine, is organized chronologically, and encourages retailers and growers to create a narrative for each trial by recording observations of each field activity throughout the growing season. This document also prompts retailers to reflect on their management choices and evaluate their findings related to yield and ROI. To ensure retailers' understanding in the use of this document, the SWCS Team created an instructional presentation for retailers and held a training webinar for them on 6/11/20.

To capture and track retailers' expenses incurred during the trials, the SWCS Team created an Expense Reporting Sheet. This document was shared with retailers on 6/3/20. This document contains budget information unique to each retailer and is the form used for submitting quarterly reimbursement requests to SWCS. To ensure retailers' understanding in the use of this document, the SWCS Team created an instructional presentation for retailers and held a training webinar for them on 6/11/20.

Work Products for Entire Project: Milestone 2.2

Work Product ID	Date Submitted	Work Product Description
2.2a	01-10-2021	Grower Protocol Reporting Form
2.2b	01-10-2021	Quarterly Expense Reporting Form
2.2c	01-10-2021	Training webinar for data and expense reporting

Milestone 2.3 (Due: June 30, 2020):

Retailer and Producer Surveys:

To address barriers to conservation adoption, the SWCS Team, in collaboration with Dr. J. Gordon Arbuckle from Iowa State University, created pre-project surveys for farmers and retailers to establish a baseline of knowledge and attitudes about conservation practices. These surveys, initially distributed to retailers on August 5, 2020, were designed to be compared with post-project surveys to gauge changes over time. Dr. Arbuckle's expertise, particularly from his work on the Iowa Farm and Rural Life Poll, contributed to the robustness of the surveys and data analysis. At the retailers' request, the plan was modified to eliminate mid-project surveys, reducing their workload while still providing sufficient insight with only pre- and post-project surveys. The final surveys were administered in September 2023, with results collected by January 2024, and Dr. Arbuckle assisted in analyzing and summarizing the data.

Producer surveys for the cover crop trial revealed that the top factors for participation were assessing economic viability and improving soil and water quality, with consistent responses in both pre- and post-project surveys. Compared to the pre-survey, producers were less likely to

agree that they lacked knowledge about cover crops, that cover crops complicate crop insurance, that expenses outweigh benefits, that cover crops are compatible with their current systems, and that cover crops reduce the need for inputs. However, they were more likely to agree that cover crops contribute to yield loss in dry years and delay spring planting. Additionally, in the post-project survey, producers were less likely to agree that trusted agricultural advisors could help with cover crop management.

The producer surveys for those participating in the zone nutrient management (ZNM) trial revealed that the top motivations for participation were assessing economic viability, improving the farm, and enhancing soil and water quality, with these factors remaining consistent in both pre- and post-project surveys. Post-trial results showed that over 93% of producers are likely or very likely to continue using ZNM, expand its use beyond demo trials, and adopt precision nutrient management techniques. Compared to the pre-survey, producers are now less likely to feel they lack knowledge about ZNM, find precision farming technologies too time-consuming to learn, believe the expenses outweigh the benefits, or see ZNM as incompatible with their current production systems. They are more likely to agree that ZNM can increase crop yields, profitability, and the efficiency of input applications.

The retailer survey responses indicated a slight decrease in their likelihood to recommend cover crops and offer additional cover crop services. Conversely, they showed a slight increase in their likelihood to recommend zone nutrient management (ZNM) and provide ZNM services. Additionally, retailers were less likely to engage with the NRCS following the trials.

Business Model Innovation Report:
To evaluate the impact of the grant on organizing processes and business strategy, leaders of each participating group, conservation agronomists, and delivery partners were contacted for semi-structured interviews by an outside research firm. These discussions took place during the first quarter of 2024 both in-person and via Zoom. The protocol for the interviews followed the logic of the business model canvas tool to assess how businesses may have changed as a result of increased involvement in conservation offerings.

The report continues with an overview of trends in conservation agronomy among agricultural retailers in the Midwest. This is followed by four anonymized case profiles and the analysis for emerging trends where there were points of convergence in their experiences.

There are several opportunities for business model innovation in retail conservation identified in the report. Scaling food production while protecting the environment presents a significant opportunity, leveraging the relationships, influence, and reach that ag retailers have with their clients. Retailers also possess valuable crop expertise that can be utilized to support conservation efforts. Additionally, partnerships and resources to promote conservation at the co-op level are emerging, providing further support for these initiatives. The demand for conservation practices is growing, with growers increasingly seeking these services, giving retailers the advantage of proactively defining their role in this evolving market.

Retail conservation business model innovation faces several significant challenges. Internal resistance within organizations can hinder progress, particularly when the return on investment

(ROI) for conservation services is unclear or delayed. Additionally, retailers must balance these conservation efforts with other business demands, such as transportation and workforce management, which can divert attention and resources. The uncertainty surrounding untested conservation theories can strain relationships with stakeholders, while a lack of capacity, human capital, and expertise further complicates implementation. Producers themselves may resist participating due to concerns about data sharing, potential yield reductions, and unclear ROI. Finally, navigating the complexities of public and private programs, which are often seen as rigid, ever-changing, and unreliable, presents another layer of difficulty, particularly for those new to conservation efforts.

Work Products for Entire Project: Milestone 2.3

Work Product ID	Date Submitted	Work Product Description
2.3a	01-10-2021	Survey for Cover Crop Growers
2.3b	01-10-2021	Survey for Zone Nutrient Management Growers
2.3c	01-10-2021	Survey for Retailers
2.3d	07-29-2024	Business Model Innovation Report

Milestone 2.4 (Due: May 30, 2021): Truterra aggregated the Year 1, 2, and 3 trial data and compiled the data into reports for each trial. The reports are attached to this report.

The Truterra™ Insights Engine is an innovative, interactive digital platform designed to help farmers achieve their stewardship and financial goals in real-time while mitigating risk. It offers profit insights, allowing farmers to analyze return-on-investment and understand the financial and environmental impacts of practice changes before implementation. The platform also provides a concrete soil quality trend score, eliminating uncertainty about soil health. Its key feature, the Insights Score, gives critical information about on-farm stewardship practices, highlighting strengths and opportunities for improvement. Innovation trials within the Truterra™ Insights Engine involve paired field sets—one using historic practices and the other implementing new practices—tracked separately to compare agronomic, economic, and environmental outcomes. Cover crop trials compared fields with and without cover crops, while nutrient zone management trials compared low-level historic practices with advanced nutrient management practices, including grid soil sampling, field management zones, variable rate fertilizer application, side-dress applications, and nitrogen stabilizers.

Over three years of trials, fields with cover crops implemented demonstrated significant environmental improvements, such as reduced sheet and rill erosion, decreased wind erosion, improved soil quality trends, and lower net greenhouse gas emissions by over 300 lbs per acre annually. Additionally, cover crops proved to be an effective weed management tool based on feedback from the participating retailers. Although there was a slight increase in corn yields, soybean yields were variable depending on the rotation. Profitability was slightly higher for trial treatments due as the increased corn yield offset the added costs of cover crop seeds, application, and termination. Given these results, growers anticipate long-term benefits in soil health and profitability as they refine their cover crop management skills.

Nutrient zone management trials revealed increased nitrogen use efficiency in check acres, while trial treatments resulted in higher corn and soybean yields and increased profitability. However, the additional costs of implementing nutrient management services and higher

nitrogen application rates did not offset the profits from increased crop yields. This higher nitrogen application, averaging more pounds per acre than the check, may be attributed to more targeted fertilizer use in high-yield zones or addressing infertile zones based on soil test results. Continued data collection over more years will provide a clearer picture and help growers optimize their zone management strategies.

The trial findings, CIG Showcase Presentation, and media coverage highlight the nitrogen sequestration benefits of cover crops, presenting an opportunity for NRCS to promote cover crop CTA and cost-share programs. This could facilitate access to emerging carbon markets and additional funding for climate-smart agriculture. Collaborations between NRCS field offices and local co-ops have increased enrollment in NRCS programs and improved natural resource conservation. Selecting co-ops involved in such projects can help NRCS expand its client base and advance key conservation goals.

Reports from all years of Cover Crop Management Trials using the Truterra Insights Engine show that cover crop management can convert fields from carbon emitters to carbon sinks. NRCS's continued efforts under the Growing Climate Solutions Act of 2021 could leverage this data to partner with Truterra as a voluntary Greenhouse Gas Technical Assistance Provider. Retailers can use this data to encourage clients to adopt cover crop programs and benefit from additional revenue through greenhouse gas sequestration contracts. A parallel project in Iowa demonstrated the viability of reduced tillage management offered by ag retailers, highlighting its easier adoption compared to Zone Nutrient Management, which requires advanced technology and equipment.

Work Products for Entire Project: Milestone 2.4

Work Product ID	Date Submitted	Work Product Description
2.4a	07-10-2022	Year 1 Cover Crop Report
2.4b	07-10-2022	Year 1 Zone Nutrient Management Report
2.4c	07-10-2023	Year 2 Cover Crop Report
2.4d	07-10-2023	Year 2 Zone Nutrient Management Report
2.4e	07-29-2024	Year-Over-Year Cover Crop Report
2.4f	07-29-2024	Year-Over-Year Zone Nutrient Management Report

Milestone 2.5 (Due: June 30, 2021): See Milestone 1.5

6. Project Outputs:

Output Type	Attachment	Description
Media and Publications	URL	SWCS Press Release: https://www.swcs.org/resources/news/soil-and-water-conservation-society-and-truterra-awarded-15m-from-usda-to-accelerate-adoption-of-p/
Media and Publications	URL	Land O'Lakes Blog Post: https://www.landolakessustain.com/news/usda-program-grant-to-help-farmers-test-on-farm-in/
Media and Publications	URL	Heartland Co-Op, "Living Our Purpose Through Conservation,": https://www.youtube.com/watch?v=7wHi7_s1C-0
Media and Publications	3.1a	Mary Eckelkamp, "Research Demonstrates Cover Crops as Carbon Negative," Dairy Herd Management, December 15, 2022.
Media and Publications	3.1b	Cindy Zimmerman, "Truterra and SWCS Research Shows Cover

		Crops' Value," AgWired, December 14, 2022.
Media and Publications	3.1c	Jesse Allen, "Truterra and Soil and Water Conservation Society-led Research Demonstrates Value of Cover Crops for the Environment," American Ag Network, December 14, 2022.
Media and Publications	3.1d	No author, "Truterra and SWCS Research Quantifies the Value of Cover Crops," AgriMarketing, December 15, 2022.
Media and Publications	3.1e	No author, "Truterra and Soil and Water Conservation Society-led Research Demonstrates Value of Cover Crops for the Environment," CropLife, December 26, 2022.
Media and Publications	3.1f	No author, "On-Farm Trials Show Cover-Cropped Fields Sequester 3 Times More Carbon," Cover Crop Strategies, December 14, 2022.
Media and Publications	3.1g	No author, "Farm trials illustrate cover crop value cutting erosion and emissions," AgDaily, December 14, 2022.
Conference Attendance	3.2a	Joe Otto, "Conservation at the Co-op," as part of the NRCS Conservation Innovation Grants Program Overview and Stakeholder Updates; Innovations in Water Conservation. SWCS International Annual Conference, July 31 to August 2, 2022, Denver CO.
Conference Attendance	3.2b	Joe Otto, "Conservation at the Co-op," as part of the NRCS Conservation Innovation Grants Program Overview and Stakeholder Updates; Innovations in Water Conservation. SWCS International Annual Conference, August 3-5, Des Moines, IA.
Trainings and Outreach Events	3.3a	Heartland Co-Op, "Cover Crop Grower Meeting: All Things Cover Crop!" Field Day Event held 6/24/21, Minburn, IA.
Trainings and Outreach Events	3.3b	On August 9-10, 2022, project partners from Truterra held a Field Day in stakeholder dinner and reception in Des Moines, and a Field Day in Vincent. The Field Day included presentations, demonstrations, and attendance from all of Truterra's agricultural retailer support personnel in the project area, as well as NRCS personnel.
Trainings and Outreach Events	3.3c	Frontier Field Day, "Herbicide & Plant Health and Cover Crops" Agronomy and Grain Summer Series held August 9, 16 2023, Syracuse and David City/Yanka, NE.
Newsletters	3.4a	SWCS, "Conservation at the Co-op," *Conservogram*, March 2021. (Circulation: 1,750 subscribers)
Newsletters	3.4b	SWCS, "Conservation at the Co-op," *Conservogram*, April 2021. (Circulation: 1,750 subscribers)
Newsletters	3.4c	SWCS, "Conservation at the Co-op," *Conservogram*, July 2021. (Circulation: 1,750 subscribers)
Newsletters	3.4d	SWCS, "Conservation at the Co-op," *Conservogram*, September 2021. (Circulation: 1,750 subscribers)
Newsletters	3.4e	Soil & Water Conservation Society, "Conservation at the Co-op," *Conservogram*, February 2022. (Circulation: 1,750 subscribers)
Newsletters	3.4f	Soil & Water Conservation Society, "Conservation at the Co-op," *Conservogram*, March 2022. (Circulation: 1,750 subscribers)
Newsletters	3.4g	Soil & Water Conservation Society, "Conservation at the Co-op," *Conservogram*, April 2022. (Circulation: 1,750 subscribers)
Newsletters	3.4h	Soil & Water Conservation Society, "Conservation at the Co-op," *Conservogram*, May 2022. (Circulation: 1,750 subscribers)
Newsletters	3.4i	Soil & Water Conservation Society, "Conservation at the Co-op," *Conservogram*, June 2022. (Circulation: 1,750 subscribers)
Newsletters	3.4j	Soil & Water Conservation Society, "Conservation at the Co-op," *Conservogram*, August 2022. (Circulation: 1,750 subscribers)
Newsletters	3.4k	Soil & Water Conservation Society, "Conservation at the Co-op," *Conservogram*, September 2022. (Circulation: 1,750 subscribers)
Newsletters	3.4l	Soil & Water Conservation Society, "Conservation at the Co-op,"

		Conservogram, April 2023. (Circulation: 1,750 subscribers)

7. Project Impacts:

Over three years of trials, the implementation of cover crops demonstrated significant environmental improvements, including reduced sheet and rill erosion, decreased wind erosion, enhanced soil quality trends, and reduced greenhouse gas emissions by over 300 lbs per acre annually. Cover crops also proved effective for weed management and slightly increased corn yields, though soybean yields varied based on rotation. Profitability was slightly higher for cover crop treatments due to increased corn yields, despite the added costs of seeds, application, and termination. These results suggest long-term benefits in soil health and profitability as growers refine their cover crop management techniques. Nutrient zone management trials also showed increased nitrogen use efficiency, higher corn and soybean yields, and increased profitability, despite the higher costs of implementing nutrient management services and nitrogen application rates.

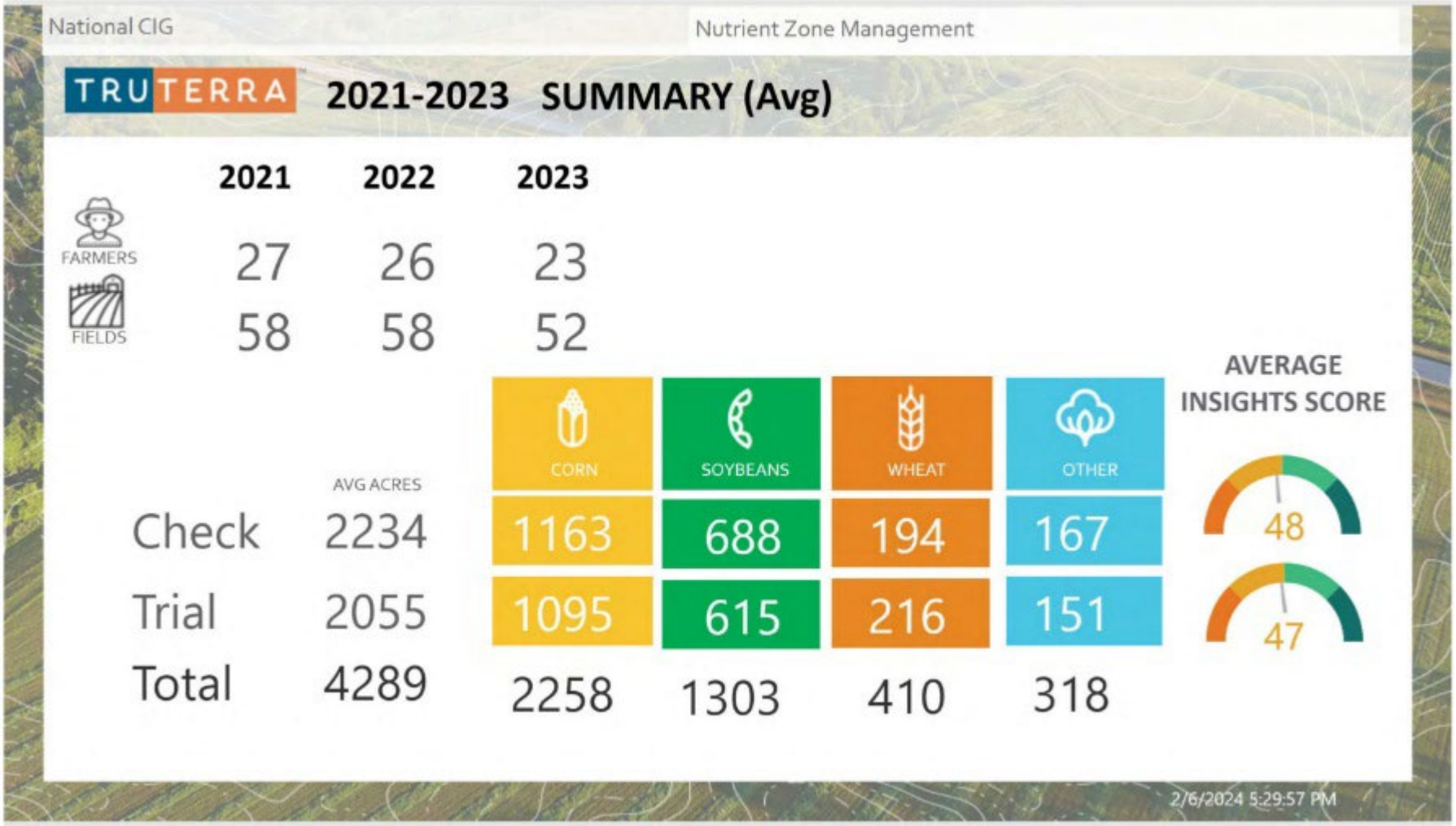
The results of these trials present substantial opportunities for advancing conservation practices in the United States. The proven environmental benefits and profitability of cover crops and nutrient zone management can encourage wider adoption among farmers. This data can help NRCS promote cover crop CTA and cost-share programs, facilitating access to carbon markets and additional climate-smart agriculture funding. Collaborations with local co-ops have already increased enrollment in NRCS programs, highlighting the potential for expanding client bases and achieving conservation goals. Additionally, retailer survey responses indicated a growing interest in recommending and providing ZNM services, despite a slight decline in support for cover crops and engagement with NRCS. These findings underscore the need for continued efforts to overcome internal resistance, clarify ROI, and navigate the complexities of public and private programs to drive broader conservation adoption.

8. Appendices:

All documents included in the appendices are listed throughout the report with corresponding milestones or deliverables. Attachments that have been submitted in previous reports were not resubmitted in this final report.

Truterra Check Trial YOY 3-0 PD

During 508 remediation for the following slide presentations, slides are placed as pictures due to the amount of time and complexity needed to recreate maps and data for each of them.


National CIG
Nutrient Zone Management
TRUTERRA
2021-2023 SUMMARY (Avg)
2021
2022
2023
FARMERS
27
26
23
FIELDS
58
58
52
AVG ACRES
CORN
SOYBEANS
WHEAT
OTHER
Check
2234
1163
688
194
167
Trial
2055
1095
615
216
151
Total
4289
2258
1303
410
318
AVERAGE INSIGHTS SCORE
48
47
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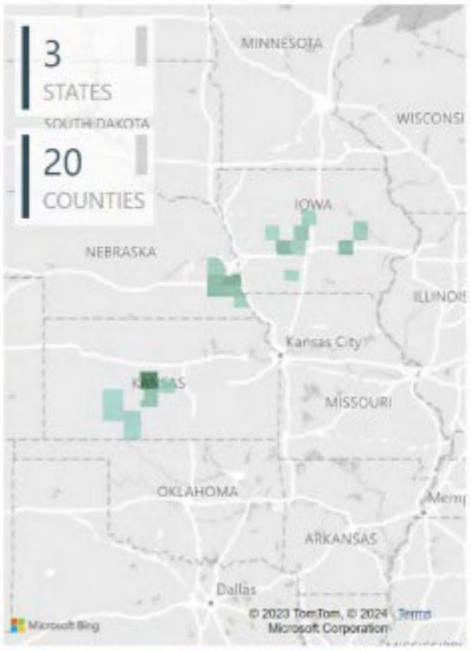
National CIG

Nutrient Zone Management

TRUTERRA 2021-2023 GEOGRAPHIC OVERVIEW

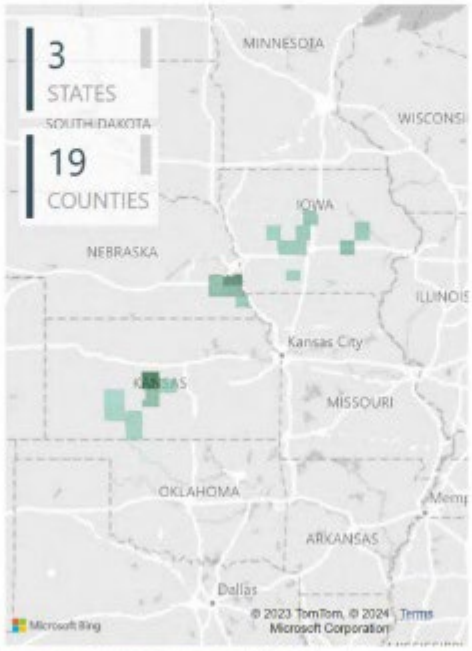
Check

ACRES BY COUNTY



Trial

ACRES BY COUNTY



County, State	Check	Trial
Barton County Kansas	413	354
Benton County Iowa	83	82
Boone County Iowa	121	86
Carroll County Iowa	37	54
Cass County Nebraska	217	290
Comanche County Kansas	48	47
Dallas County Iowa	73	81
Ford County Kansas	41	40
Guthrie County Iowa	167	76
Hamilton County Iowa	79	110
Hodgeman County Kansas	24	28
Kiowa County Kansas	64	63
Lancaster County Nebraska	170	127
Nemaha County Nebraska	66	78
Otoe County Nebraska	138	143
Poweshiek County Iowa	166	135
Rice County Kansas	68	66
Saunders County Nebraska	76	0
Stafford County Kansas	131	129

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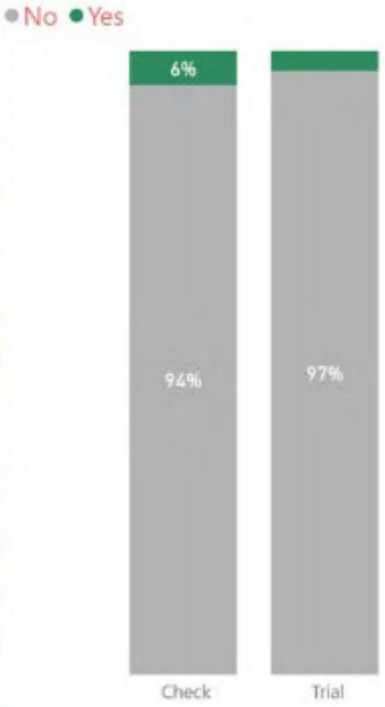
National CIG

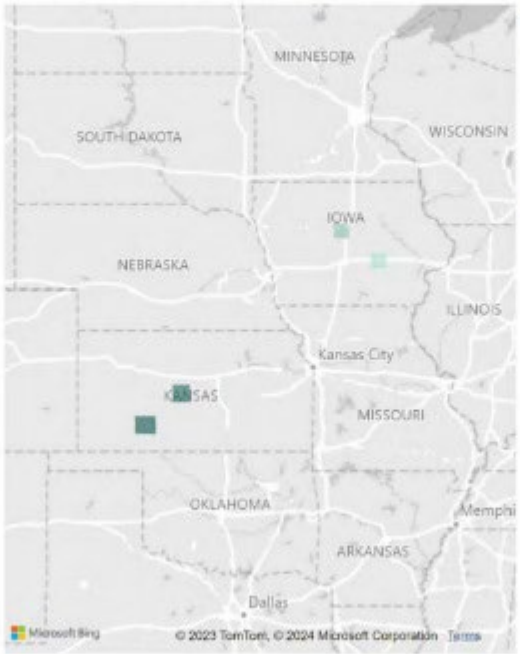
Nutrient Zone Management

TRUTERRA 2021-2023 COVER CROPS (Avg)

COVER CROPS



ACRES USING COVER CROPS



County & State	Check	Trial
Barton County Kansas	46	26
Ford County Kansas	41	40
Hamilton County Iowa	26	0
Poweshiek County Iowa	10	0
Total	**123**	**66**

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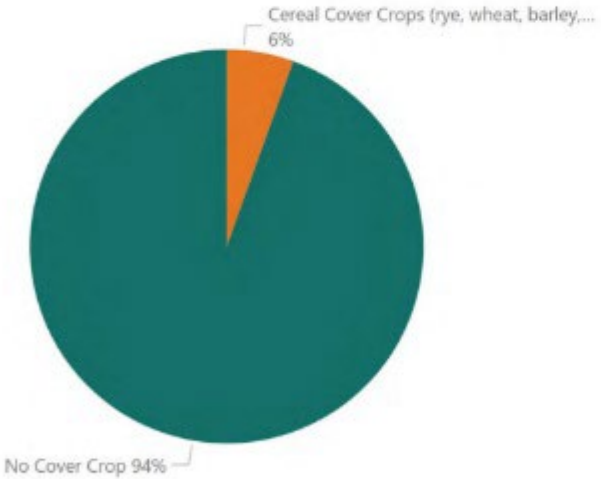
Nutrient Zone Management

