NRCS CONSERVATION INNOVATION GRANT
Final Technical Report

Grantee Name: Colorado Conservation Tillage Association
Project Title: Farmers for Advancing Regenerative Management Systems
Agreement Number: NR203A750013G008
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Project Summary

Despite the adoption of individual conservation practices rising in recent years, there remains a widely untapped opportunity to advance the effectiveness and economic benefit of these practices in the High Plains region. Soil health is rarely achieved through isolated methods, but rather through a producer's integration and adaptation of a suite of practices to his/her local context. It is this systems-based and context-dependent approach to soil health, in concert with social support, that can transcend the limitations of isolated conservation practices and decision making.

To increase the adoption of soil health management systems in the High Plains, the FARMS project utilized a principle-based systems approach to soil health alongside 24 producers in Colorado, Kansas, and Nebraska. Producers received financial support to complete in-field observation activities, author Comprehensive Soil Health Management Plans, and implement new soil health management practices. Additionally, FARMS organized a peer mentoring and learning network, prioritized social support for participants, and provided educational opportunities related to soil health management.

The evaluation component of FARMS included soil and nutrient density testing, economic case studies for producers, a consumer interest survey, semi-structured qualitative interviews with producers, and a social network analysis. Key takeaways from the evaluation include:

1. 100 percent of FARMS participants reported that they intend to continue utilizing soil health management beyond the timeframe of the program.
2. The peer-to-peer support in the FARMS program had a positive impact on the challenges and stress related to farming and was the most valuable aspect of the FARMS program overall.
3. Increasing continuous living roots and reducing fallow periods had the largest positive impact on soil health indicators.
4. A diverse crop rotation can use less water and be more dependably profitable over the long term, avoiding the boom/bust cycle of conventional rotations.
5. When informed about regenerative farming practices and a brand's efforts to support them, reported loyalty to the brand increased, as compared to organic farming.

Project Goal and Objectives

The overarching goal for the FARMS project is to increase the adoption of soil health management systems in the High Plains. To achieve this goal, the following objectives were adopted:

1. Financially support farmers innovating in soil health with incentive payments, allowing them to take up practices which would otherwise be risk- or cost-prohibitive.
2. Socially support farmers innovating in soil health with peer working groups and mentoring, as well as technical assistance from external supporters.
3. Measure the costs and value of (a) soil health on all participating farms and nutritional density of grain in long-term and control farms, (b) the economic burdens, advantages, and market opportunities of soil health management, and (c) the social impacts of the innovative practices outlined in the FARMS proposal.

Project Background

A successful soil health management system is one which improves soil health while maintaining profitability. Although the adoption of individual conservation practices on farming operations in the High Plains has risen in recent years, there remains a widely untapped opportunity to advance the effectiveness and economic benefit of these practices in the region. **Soil health is rarely achieved through isolated methods, but rather through a producer's integration and adaptation of a suite of practices to his/her local context, guided by core soil health principles.** The knowledge and expertise learned through this adaptation and integration process is one of the more difficult things to translate through traditional extension and outreach approaches. With this project, we leveraged the expertise of long-term soil health practitioners to mentor less experienced producers in addition to providing technical support. We collected data on thought processes that have guided long-term soil health practitioners, in addition to the soil health and economic outcomes.

Project Methods

Objective 1: Financial Support

To financially support the adoption of risk- or cost-prohibitive soil health management practices, FARMS paid participants a stipend ($2,500 in Year 1, $1,500 in Year 2, and $1,000 in Year 3) to complete a Soil Evaluation Tool (SET) and Comprehensive Soil Health Management Plan (CSHMP). The SET facilitated in-field observations and learning, while the CSHMP provided an opportunity for producers to map out goals, crop rotations, and details for how each soil health management principle would be addressed on enrolled acres. Producers serving as mentors were also compensated for their time and travel related to mentoring activities and education.

Objective 2: Social and Technical Support

Of the 24 FARMS participants, six were enrolled as Long-Term Practitioners and 18 as Transitioning Producers. FARMS organized these participants into formal mentoring hubs (see Figure 1), where each LTP was assigned 2-4 mentees. A peer learning and social network was also encouraged through various facilitated events, including webinars, workshops, bus tours, and field days.

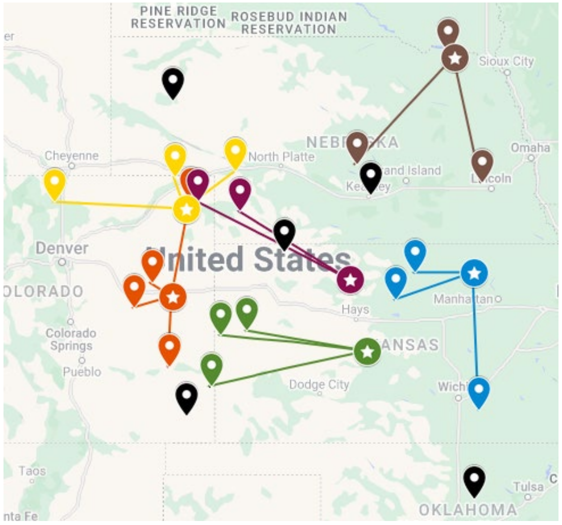


Figure 1. A map of the participating producers. Stars indicate Long-Term Practitioners, dots indicate Transitioning Producers, colors indicate hub membership.

Four Technical Assistants remained on staff throughout the project to review and approve CSHMPs and provide technical assistance to producers as needed. Additional technical assistance was made available through various consultants with expertise in areas of innovative soil health management topics requested by participants.

Objective 3: Evaluation

(a) Environmental: Field sampling was conducted in May/June of 2020 and 2023. Each field was divided into 4 representative sampling zones by soil types and layout and sampled as a transect at 5 locations and composited from 0-2 inch and 2-6 inch depths. Soil bulk density samples were collected using a slide hammer sampler and sleeve inserts and separated into 0-2 inch and 2-6 inch increments. After returning to the lab, soils were refrigerated until processed. Soils were sieved to 8mm and 2mm. Sieved soil was freeze-dried for Phospholipid Fatty Acid Analysis (PLFA) and the remainder was air-dried for further analysis. The PLFA, nutrient and texture analyses were completed by Ward Laboratories. Soil respiration (CO2 burst), active carbon (permanganate oxidizable carbon, POXC), and soil enzyme activity were completed at Colorado State University. Aggregate stability was completed at Kansas State University.