TRUTERRA

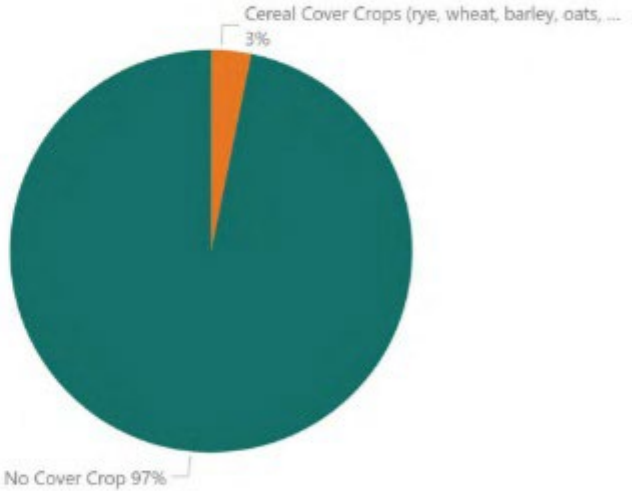
2021-2023 COVER CROP TYPE

Check



123
Avg Acres

Trial



66
Avg Acres

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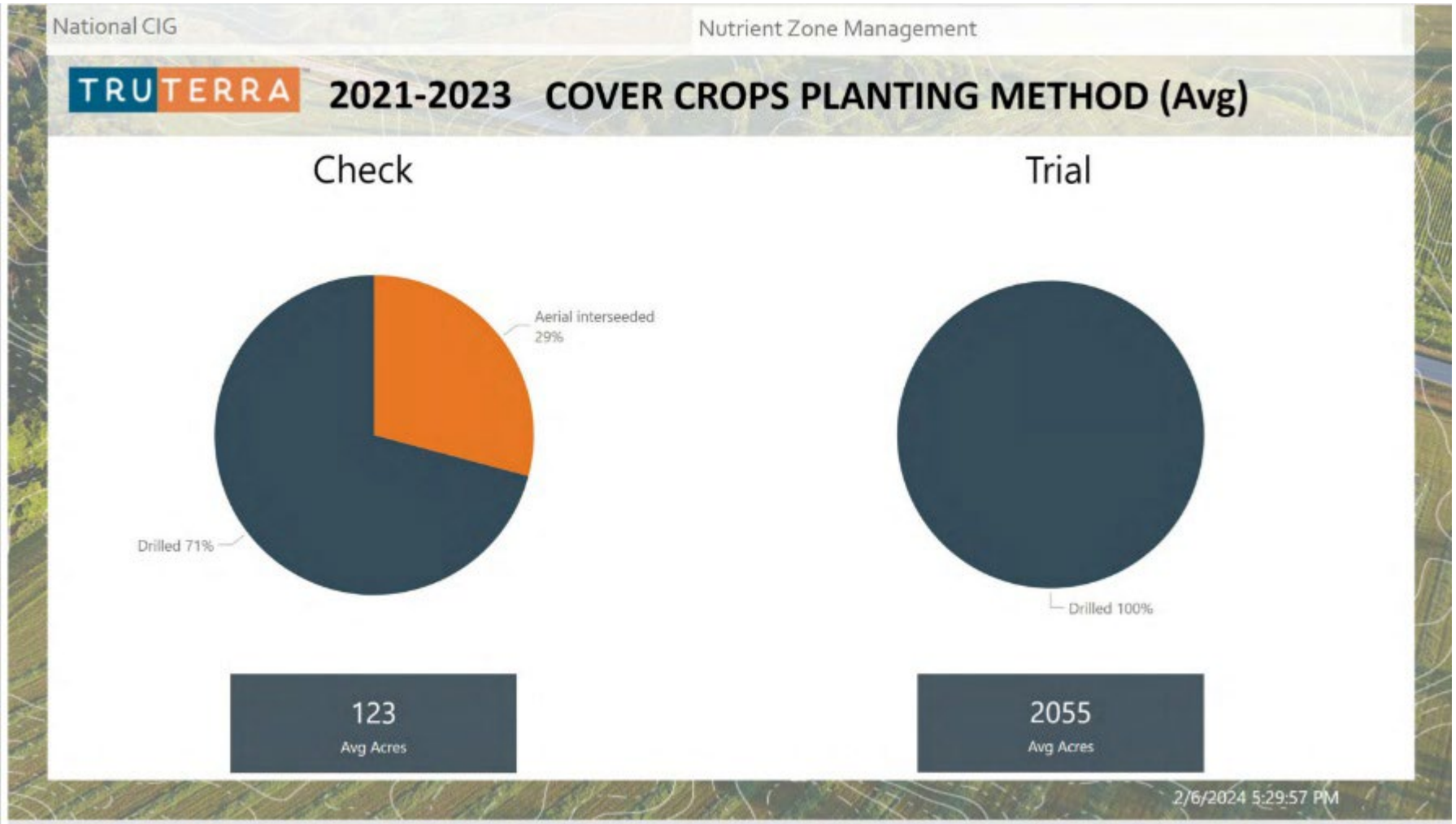

National CIG
Nutrient Zone Management
TRUTERRA
2021-2023 COVER CROPS PLANTING METHOD (Avg)
Check
Trial
Aerial interseeded
29%
Drilled 71%
Drilled 100%
123
Avg Acres
2055
Avg Acres
2/6/2024 5:29:57 PM

National CIG

Nutrient Zone Management

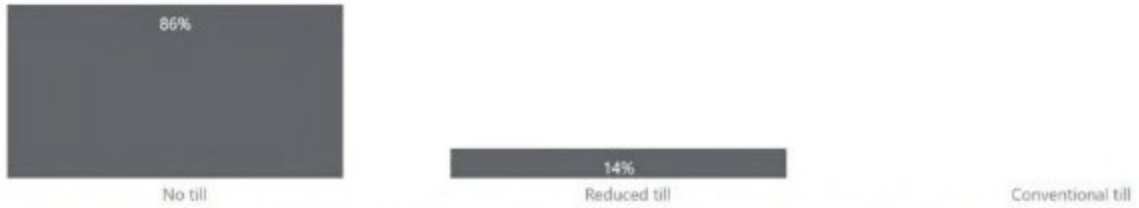
TRUTERRA 2021-2023 TILLAGE

Check

% ACRES BY SPECIFIC TILLAGE MANAGEMENT TYPE

Trial

% ACRES BY SPECIFIC TILLAGE MANAGEMENT TYPE



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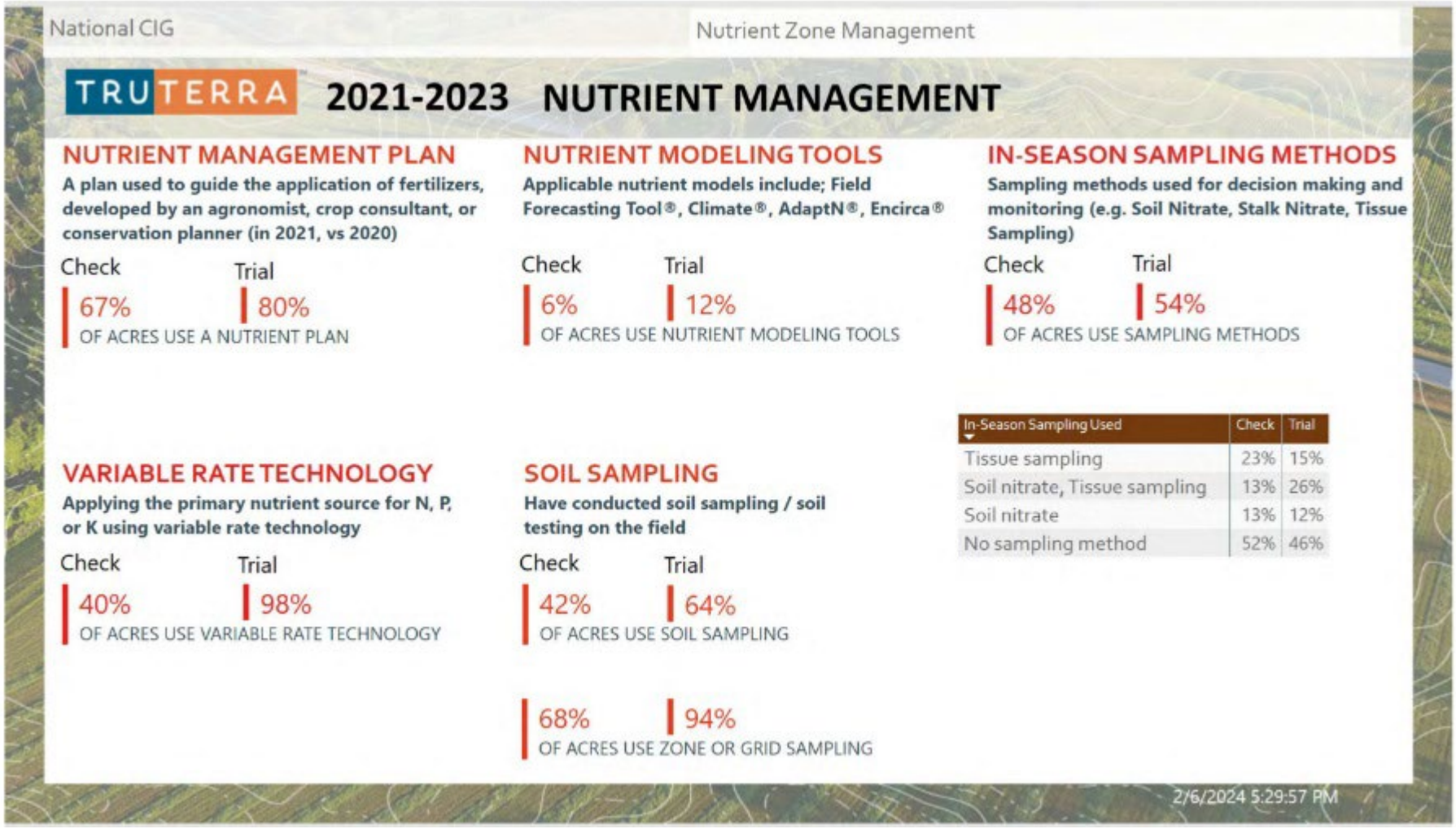
National CIG
Nutrient Zone Management
TRUTERRA
2021-2023 NUTRIENT MANAGEMENT
NUTRIENT MANAGEMENT PLAN
A plan used to guide the application of fertilizers, developed by an agronomist, crop consultant, or conservation planner (in 2021, vs 2020)
Check
Trial
67%
80%
OF ACRES USE A NUTRIENT PLAN
NUTRIENT MODELING TOOLS
Applicable nutrient models include; Field Forecasting Tool®, Climate®, AdaptN®, Encirca®
Check
Trial
6%
12%
OF ACRES USE NUTRIENT MODELING TOOLS
IN-SEASON SAMPLING METHODS
Sampling methods used for decision making and monitoring (e.g. Soil Nitrate, Stalk Nitrate, Tissue Sampling)
Check
Trial
48%
54%
OF ACRES USE SAMPLING METHODS
In-Season Sampling Used
Check
Trial
Tissue sampling
23%
15%
Soil nitrate, Tissue sampling
13%
26%
Soil nitrate
13%
12%
No sampling method
52%
46%
VARIABLE RATE TECHNOLOGY
Applying the primary nutrient source for N, P, or K using variable rate technology
Check
Trial
40%
98%
OF ACRES USE VARIABLE RATE TECHNOLOGY
SOIL SAMPLING
Have conducted soil sampling / soil testing on the field
Check
Trial
42%
64%
OF ACRES USE SOIL SAMPLING
68%
94%
OF ACRES USE ZONE OR GRID SAMPLING
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National CIG

Nutrient Zone Management

TRUTERRA 2021-2023 FERTILIZER

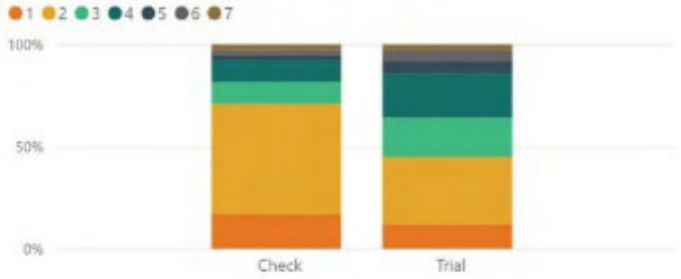
IN-SEASON APPLICATIONS - CORN

Check	Trial
26%	64%
OF ACRES APPLIED IN-SEASON	

COMMERCIAL FERTILIZER APPLICATION METHOD BY PASS

Application Method	Check	Trial
Fertigation	10%	10%
Surface Band	8%	9%
Injected/Sub-Surface Band	25%	22%
Broadcast Incorporated (within 24 hours)		0%
Broadcast (ground or air)	57%	60%

WHEAT & CORN - # OF N APPLICATIONS



AVG FERTILIZER APPLICATION (LBS/ACRE) - CORN

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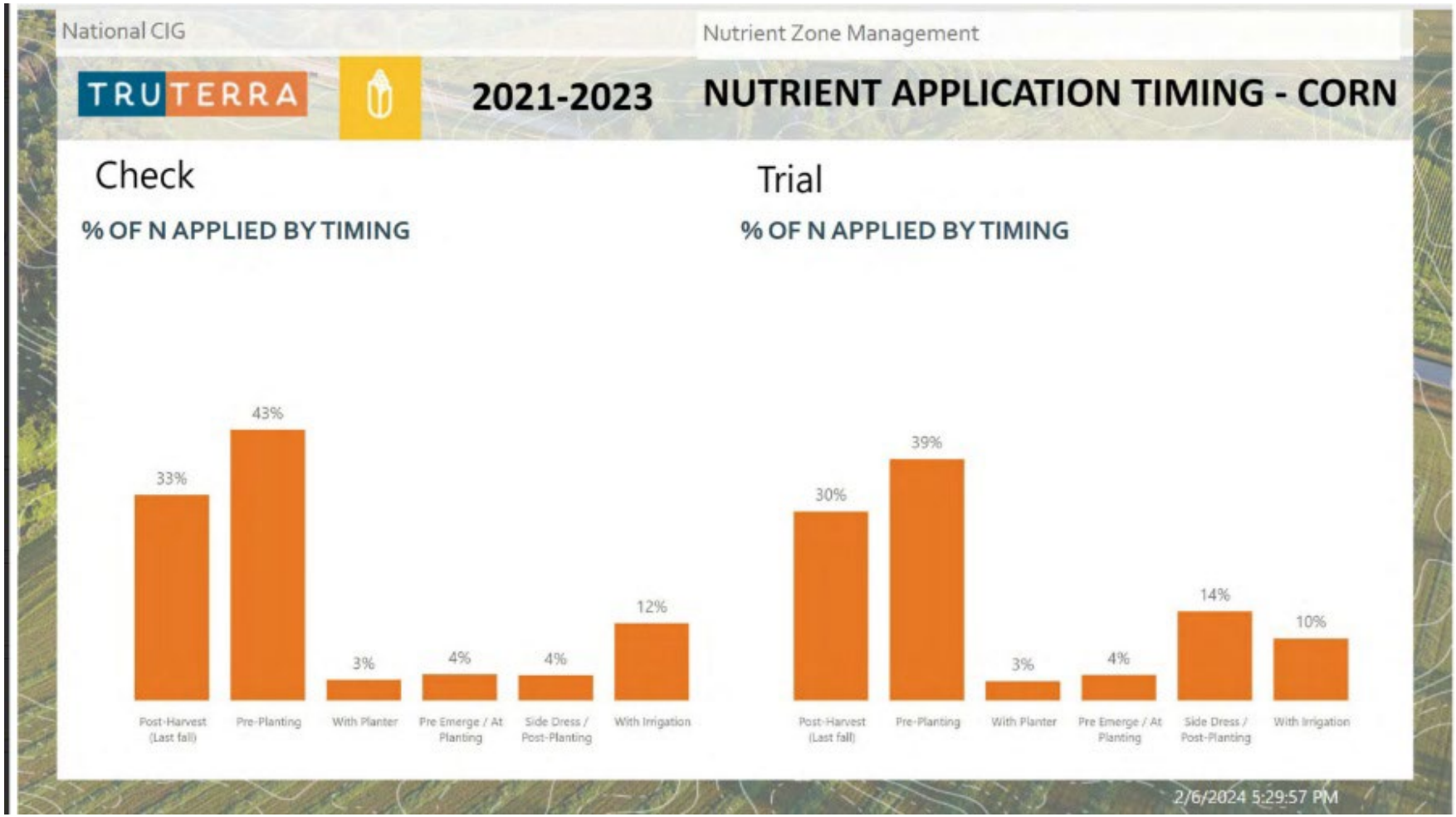

National CIG
Nutrient Zone Management
TRUTERRA
2021-2023
NUTRIENT APPLICATION TIMING - CORN
Check
% OF N APPLIED BY TIMING
33%
43%
3%
4%
4%
12%
Post-Harvest (Last fall)
Pre-Planting
With Planter
Pre Emerge / At Planting
Side Dress / Post-Planting
With Irrigation
Trial
% OF N APPLIED BY TIMING
30%
39%
3%
4%
14%
10%
Post-Harvest (Last fall)
Pre-Planting
With Planter
Pre Emerge / At Planting
Side Dress / Post-Planting
With Irrigation
2/6/2024 5:29:57 PM

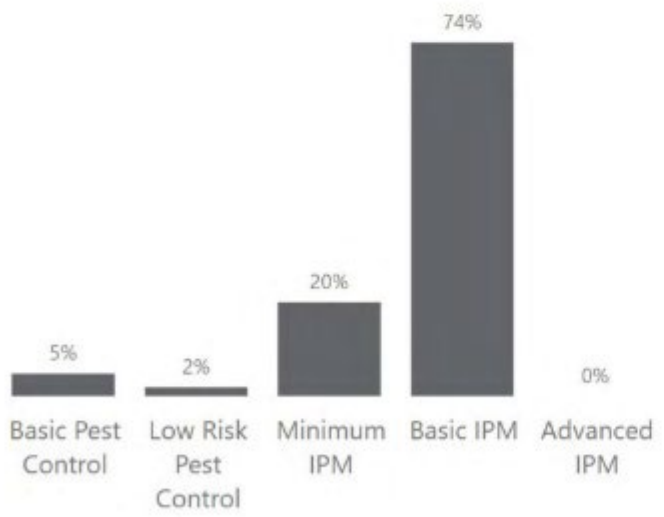
National CIG

Nutrient Zone Management

TRUTERRA **2021-2023 PEST MANAGEMENT**

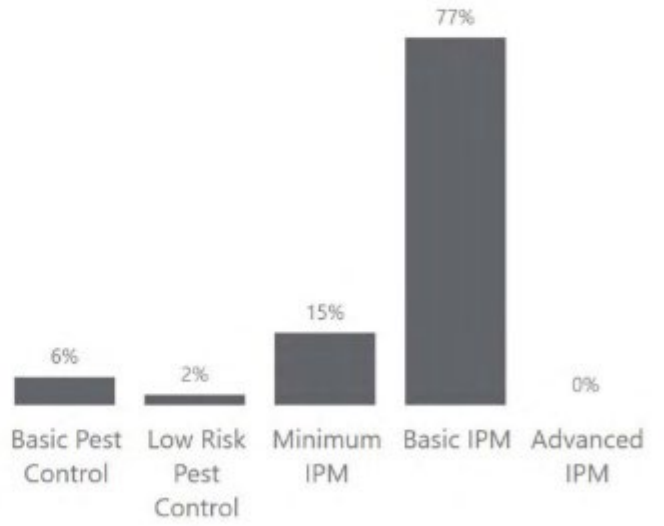
Check

% OF ACRES BY SPECIFIC PEST MANAGEMENT TYPE



Trial

% OF ACRES BY SPECIFIC PEST MANAGEMENT TYPE



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National CIG

Nutrient Zone Management

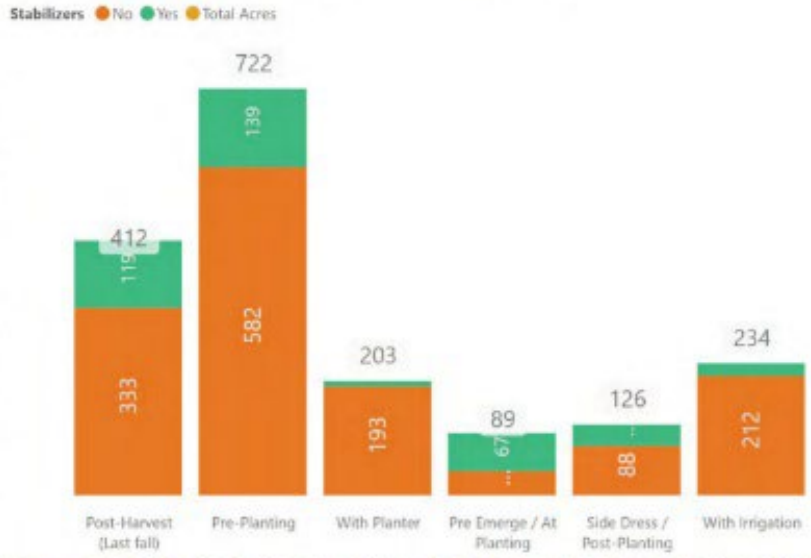
TRUTERRA

2021-2023 STABILIZERS USE WITH COMMERCIAL NITROGEN - CORN

Check

31% Acres with Commercial Fertilizer and Stabilizers

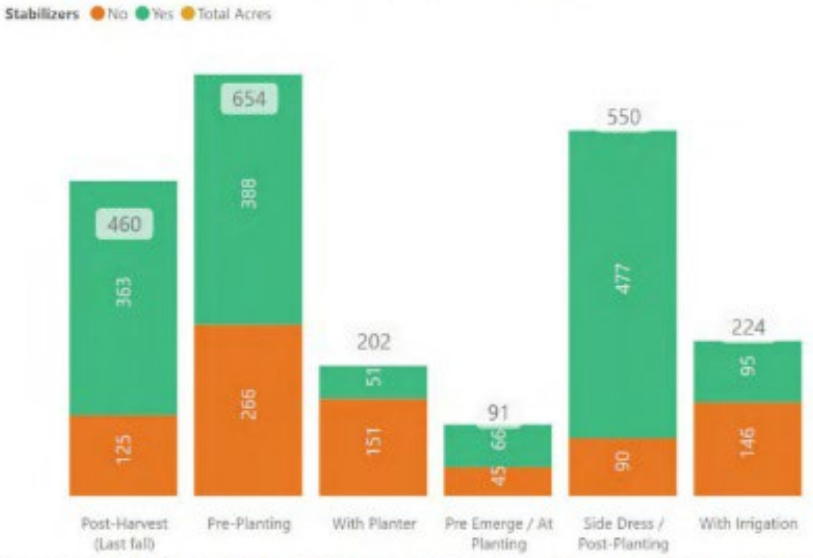
APPLICATION TIMING (% of total acres)



Trial

94% Acres with Commercial Fertilizer and Stabilizers

APPLICATION TIMING (% of total acres)



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National CIG

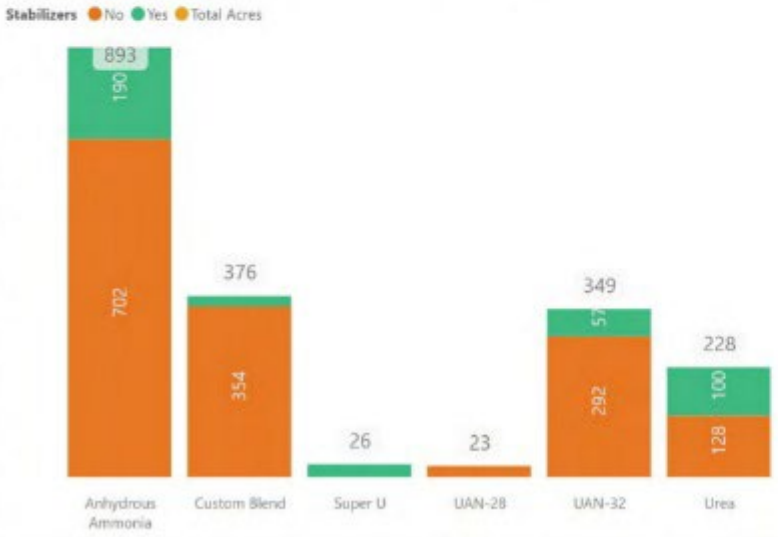
Nutrient Zone Management

TRUTERRA **2021-2023 STABILIZERS USE WITH COMMERCIAL NITROGEN - CORN**

Check

31% Acres with Commercial Fertilizer and Stabilizers

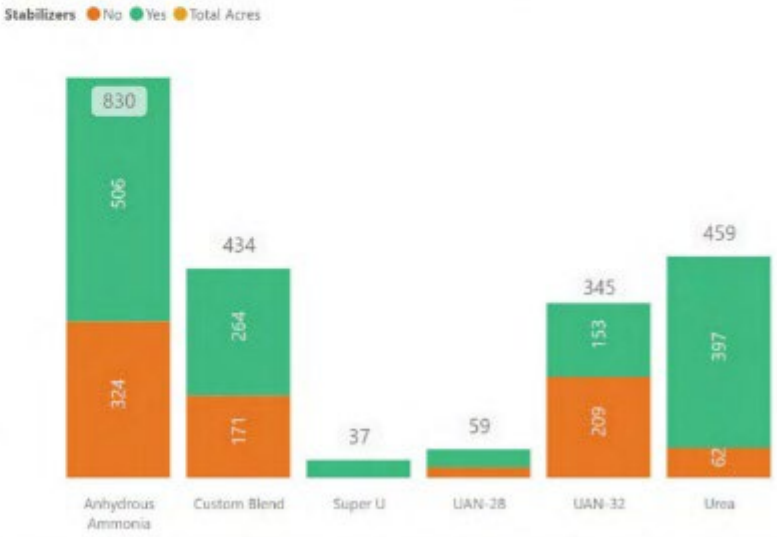
NITROGEN SOURCE (% of total acres)



Trial

94% Acres with Commercial Fertilizer and Stabilizers

NITROGEN SOURCE (% of total acres)



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National CIG

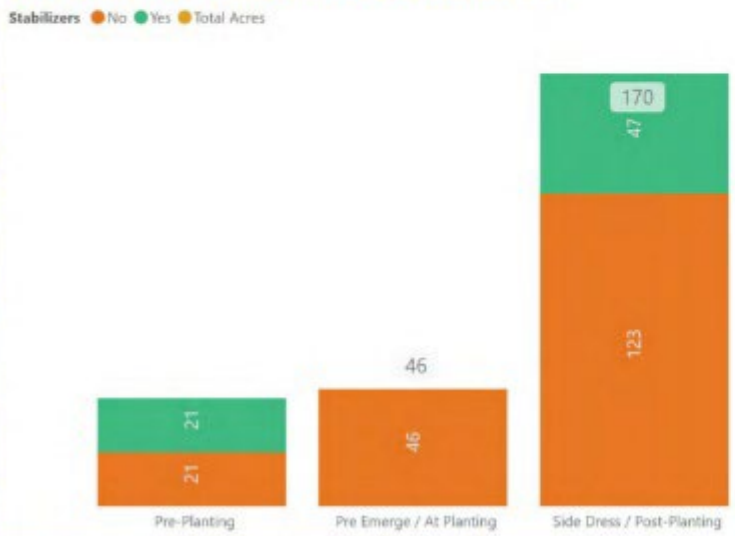
Nutrient Zone Management

TRUTERRA **2021-2023 STABILIZERS USE WITH COMMERCIAL NITROGEN - WHEAT**

Check

32% Acres with Commercial Fertilizer and Stabilizers

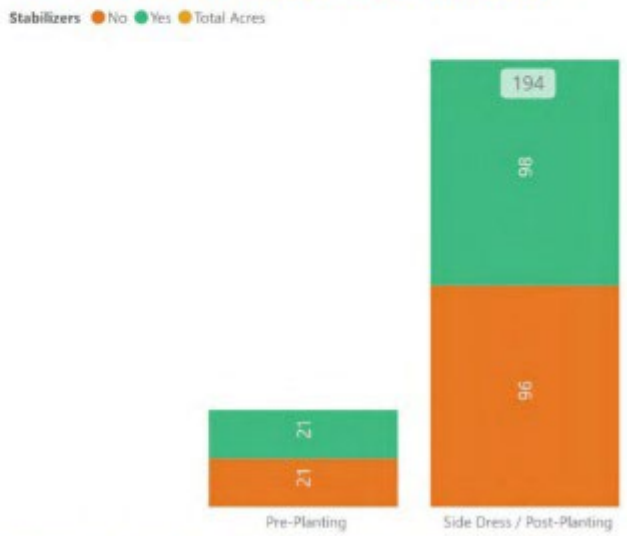
APPLICATION TIMING (% of total acres)



Trial

61% Acres with Commercial Fertilizer and Stabilizers

APPLICATION TIMING (% of total acres)



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National CIG

Nutrient Zone Management

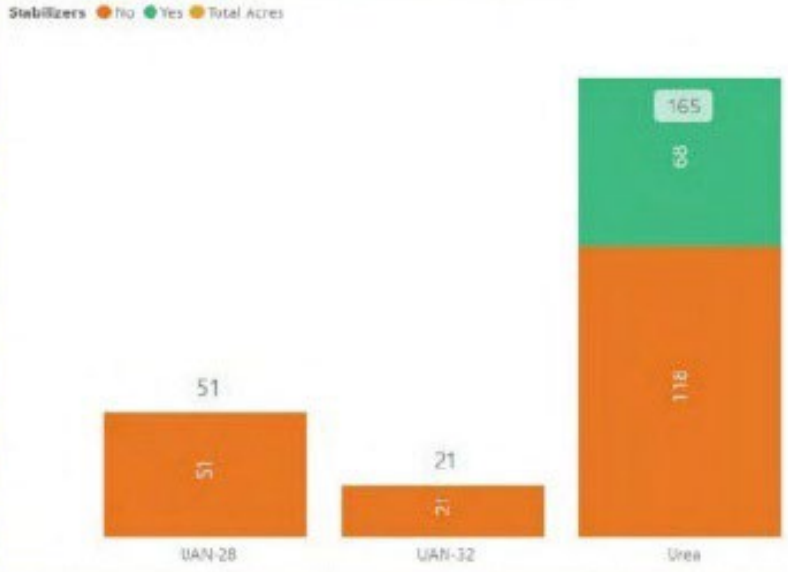
TRUTERRA

2021-2023 STABILIZERS USE WITH COMMERCIAL NITROGEN - WHEAT

Check

32% Acres with Commercial Fertilizer and Stabilizers

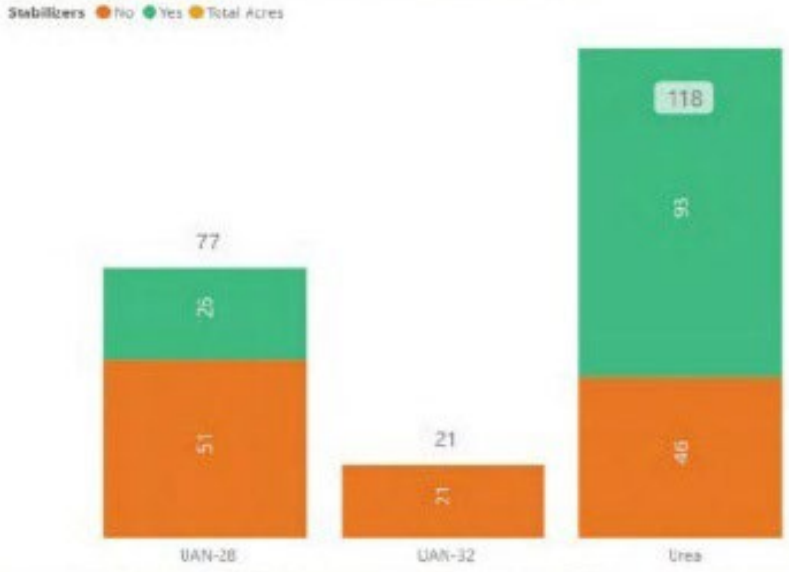
NITROGEN SOURCE (% of total acres)



Trial

61% Acres with Commercial Fertilizer and Stabilizers

NITROGEN SOURCE (% of total acres)



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National CIG

Nutrient Zone Management

TRUTERRA

2021-2023 CONSERVATION PRACTICES (Total)

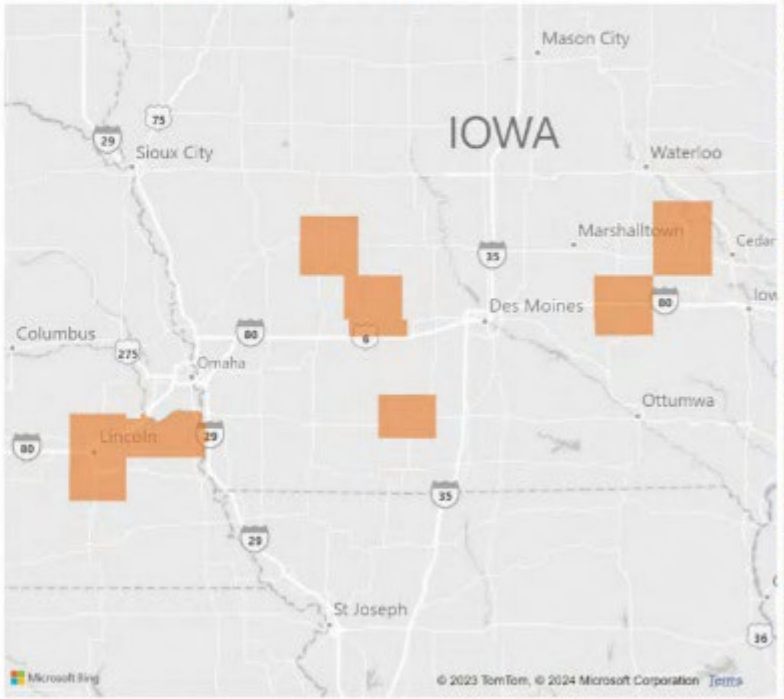
Check	Trial
31	27

FIELDS WITH CONSERVATION PRACTICES

PRACTICE USAGE (BY COUNT AND % OF FIELDS)

ByProduct Category Practice	Check Count	Check % of Fields	Trial Count	Trial % of Fields
Contour Buffer Strips	2	6%	2	4%
Contour Farming	2	33%	2	25%
Grassed Waterway	2	41%	2	26%
Sediment Basin	3	12%	2	4%
Terrace	3	41%	2	25%
Total	**2**	**58%**	**2**	**42%**

PRACTICES IN USE BY COUNTY



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National CIG

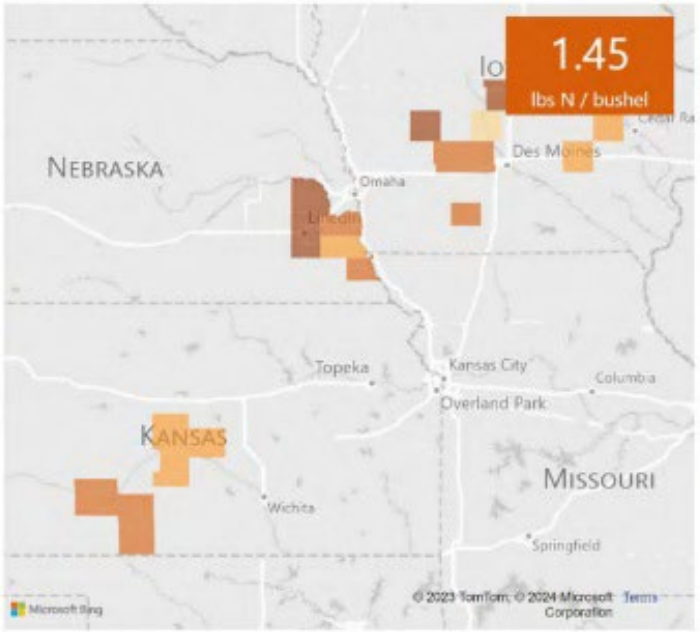
Nutrient Zone Management

TRUTERRA

2021-2023 NITROGEN USE EFFICIENCY lbs N / bushel

Check

AVERAGE NUE BY COUNTY



CORN

NUE	Avg Acres	Treatment
1.45	1163	Check
1.48	1095	Trial

ADVANCED: <= 1.0

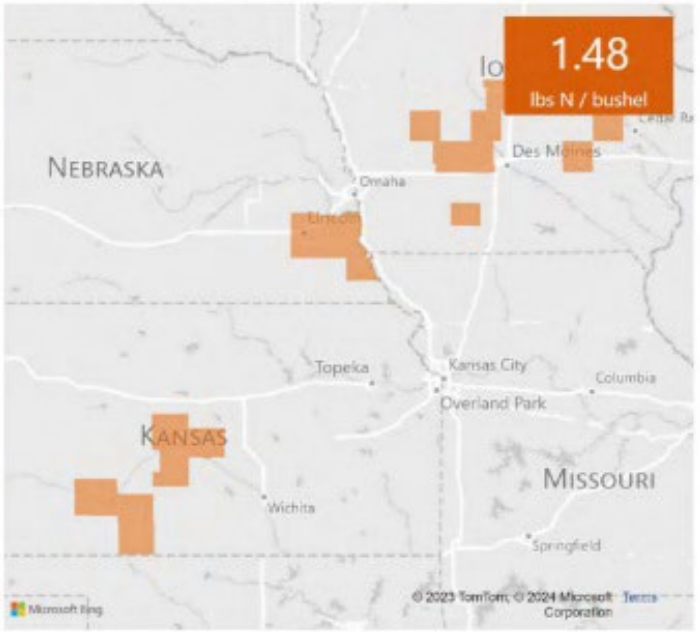
HIGH: > 1.0

MODERATE: > 1.4

BASIC: > 1.8

Trial

AVERAGE NUE BY COUNTY



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National CIG

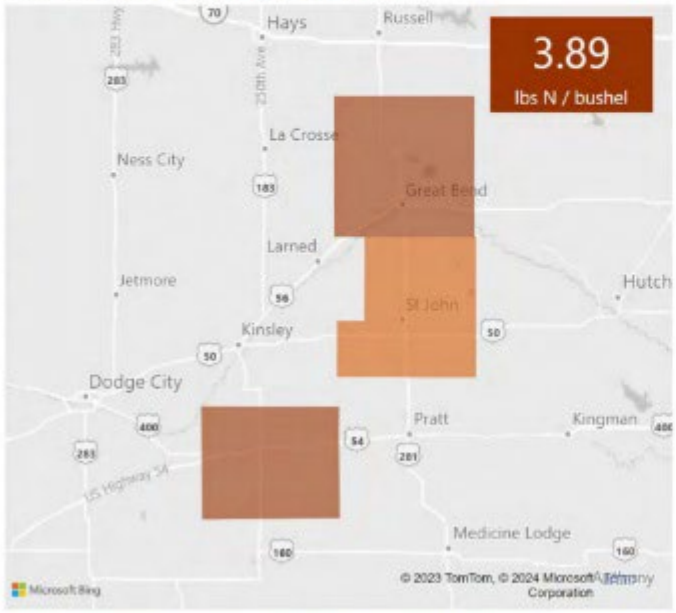
Nutrient Zone Management

TRUTERRA

2021-2023 NITROGEN USE EFFICIENCY lbs N / bushel

Check

AVERAGE NUE BY COUNTY



WHEAT

NUE	Avg Acres	Treatment
3.89	216	Check
2.44	194	Trial

ADVANCED: <= 1.0

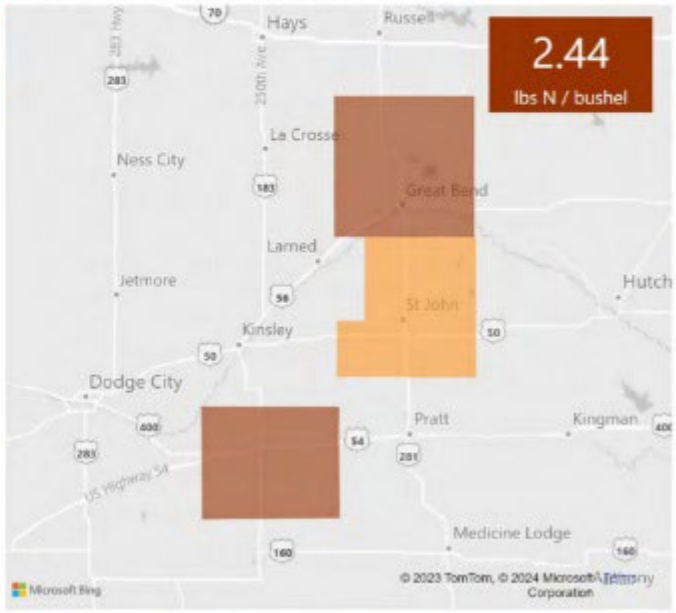
HIGH: > 1.0

MODERATE: > 1.4

BASIC: > 1.8

Trial

AVERAGE NUE BY COUNTY



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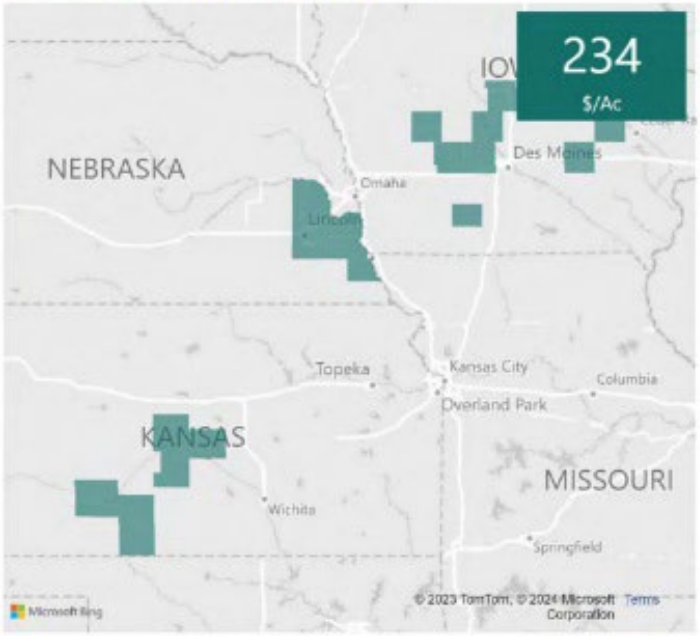
National CIG

Nutrient Zone Management

TRUTERRA **2021-2023 PROFIT PERFORMANCE ESTIMATE** Average $ / Acre

Check

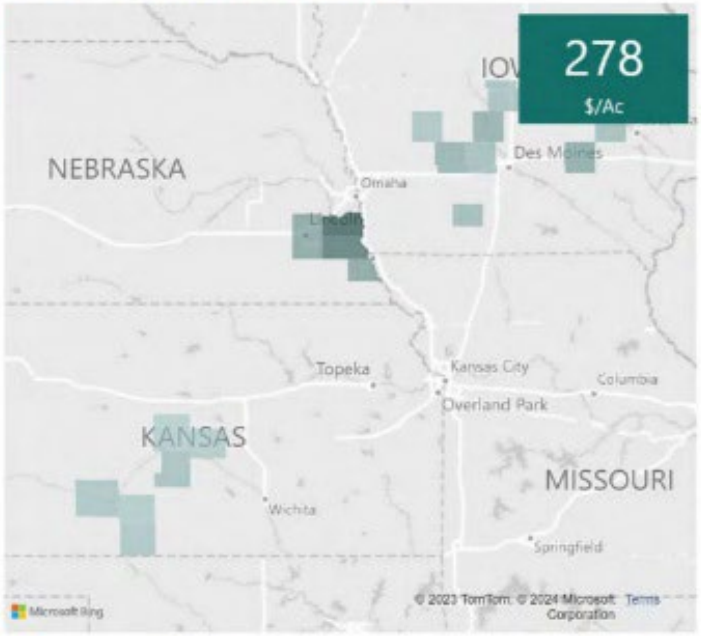
PROFIT ESTIMATE BY COUNTY



$/Ac	Avg Acres	Treatment
234	2234	Check
278	2055	Trial

Trial

PROFIT ESTIMATE BY COUNTY



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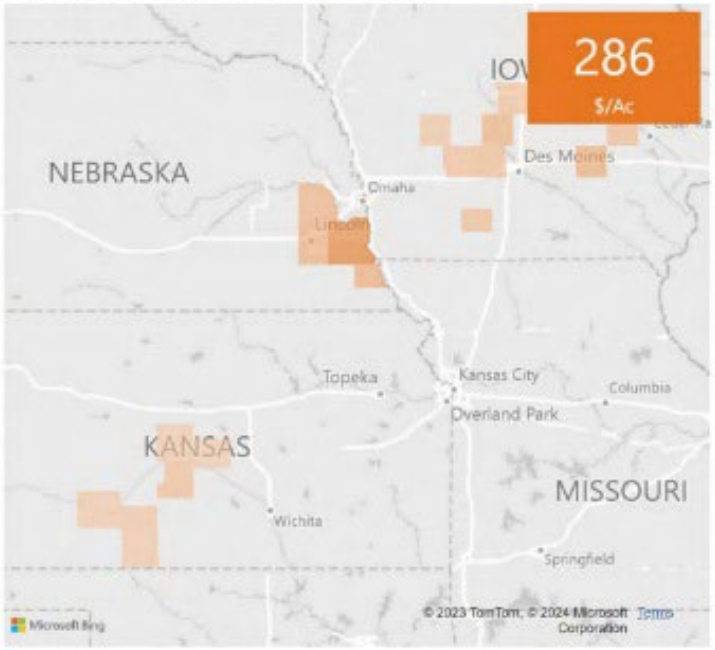
National CIG

Nutrient Zone Management

TRUTERRA **2021-2023 PROFIT PERFORMANCE ESTIMATE** Average $ / Acre

Check

PROFIT ESTIMATE BY COUNTY

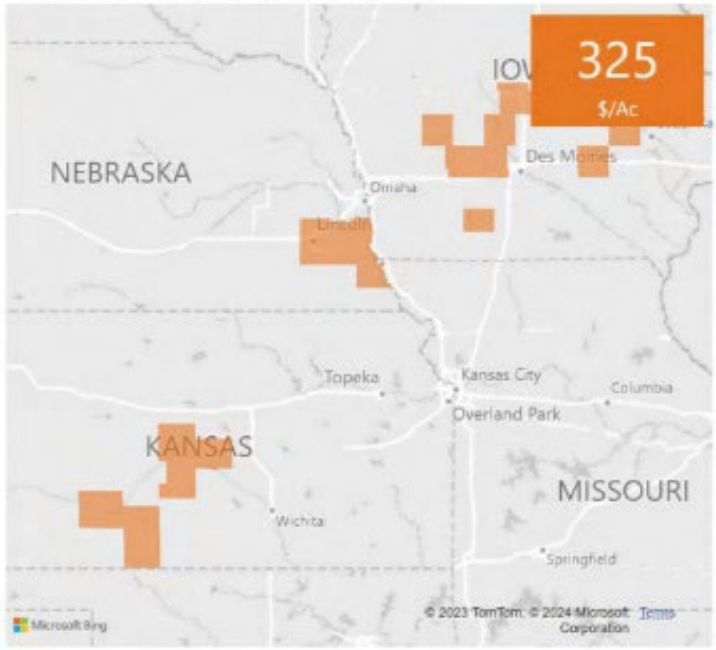


CORN & SOYBEANS

$/Ac	Avg Acres	Treatment
286	1851	Check
325	1710	Trial

Trial

PROFIT ESTIMATE BY COUNTY



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National CIG

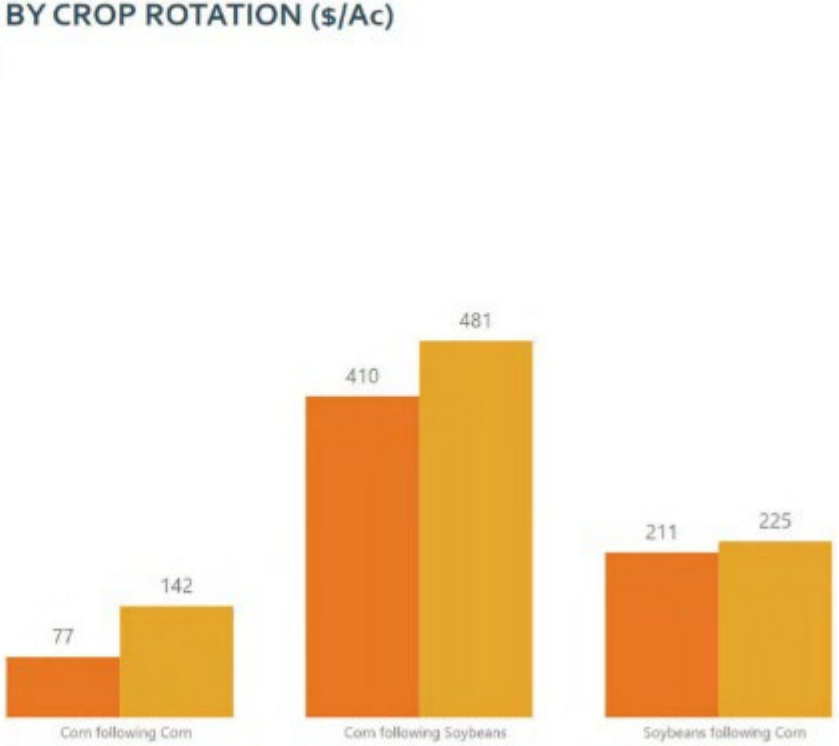
Nutrient Zone Management

TRUTERRA 2021-2023 CROP ROTATION - PROFIT

Check

Trial

Previous Current Crop	# of Fields	Profit ($/Ac)
Corn following Corn	6	142
Corn following Soybeans	33	481
Soybeans following Corn	22	225



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National CIG

Nutrient Zone Management

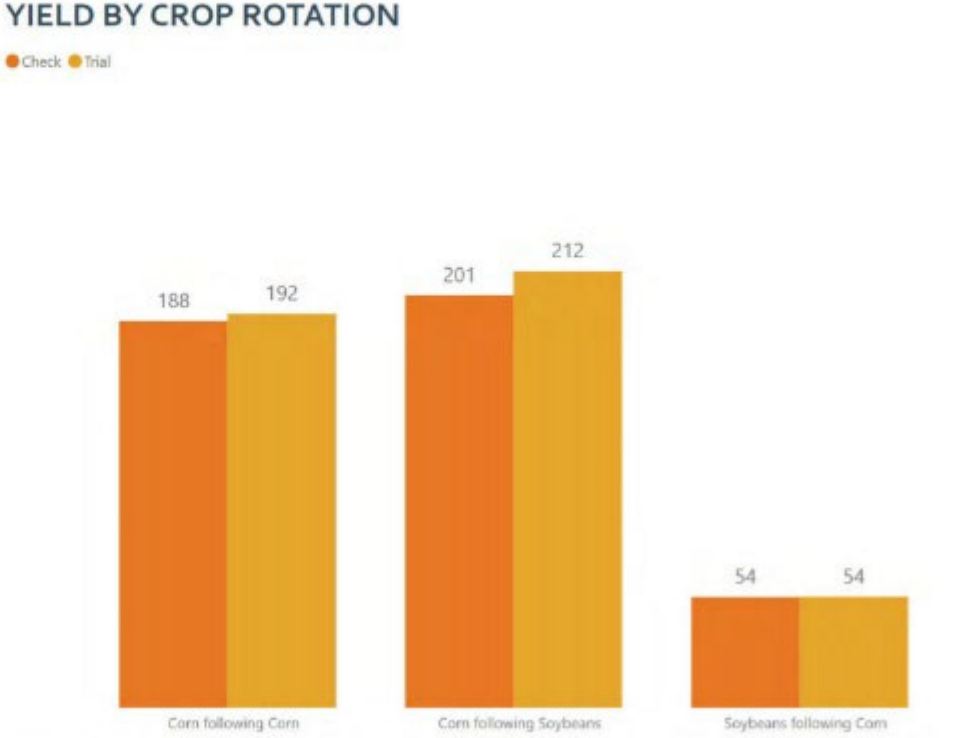
TRUTERRA 2021-2023 CROP ROTATION - YIELD

Check

Previous - Current Crop	# of Fields	Yield (bu/ac)
Corn following Corn	8	188
Corn following Soybeans	33	201
Soybeans following Corn	22	54

Trial

Previous - Current Crop	# of Fields	Yield (bu/ac)
Corn following Corn	6	192
Corn following Soybeans	33	212
Soybeans following Corn	22	54