Health First also collected grains as a composite grab sample at time of harvest for LTPs and controls in Years 1, 2, and 3, and TPs in Year 3. Feed analysis was completed at Ward Lab in Kearney, Nebraska, with additional testing conducted by Biome Makers in Davis, California.

(b) Economic Evaluation: The Food Systems group in the Department of Agricultural Resource Economics at Colorado State University conducted a consumer interest study in 2023 to address the research question, “How do consumers’ opinions about a brand change after they learn that the brand supports regenerative agriculture?" They compared the effect of supporting regenerative ag to a similar engagement in supporting "organic," with a subset of participants exposed to explanations of the main production practices associated with each of the labels. Two pilot surveys helped them identify high- and low-reputation retailers, and fine-tune the information treatment infographic, with a final survey sent out to 2275 consumers in September and October 2023.

Economic Case Studies: Case studies were written based on T-charts prepared according to Tech Note ECN 200-1, though the final form of the case studies tended to diverge from this format. We found that a more contextual, multi-year analysis was needed to tell the story in each of the case studies.

Management Data Gathering: From willing producers where data was available, we collected data from 2014-2021 on yields and acres harvested; materials sprayed, cost per acre, and acres sprayed (mainly fertilizers and herbicides); seed cultivars planted, cost of seed, acres planted, and actual sales prices. Neighboring conventional farmers were unwilling to divulge such data to us.

(c) Social Evaluation: A mixed methods approach was used to evaluate the social objective of the FARMS program. First, qualitative interviews were conducted in Years 1 and 3 with participating farmers to gather data on farming-related challenges or stressors, FARMS-related supports and impacts, motivation related to soil health management systems, farmer knowledge sharing and support networks, and overall job satisfaction. Four conventional control producers were also interviewed in Year 3 to discuss barriers to adoption. Interviews were qualitatively analyzed using inductive thematic coding by the Institute for Research in the Social Sciences at Colorado State University and Helios Design. Farmers also participated in social network surveys to measure the development of participant farmer social networks over time (pre-project, after Year 1, and after Year 3). Surveys were analyzed using social network analysis and network mapping visualizations.

Project Results

Environmental Results

The environmental testing in this project was designed to understand the impact of systems of soil health implemented on the High Plains of CO, KS, and NE. We sought to understand the impact on soil health metrics, as well as the nutrient density of grains.

Soil Health

We initially categorized fields into "conventional," "transitioning," and "long-term practitioners," but found that those classifications weren't detailed enough to explain the variation in soil health results. In addition, due to the highly variable year-to-year climate conditions (see Fig 2) and the abbreviated time period between measurements (2020 and 2023), we did not find any consistent changes in soil health variables between the start and end of the project.

Figure 2. Drought was a major feature of 2020-2023 in this region, and likely affected the lab results. Colors indicate the drought intensity score (D0-D4).

This led us to utilize the finer-grained Regenerative Intensity (RI) score to assess the effects of regenerative management practices on soil health outcomes. The RI score captures how intensely a producer is managing for the five soil health principles (minimize disturbance, maximize diversity, maximize a living root, maximize soil cover, and integrate livestock) (Fig 3).

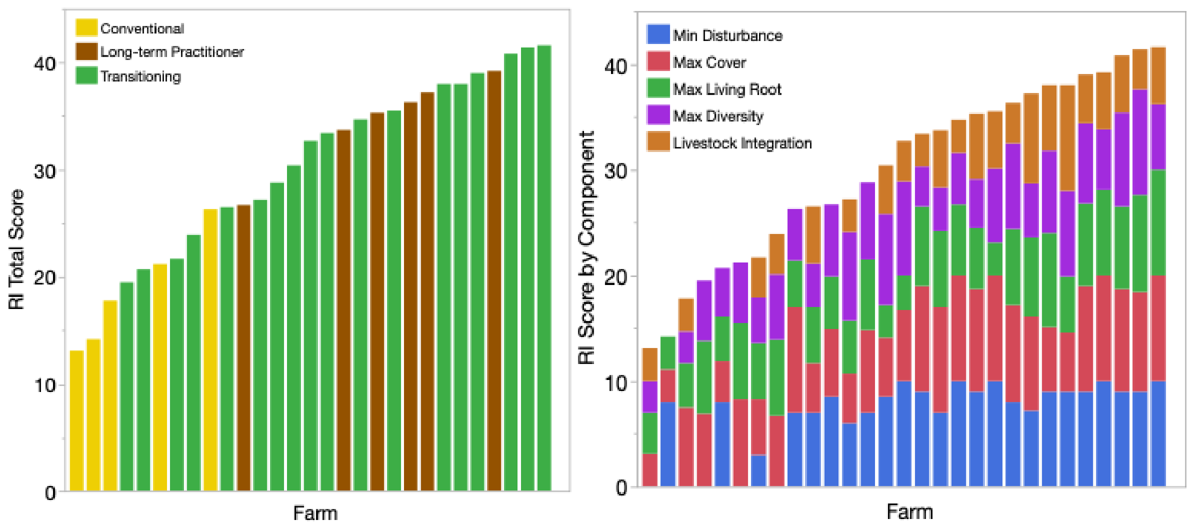
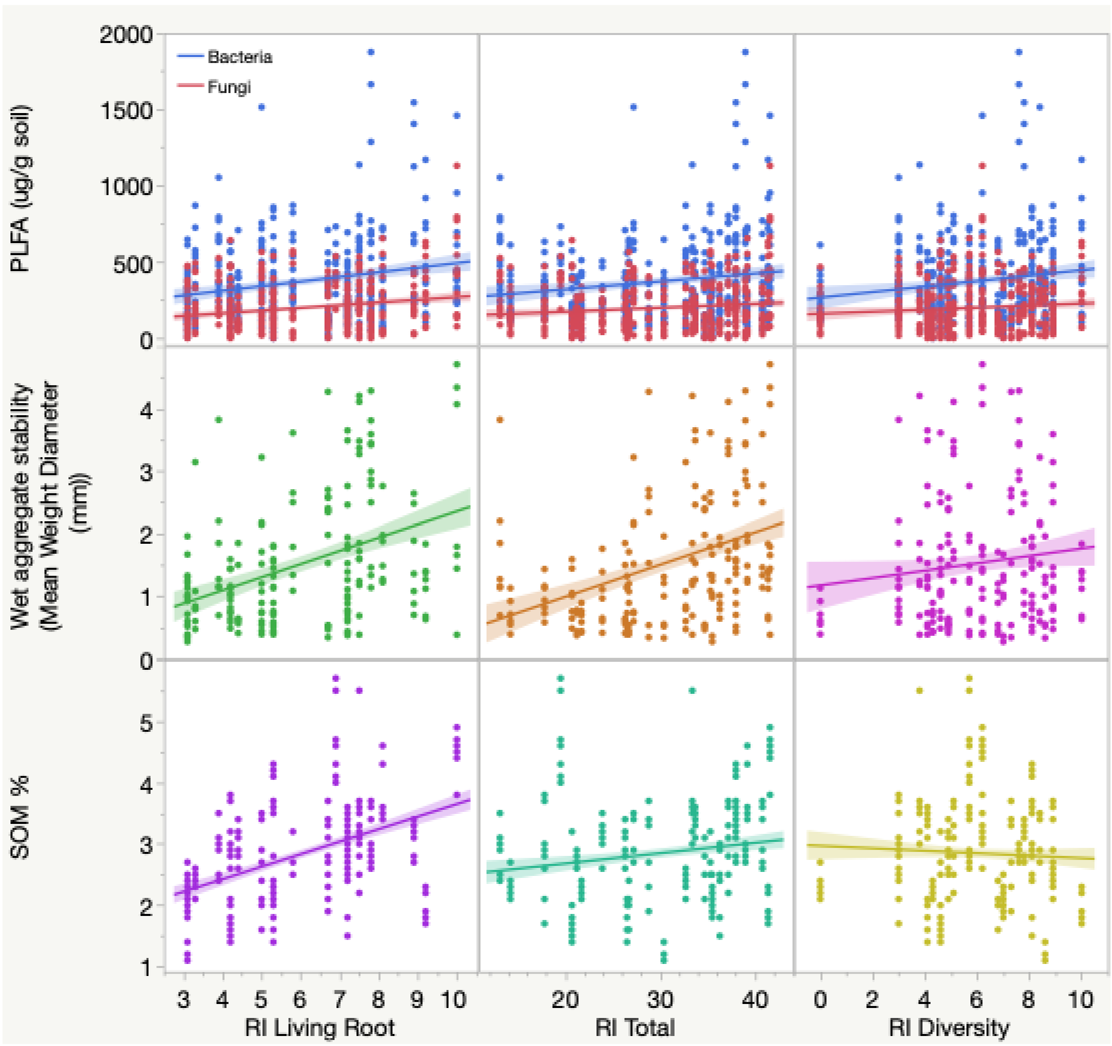