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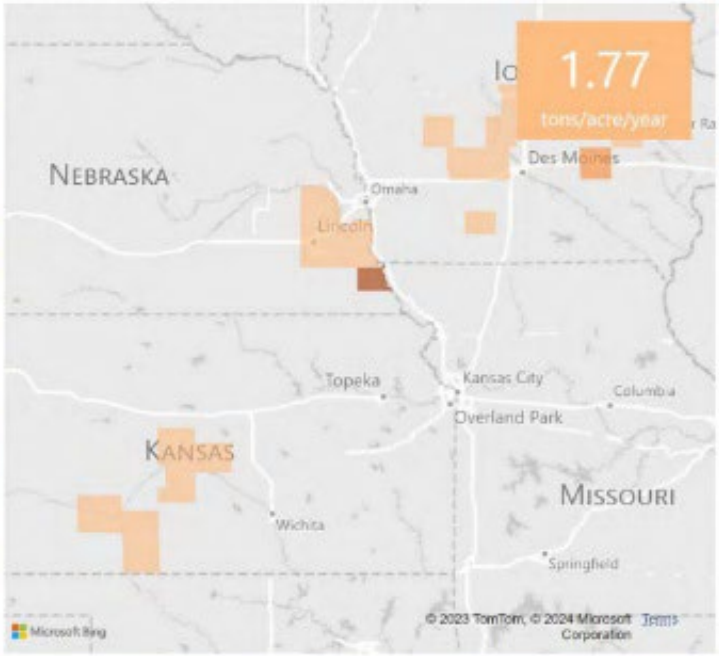
National CIG

Nutrient Zone Management

TRUTERRA **2021-2023** **SHEET & RILL EROSION** tons / acre.year

Check

AVERAGE EROSION



KPI	Avg Acres	Treatment
1.77	2234	Check
1.63	2055	Trial

LOW: < 3

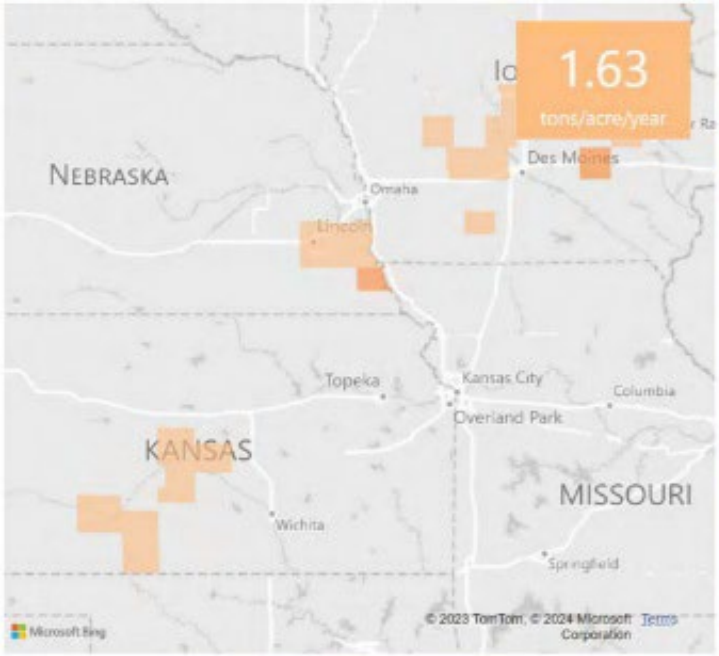
MODERATE: >= 3

HIGH: >= 7

SEVERE: >= 10

Trial

AVERAGE EROSION



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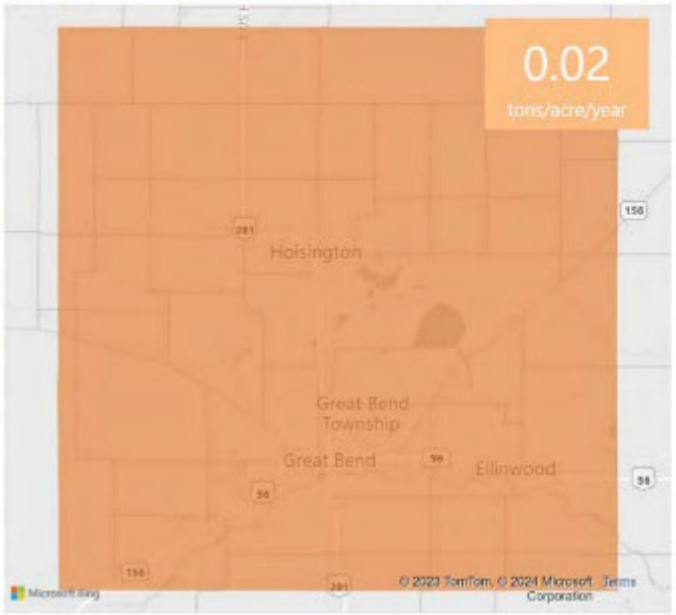
National CIG

Nutrient Zone Management

TRUTERRA **2021-2023 WIND EROSION** tons / acre.year

Check

AVERAGE PREDOMINANT EROSION



KPI	Avg Acres	Treatment
0.02	2234	Check
0.00	2055	Trial

LOW: < 3

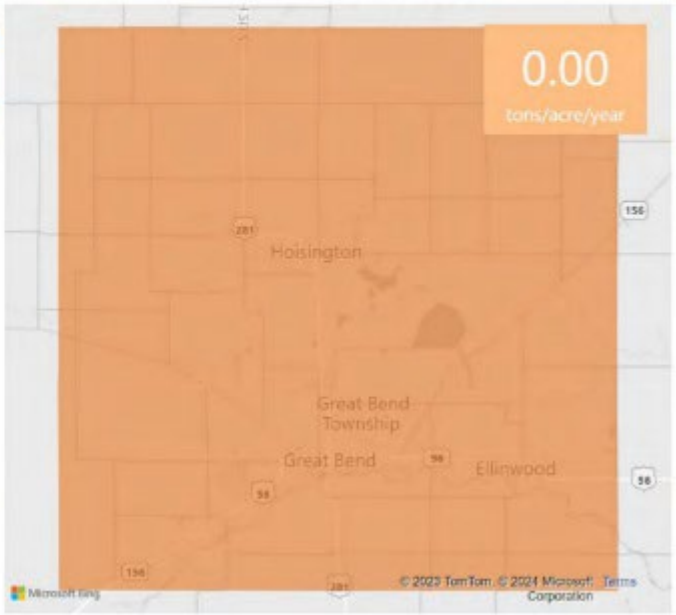
MODERATE: >= 3

HIGH: >= 7

SEVERE: >= 10

Trial

AVERAGE PREDOMINANT EROSION



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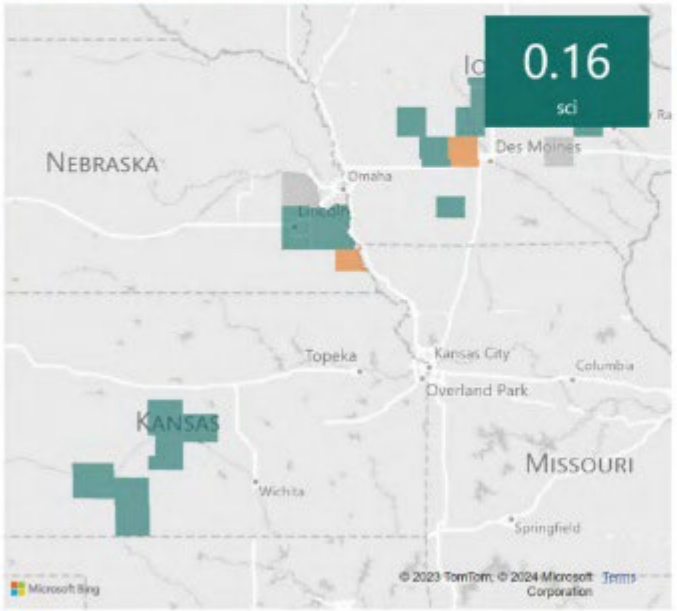
National CIG

Nutrient Zone Management

TRUTERRA **2021-2023 SOIL QUALITY TREND** soil conditioning index

Check

AVERAGE SCI BY COUNTY



SCI	Avg Acres	Treatment
0.16	2234	Check
0.13	2055	Trial

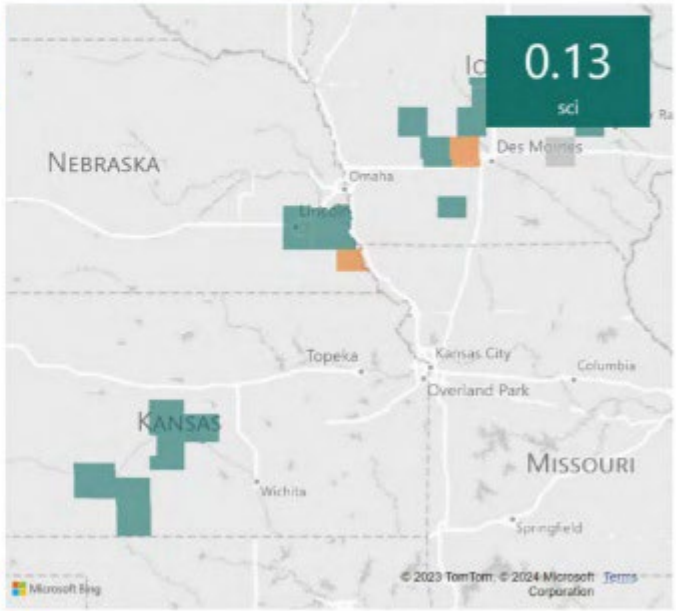
IMPROVING
>= 0.05

MAINTAINING
> -0.05 AND < 0.05

DECLINING
<= -0.05

Trial

AVERAGE SCI BY COUNTY



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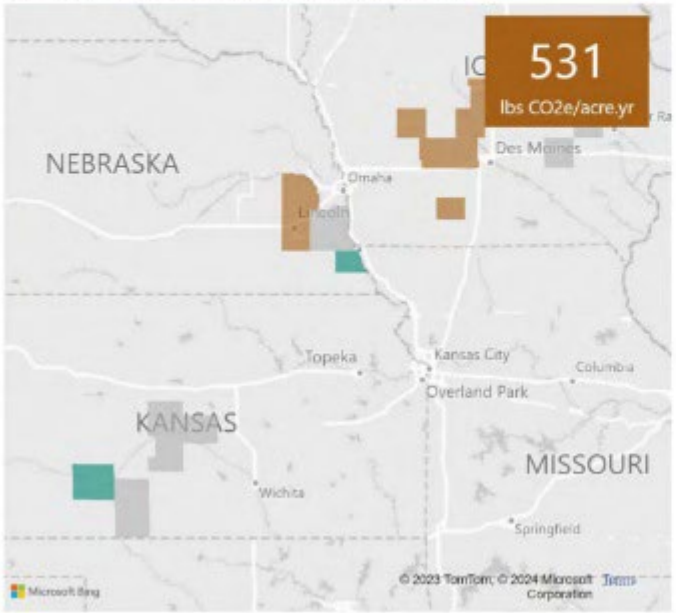
National CIG

Nutrient Zone Management

TRUTERRA **2021-2023 NET GHG EMISSIONS** lbs CO2e / acre.year

Check

AVERAGE EMISSIONS BY COUNTY



GHG	Avg Acres	Treatment
531	2234	Check
772	2055	Trial

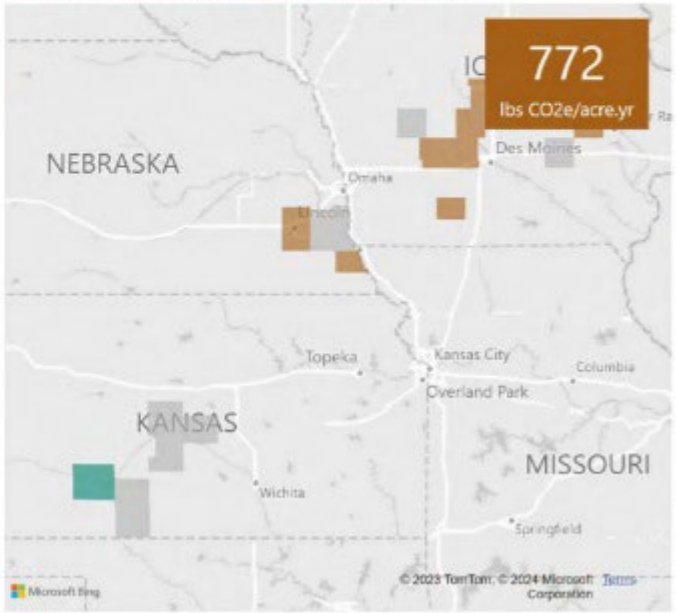
CAPTURING GHG
<= -500

NEUTRAL
> -500 AND < 500

EMITTING GHG
>= 500

Trial

AVERAGE EMISSIONS BY COUNTY



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National CIG

TRUTERRA **2021-2023 KPI SCORING**

Check

KPI SUMMARY

Acres	2234
Farmers	27
Truterra Sustainability Score	48
Cover Crops %	6%
Corn Nitrogen Use Efficiency	1.45
Wheat Nitrogen Use Efficiency	3.89
Conservation Practices - Season Fields	31
Sheet/Rill Erosion (tons/ac.yr)	1.77
Wind Erosion (tons/ac.yr)	0.02
Greenhouse Gas (lbs/ac.yr)	531
Soil Quality Index	0.16

Trial

KPI SUMMARY

Acres	2055
Farmers	27
Truterra Insights Score	47
Cover Crops %	3%
Corn Nitrogen Use Efficiency	1.48
Wheat Nitrogen Use Efficiency	2.44
Conservation Practices - Season Fields	27
Sheet/Rill Erosion (tons/ac.yr)	1.63
Wind Erosion (tons/ac.yr)	0.00
Greenhouse Gas (lbs/ac.yr)	772
Soil Quality Index	0.13

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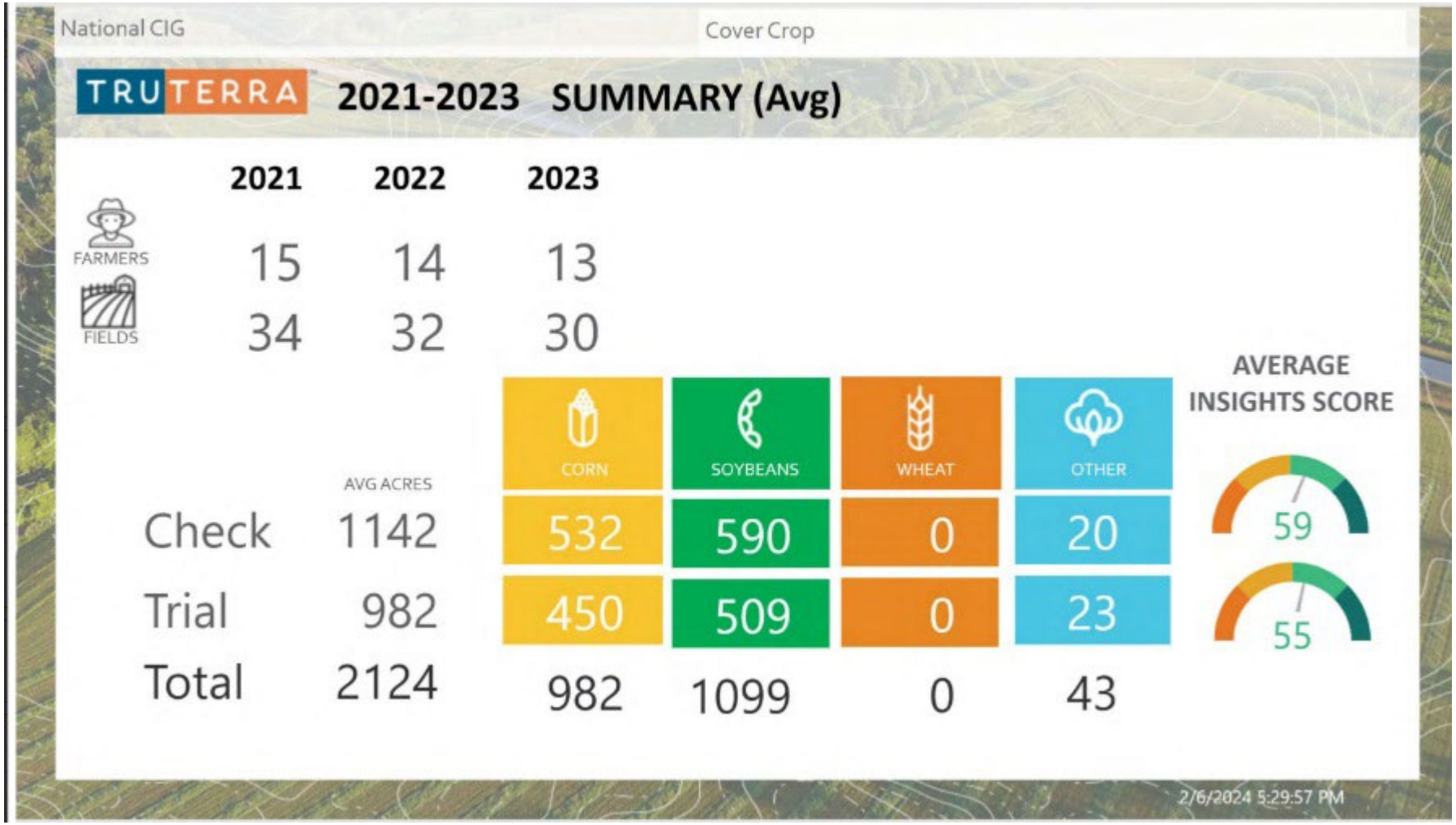
Truterra Check Trial YOY 3-0 PD

Last data refresh:
2/6/2024 5:31:15 PM UTC


National CIG
Cover Crop
TRUTERRA
2021-2023 SUMMARY (Avg)
2021
2022
2023
FARMERS
15
14
13
FIELDS
34
32
30
AVG ACRES
CORN
SOYBEANS
WHEAT
OTHER
Check
1142
532
590
0
20
Trial
982
450
509
0
23
Total
2124
982
1099
0
43
AVERAGE INSIGHTS SCORE
59
55
2/6/2024 5:29:57 PM

National CIG

Cover Crop

TRUTERRA **2021-2023 GEOGRAPHIC OVERVIEW**

Check

ACRES BY COUNTY

Trial

ACRES BY COUNTY

County, State	Check	Trial
Butler County Nebraska	29	23
Dallas County Iowa	75	84
Guthrie County Iowa	219	80
Harrison County Iowa	49	47
Iowa County Iowa	84	78
Kiowa County Kansas	123	130
Lancaster County Nebraska	199	146
Otoe County Nebraska	70	76
Saunders County Nebraska	229	240
Union County Iowa	65	78

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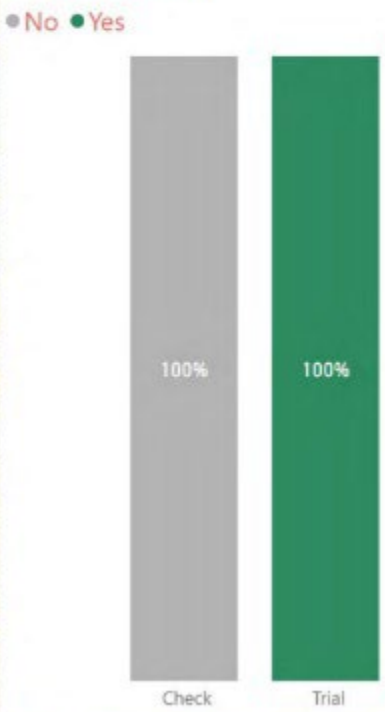
National CIG

Cover Crop

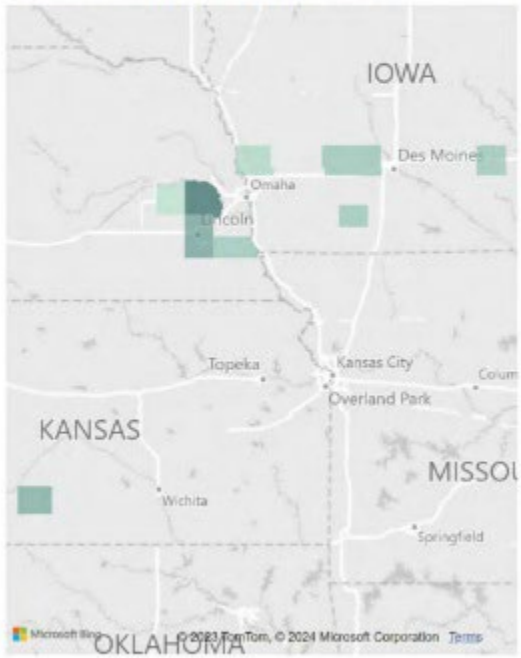
TRUTERRA

2021-2023 COVER CROPS (Avg)

COVER CROPS



ACRES USING COVER CROPS



County & State	Check	Trial
Butler County Nebraska	0	23
Dallas County Iowa	0	84
Guthrie County Iowa	0	80
Harrison County Iowa	0	47
Iowa County Iowa	0	78
Kiowa County Kansas	0	130
Lancaster County Nebraska	0	146
Otoe County Nebraska	0	76
Saunders County Nebraska	0	240
Union County Iowa	0	78
Total	**0**	**982**

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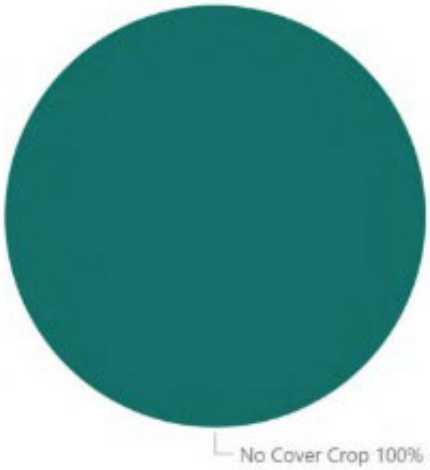
National CIG

Cover Crop

TRUTERRA

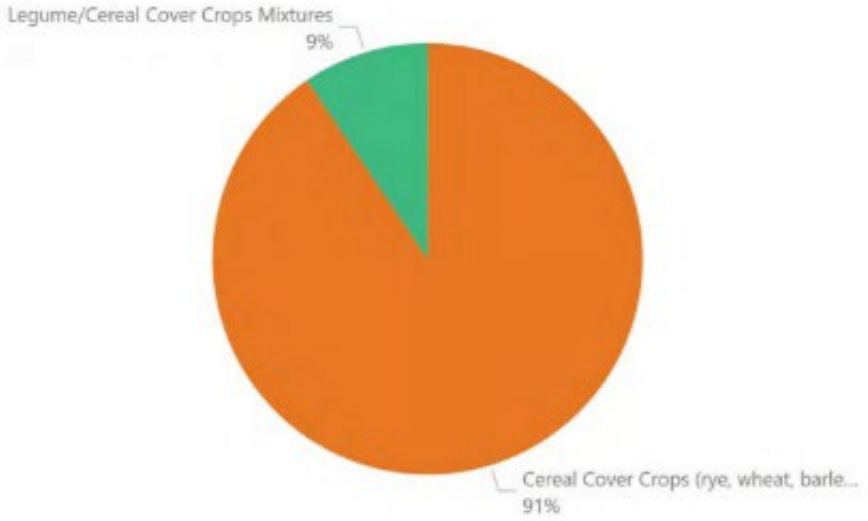
2021-2023 COVER CROP TYPE

Check



0
Avg Acres

Trial



982
Avg Acres

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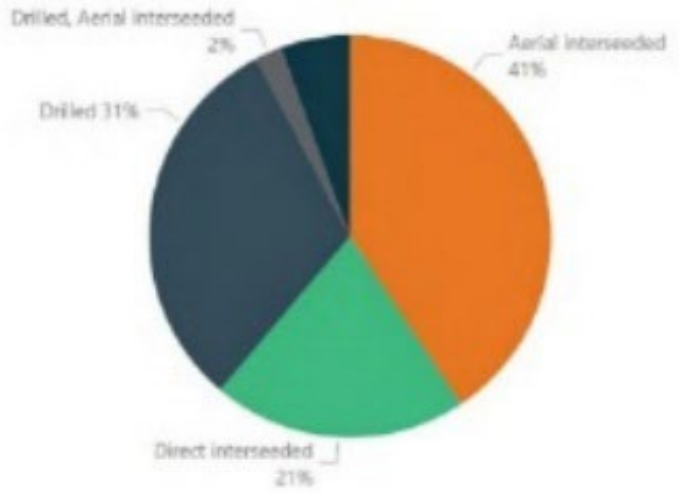
TRUTERRA

2021-2023 COVER CROPS PLANTING METHOD (Avg)

Check

0
Avg Acres

Trial



982
Avg Acres

National CIG

Cover Crop

TRUTERRA **2021-2023 TILLAGE**

Check

% ACRES BY SPECIFIC TILLAGE MANAGEMENT TYPE

Trial

% ACRES BY SPECIFIC TILLAGE MANAGEMENT TYPE

2/6/2024 5:29:57 PM


National CIG
Cover Crop
TRUTERRA
2021-2023 NUTRIENT MANAGEMENT
NUTRIENT MANAGEMENT PLAN
A plan used to guide the application of fertilizers, developed by an agronomist, crop consultant, or conservation planner (in 2021, vs 2020)
Check
Trial
64%
66%
OF ACRES USE A NUTRIENT PLAN
NUTRIENT MODELING TOOLS
Applicable nutrient models include; Field Forecasting Tool®, Climate®, AdaptN®, Encirca®
Check
Trial
23%
21%
OF ACRES USE NUTRIENT MODELING TOOLS
IN-SEASON SAMPLING METHODS
Sampling methods used for decision making and monitoring (e.g. Soil Nitrate, Stalk Nitrate, Tissue Sampling)
Check
Trial
39%
44%
OF ACRES USE SAMPLING METHODS
In-Season Sampling Used
Check
Trial
Tissue sampling
39%
44%
No sampling method
61%
56%
VARIABLE RATE TECHNOLOGY
Applying the primary nutrient source for N, P, or K using variable rate technology
Check
Trial
83%
83%
OF ACRES USE VARIABLE RATE TECHNOLOGY
SOIL SAMPLING
Have conducted soil sampling / soil testing on the field
Check
Trial
59%
67%
OF ACRES USE SOIL SAMPLING
81%
91%
OF ACRES USE ZONE OR GRID SAMPLING
2/6/2024 5:29:57 PM