Figure 3. The cumulative Regenerative Index (RI) scores for all 30 FARMS producers a) by broad management category; and b) by individual index component.

We then assessed the relationships between the total and each component factor of the Regenerative Index score and soil health indicators to better understand how producer management practices are influencing soil health (Fig 4). Interestingly, the composite RI score was positively correlated with only a few soil variables (soil organic matter and wet aggregate stability). In contrast, the positive correlations were stronger between maximizing a living root in the soil and those same indicators (SOM and wet aggregate stability) as well as PLFA measurements of soil bacterial and fungal biomass. Maximizing diversity within the cropping system was not strongly correlated with many soil health variables, but it was more strongly associated with increased soil bacterial and fungal biomass relative to the other RI component factors.

We tested for the importance of soil type (texture) and climate (potential evapotranspiration) in determining soil health metrics. Lighter textured soils (sandier soils) did tend to have lower soil health metrics relative to heavier (more clay) soils. Despite the broad climatic range of the FARMS fields, these climatic differences did not help explain the variability in soil health outcomes.

Figure 4. Correlation analyses between Regenerative Index (RI) total and component scores for Maximizing Living Roots and Maximizing Diversity and a subset of soil health indicators (soil organic matter (%SOM), wet aggregate stability, and bacterial and fungal biomass (Phospholipid Fatty Acid (PLFA)) across all 30 FARMS fields.



In summary, a 3-year study in semi-arid regions with high annual climate variability is not sufficient to show consistent changes in most soil health indicators. However, the FARMS project generated a unique and powerful on-farm, soil health dataset across 30 farms using diverse regenerative practices. We found that regenerative management practices do have positive effects on soil health outcomes. **Increasing continuous living roots and reducing fallow periods had the largest positive impact on soil health indicators.** Wet aggregate stability was the most responsive indicator to regenerative practices followed by total soil organic matter. Biological indicators, including PLFA, Cmin, and soil enzyme activity, were more variable and generally showed weaker relationships with management systems. These relationships held true across the broad climate gradient represented by the FARMS field sites.

Nutrient Density

Grains were analyzed from long-term soil health management fields and compared to conventional fields. Mineral content was compared to the available data on the USDA FoodData Central website (https://fdc.nal.usda.gov/fdc-app.html#/) or FeedTables (https://www.feedtables.com). Mineral content was reported as a percent of standard with 100% equal to the standard. Comparing grains of the same year, soil health grains did not show 10% or larger differences for any one mineral across every year of the study. Averaged over the three years, soil health grains showed 10% or larger difference in Calcium (Ca), Magnesium (Mg), Iron (Fe), and Copper (Cu) over conventional grains. Statistical analysis was not completed. The final report from the Health First team is attached to this report.

Economics Results

The economics objectives of this project were designed to understand the costs and values of regenerative agriculture in the High Plains. We tackled this in three ways: (1) studying consumer interest in regenerative agriculture, (2) case studies of costs and returns for two scenarios, and (3) wholescale gathering of management data from participants.

Consumer Interest Study

The final survey was disseminated by the Food Systems group in the Department of Agricultural Resource Economics at Colorado State University, to 2,275 consumers across the US. It tested consumer support of brands who engage in CSR supporting regenerative ag. It compared:

- regenerative vs. organic vs. fair trade
- Whole Foods vs. Kroger vs. Walmart
- Giving information about the production process AND what the brand is doing to support it vs. limited information vs. no information at all (control).