National CIG

Cover Crop

TRUTERRA 2021-2023 FERTILIZER

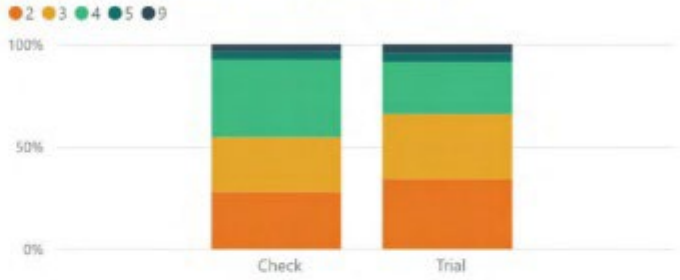
IN-SEASON APPLICATIONS - CORN

Check	Trial
86%	78%
OF ACRES APPLIED IN-SEASON	

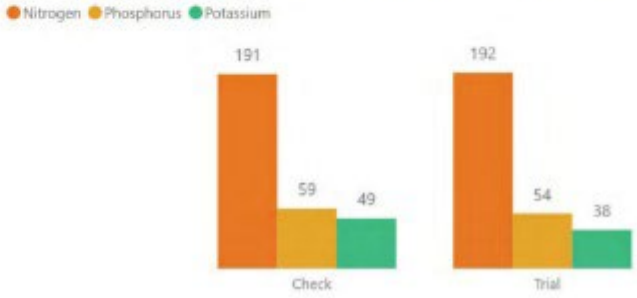
COMMERCIAL FERTILIZER APPLICATION METHOD BY PASS

Application Method	Check	Trial
Fertigation	7%	7%
Surface Band	12%	12%
Injected/Sub-Surface Band	28%	28%
Broadcast (ground or air)	53%	53%

WHEAT & CORN - # OF N APPLICATIONS



AVG FERTILIZER APPLICATION (LBS/ACRE) - CORN



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National CIG

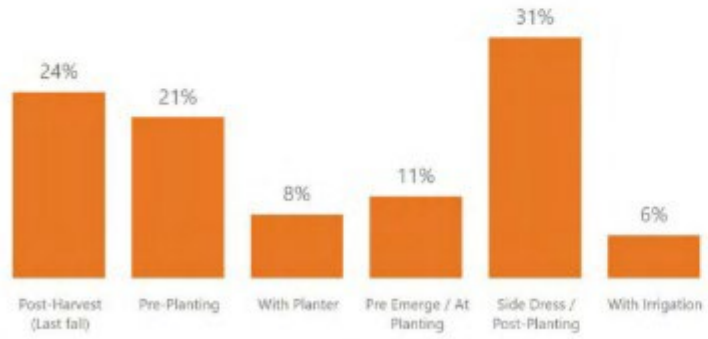
Cover Crop

TRUTERRA

2021-2023 NUTRIENT APPLICATION TIMING - CORN

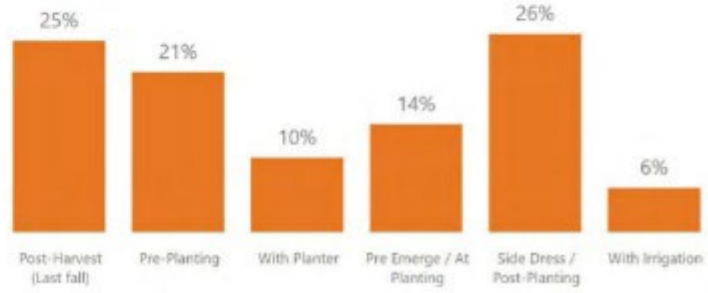
Check

% OF N APPLIED BY TIMING



Trial

% OF N APPLIED BY TIMING



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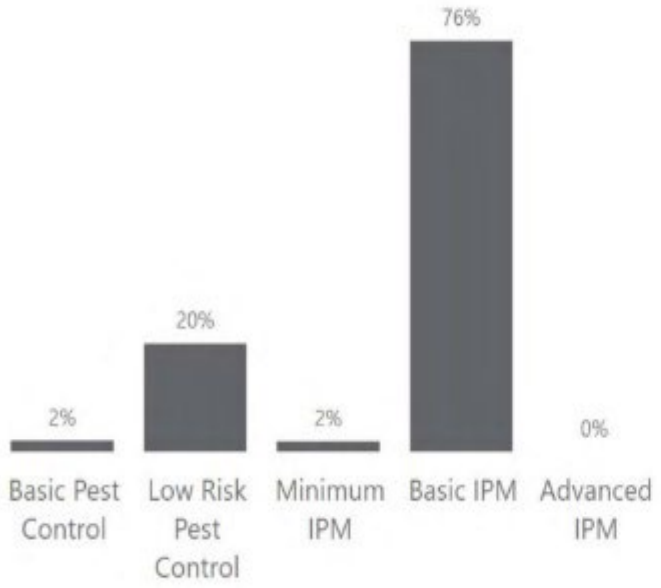
National CIG Cover Crop

TRUTERRA **2021-2023 PEST MANAGEMENT**

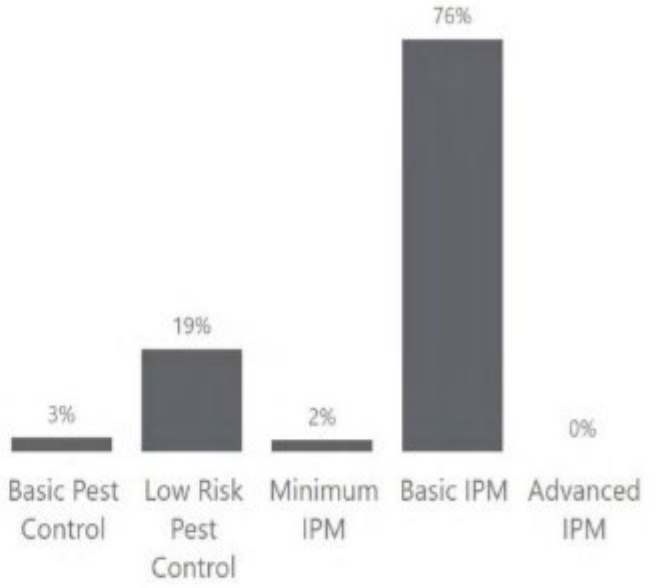
Check

% OF ACRES BY SPECIFIC PEST MANAGEMENT TYPE



Trial

% OF ACRES BY SPECIFIC PEST MANAGEMENT TYPE



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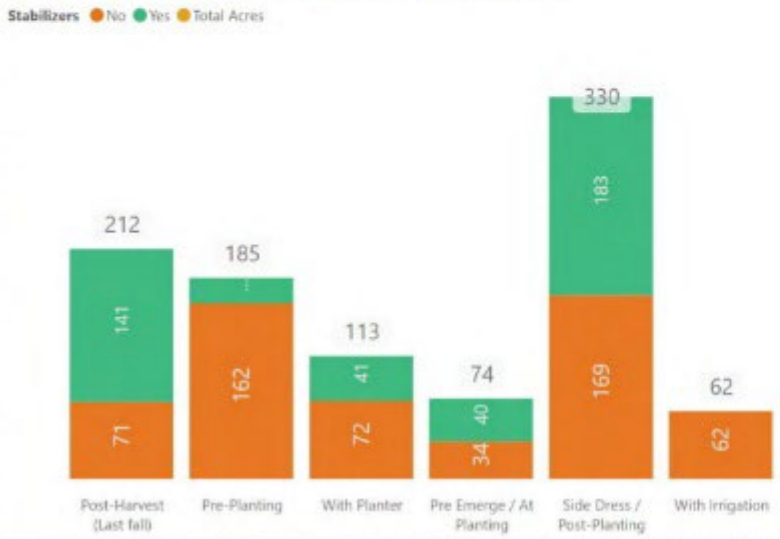
National CIG | Cover Crop

TRUTERRA **2021-2023 STABILIZERS USE WITH COMMERCIAL NITROGEN - CORN**

Check

56% Acres with Commercial Fertilizer and Stabilizers

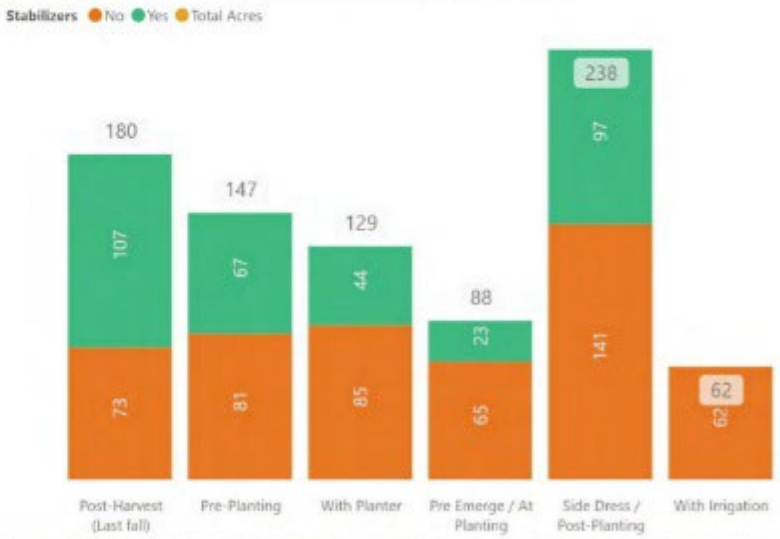
APPLICATION TIMING (% of total acres)



Trial

49% Acres with Commercial Fertilizer and Stabilizers

APPLICATION TIMING (% of total acres)



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National CIG

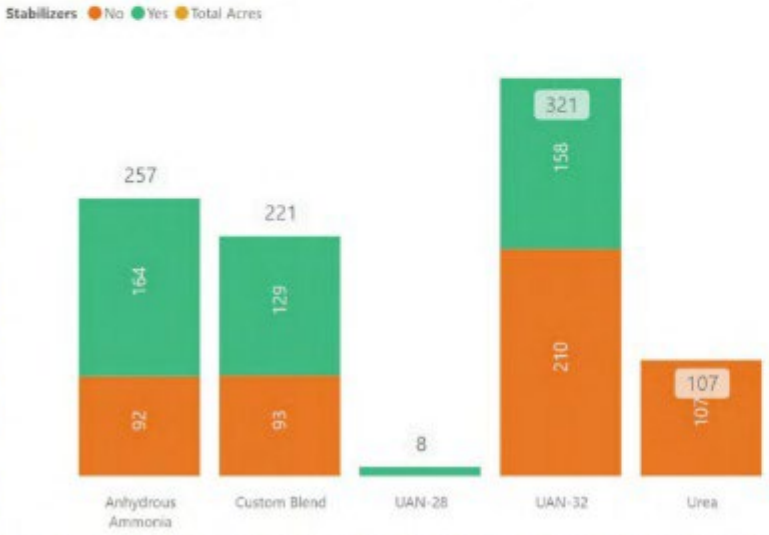
Cover Crop

TRUTERRA **2021-2023 STABILIZERS USE WITH COMMERCIAL NITROGEN - CORN**

Check

56% Acres with Commercial Fertilizer and Stabilizers

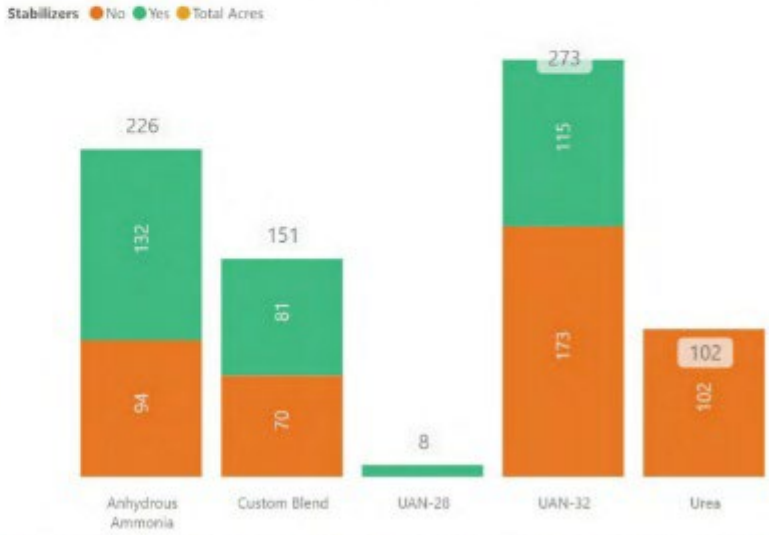
NITROGEN SOURCE (% of total acres)



Trial

49% Acres with Commercial Fertilizer and Stabilizers

NITROGEN SOURCE (% of total acres)



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National CIG
Cover Crop
TRUTERRA
2021-2023 STABILIZERS USE WITH COMMERCIAL NITROGEN - WHEAT
Check
0%
Acres with Commercial Fertilizer and Stabilizers
APPLICATION TIMING (% of total acres)
Trial
0%
Acres with Commercial Fertilizer and Stabilizers
APPLICATION TIMING (% of total acres)
2/6/2024 5:29:57 PM


National CIG
Cover Crop
TRUTERRA
2021-2023 STABILIZERS USE WITH COMMERCIAL NITROGEN - WHEAT
Check
0%
Acres with Commercial Fertilizer and Stabilizers
NITROGEN SOURCE (% of total acres)
Trial
0%
Acres with Commercial Fertilizer and Stabilizers
NITROGEN SOURCE (% of total acres)
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National CIG | Cover Crop

TRUTERRA 2021-2023 CONSERVATION PRACTICES (Total)

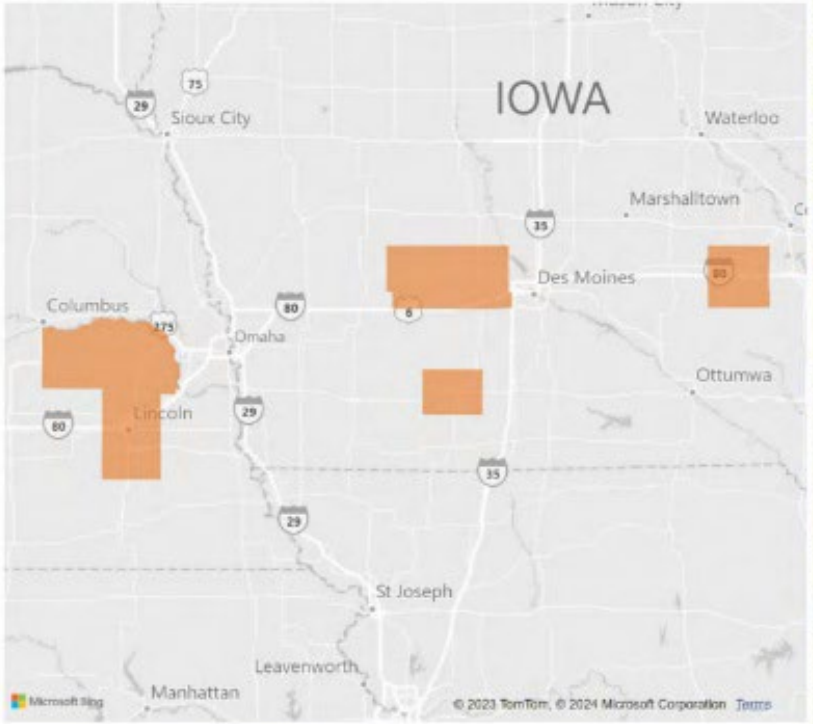
Check	Trial
29	24

FIELDS WITH CONSERVATION PRACTICES

PRACTICE USAGE (BY COUNT AND % OF FIELDS)

ByProduct Category Practice	Check Count	 % of Fields	Trial Count	 % of Fields
Amending Soil Properties with Gypsum Products	2	17%	1	5%
Conservation Cover	2	4%		
Contour Farming	2	20%	2	20%
Field Border	3	12%		
Grassed Waterway	2	43%	2	18%
Sediment Basin	3	21%	2	6%
Terrace	2	36%	2	21%
Total	**2**	**62%**	**2**	**38%**

PRACTICES IN USE BY COUNTY



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National CIG

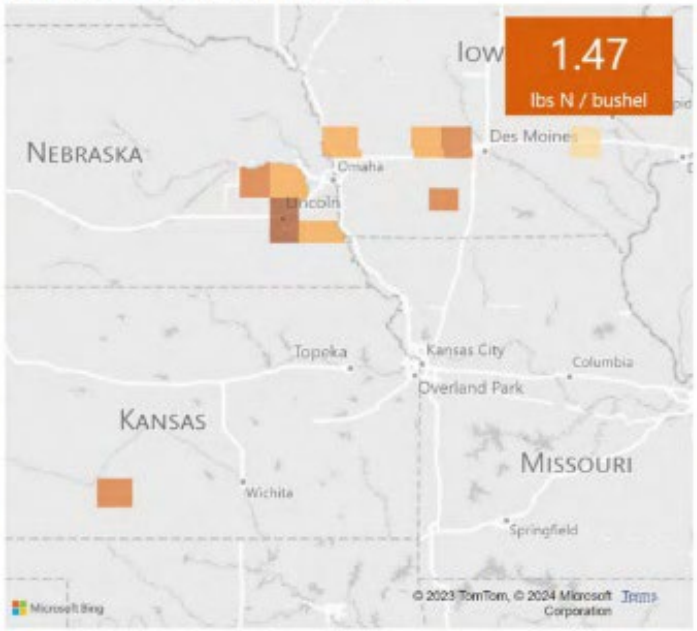
Cover Crop

TRUTERRA

2021-2023 NITROGEN USE EFFICIENCY lbs N / bushel

Check

AVERAGE NUE BY COUNTY



CORN

NUE	Avg Acres	Treatment
1.47	532	Check
1.47	450	Trial

ADVANCED: <= 1.0

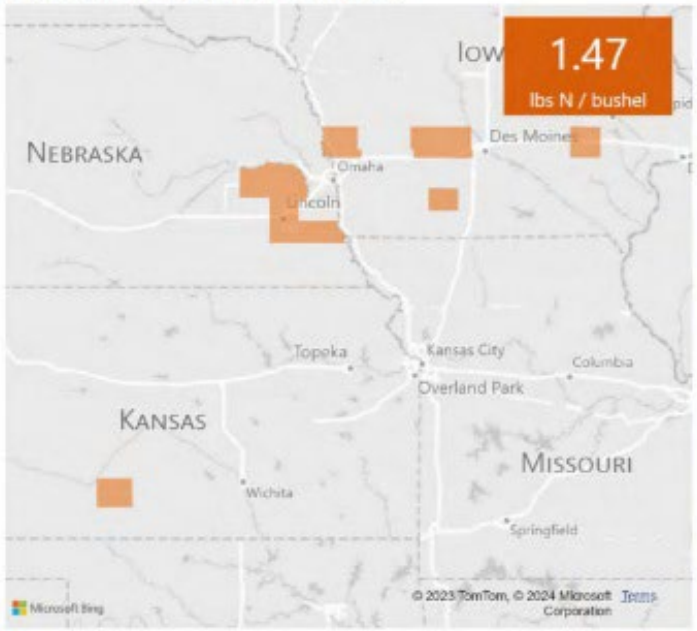
HIGH: > 1.0

MODERATE: > 1.4

BASIC: > 1.8

Trial

AVERAGE NUE BY COUNTY



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National CIG

Cover Crop

TRUTERRA

2021-2023 NITROGEN USE EFFICIENCY lbs N / bushel

Check

AVERAGE NUE BY COUNTY

WHEAT

NUE	Avg Acres	Treatment
	0	Check
	0	Trial

ADVANCED: <= 1.0

HIGH: > 1.0

MODERATE: > 1.4

BASIC: > 1.8

Trial

AVERAGE NUE BY COUNTY

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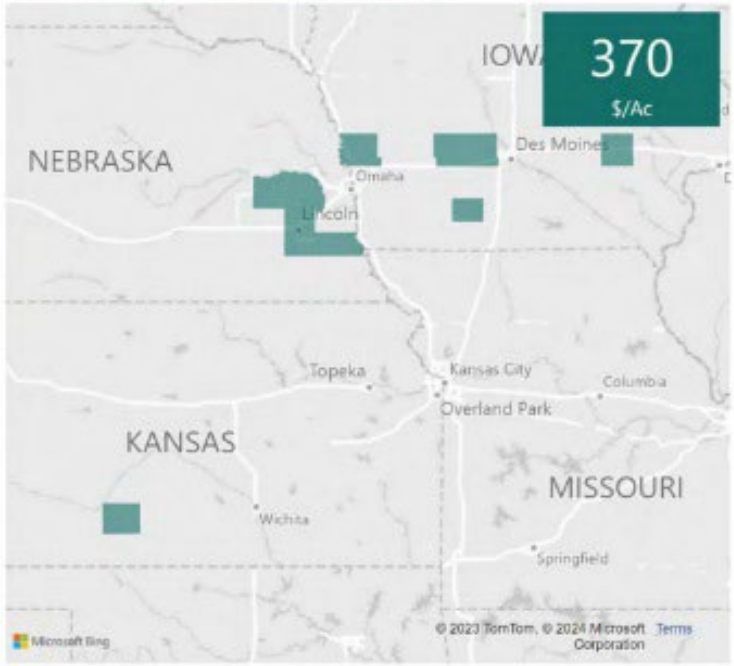
National CIG

Cover Crop

TRUTERRA **2021-2023 PROFIT PERFORMANCE ESTIMATE** Average $ / Acre

Check

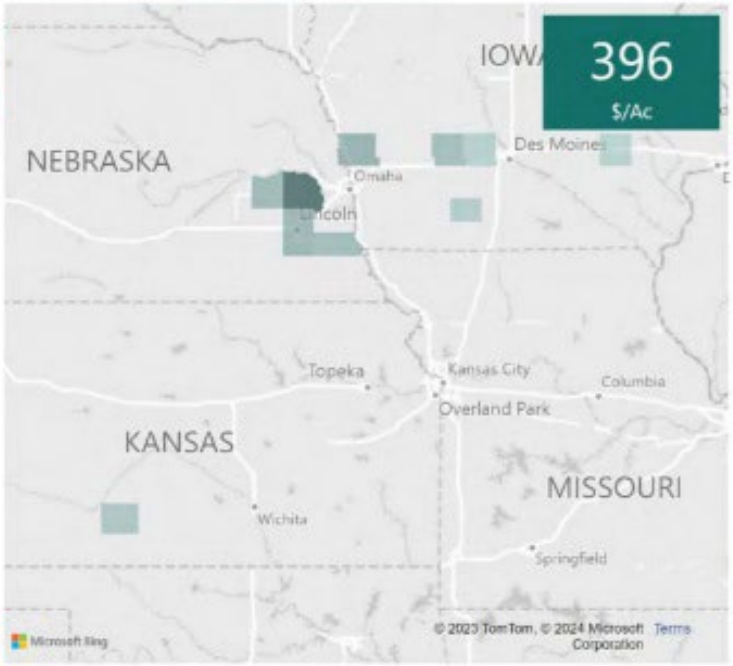
PROFIT ESTIMATE BY COUNTY



$/Ac	Avg Acres	Treatment
370	1142	Check
396	982	Trial

Trial

PROFIT ESTIMATE BY COUNTY



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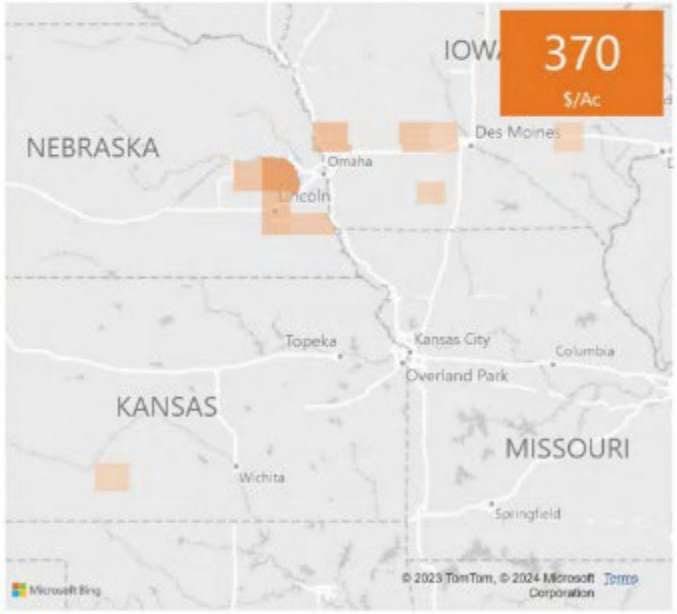
National CIG