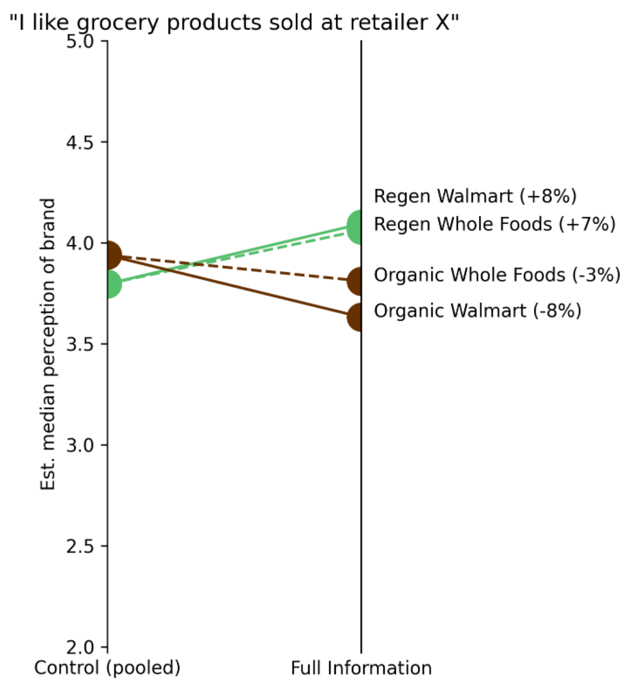


Figure 5. Results of the consumer interest survey revealed that delivering information about regenerative practices alongside a brand's actions to support these practices, improved reported consumer loyalty to the brand.

A series of questions were asked to measure Brand Perception, Perceived Quality, and Brand Loyalty. For all questions other than "trust safety," "product quality," and "product healthiness," the trend was similar to "I like products," shown in Fig 5.

Absent any information about the production process (organic vs. regenerative), or the brand's specific actions, people had higher perceptions of Organic. **However, with a full information treatment, people had higher perceptions of Regenerative, across both Walmart and Whole Foods.** Some of the perceptions did not follow this trend. When asked about healthiness, consumer responses for Walmart were not different between no information or full information. Consumers perceived Organic as more healthful at Whole Foods, compared to Regenerative. A full paper regarding this study is expected to be published by PhD student Mackenzie Gill at a later date.

Case Studies

Two case studies were prepared for two producers' economic scenarios. One takes a holistic look at the agronomic and economic benefits of Kernza in central Kansas, a perennial intermediate wheatgrass which can be harvested for grain and used in baked goods. This study found that the newly established Kernza did not fare well during the 2022-2023 drought and that pasture-cropping is probably not a viable tool for increasing diversity in a monocropped Kernza field. The other case study evaluated the economic returns from a diverse rotation under pivot irrigation in Southwest NE. It found that **a diverse crop rotation can use less water and still be more dependably profitable over the long term, avoiding the boom/bust cycle of**

conventional corn-corn-soybean-wheat rotations. Both case studies are attached to this report, and links are available in the Publications section.

Whole-project Management Data

Management data was gathered from all participant fields, according to the SHDT Field Operations Template. Equipment costs were brought in on a per-acre basis from UNL Extension data in 2020. Breakeven yields and costs were calculated, and here we report the mean, and Quantiles 1 and 3.

Table 1. Breakeven yields and prices for crops grown by FARMS producers, 2016-2022.

Crop	Breakeven Prices Mean	Breakeven Prices Quantile 1	Breakeven Prices Quantile 3		Breakeven Yields Mean	Breakeven Yields Quantile 1	Breakeven Yields Quantile 3
corn	$1.68	$0.65	$2.76		29.90	15.92	37.07
soybean	$5.33	$1.93	$7.55		11.60	9.57	12.83
wheat	$3.32	$1.98	$3.95		24.22	21.39	26.90
sorghum	$1.48	$0.90	$1.51		29.23	15.99	38.49
millet	$8.57	$5.54	$10.32		18.58	16.56	19.74
pea	$7.00	$6.06	$8.54		16.86	12.47	22.37
rye	$8.87	$3.56	$13.06		7.80	6.05	9.35

PODS Data Entry

Raw data has been sent to the PODS database engineers at NRCS in .csv format, and we are working with them to beta-test their new import function.

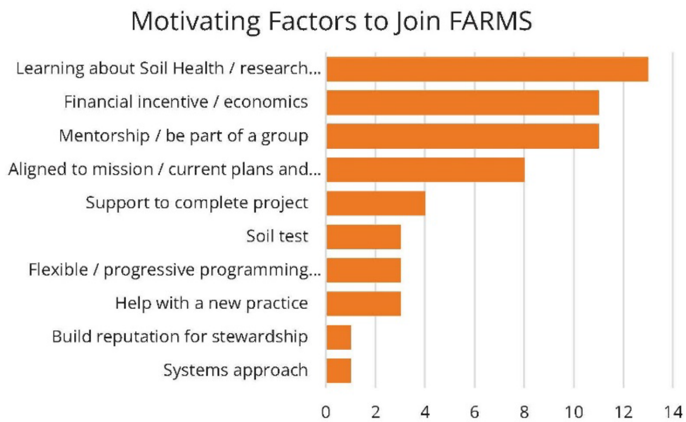
Social Analysis Results

Complete reports related to the social evaluation of FARMS are attached to this report, and links are available in the Publications section below.

Qualitative Interviews

All 24 FARMS producers participated in the social interviews in both Years 1 and 3 of the project. These semi-structured conversations centered on discussing motivating factors related to soil health, barriers to adoption, challenges, and program impact.

Figure 6. Motivating factors to join the FARMS Project.



Motivating Factors

When asked in Year 1 why they originally became interested in soil health management, producers most frequently gave answers relating to financial reasons, reducing inputs, reducing erosion, and integrating livestock. A separate line of questions sought to understand why producers specifically chose to engage in the FARMS program, with the number one response being the opportunity to learn more about soil health. The financial support and mentorship components of the program tied for the second most motivating factor.

In Year 3, **100 percent of FARMS participants reported that they intend to continue utilizing soil health management** beyond the timeframe of the program. Respondents most frequently cited soil health, financial resiliency, and environmental improvements as their reasons for planning to continue.

Barriers to Adoption

Interviews with four conventional control producers in Year 3 identified financial concerns (e.g. variable cost of chemicals, equipment investment, seed expense) and limited moisture as the primary reasons individuals choose not to engage in intensified soil health management. Other barriers mentioned included timing challenges, landlord relations, soil compaction, and perception of neighbors. Subsequently, controls were asked what would help them overcome their reported barriers. Enablers included witnessing hyper-local success at field days (or “seeing proof” that it works), identifying methods for overcoming herbicide resistance, market drivers, and finding ways to preserve moisture with soil health management.

Challenges

For those involved in the FARMS program, the interviews also identified the most prominent challenges that producers faced while implementing a soil health management system, as shown in Figure 7.