Cover Crop

TRUTERRA **2021-2023 PROFIT PERFORMANCE ESTIMATE** Average $ / Acre

Check

PROFIT ESTIMATE BY COUNTY

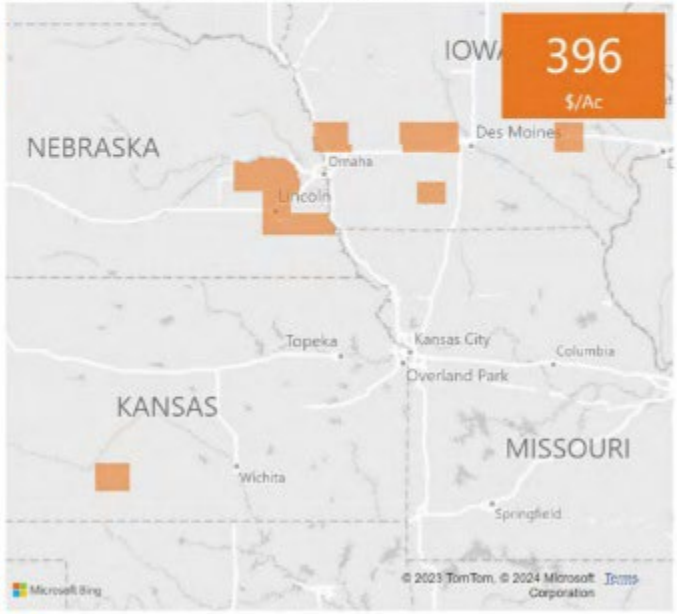


CORN & SOYBEANS

$/Ac	Avg Acres	Treatment
370	1122	Check
396	959	Trial

Trial

PROFIT ESTIMATE BY COUNTY



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National CIG

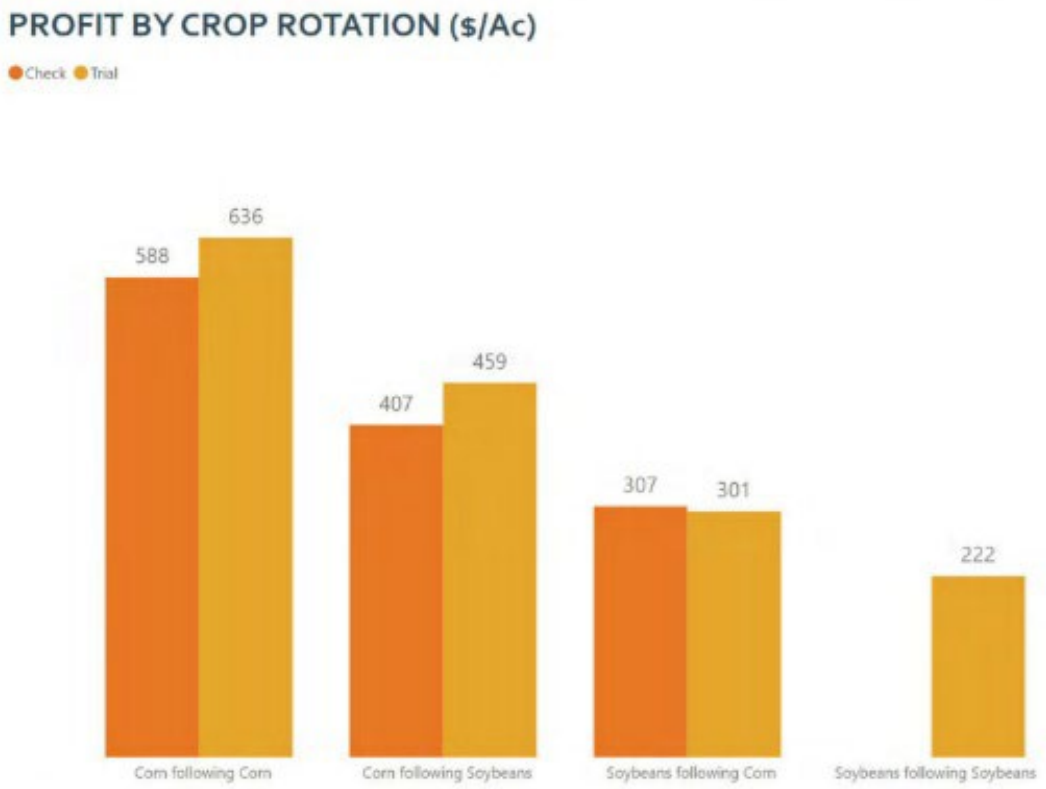
Cover Crop

TRUTERRA 2021-2023 CROP ROTATION - PROFIT

Check

Trial

Previous Current Crop	# of Fields	Profit ($/Ac)
Corn following Corn	6	636
Corn following Soybeans	16	459
Soybeans following Corn	21	301
Soybeans following Soybeans	2	222



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National CIG

Cover Crop

TRUTERRA 2021-2023

CROP ROTATION - YIELD

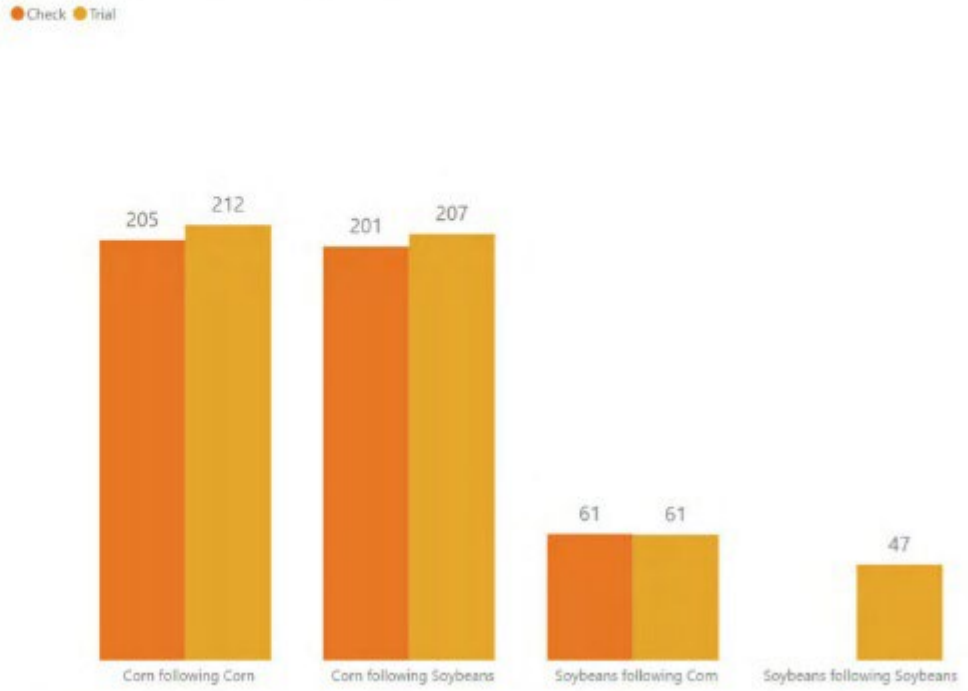
Check

Previous - Current Crop	# of Fields	Yield (bu/ac)
Corn following Corn	6	205
Corn following Soybeans	16	201
Soybeans following Corn	19	61

Trial

Previous - Current Crop	# of Fields	Yield (bu/ac)
Corn following Corn	6	212
Corn following Soybeans	16	207
Soybeans following Corn	21	61
Soybeans following Soybeans	2	47

YIELD BY CROP ROTATION



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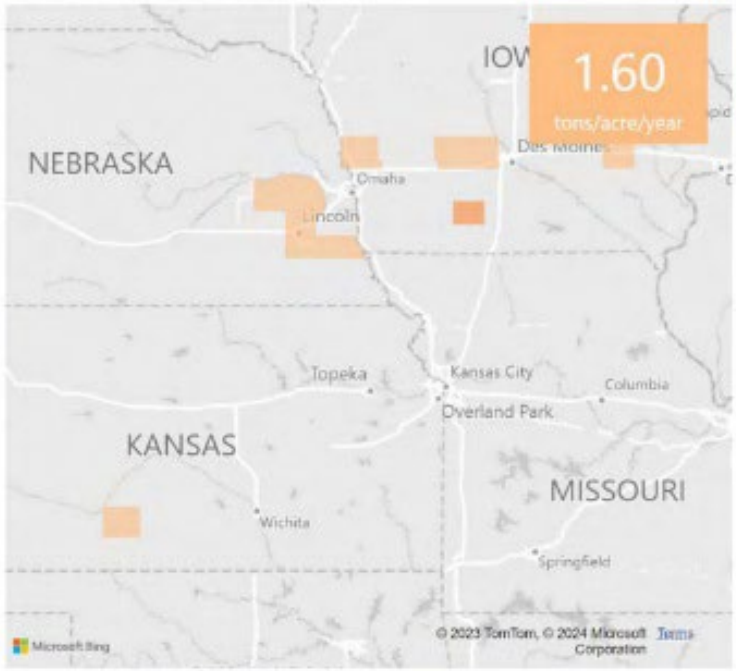
National CIG

Cover Crop

TRUTERRA **2021-2023** **SHEET & RILL EROSION** tons / acre.year

Check

AVERAGE EROSION



KPI	Avg Acres	Treatment
1.60	1142	Check
1.40	982	Trial

LOW: < 3

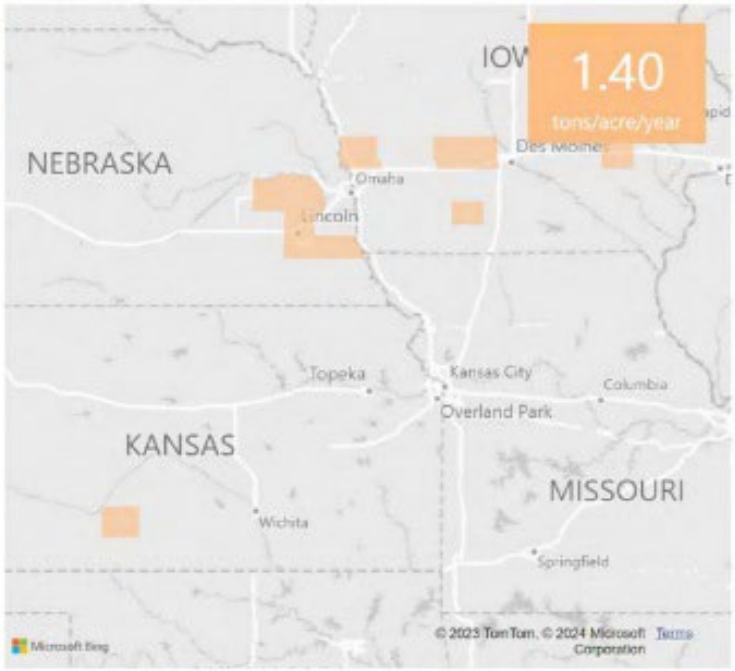
MODERATE: >= 3

HIGH: >= 7

SEVERE: >= 10

Trial

AVERAGE EROSION



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National CIG

Cover Crop

TRUTERRA **2021-2023 WIND EROSION** tons / acre.year

Check

AVERAGE PREDOMINANT EROSION

KPI	Avg Acres	Treatment
0.00	1142	Check
0.00	982	Trial

LOW: < 3

MODERATE: >= 3

HIGH: >= 7

SEVERE: >= 10

Trial

AVERAGE PREDOMINANT EROSION

2/6/2024 5:29:57 PM

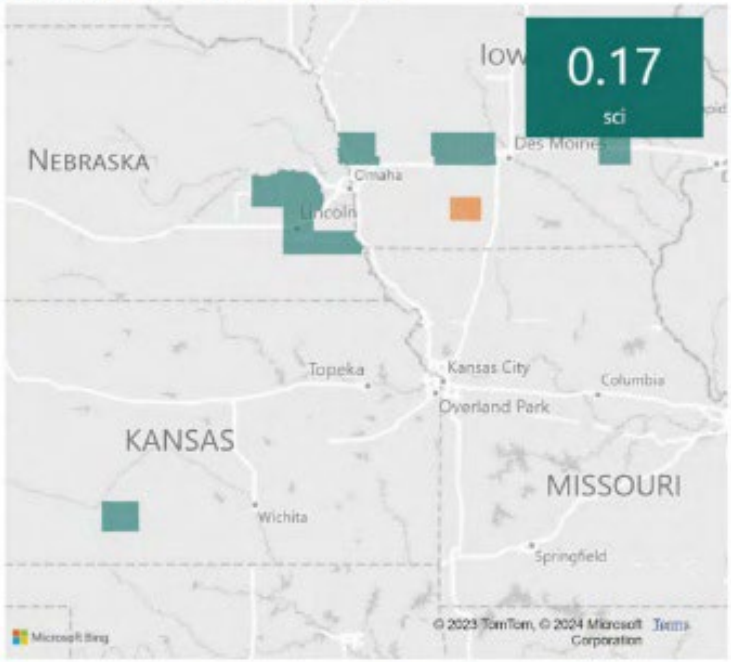
National CIG

Cover Crop

TRUTERRA **2021-2023 SOIL QUALITY TREND** soil conditioning index

Check

AVERAGE SCI BY COUNTY



SCI	Avg Acres	Treatment
0.17	1142	Check
0.19	982	Trial

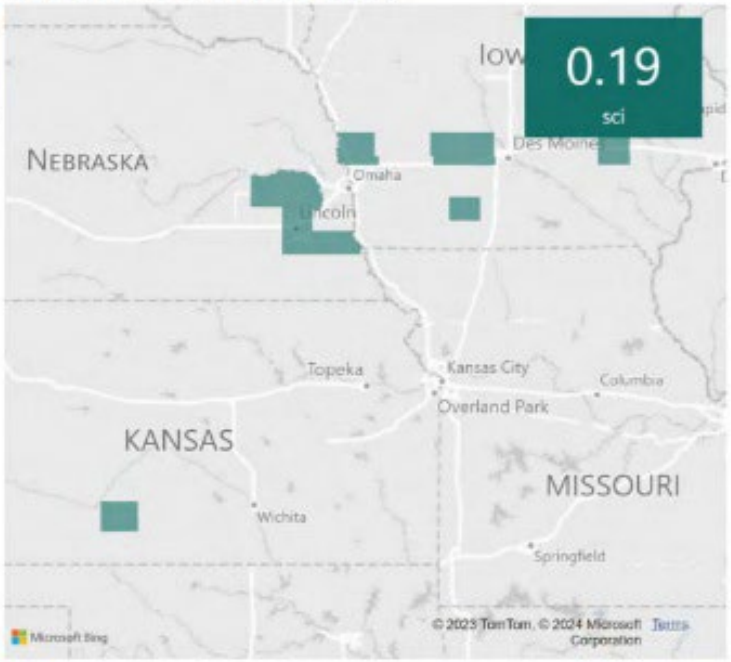
IMPROVING
>= 0.05

MAINTAINING
> -0.05 AND < 0.05

DECLINING
<= -0.05

Trial

AVERAGE SCI BY COUNTY



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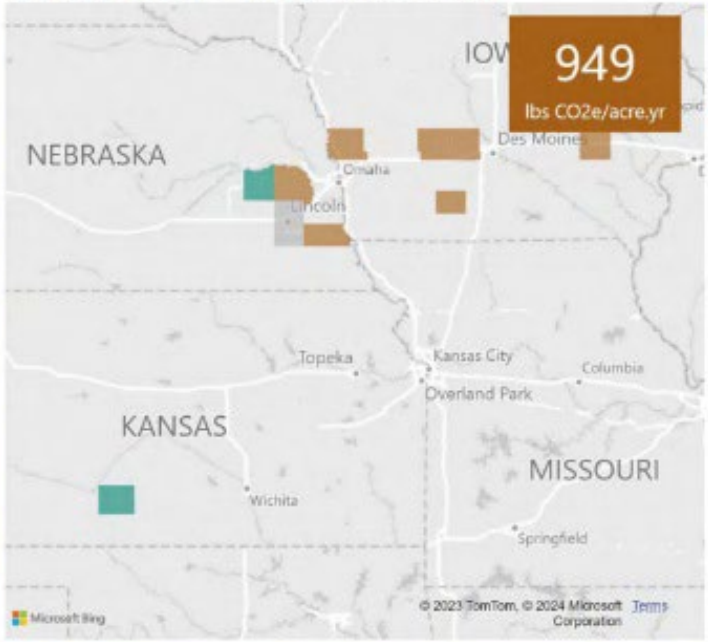
National CIG

Cover Crop

TRUTERRA **2021-2023 NET GHG EMISSIONS** lbs CO2e / acre.year

Check

AVERAGE EMISSIONS BY COUNTY



GHG	Avg Acres	Treatment
949	1142	Check
622	982	Trial

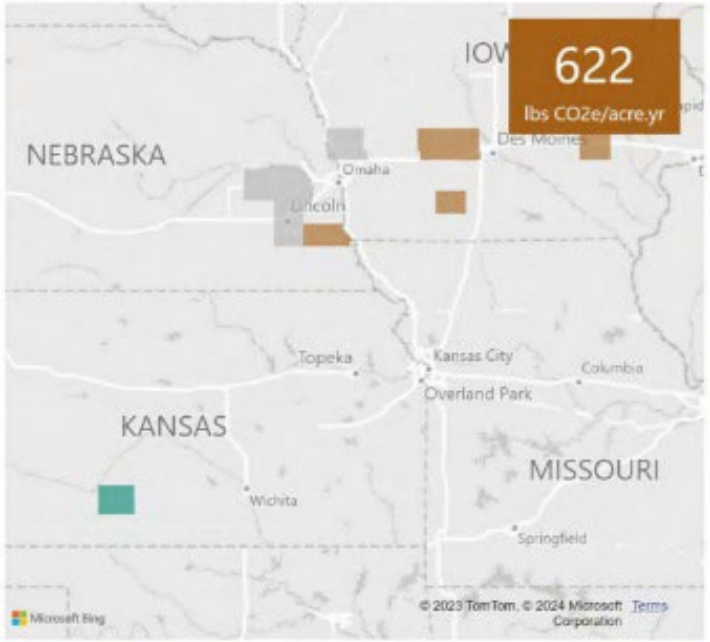
CAPTURING GHG
<= -500

NEUTRAL
> -500 AND < 500

EMITTING GHG
>= 500

Trial

AVERAGE EMISSIONS BY COUNTY



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National CIG
TRUTERRA 2021-2023 KPI SCORING
Check
KPI SUMMARY
Acres 1142
Farmers 15
Truterra Sustainability Score 59
Cover Crops % 0%
Corn Nitrogen Use Efficiency 1.47
Wheat Nitrogen Use Efficiency
Conservation Practices - Season Fields 29
Sheet/Rill Erosion (tons/ac.yr) 1.60
Wind Erosion (tons/ac.yr) 0.00
Greenhouse Gas (lbs/ac.yr) 949
Soil Quality Index 0.17
Trial
KPI SUMMARY
Acres 982
Farmers 15
Truterra Insights Score 55
Cover Crops % 100%
Corn Nitrogen Use Efficiency 1.47
Wheat Nitrogen Use Efficiency
Conservation Practices - Season Fields 24
Sheet/Rill Erosion (tons/ac.yr) 1.40
Wind Erosion (tons/ac.yr) 0.00
Greenhouse Gas (lbs/ac.yr) 622
Soil Quality Index 0.19
2/6/2024 5:29:57 PM

Business Model Innovation

Grantee Name: Soil and Water Conservation Society

Project Title: Advancing Precision Nutrient and Soil Health Management with Retailer Cooperatives

Agreement Number: NR203A750013G019

Project Director: Claire Lindahl

Phone Number: 515-289-2331 (Office)

E-Mail: claire.lindahl@swcs.org

Acknowledgements

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Overview

In today's dynamic agri-business landscape, organizations are continually challenged to adapt, innovate, and differentiate themselves to stay competitive. Business model innovation, through which a company reimagines the ways in which it creates, delivers, and captures value, has emerged as a powerful approach to addressing market opportunities. The purpose of this research project was to explore the commercial experiences of agricultural retailers who participated in the above referenced grant program and analyze their collective results for emerging evidence of business innovation through the offering of conservation services.

Business model innovation often entails challenging existing assumptions and conventions to create novel approaches that better serve customer needs, exploit emerging technologies, and capitalize on shifting market dynamics. This process may involve reconfiguring value chains, leveraging new distribution channels, embracing new revenue sources, etc. Importantly, successful business model innovation often leads to disruptive changes that redefine industry paradigms and reshuffle competitive dynamics.

However, such innovation is not without its challenges. It requires organizations to overcome internal resistance, navigate regulatory constraints, and manage uncertainties associated with untested strategies. Furthermore, sustained change required learning, experimentation, and adaptation to evolving market conditions. For small organizations, or those running very lean, it can be difficult to maintain momentum as conditions change on the ground.

To evaluate the impact of the grant on organizing processes and business strategy, leaders of each participating group, conservation agronomists, and delivery partners were contacted for semi-structured interviews by an outside research firm. These discussions took place during the first quarter of 2024 both in-person and via Zoom. The protocol for the interviews followed the logic of the business model canvas tool to assess how businesses may have changed as a result of increased involvement in conservation offerings.

The report continues with an overview of trends in conservation agronomy among agricultural retailers in the Midwest. This is followed by four anonymized case profiles and the analysis for emerging trends where there were points of convergence in their experiences. The conclusion offers summary insights and considerations for future work.

Introduction

Agriculture today must navigate the critical balance between scaling food production for a growing global populace and the call for sustainable practices to protect vital soil ecosystem services like carbon sequestration, nutrient cycling, and water regulation. Conservation agronomists are vital in this endeavor, serving as the bridge between complex conservation principles and practical farming methods. They work closely with farmers and communities to customize approaches that enhance both output and crop quality, ensuring the conservation of natural resources.

Ag retailers have tremendous influence given their role in informing farmers' purchasing decisions and providing agronomic advice. There is increasing evidence of a business case for promoting conservation practices and sustainability. Across the agricultural landscape, diverse business models and partnerships are evolving to support these efforts. For instance,

- Agricultural retailers and con servation agencies are collaborating to offer technical support and cost-sharing for conservation efforts. This can include guidance on cover crops, nutrient management, and sustainable livestock grazing.

- Partnerships between state agencies, industry associations, and/or educational institutions have given rise to programs such as the Conservation Cropping Systems and Precision Conservation Management Initiative, which grant farmers access to agronomists. educational resource and training to advance sustainable agriculture.

- Emerging programs, funded by private foundations, industry partners, or downstream communities, provide financial incentives to farmers who are willing to adopt new conservation practices on their farms that yield positive environmental outcomes.

- Agricultural cooperatives provide their member farmers with access to specialized agronomic services, up-to-date agricultural products, and the delivery of environmentally sustainable practices on the land.

- Companies like Truterra and ADM are also pioneering efforts in conservation agronomy. Truterra's Conservation Agronomist program, which is partially funded by USDA/NRCS

and grants from the National Fish and Wildlife Foundation and national, state, and local conservation districts, works with ag retailers. Archer-Daniels-Midland (ADM)'s conservation agronomy program "re:generations", launched in partnership with local conservation agronomy groups, supports farmer's legacies and consumer demand by implementing and compensating farmers who use conservation agronomy practices.

Collectively, these initiatives and business models represent a concerted effort to align agricultural profitability with environmental stewardship. They reflect a growing recognition of the role that agronomy can play in addressing climate change and environmental degradation while supporting the economic viability for farmers. It is against this backdrop that the organizations which participated in this grant carried out their work. It is to their stories that we turn next.

Case Studies

The interviews to construct these profiles followed the Business Model Canvas. This is a strategic management tool that provides a comprehensive framework for analyzing and developing business models. It consists of nine key building blocks: Customer Segments, Value Propositions, Channels, Customer Relationships, Revenue Streams, Key Resources, Key Activities, Key Partnerships, and Cost Structure. Each block represents a crucial aspect of a business, helping leaders visualize, assess, and refine their business concepts. By systematically examining these elements, organizations can identify opportunities for innovation and reexamine resource allocation.

Questions posed to the interviewees roughly followed these themes over the course of the conversations depending on the role and knowledge of the participant. Each of these organizations are at different stages of integrating conservation into their core business. The profiles are organized from those for whom the grant added on something new or extra to those whose offerings were more mature.

Organization A

'We tried running before we knew how to walk!'

From a business perspective, this co-op has approached conservation opportunistically. Past work with a shared conservation agronomist was challenging due to uneven and unclear time allocation and budgetary constraints. It felt like the shared resource did not prioritize area retailers and was just putting in the minimum required hours regardless of outcomes or goals. This business is located in a region where cover crop adoption has been limited due to climate-related challenges like water scarcity. Zone management for fertilizer has been outsourced due to lack of in-house expertise.

This organization also faced general human capital issues over the grant period. The number of people available to work on the program was reduced by half and fewer salespeople were out in the field. Conservation requests were addressed if they came in. As such, the burden on each individual to meet the overall goals increased and there was not sufficient bandwidth to do the

work. Low data and IT skills among some staff members also made it more difficult to meet reporting needs. As such, communication and relationships with producers suffered. Some growers were asking why they were providing so much data, how it helped them, and where it was going.

Despite these setbacks, some growers showed interest and saw positive returns, particularly in fertilizer and chemical application reduction. Three of their participating farmers intend to expand their planting of cover crops. However, challenges persist with complex NRCS programs, including cost justifications, requirements that do not make sense for local soil conditions, and personnel mismatches. Collaboration with entities like TruTerra aim to address these challenges, particularly in water management, which is critical given impending water rights disputes and regulatory changes. There's also a need to streamline processes, improve communication, and adapt to uncertain markets and regulatory landscapes. Overall, in this particular part of the state, pending lawsuits and government decisions on water rights will be a driving factor in whether or not growers expand implementation on the land.

Organization B

"We have come full circle to where we were."

This co-op started the program with a strong champion who was very focused on building out one piece of the business around a rather complex conservation initiative. Within the organization, the project design revolved around that one individual who was going to execute the project without demanding much additional time or resources from other teams. Though plot days and cover crops were already a facet of the landscape, for many growers who participated in the program, this was their taste of conversation agronomy.

Unfortunately, there was significant personnel turnover and a drought which negatively impacted the program results. With a water shortage, cover crops were not an option growers wanted to discuss. When asked what else could stand in the way of expanding conservation based on learnings from this experience, challenges cited included:

- Difficulty navigating programs and eligibility
- Heavy data and reporting requirements
- Administrative burden
- Farmers are unconvinced the benefits are in line with the needed effort
- Programs are temporary and change too often

Upon reflection, leaders at this retailer thought that if they were to do it again, they would have built a bigger team in the beginning, simplified the process, conducted more educational efforts, discussions, and scouting among the growers, and been less focused on equipment. Essentially, spending more time up front on organizing the design and management of how the program was implemented.

Within the local community, these managers also reported that conservation programs can be tricky at times because some producers who have been implementing conservation practices

previously are not always eligible. Incentives are directed at those who have not yet done much or anything to date. So, it feels to some like money is being thrown at those who want extrinsic rewards rather than those who have been intrinsically motivated to be better stewards.

That said, there is demand in the local marketplace and positive buzz around conservation. Farmers are interested in more cover crops, less erosion, and referral rates are high. The co-op is seen has making everything easier for the growers to access what is available to them. There is also concern about the future use of metrics such as carbon intensity scores and what would happen if banks, insurance companies, etc. started using them. If this change were not gradual, how would the co-op help producers adapt? While it is the right thing to do, if forced, what is the role of these professionals in helping them adapt to changing market conditions.

This group is in talks to hire a conservation agronomist, and leaning in that direction, though a job offer has not yet been made. The vision is that this individual would both integrate with the sales agronomists and scout projects separately. They recognize the value of someone who knows the programs that serve growers and can advise on specific practices. Position would be funded by a multi-year grant at the moment through matching funds. There is concern about giving away services for free because it's hard to start charging for the same activities in the future so the models for revenue generation are also still being debated.

Organization C

"There is a lot of interest, but we don't call it conservation."

Initially, before participating in the CIG, the co-op had a nascent but growing interest in conservation agronomy, aiming to connect farmers with conservation programs and provide assistance with paperwork to alleviate farmer concerns. The co-op had already made strides in precision agriculture and conservation practices, such as nutrient stabilizer programs and precision application. While the group had capacity to provide conservation agronomy services on a small level, this was augmented through collaboration with third parties for remote sensing, soil testing, or zone nutrient management prescriptions.

Participation in the CIG program didn't drastically change the co-op's offerings, as they were already ahead in providing services like zone sampling and had been pioneering related activities in precision agriculture. However, this funding provided an opportunity to focus more on dry land acreage and expand research efforts. The co-op's approach to conservation-related activities emphasized profitability and yield improvement rather than framing it explicitly as conservation, recognizing that farmers were more receptive to discussions centered around profit and soil health rather than conservation terminology.

The co-op's clientele consisted of a mix of progressive growers willing to adopt new practices and traditionalists hesitant to change. There is an interesting socio-cultural aspect of this business which is that local farmers resist "conservation" or "sustainability" but will enroll in programs if they are labeled soil health or stewardship planning. Not surprisingly, producers are attracted to programs that offer cost-neutral or positive economic impact, but generally deterred by time

constraints, heavy reporting requirements, or unfamiliar methods they may be reluctant to try if it means risking yield.

Looking ahead, this group anticipates continued growth in conservation-related services, particularly focusing on practices that enhance profitability and soil health. While government programs like those offered by the NRCS are available, the co-op would also aim to rely on growers' willingness to invest in these practices themselves, with potential future involvement from consumer-packaged goods (CPG) companies.

Reflecting on lessons learned, the co-op emphasizes the importance of selecting growers who are proactive and vocal in their communities to champion conservation efforts. Additionally, dedicating staff specifically to conservation-related roles is crucial to ensure adequate support and implementation of these programs without overwhelming existing sales or agronomy personnel. Finally, streamlining internal processes and aligning them with external requirements can enhance program effectiveness and farmer satisfaction.

Organization D

"We want to be a useful tool for farmers who want to engage…."

This co-op has a department dedicated to conservation agronomy that develops its own sales and recruitment plans and has responsibility for financial stability by actively forming public-private partnerships with public agencies and nonprofit organizations. Based on competing interests when employees are shared, leadership decided to invest in employing conservation agronomists directly so they could ensure alignment with the organization's vision and foster unity among the team. This structure allowed for better coordination between conservation and sales agronomy teams, benefiting farmers' profitability and environmental considerations. External funding removes the investment risk in hiring additional personnel into a new department, while also providing the co-op with built-in marketing and networking opportunities through service and outreach activities. The department aims to be cost-neutral if not revenue positive.

From a business strategy perspective, this co-op had decided before participating in this grant that they wanted to chart out the space for ag retail in conservation. Characterizing the conservation world as a complicated, opaque, bureaucratic web, leadership set out to map the various governments, public agencies, universities, and non-profits to figure out where they could fit into the equation. A resulting hypothesis was that that generating downstream value through public or private funding would support the implementation of conservation practices on the ground. Additionally, they did not want to sell conservation services to farmers, as those already convinced of their importance would likely be the primary buyers. Instead, the focus was on removing administrative and cost barriers to attract middle and late adopters.

As they built a team of conservation agronomists, the co-op quickly demonstrated that farmers were much more responsive to their presenting programming versus representatives from public agencies. Over time this has evolved from initially helping build partnerships to directly selling conservation programs to now pitching ideas to various entities such as consumer packaged goods companies or public agencies. They offer to sell and implement conservation practices,

allowing these entities to claim biodiversity or ecosystem services credits. Despite challenges, they've found success in navigating partnerships, acknowledging positive collaborations with NRCS in some counties. Future efforts will likely focus on advocating for program design that gives tenant farmers real incentives to participate in conservation and educating absentee landowners who may not understand what's happening literally on the ground.

For this group, participation in the grant program allowed for an expansion of existing programming and the recruitment of additional growers into cover crops and nutrient management. Despite having a robust staff and experience, however, there were still some challenges. The number of producers and trials involved was very large. They found some of the nutrient management elements too abstract and difficult to manage. This made is harder to compare outcome data from year to year. Agronomists suggested having greater involvement of experts in experimental design engaged earlier in the process to ensure retailers can succeed without needing to cobble together information or practices.

Business Model Analysis

The figure below summarizes the business ecosystem across the cases under investigation. Their compiled perspectives provide for a more holistic view of conservation as an additional activity for ag retailers.

<table>
<tr><th></th><th></th><th>Customer
Proposition</th><th>Relationships</th><th>Segments</th></tr>
<tr><td rowspan="3">Key
Partners
Corporations (increasing CPGs)

Foundations

Government

Industry Associations

Research Groups
Universities</td><td>Key
Activities
Advising

Practice Design and Build
Grant Writing
Sales</td><td rowspan="3">Value
Proposition
Better agronomics

Expertise in sustainability

Education and Outreach</td><td rowspan="2">Customer
Relationships
Key asset for retailers is the direct and trusted relationships with growers</td><td rowspan="3">Customer Segments

Farmer Personas:

Early Adopters

Conservation Curious

Skeptics (typically, due to weather issues, land ownership, or nearing retirement and don't think they'll see the ROI)
Landowners</td></tr>
<tr><td>Key
Resources
Agronomists

Grant Writing

Partnership Management
Third Party Service Providers</td></tr>
<tr><td>Channels

Exiting sales channels
- Sales agronomists as lead generators
- Referrals

New sales relationships where conservation is lead</td></tr>
</table>

Cost Structure	Revenue Streams
Human capital is primary driver either because existing people are deployed to administrative tasks such as data or new staff (conservation agronomists) brought on board.	Grants and Incentives Cost share programs Fees for service implementation

The business case for increased conservation work within private ag retail centers upon:

Additional Expertise: Expanded ability to advise farmers on practices aimed at minimizing environmental impact while maximizing productivity e.g., reduced tillage, cover cropping, crop rotation, and precision agriculture through plans tailored to each operation.

Differentiation and Market Positioning: Offering conservation services can set an ag retailer apart by demonstrating a commitment to environmental stewardship. This can attract some farmers and enhance the retailer's reputation.

Land Stewardship: By promoting practices that enhance soil health, water quality, and biodiversity, the ag retailer can contribute to improved yields, resilience to climate change, and overall profitability fostering deeper client relationships.

Regulatory Compliance and Risk: With increasing regulations related to environmental concerns, ag retailers can ensure that their clients remain compliant with relevant laws. This reduces the risk of penalties for non-compliance as well as future regulation.

Emerging Trends

While these four organizations are at different levels of development in terms of the integration of conservation into their businesses, there are still several important commonalities in their experiences that merit commentary.

Boundary Spanning

A boundary spanner is an individual or a role within an organization who bridges the gap between different departments, functions, or external entities. They act as intermediaries, facilitating communication, information exchange, and collaboration across organizational or contextual boundaries. Boundary spanners play a crucial role in integrating diverse perspectives, aligning goals, and ensuring that organizational activities are coordinated effectively. They often possess strong interpersonal skills, cultural awareness, and the ability to navigate complex relationships across organizations. Boundary spanners can include managers, team leaders, customer service representatives, or any individual who regularly interacts with multiple stakeholders to facilitate the flow of information and resources.

Every participant cited conservation agronomists has filling an institutional gap in the value chain between ag retail and their producers on one side and government programs and funding opportunities on the other. While growers may see value in participating in programs that offset possible losses and risks for implementing conservation, they are also seen as extremely bureaucratic, difficult to access, and costly to manage. The presence of an expert who has deep knowledge of conservation opportunities and can aid in the selection and execution of programming was unanimously viewed as an advantage to growing this business segment.

Grow into Complexity

Starting a new service area for any company can be an exciting opportunity for growth and diversification, but it also presents several challenges. In this cohort, we can see some of the choices and tensions that present themselves as retailers balance different objectives for their own businesses and the well-being of those they serve:

1. **Market Understanding**: Understanding the needs, preferences, and behaviors of customers in a new service area can be challenging. Retailers are aware that farmers hold diverse attitudes towards conservation so time must be invested in selecting the right participants for these sorts of programs. Failure to do so risks the trust that they have built with local growers over time. Additionally, the growth in carbon markets, opportunities for upstream-downstream collaboration, watershed management districts, etc. will influence the future conservation business opportunities available to farmers. They will need assistance to take advantage of these developments.
2. **Operational Challenges**: Launching a new service area requires allocating resources, including human resources, and time. For instance, capacity to manage data collection and reporting was seen as an impediment to scaling trials and services. In one case there was concern about the cross-over between traditional sales agronomists and conservation services. As such, retailers may need guidance on smooth coordination between different departments to avoid disruptions and maintain service quality.
3. **Talent Acquisition and Training**: Recruiting and retaining skilled employees with expertise in the new service area can be challenging. There is a concern that finding enough people with the right skill sets will prove challenging if demand for conservation continues to grow. Options to provide adequate training and development to upskill employees may be critical in the future.
4. **Regulatory Compliance**: Compliance with regulatory requirements and industry standards governing the new service area is essential to avoid legal issues, fines, or reputational damage. Working to prevent future regulation that would impact the commercial viability of family agriculture was a theme that emerged during the interviews given the precarious economics of some rural communities.
5. **Financial Risks**: Launching a new service area involves financial risks, including upfront investments in infrastructure, marketing, and operations. Participants thought that there is significant revenue-generating potential embedded in conservation efforts, offering various avenues for financial growth e.g., harnessing conservation innovation grants, offering specialized services like coordinating data management programs, sales revenue generation through the sale of cover crops, practice implementation, etc. There was some concern about offering services now for free under grant programs and then trying to charge for them later.

Relational Capital

Relational capital refers to the value generated by the relationships a company has with its various stakeholders, including customers, suppliers, employees, and partners. It encompasses the goodwill, trust, and mutual understanding built over time through interactions and

collaborations. Relational capital is considered an intangible asset of a company and can contribute significantly to its long-term success and competitive advantage.

Across all of the interviews, it is clear that one of the main advantages that retailers bring into the conservation ecosystem is their trusted relationships with farmers. They are much more effective at recruiting growers than most representatives from government or industry. As such, those who wish to work with retailers, provide funding, or design new incentive programs should pay close attention to relational risks. Trust can take a long time to build but only one bad piece of advice to damage. Equipping retailers with the right tools to set farmers up for success as much as possible will be crucial for expanding public-private partnerships. No one expects that there will be no business risk, but those who want to work with growers and retailers to accelerate the adoption of certain practices on the ground cannot expect them to shoulder all of the risk.

Conclusion & Recommendations

Though some of these organizations experienced internal and external challenges in managing various components while participating in the grant, it is worth noting that when asked about the future, all of them reported that the growers in their communities generally wanted more access to information and resources about conservation. Given the amount of funding that is coming into the space, participants appreciated the opportunity to learn and potentially scale their business efforts. In order to stay relevant, ag retailers must be able to adapt and provide support to farmers in their stewardship of the land. Insights for future programs would include:

- Continued promotion of practices that enhance farmer efficiency is paramount. All of the interviewees stated that retailers should be advised to **start simple**. For those with little experience, adding one shared employee to manage many complex trials is disadvantageous.
- Flexibility and patience are essential when implementing new conservation efforts. This requires creates space for retailers who are willing to review programs for continuous improvement and adapt approaches based on outcomes.
- Partnering with allied organizations can lead to steady growth and success whether this is a local government office, local non-profit or association, or third-party service providers to scale implementation more quickly.
- Farmers see value in integrating conservation into total crop planning for comprehensive sustainability efforts.
- The primary role for the conservation agronomist on staff is to focus on conservation. Avoid using them to fill temporary assignments in the sales team or other duties that make their role confusing to growers who are exploring opportunities for the first time.
- Clearly defining goals, expectations, and timelines for conservation business activities and associated staff is essential for success along with clear expectations for overall team support of a conservation agronomist if such an individual is hired.

In terms of future research directions, the top priority among these interviewees was the development of a clear, simple, and shared articulation of the return on investment for conservation implementation. Each had experimented with different ways of addressing this concern among their growers. If the retail space can move towards a consensus position that can

be easily used, this will accelerate acceptance among producers. There is also an opportunity to make a very clear business case and pathways for retailers to reduce their learning curve.

In conclusion, while none of these organizations fundamentally transformed their business models based on participation in the grant, it is clear that all of them learned through the process. It is encouraging that all of them intend to continue the expansion of conservation-related services to their growers. This indicates that there is opportunity to expand the role of ag retail in driving conservation for enhanced land stewardship and a more sustainable future for food production. Continued efforts to educate retailers on the business configurations available to them – whether conservation is integral to their business strategy or remains peripheral to their core operations - and stable financial opportunities will be key to making this a reality.

Appendix – Sample Interview Protocol

1. **Introduction and Background:**
   - Can you provide a brief overview of your offering conservation services/ having a conservation agronomist (CA) in the organization so far? (or the decision to bring one on staff if new to the team).
2. **Business Model Overview:**
   - Could you explain how you view having a CA enhances your firm's current business?
   - To what extent has the CA impacted how you think of the services and value you offer your community?
3. **Market and Customer Segmentation:**
   - How do you assess the current market landscape in your community for CA-related activities?
   - How have you organized and integrated the CA into your workflow?
   - How does the CA impact your strategies for customer acquisition and retention?
   - How do you tailor your products/services to meet conservation goals?
   - How does your organization collect and use customer feedback to refine and adapt your business model? What has it been for this segment?
4. **Finance:**
   - How do you manage and optimize your organization's cost structure for CA and conservation?
   - To what extent have you tried to generate revenue for your organization through conservation? How?
   - How do you manage the many public and private [financial] partnership programs to support the farmers in accessing conservation incentives?
   - How have you tried to understand the ROI of your CA?
5. **Innovation and Adaptability:**
   - How do you anticipate changing or expanding the role CAs can play in your company?
   - Have these initiatives impacted your overall customer loyalty?
6. **Risk Management:**
   - Do you perceive How does your organization identify and mitigate potential risks associated with having a CA on staff?
   - Can you provide examples of challenges your organization has faced integrating a CA onto the team and how they were addressed?
7. **Strategic and Success**
   - Can you discuss how CAs fit into the long-term strategic planning process within your organization?
   - What key performance indicators (KPIs) does your organization use to measure the success of its business model?
   - How do you ensure alignment between the business model, team performance, and organizational goals?
8. **Future Trends and Challenges:**
   - What emerging trends do you see affecting your organization's deployment of CAs in the future?
   - Are there specific challenges you anticipate and how does your organization plan to address them?
9. **Reflection and Advice:**
   - Looking back, what lessons have you learned about supporting your organization's conservation business model?
   - What advice would you give to others seeking to enhance or rethink their business approach to having CAs?

On-Farm Demonstration Trials
End of Project Meeting

A collaboration between
SWCS, Truterra and Land O'Lakes Member Cooperatives

2019 - 2024

Agenda

- Introductions
- Recap of Final Project
  - Truterra Year 3 Results
  - Pre- vs Post-Survey Responses (Producers + Retailers)
  - Business Model Interviews Report
- Communications
- Future Directions

Introductions

- Soil & Water Conservation Society
- Land O' Lakes / Truterra
- Alliance Ag & Grain Coop
- Frontier Coop
- American Plains Coop
- Heartland Coop

Introductions

What was the best part of this project?

What did you most enjoy?

What has left you excited about the future of conservation agronomy work?

The Project

Over three growing seasons -

- Zone Nutrient Management
  - 5,760 Acres
- Cover Crop Management
  - 2,880 Acres

Totals: 49 producers, 8,640 acres

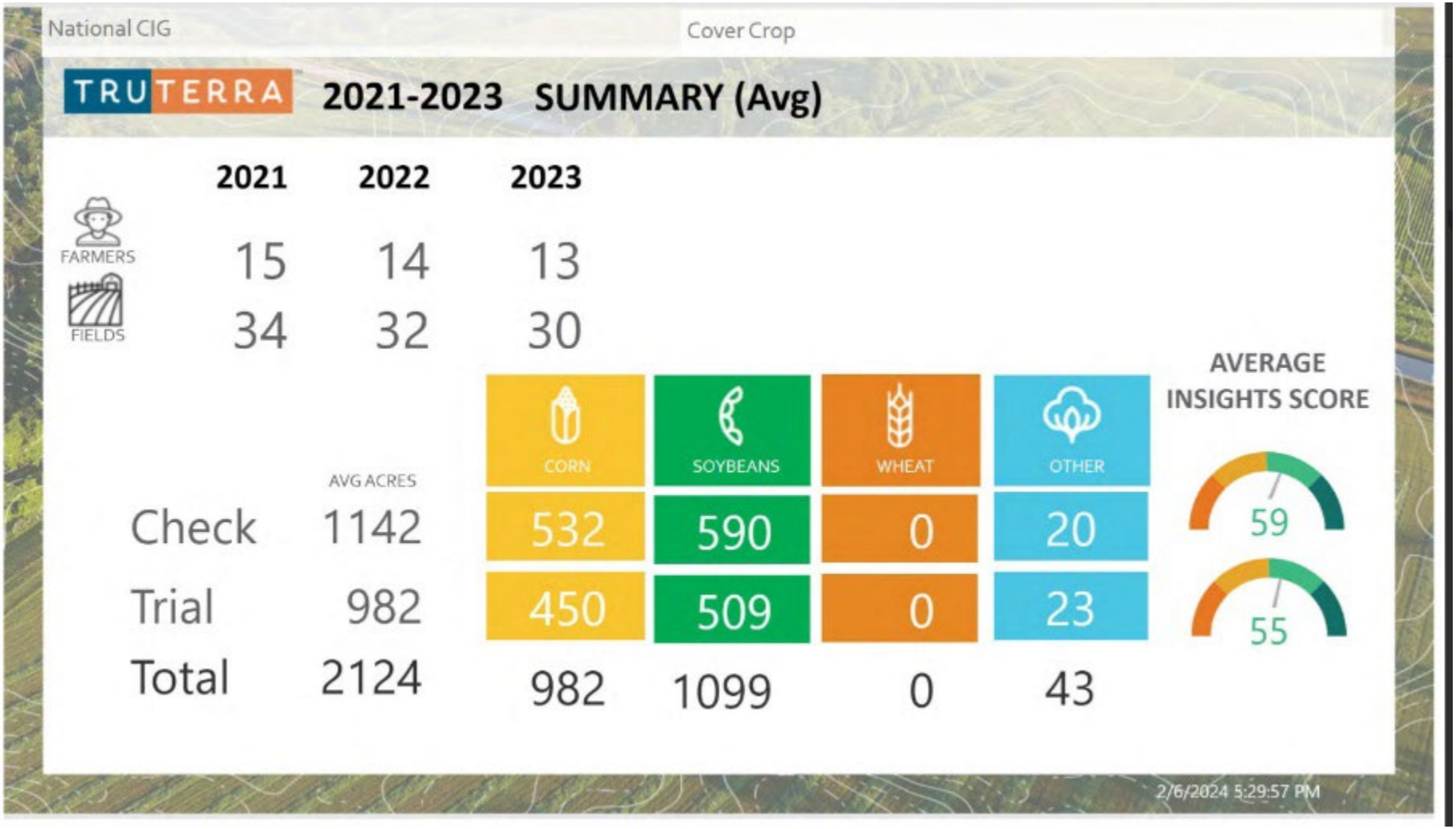
WHY On-Farm Demonstrations

- To answer producer questions on their own land
  - To realistically determine outcomes given producer schedules, pressures, etc.
  - Large test areas
- De-risking the investment in conservation services

Purpose - the big picture

SOIL AND WATER CONSERVATION SOCIETY

- Demonstrate economic, environmental and social aspects of conservation practices on the farm
- Engage producers in on -farm trials
- Increase producer knowledge of these practices
- Integrate conservation management programs into retailer services
- Broaden and accelerate conservation practice adoption
- Familiarize both retailers and farmers to NRCS support and cost-share services


National CIG
Cover Crop
TRUTERRA
2021-2023 SUMMARY (Avg)
2021
2022
2023
FARMERS
15
14
13
FIELDS
34
32
30
AVG ACRES
CORN
SOYBEANS
WHEAT
OTHER
Check
1142
532
590
0
20
Trial
982
450
509
0
23
Total
2124
982
1099
0
43
AVERAGE INSIGHTS SCORE
59
55
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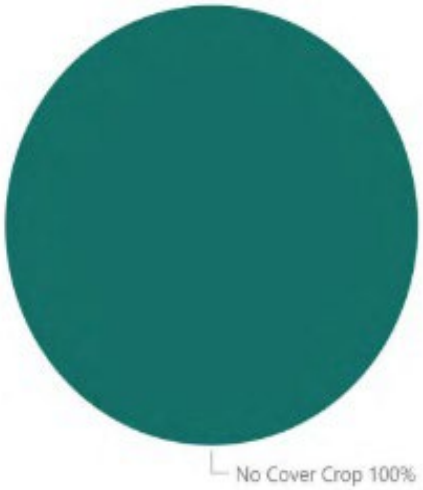
National CIG

Cover Crop

TRUTERRA

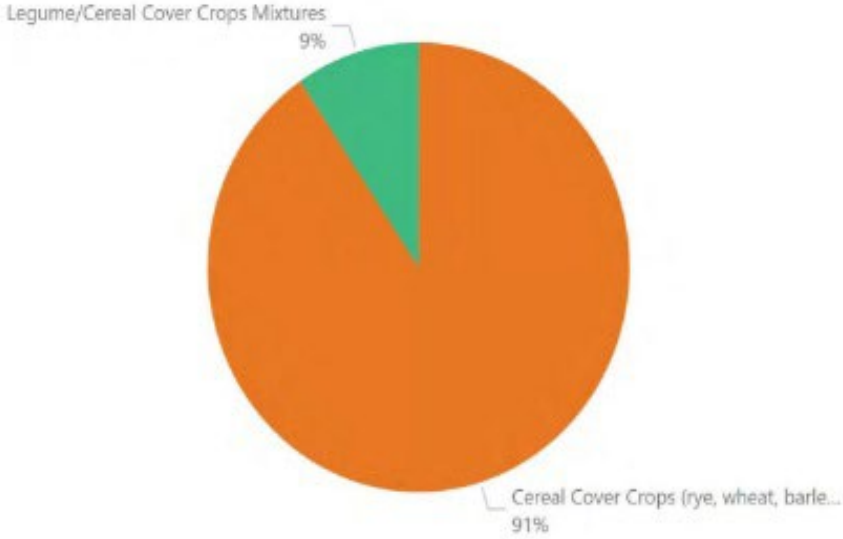
2021-2023 COVER CROP TYPE

Check



0
Avg Acres

Trial



982
Avg Acres

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National CIG

Cover Crop

TRUTERRA

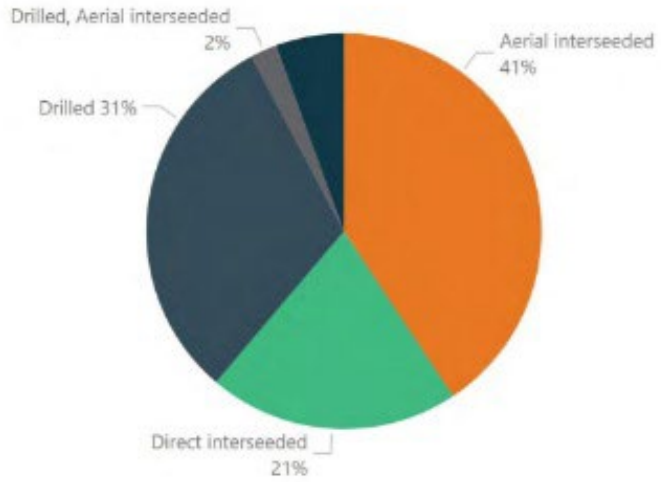
2021-2023 COVER CROPS PLANTING METHOD (Avg)

Check

0

Avg Acres

Trial



982

Avg Acres

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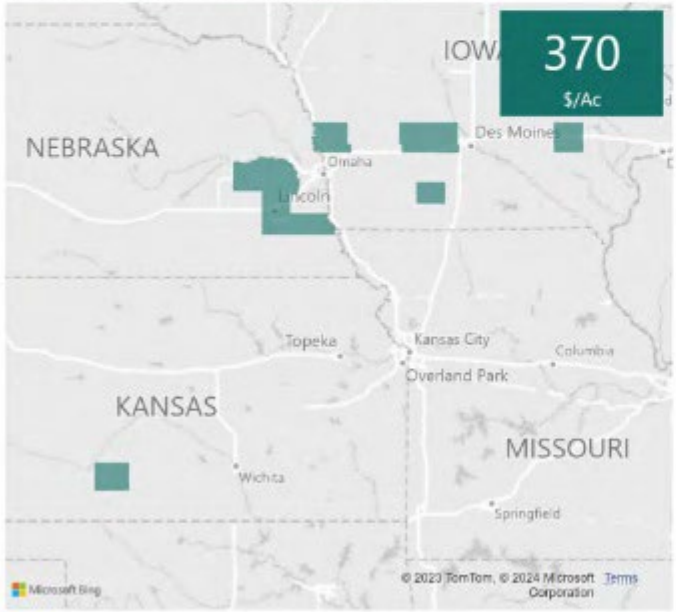
National CIG