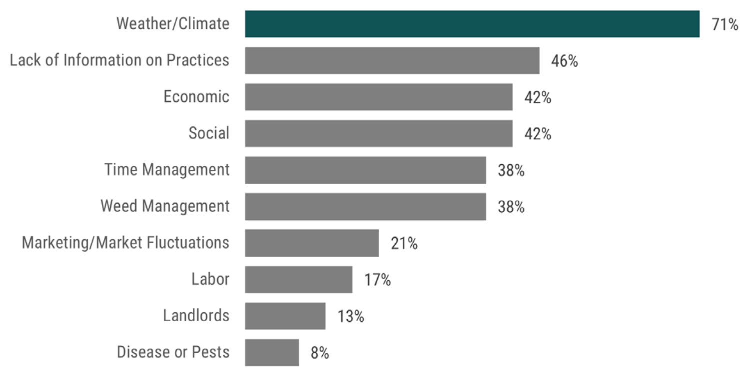
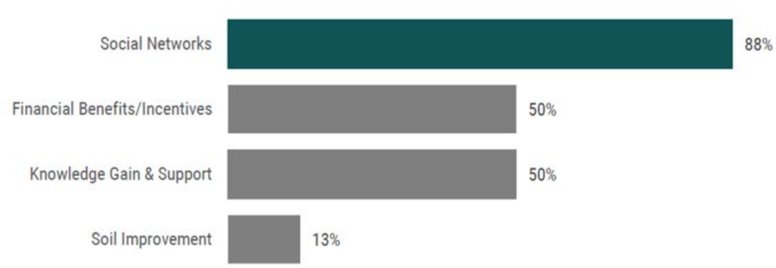


Figure 7. The most frequently cited challenges were related to weather and/or climate.

When discussing a "lack of information on practices," producers noted that general information could usually be found on innovative practices, but not information specific to their environment. This echoes the responses from control interviews that demonstrate that hyper local support is seen as highly valuable and currently lacking in the High Plains region.

Program Impact

Of all the farmers interviewed, the vast majority (88%) said that the **social networking aspect of the FARMS program had a positive impact on the challenges and stress they face related to farming** (Fig 8)**.**



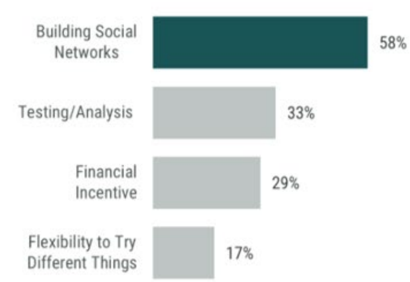


Figure 8. The majority of farmers said that the social networking component of FARMS positively impacted their stress around farming and was the most valuable aspect of the program overall.

These farmers said that FARMS social networks allowed them to gain new farming knowledge, bounce ideas off other farmers, utilize mentorship opportunities, and experience comradery around farming-related challenges. Half of the farmers interviewed also mentioned the positive impact that the financial benefits of the program had on their stress level, and half said that the knowledge they gained through participation in the program helped to minimize challenges and reduced stress.

Additionally, building social networks was most commonly viewed by participants as the most valuable aspect of the FARMS program overall, following by the testing and analysis provided, the financial incentives, and flexibility.

Social Network Analysis

The FARMS program enabled producers to form dense, interconnected networks to facilitate engagement, cooperation, and knowledge-sharing. The network data that was collected can be visualized as maps showing connections between producers. Each of the boxes is a producer, and a line between them indicates that one or both said that they were connected.

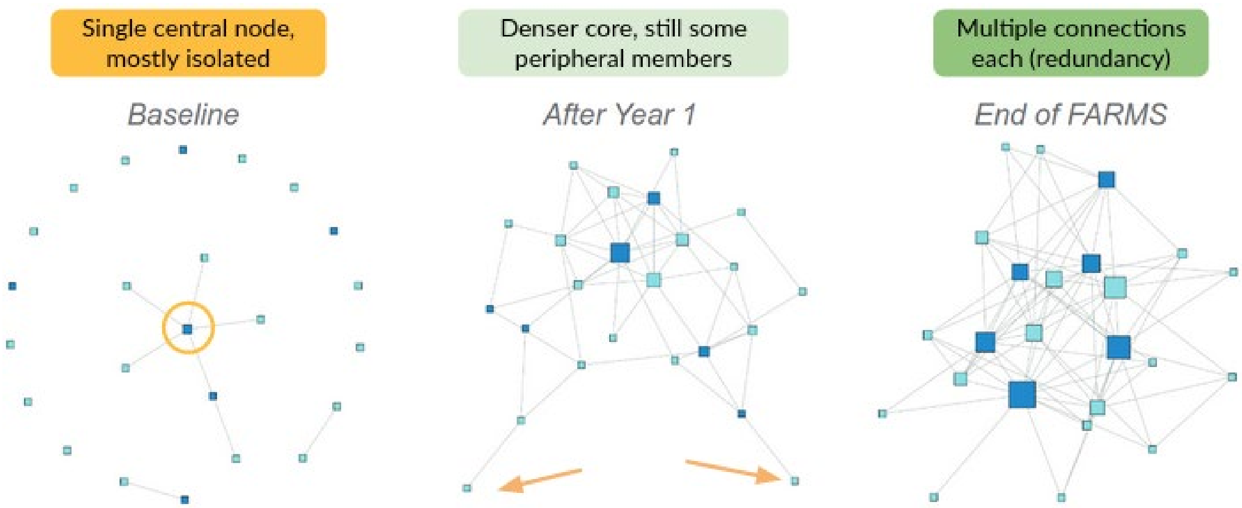


Figure 9. Social network maps and interpretation for the Support Network: who the producers indicate that they "Talk about farming practices, Go to for technical assistance, Go to for advice, or Discuss challenges." Dark blue squares indicate Long-Term Producers, light blue is Transitioning producers, and green is Admin/TA.

Baseline	Year 1	Year 3
Baseline shows little interconnectedness between producers. If the node circled in yellow were to exit the network, there would be virtually no connections remaining. This is a very fragile network.	Year 1 is starting to show a stronger network, with more people connected, often redundantly. The two nodes indicated with yellow arrows are still vulnerable because they only have a single connection. If a few key people in the center of the network were to drop out, the network might fracture into two separate networks.	Year 3 - this is ideal. Dense network with redundant connection between people. Even if some people drop out after FARMS ends, this network will not collapse. This is especially important in an informal, voluntary network, where no one is getting paid to be here.

The other networks that were measured show similar patterns of growth, from Year 1 to Year 3, as shown in Figure 11. The friendship network in particular is worth highlighting, as it is the most long-lasting, compared to other more formal types.