Cover Crop

TRUTERRA **2021-2023 PROFIT PERFORMANCE ESTIMATE** Average $ / Acre

Check

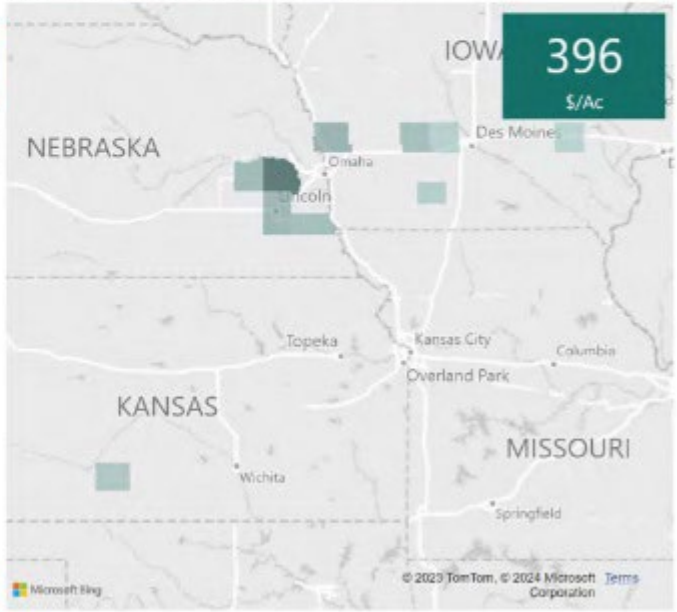
PROFIT ESTIMATE BY COUNTY



$/Ac	Avg Acres	Treatment
370	1142	Check
396	982	Trial

Trial

PROFIT ESTIMATE BY COUNTY



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National CIG

Cover Crop

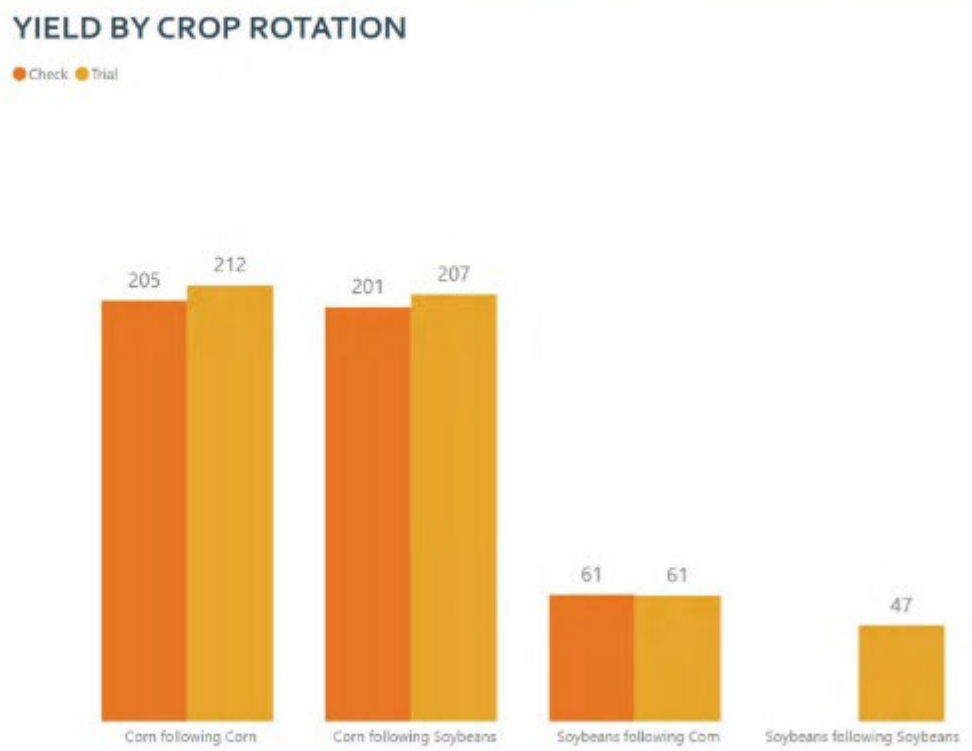
TRUTERRA 2021-2023 **CROP ROTATION - YIELD**

Check

Previous - Current Crop	# of Fields	Yield (bu/ac)
Corn following Corn	6	205
Corn following Soybeans	16	201
Soybeans following Corn	19	61

Trial

Previous - Current Crop	# of Fields	Yield (bu/ac)
Corn following Corn	6	212
Corn following Soybeans	16	207
Soybeans following Corn	21	61
Soybeans following Soybeans	2	47



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National CIG

TRUTERRA **2021-2023 KPI SCORING**

Check

KPI SUMMARY

Acres	1142
Farmers	15
Truterra Sustainability Score	59
Cover Crops %	0%
Corn Nitrogen Use Efficiency	1.47
Wheat Nitrogen Use Efficiency	
Conservation Practices - Season Fields	29
Sheet/Rill Erosion (tons/ac.yr)	1.60
Wind Erosion (tons/ac.yr)	0.00
Greenhouse Gas (lbs/ac.yr)	949
Soil Quality Index	0.17

Trial

KPI SUMMARY

Acres	982
Farmers	15
Truterra Insights Score	55
Cover Crops %	100%
Corn Nitrogen Use Efficiency	1.47
Wheat Nitrogen Use Efficiency	
Conservation Practices - Season Fields	24
Sheet/Rill Erosion (tons/ac.yr)	1.40
Wind Erosion (tons/ac.yr)	0.00
Greenhouse Gas (lbs/ac.yr)	622
Soil Quality Index	0.19

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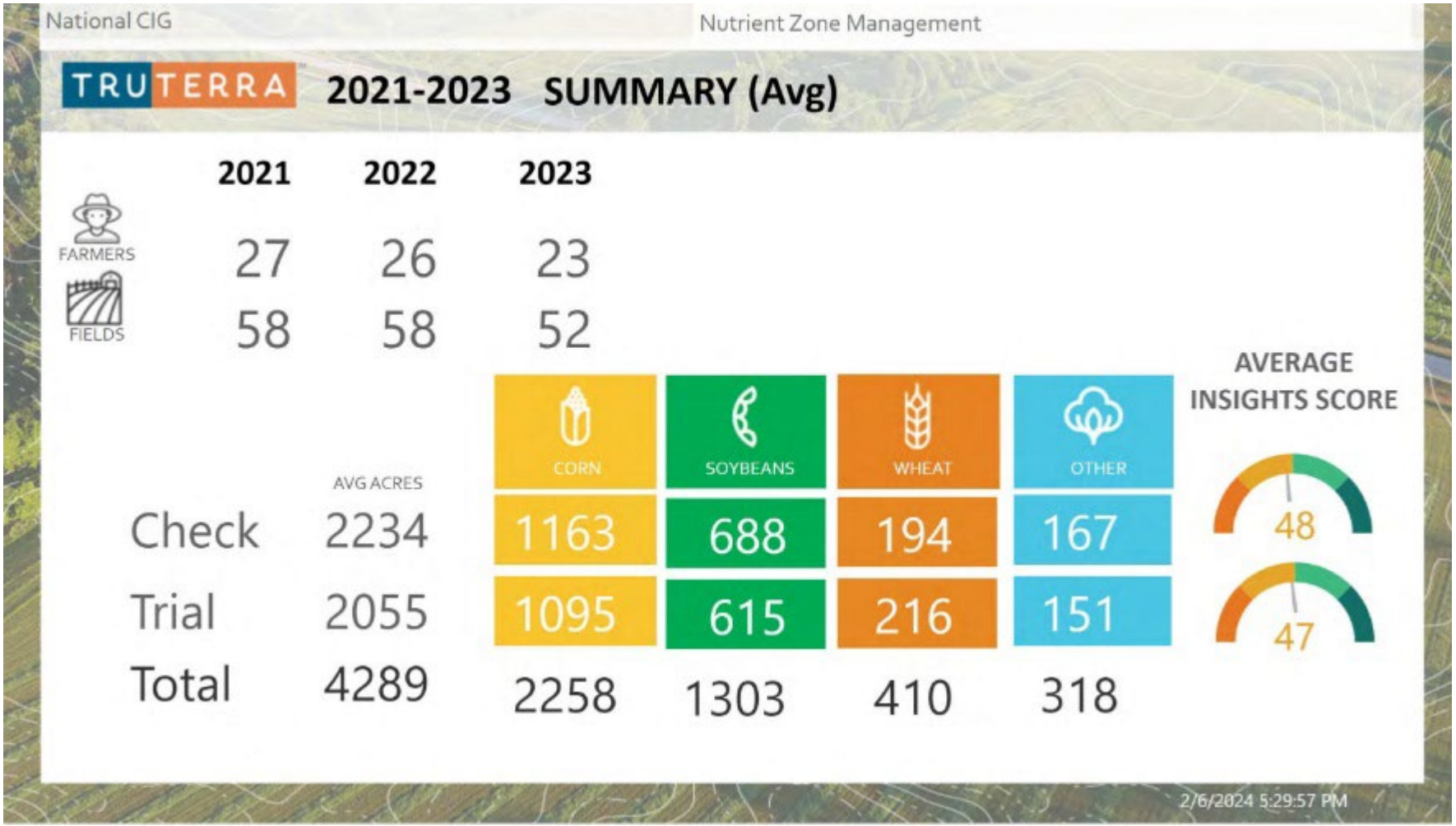
Cover Crop Trial Findings

- Remaining Questions:
  - Why is the sustainability score reduced with the cover crop trials?
  - What do you think are the lead reasons for increased profitability?


National CIG
Nutrient Zone Management
TRUTERRA
2021-2023 SUMMARY (Avg)
2021
2022
2023
FARMERS
27
26
23
FIELDS
58
58
52
AVG ACRES
CORN
SOYBEANS
WHEAT
OTHER
Check
2234
1163
688
194
167
Trial
2055
1095
615
216
151
Total
4289
2258
1303
410
318
AVERAGE INSIGHTS SCORE
48
47
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TRUTERRA 2021-2023 FERTILIZER

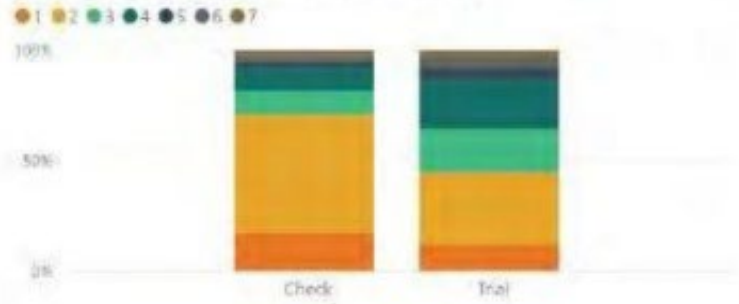
IN-SEASON APPLICATIONS - CORN

Check	Trial
26%	64%
OF ACRES APPLIED IN-SEASON	

COMMERCIAL FERTILIZER APPLICATION METHOD BY PASS

Application Method	Check	Trial
Fertigation	10%	10%
Surface Band	8%	9%
Injected/Sub-Surface Band	25%	22%
Broadcast Incorporated (within 24 hours)		0%
Broadcast (ground or air)	57%	60%

WHEAT & CORN - # OF N APPLICATIONS



AVG FERTILIZER APPLICATION (LBS/ACRE) - CORN

National CIG

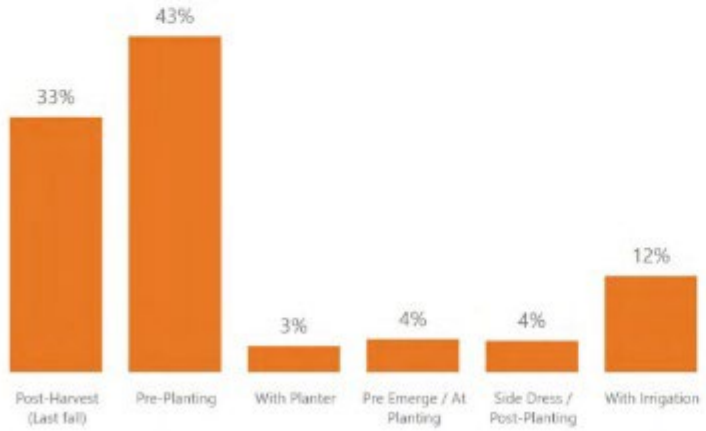
Nutrient Zone Management

TRUTERRA

2021-2023 NUTRIENT APPLICATION TIMING - CORN

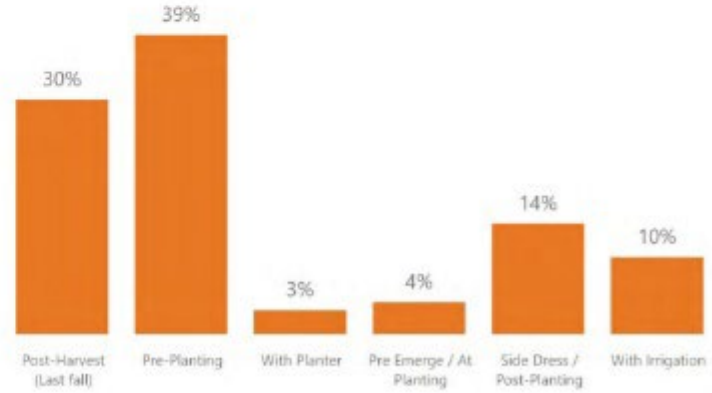
Check

% OF N APPLIED BY TIMING



Trial

% OF N APPLIED BY TIMING



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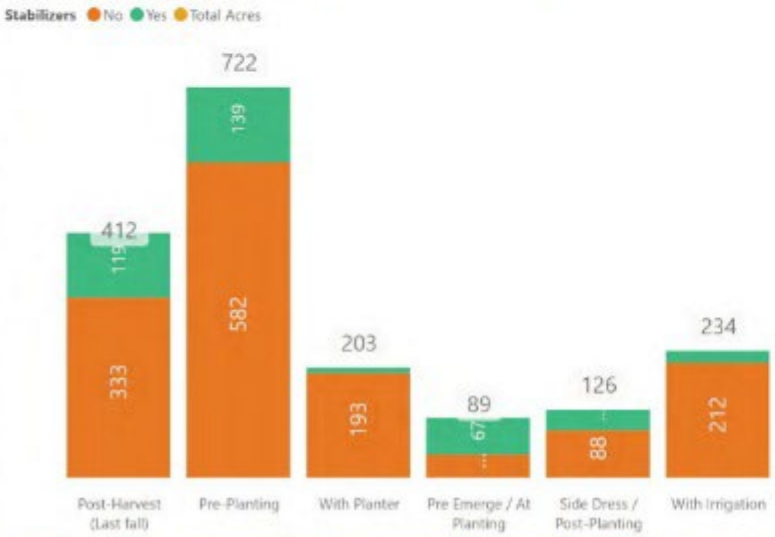
National CIG | Nutrient Zone Management

TRUTERRA 2021-2023 STABILIZERS USE WITH COMMERCIAL NITROGEN - CORN

Check

31% Acres with Commercial Fertilizer and Stabilizers

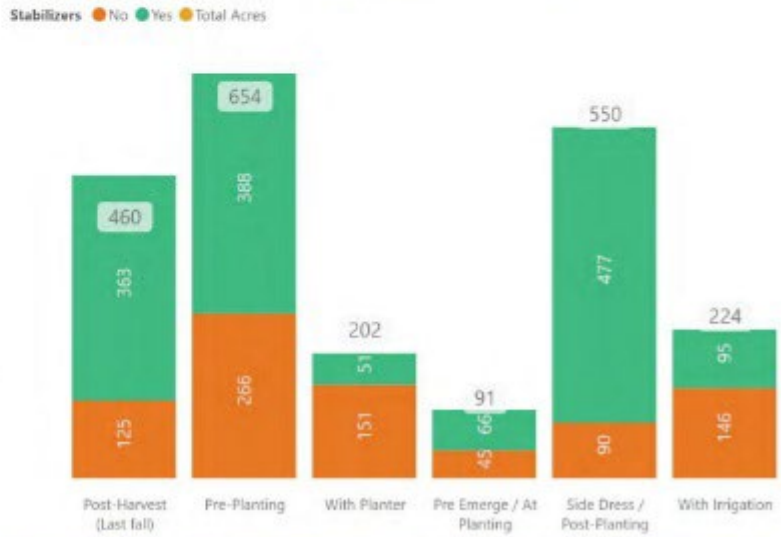
APPLICATION TIMING (% of total acres)



Trial

94% Acres with Commercial Fertilizer and Stabilizers

APPLICATION TIMING (% of total acres)



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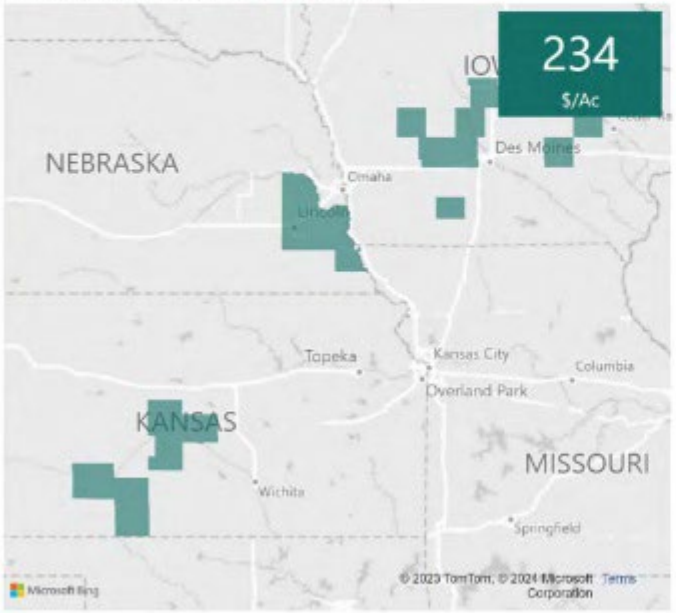
National CIG

Nutrient Zone Management

TRUTERRA **2021-2023 PROFIT PERFORMANCE ESTIMATE** Average $ / Acre

Check

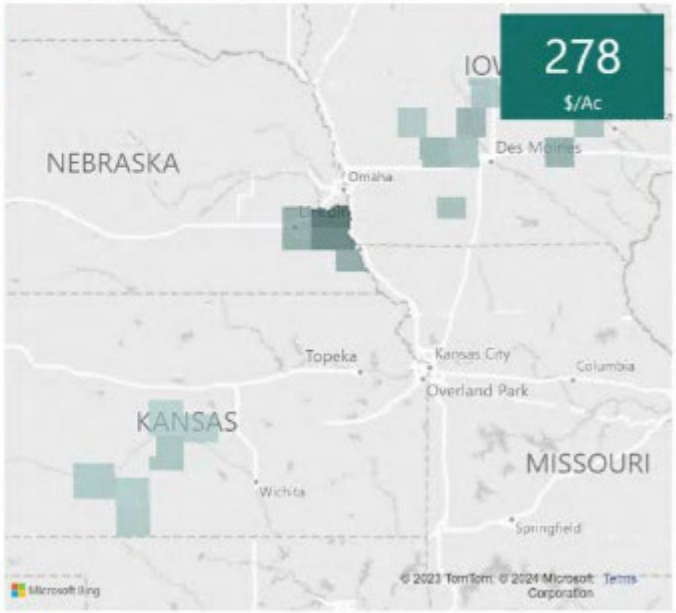
PROFIT ESTIMATE BY COUNTY



$/Ac	Avg Acres	Treatment
234	2234	Check
278	2055	Trial

Trial

PROFIT ESTIMATE BY COUNTY



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National CIG

TRUTERRA 2021-2023 KPI SCORING

Check

KPI SUMMARY

Acres	2234
Farmers	27
Truterra Sustainability Score	48
Cover Crops %	6%
Corn Nitrogen Use Efficiency	1.45
Wheat Nitrogen Use Efficiency	3.89
Conservation Practices - Season Fields	31
Sheet/Rill Erosion (tons/ac.yr)	1.77
Wind Erosion (tons/ac.yr)	0.02
Greenhouse Gas (lbs/ac.yr)	531
Soil Quality Index	0.16

Trial

KPI SUMMARY

Acres	2055
Farmers	27
Truterra Insights Score	47
Cover Crops %	3%
Corn Nitrogen Use Efficiency	1.48
Wheat Nitrogen Use Efficiency	2.44
Conservation Practices - Season Fields	27
Sheet/Rill Erosion (tons/ac.yr)	1.63
Wind Erosion (tons/ac.yr)	0.00
Greenhouse Gas (lbs/ac.yr)	772
Soil Quality Index	0.13

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ZNM Trial Findings

- Remaining Questions
  - Why is more fertilizer applied under ZNM trials compared to the control?
  - What factors are contributing to less erosion with the ZNM trial?
  - What is leading to higher GHG emissions for ZNM trial?

Other Questions

- Have you had any field days about this project since last summer?
- How have you continued to use equipment purchased from this grant?

Survey Results:
Cover Crop Producers

SOIL AND WATER CONSERVATION SOCIETY

Survey Results:
Cover Crop Producers

Compared to pre-survey:

- Producers are **less likely to agree** that
  - They don't know enough about cover crops to use them
  - Cover crops complicate crop insurance
  - Expenses outweigh the benefits
  - Cover crops are compatible with their current systems
  - Cover crops reduce the need for inputs
- Producers are **more likely to agree** that
  - Cover crops contribute to yield loss in dry years
  - Cover crops delay planting in the sprlng

Survey Results:
Cover Crop Producers

If trusted agricultural advisors (ag retailers, seed dealer, Extension, etc.) could help me With cover crop management, I would be more likely to use cover crops:

	Pre-Survey	Post Survey
Strongly Agree	43.8%	0%
Agree	25.0%	53.8%
Uncertain	31.3%	30.8%
Disagree	0%	15.4%

Survey Results: ZNM Producers

Survey Results:
ZNM Producers

After these trials, > 93% of producers are likely or very likely to:

- Use ZNM
- Expand use of ZNM beyond demo trials
- Adopt precision nutrient management beyond ZNM

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Survey Results: ZNM Producers

Compared to pre-survey:

- Producers are **less likely to agree** that
  - They don't know enough about ZNM to use it
  - Precision farm technologies take too much time to learn
  - The expenses of ZNM outweigh the potential benefits
  - ZNM is incompatible with my current production system
- Producers are **more likely to agree** that
  - ZNM can increase crop yields
  - ZNM can increase profitability
  - ZNM can increase efficiency of input applications

Survey Results: Retailers

Capture answers to a few questlons missed by Form Stack - our polling software. poll link (fill out the link in the chat)

Slightly less likely to recommend cover crops and offer additlonal cover crop services.

Slightly more likely to recommend ZNM and offer ZNM services.

Less likely to engage with NRCS.

Business Model Innovation Report

Purpose: Evaluate the impact of the grant and increased conservation involvement on business strategy and development.

Methods: Semi-structured interviews conducted by an outside research firm during the first quarter of 2024 in-person and via Zoon with leaders of each participating group.

Interviews aligned with the *Business Model Canvas*, a strategic tool for analyzing and developing business models. The canvas includes nine building blocks: Customer Segments, Value Propositions, Channels, Customer Relationships, Revenue Streams, Key Resources, Key Activities, Key Partnerships, and Cost Structure.

Resulted in a report that identified opportunities, challenges, and recommendations.

The Opportunity

- Scaling food production and protecting the environment
- Ag retailers have relationships, influence, and reach
- Ag retailers have crop expertise
- Partrerships and resources to support conservation at the co-op is emerging
- It is happening; growers are asking, advantage in getting ahead of it and defining your role

Challenges

- Internal resistance
- Unclear ROI, charging for conservation services later
- Other business demands and challenges (transportation, workforce, etc,)
- Uncertainty associated with untested theories, put relationships at risk
- Lack of capacity, human capital , expertise
- Producer resistance (providing data, yield hit, ROI is not clear)
- Public and private programs (complex, ever changirg, rigid, source is not trusted, new, eligibility, only for those that are new to conservation)

All participants intend to expand conservation related services for growers!
Let's go !!!

Communications Refresher

- We are part of this exciting project
- In partnership with NRCS
- Our clients are saying…
- Our co-op has learned a lot about…

Acknowledging NRCS in publications

- Any material "that is substantially based upon or developed under this award" must include:

- "This material is based upon work supported by the U. S. Department of Agriculture, under agreement number NR203A750013G019."
- Any material, copyrighted or not
- Any products in electronic formats (web, computer programs)

Discussion

- Big wins and important messages to spread

Acknowledging NRCS in news media

"The recipient is responsible for ensuring that an acknowledgement of USDA is made during news media interviews, including popular media such as radio, television, and news magazines, that discuss work funded by this award in a substantial way."

Next Steps, Next Time

SOIL AND WATER CONSERVATION SOCIETY

Preparatory phase to…

- **Externally -** hold listening sessions with farmers, conduct education and outreach with farmers, scouting, define roles for farmers, is there a trusted champion farmer who is paid to be an ambassador for projects, foster buy in from customers
- **Internally** – set and clearly define conservation goals, expectations and timelines for business activities, capacity and expertise needed, roles of team members and partners, foster buy in at all levels internally
- **Brand programs -** don't call it conservation or sustainability, focus on value proposition to farmer, integration of conservation into farmer crop/business plan, ROI, regulatory compliance, resilience
- **Charge for it straight away** – a 10% admin of what is being brought into the farmer by the external funding? An optional contribution among co-op customers? Support a position that informs customers on carbon programs they qualify for, for a fee

Next Steps, Next Time (continued)

SOIL AND WATER CONSERVATION SOCIETY

Preparatory phase to…

- Added capacity (a dedicated conservation agronomist focused on conservation, technology support, etc.)
- Develop a conservation customer segment, selection criteria for conservation agronomists to use in targeting potential conservation customers
- An onboarding and training program to teach *needed* skill sets
- Partnership and alliances that *fill* gaps
- A positive, supportive, encouraging mindset and culture: flexibility, patience, space for continuous improvement, adaptation of approaches based on outcomes, a sense of being in it together
- Expect the unexpected (employee turnover, weather, etc.)
- A focus on simplicity

Role of SWCS and other partners and allies and gaps

SOIL AND WATER CONSERVATION SOCIETY

- Fill the *actual* gaps! Write projects to allow for flexibility based on lessons learned during the project.

- Translator (conservation to co-ops AND co-ops to conservation, i.e.:
  - **Co-ops to Conservation**: Retailer 101 to the public and NGO sectors. Pilot connections between USDA and retailers in Climate Smart Commodity Projects
  - **Conservation to Co-ops:** Advise on an onboarding and training program to teach needed skill sets (Conservation basics, NRCS 101, selling conservation)

- Outfit retailers with on-farm, real time, testing equipment that sells conservation to the farmer, soil testing equipment, rainfall simulators, etc.

Role of SWCS and other partners and allies and gaps (continued)

SOIL AND WATER CONSERVATION SOCIETY

- Utilize rural sociology and communications expertise to support external preparatory phase, mapping of community influencers, customer segmentation and branding and outreach efforts
- Use nonprofit, noncompetitive status to offer best business practices across co-ops
- Provide TSP sign-up and training opportunities to ag retailers
- A data project that turns anonymized data from retailer customers into different infographics and products that tell the story to the farmer about how their data can tell different stories about their farm

Discussion

Fill out the poll in the chat.

SOIL AND WATER CONSERVATION SOCIETY

Healthy Land
Clean Water
For Life

END

Thank you!