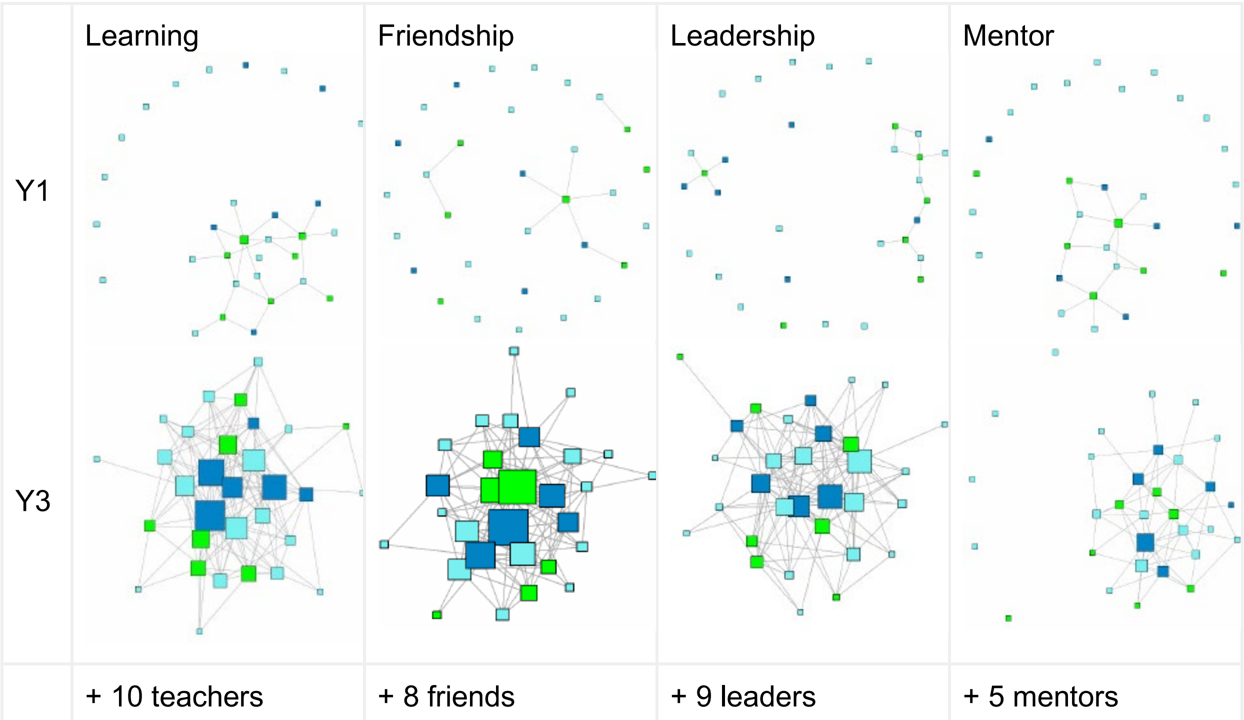


Figure 11. Social networks for Learning, Friendship, Leadership, and Mentors.

These network maps validate the findings from the interviews, where **people overwhelmingly reported that social support was the most valuable aspect of the FARMS program.**

Project Outputs

Websites

www.farmsproject.org is the project website. It currently contains results and reports generated by the project. Launched at the start of the project, it has received 10,852 unique pageviews, with the greatest spike when we launched applications for farmers (1,951 unique pageviews in Feb 2020).

Software

These products are all available as attachments to this report.

Producer soil health planning worksheets

SET (Soil Evaluation Tool) - an extension of the NRCS Cropland In-Field Soil Health Assessment Worksheet, with additional indicators and a guided brainstorming section to help producers decide which practices to implement, based on the in-field results.

CSHMP (Comprehensive Soil Health Management Plan) - a soil health planning document for producers, emphasizing the systems approach to soil health.

Verification Job Sheet - the verification documents used to approve conservation payments.

RI Score (Regeneration Intensity score) - the 10-min survey used to gauge the intensity of soil health management.

Media and Publications

Media Coverage

"Bennet Applauds USDA Grant to Promote Soil Health and Boost Farm Profitability on Colorado's Eastern Plains." *Michael Bennet*, https://www.bennet.senate.gov/public/index.cfm/2019/12/bennet-applauds-usda-grant-to-promote-soil-health-and-boost-farm-profitability-on-colorado-s-eastern-plains. Accessed 5 Apr. 2024.

"CCTA Awarded $1.6 Million to Support Soil Health in the High Plains." *BARN OnAir & OnLine 24/7/365*, 27 Nov. 2019, https://barnmedia.net/2019/11/27/11-27-19-ccta-awarded-1-6-million-to-support-soil-health-in-the-high-plains/.

Hafford, Lauren. "Opinion: Colorado FARMS Project Grant Could Help Address Climate Change, Make Agriculture More Sustainable." *The Colorado Sun*, 8 Dec. 2019, http://coloradosun.com/2019/12/08/agriculture-farming-climate-change-opinion/.

Applications Open for High Plains Soil Health Demonstration Program | KiowaCountyPress.Net. https://kiowacountypress.net/content/applications-open-high-plains-soil-health-demonstration-program. Accessed 5 Apr. 2024.

Mannette, Alice. "Farmers Can Get Funds to Improve Their Soil." *The Topeka Capital-Journal*, https://www.cjonline.com/story/news/local/kansas-agland/2020/02/21/farmers-can-get-funds-to-improve-their-soil/1667874007/. Accessed 5 Apr. 2024.

FARMS: Farmers Advancing Regenerative Management Systems. Directed by Soil Revolution Conference, 2021. *YouTube*, https://www.youtube.com/watch?v=E2TUW1RRm9I.

Theler, Rachel. "The FARMS Project: Where Science and Community Meet." Colorado Department of Agriculture Soil Health Initiative, 2021. https://ag.colorado.gov/conservation/soil-health-program/soil-health-initiative

Publications

Obour, A., J. Holman, S. Johnson, D. Presley, K. Roozeboom, and L. Simon. 2022. Does grazing cover crops impact soil properties? Agronomy eUpdate, issue 905. https://eupdate.agronomy.ksu.edu/article_new/does-grazing-cover-crops-impact-soil-properties-493.

Obour, A.K., J.D. Holman,. L. M. Simon, and S.K. Johnson. 2023. "Grazing Cover Crops Improved Soil Health in Dryland Cropping Systems," Kansas Agricultural Experiment Station Research Reports: Vol. 9: Iss. 6. https://doi.org/10.4148/2378-5977.8486.

Project Publications

All publications are available at www.farmsproject.org.

Mitchek, J. 2020. FARMS Informational Flyer. https://farmsproject.org/wp-content/uploads/2020/02/FARMS-Updated-Flyer.pdf

Mitchek, J. 2021. Y1 FARMS Fact Sheet. https://farmsproject.org/wp-

content/uploads/2021/08/FARMS-Year-1-Fact-Sheet.pdf
Hafford, L. 2021. Interseeding Fact Sheet. https://farmsproject.org/wp-content/uploads/2023/10/FARMS-Interseeding-Y2.pdf
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Michaelidis, Y., Clark, L. 2022. Helios Y1 Social Presentation. https://farmsproject.org/wp-content/uploads/2023/10/FARMSYear1QualResearchReportOut_220725.pdf
Hafford, L. 2023. Kernza Case Study. https://farmsproject.org/wp-content/uploads/2023/10/FARMS-Kernza-writeup.pdf
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Michaelidis, Y., Clark, L. 2023. FARMS Year 3 Qualitative Research Analysis. https://farmsproject.org/wp-content/uploads/2024/02/FARMSYear3QualResearchReportOut_231024-2.pdf
Ravenkamp, B. 2023. FARMS Nutrient Density Report. https://farmsproject.org/wp-content/uploads/2023/11/Final-ND-Report-2023-1.pdf
Hafford, L. 2023. Year 3 Soil Test Results Report. https://farmsproject.org/wp-content/uploads/2024/04/Sample-Soils-Report.pdf
Mitchek, J. 2023. Social Fact Sheet. https://farmsproject.org/wp-content/uploads/2023/10/FARMS-Social-1pg-summary.pdf
Mitchek, J. 2024. Project Summary. https://farmsproject.org/wp-content/uploads/2024/04/FARMS-1-Page-Summary.pdf

Conference Attendance

Producer-focused

Mitchek, J. (2019). *Farmers Advancing Regenerative Management Systems, FARMS* [Conference presentation] Soil Revolution, Boulder, CO.

Mitchek, J., Hafford, L., Ravenkamp, B. (2020). *Farmers Advancing Regenerative Management Systems, FARMS* [Conference presentation]. High Plains No-Till Conference, Burlington, CO.

Mitchek, J., Hafford, L., Ravenkamp, B. (2020). *Farmers Advancing Regenerative Management Systems, FARMS* [Conference presentation]. Farming Evolution, Holyoke, CO.

Garrison, D. (2021) *Cool Season Annuals into Warm Season Perennial Pasture* [Conference presentation]. High Plains No-Till Conference, Burlington, CO.

Wiltse, K. (2021) *Advancing our Regenerative Farming Practices* [Conference presentation]. High Plains No-Till Conference, Burlington, CO.

Steffen, J. (2021) *Does Soil Health Really Pay?* [Conference presentation]. High Plains No-Till Conference, Burlington, CO.

Pfaltzgraff, R III. (2021) *Challenging the Status Quo: I have too much storage, I like working on planters, and other things never said by dryland farmers* [Conference presentation]. High Plains No-Till Conference, Burlington, CO.

Niswonger, J. (2021) *Biology, Compost, Rotations, and Grazing* [Conference presentation]. High Plains No-Till Conference, Burlington, CO.

Niswonger, J. & Young, J. (2021) *Biology in Action* [Conference presentation]. High Plains No-Till Conference, Burlington, CO.

Stuenkel, L., Most, T., Sayles, C. (2022) *FARMS Producer Panel: Reducing Inputs* [Conference presentation]. High Plains No-Till Conference, Burlington, CO.

Wiltse, K. (2022) *Plan B Ranch* [Conference Presentation]. High Plains No-Till Conference, Burlington, CO.

Young, J. (2023) *Become Extremely Efficient and Successful as a Regenerative Farmer* [Conference presentation]. High Plains No-Till Conference, Burlington, CO.

Pfaltzgraff, R III. (2023) *Arid Farming in Colorado: It's Time to Question Everything* [Conference presentation]. High Plains No-Till Conference, Burlington, CO.

Stephens, C. (2023) *Farming with Compost, Ranching with Purpose* [Conference presentation]. High Plains No-Till Conference, Burlington, CO.

White Heckman, D., Young, J., Steffens, J. (2023) *Interseeding Covers into Corn* [Conference presentation]. High Plains No-Till Conference, Burlington, CO.

Obour, A.K., L. M. Simon, J. D. Holman, S. Johnson. 2023. Cover crops grazing and soil health in dryland production in western Kansas. Cover Your Acres Conference. Jan 17-18, 2023. Oberlin, KS.

Obour, A.K. L.M. Simon, and M. Schipanski. 2023. Crop management effects on soil properties: Data from producer fields. Tear Down the Walls Meeting, September 19-20, 2023, Rapid City, SD.

Obour, A.K. 2023. Soil physical and chemical properties as impacted by regenerative agriculture practices. FARMS Field Day. Green Cover Facility August 14, 2023. Bladen, NE.

Obour, A.K. 2003. Grazing cover crops in dryland systems. NRCS Field Day. August 22, 2023. Hugoton, KS

Pfaltzgraff, R III. (2023) *Don't Tell Me How to Do Soil Health (Farming in Arid Regions)* [Conference presentation]. Soil Health U, Salina, KS.

Young, J. (2023) *Going Deeper into Regenerative Ag with Compost and Interseeding Cover Crops* [Conference presentation]. Soil Health U, Salina, KS.

Pfaltzgraff, R III. (2024) *It's Time to Question Everything, Again…* [Conference presentation]. High Plains No-Till Conference, Burlington, CO.

Einspahr, P., Sayles, C. (2024) *A Flexible Mindset for a Volatile Environment* [Conference presentation]. High Plains No-Till Conference, Burlington, CO.

Thompson, M., Pfaltzgraff, R III., Smith, Z. (2024) *Maximizing Diversity* [Conference presentation]. High Plains No-Till Conference, Burlington, CO.

Casper, M S. (2024) *A Path of Hope* [Conference presentation]. Farming Evolutions, Holyoke, CO.

Grosbach, J., Sayles, C., Schipanski, M. (2024) *What We Have Learned Through the FARMS Project* [Conference presentation]. Farming Evolutions, Holyoke, CO.

Academia & Ag Professionals

Schipanski, M. Conserving soil and water resources in semi-arid regions. UN FAO World Soil Day Celebration, New York, NY. December 7, 2023.

Mitchek, J., Hafford, L., Ravenkamp, B. (2022). *Farmers Advancing Regenerative Management Systems, FARMS* [Conference presentation]. Soil and Water Conservation Society Meeting, CIG Showcase. Denver, CO.

Hafford, L. (2022). *Farmers Advancing Regenerative Management Systems, FARMS* [Society chapter presentation]. Environmental Entrepreneurs and Grist. San Francisco, CA.

Obour, A.K, and J. Holman, and L. M. Simon. 2022. Cover crops as forages in the western Great Plains. American Forage & Grassland Council Conference. Jan 9-12, 2022.

Wichita, KS.
Simon, L. M., Obour, A. K., Holman, J. D., Schipanski, M. E., Lawrence, M. A., Johnson, S. K., & Roozeboom, K. L. (2022) On-Farm Soil Health Practices Effect Wind Erosion Potential in the Semi-Arid Central Great Plains [Abstract]. ASA, CSSA, SSSA International Annual Meeting, Baltimore, MD. https://scisoc.confex.com/scisoc/2022am/meetingapp.cgi/Paper/141704.
Mitchek, J., Hafford, L. (2024). *Farmers Advancing Regenerative Management Systems, FARMS* [Committee presentation]. State Technical Advisory Committee, Natural Resources Conservation Service. Broomfield, CO.
Schipanski, M. Building resilient cropping systems and communities in the Central Great Plains. CSU College of Agricultural Sciences Research Seminar series, February 13, 2023.
Schipanski, M. Regenerative agriculture principles in a drier landscape. Department of Horticulture and Crop Science Seminar Series, The Ohio State University, February 15, 2023.
Jackson, E. Farmer-led regenerative management practices impact soil health. Front Range Student Ecology Symposium, February 2, 2024.
Meis, B. 2023. A Periodic Review of How Soil and Management Factors Influence Carbon Mineralization. ASA, CSSA, SSSA International Annual Meeting, St. Louis, MO. https://scisoc.confex.com/scisoc/2023am/meetingapp.cgi/Paper/148348
Hafford, L. *Farmers Advancing Regenerative Management Systems, FARMS*. CSU College of Agricultural Sciences Research Seminar series, April 10, 2024.
Gill, M., Costanigro, M., Berry, C. 2024. "Can Supporting Regenerative Agriculture Yield Brand Equity? Evidence from a Consumer Survey Experiment." *Agricultural and Applied Economics Association 2024 Annual Meeting*. New Orleans, LA. [forthcoming]

Trainings and outreach events

Date	Event	Attendance
2/6/2020	Kickoff Event (Burlington, CO)	19
5/6/2020	LTP Orientation (Virtual)	6
5/21-22/2020	Hub Trainings (Virtual)	24
8/18/2020	Green Cover Seed webinar (Virtual)	17
8/25/2020	Senator Bennet visited FARMS producer's operation	6
11/2/2020	Field day (Timken, KS)	9
11/20/2020	LTP/TA Round Table (Virtual)	10
1/28/2021	Soil Test Q&A (Virtual)	22
3/13/2021	Field Day (Stockton, KS)	19

4/15/2021	LTP Round Table (Virtual)	12
4/29/2021	Interseeding Round Table (Virtual)	13
5/14/2021	Mad Ag Holistic Pathfinding Workshop (Virtual)	7
6/12/2021	FARMS Field Tour (Haxtun, CO)	30
8/18/2921	Mad Ag Field Visit (Seibert, CO)	3
8/23/2021	Field Day (Seibert, CO)	21
8/21/2021	FARMS Social (Burlington, CO)	52
8/22-23 2021	Booth at High Plains No-Till Conference (Burlington, CO)	16
11/16/2021	Soil Biology Webinar (Virtual)	16
11/27/2021	Facilitated Hub Meeting (Virtual)	5
12/14/2021	Facilitated Hub Meeting (Virtual)	4
1/31/2022	Soil Biology and Composting Workshop (Seibert, CO)	35
1/31/2022	FARMS Social (Burlington, CO)	70
2/1/2022	Booth at High Plains No-Till Conference (Burlington, CO)	23
2/15/2022	Hub Farm Visit (Crook, CO)	8
2/16/2022	Booth at Farming Evolution conference (Holyoke, CO)	10
3/11/2022	Open Gate with HMI (Holly, CO)	24
3/28/2022	Green Cover Planning Q&A (Virtual)	17
5/25/2022	LTP Meeting (Virtual)	6
6/10/2022	4-H Fun Day (Hugo, CO)	20
6/28/2022	Helios Workshop	7
7/13/2022	Field Day (Palmer, KS)	22
8/4-8/6/2022	Regenerative Bus Tour (NE)	12
8/22/2022	Soil Carbon Initiative (Virtual)	18
10/2-4/2022	Booth at Regenerate Conference (Denver, CO)	8
10/12/2022	SuSoils Webinar (Virtual)	10
12/7/2022	Soil Health Workshop (Tribune, KS)	55

12/12/2022	Tom Dykstra Webinar (Virtual)	11
2/6/2023	Profitability Workshop (Burlington, CO)	51
2/6/2023	FARMS Social (Burlington, CO)	70
2/7-8 2023	Booth at High Plains No-Till Conference (Burlington, CO)	21
2/22-23 2023	Booth at Farming Evolution Conference (Holyoke, CO)	10
5/31/2023	4-H Fun Day (Hugo, CO)	15
8/14/2023	Field Day/End of Project Workshop (Bladen, NE)	28
8/31/2023	Field Day (Enders, NE)	44
11/14/2023	Soil Health Workshop (Holly, CO)	15
12/11/2023	Producer Soil Results Meeting (Virtual)	13
2/5/2024	FARMS/NRCS Final Meeting (Burlington, CO)	54

Newsletters

The FARMS project utilized a monthly producer newsletter to communicate with participants and staff about upcoming tasks, frequently asked questions, educational opportunities, and other project details (circulation 30). A quarterly newsletter with project updates was also disseminated to a list of interested parties who signed up for information during outreach events or online through the FARMS website (circulation 133). Finally, the CCTA Journal (circulation 1,184) included project status updates three times each year to the organization's membership.

Project Impacts

There were 3,052 unique acres directly impacted through enrollment in the FARMS program. Activities from the project will subsequently influence the approximate 59,930 acres on which participants operate or currently own.

Of the 24 producers that FARMS engaged, 100% intend to continue soil health management practices. Additionally, 29% (7) of the participants were classified as Historically Underserved (Beginning, Veteran, Limited Resource, or Socially Disadvantaged).