Introduction

In November of 2019, The Colorado Conservation Tillage Association (CCTA) was awarded a grant from the US Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) to support incentive payments for farmers implementing conservation practices for soil health. The name of the grant program is Farmers for Advancement of Regenerative Management Systems (FARMS). The long-term goal of the project is to increase the adoption of soil health management systems in the High Plains region. Objectives associated with this goal include: 1) financially supporting farmers through the use of incentives; 2) socially supporting farmers using soil health practices through establishing peer working groups, mentoring and technical assistance; and 3) measuring the costs and value of soil health management systems in the project region. This report focuses on evaluating the social objective of the program, objective two.

Methods

A mixed methods approach was used to evaluate the social objective of the FARMS program. This approach included interviews with participating farmers to gather data on farming-related challenges or stressors, FARMS-related supports and impacts, motivation to continue using soil health management systems, farmer knowledge sharing and support networks, and overall job satisfaction. Farmers also participated in social network surveys to measure the development of participant farmer social networks over time. All 24 FARMS farmers participated in interviews and social network surveys. Of the 24 farmers, 18 farmers are transitioning practitioners and six farmers are long-term practitioners. Interviews were qualitatively analyzed using inductive thematic coding. Surveys were analyzed using social network analysis and network mapping visualization. Results of the interviews and social network surveys are presented in the Findings section below.

Findings

Farmer Interviews

Challenges

Farmers were asked to identify the various farming-related challenges or stressors they currently experience in relation to implementing soil health management systems and whether or how that stress has changed since they were last interviewed in 2020. Farmers most frequently cited weather or climate-related issues as the primary challenge they currently face, with 71% of those

“This year we’re sitting at three-and-a-half inches of rainfall since last November. Nothing really worked well, and so it was just discouraging... Mother Nature throws that nice curveball and makes anything that uses water look bad.”
interviewed citing this as a challenge (see Figure 1). Related to weather and climate, farmers commonly discussed persistently dry conditions on their farms leading to difficulties with crop planning and management. The second most frequently cited challenge farmers discussed was a lack of information related to soil health management practices (46%). Farmers discussed a dearth of soil health management information available locally, including from neighbors and community members. This posed an issue with implementing new systems.

Farmers also discussed economic (42%) and social (42%) challenges related to implementing soil health management practices. Economically, farmers discussed the costs associated with purchasing new equipment, buying cover crops, and labor costs as challenges. Related to social challenges, farmers discussed familial resistance to change, generational transitions, and community perception of these practices as challenges. Challenges related to time management (38%) and weed management (38%) were also significant challenges, impacting over a quarter of farmers interviewed.

Farmers said that these stressors or challenges have, by and large, not changed significantly since they were first interviewed in 2020. In 2020, FARMS participants discussed similar challenges, including weather, lack of helpful information, financial issues, lack of social support, market/commodity pricing, landlord-tenant issues, time management, and labor issues.

Figure 1. Producers most frequently cited challenges were related to weather and/or climate.

FARMS Impact on Challenges and Farm-Related Stressors
Of the farmers interviewed, 83% explicitly said that their participation in the FARMS program alleviated farming-related stress, while only 25% said the FARMS program caused some stress. Of all the farmers interviewed, the vast majority (88%) said that the social networking aspect of
the program had a positive impact on the challenges and stress they face related to farming (See Figure 2). These farmers said that FARMS social networks allowed them to gain new farming knowledge, bounce ideas off other farmers, provided mentorship opportunities, and experience comraderie 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 also said that the knowledge they gained through participation in the program helped to minimize challenges and reduced stress.

Those farmers that said that the program increased stress, mostly characterized the program-related stress as minor or as “good stress.” For example, farmers said that the paperwork associated with the program was a minor burden (n=2) or that learning new management practices or growing new crops was somewhat stressful and more time intensive (n=3). One farmer said that this year was stressful, in particular, because their cover crop died. Another farmer said that the soil testing component of the program was stressful because it resulted in conflicting recommendations from different sources.

Farmers feelings about the program’s impact on stressors was consistent with interview findings from 2020, where farmers said they felt that FARMS has a positive impact on them and, in particular, they liked the opportunity it provided related to accessing support networks.

Figure 2. The majority of farmers said that the social networking component of FARMS positively impacted their stress around farming.
Some farmers shared ideas for how future conservation programming could help to further reduce farming-related stress (n=3). Two farmers said they would like to see programming that included a personal development component specifically aimed at managing stress. One farmer suggested integrating communication technology, such as a workplace app, as part of the program to facilitate farmer-to-farmer communications. Both strategies were seen as potential ways that programs could improve stress for participants in the future.

Social Connectedness
Farmers were asked to examine their social connectedness as related to farming. As part of this discussion, farmers were first asked whom they go to for farming advice, generally. The vast majority of farmers (92%) named specific individuals when asked this question (see Figure 3). Some shared the names of other practitioners; others shared the names of relatives or neighbors.

Figure 3. Farmers most frequently named specific individuals when asked whom they go to for farming-related advice.

Farmers also commonly said they go to particular groups and businesses (58%) or the internet or other media sources for farming advice (50%). Related to groups and businesses, farmers gave examples such as Green Cover (n=9), local farmer groups (n=6), and the FARMS support network specifically (n=6). The most frequently cited media channel farmers use for advice was YouTube (n=6). Farmers also mentioned Twitter, Facebook, podcasts, and No-Till Farmer Magazine. A quarter of farmers mentioned events they access for advice, including various webinars, conferences, and field days.
In addition to farmers answering questions related to who they go to for farming advice, generally, they also discussed how they engage with FARMS specifically. Engagement with the program fell into two categories. The most frequently discussed way in which farmers engage with the program was attendance at various FARMS activities (83%), including farm visits, FARM-sponsored webinars, conferences, field days, and other specific events such as the composting workshop. The second most frequently cited way farmers engaged with the program was through specific people (75%). These people included various administrative personnel, technical assistant liaisons, and other FARMS farmers in their hubs. The fact that farmers actively engaged with the program in this way is not surprising based on the findings from the interviews in 2020, where farmers expressed a desire for program activities such as farm visits and training events in order to build their social circles and have opportunities to learn from other farmers.

**Most Support from FARMS**

Farmers were asked who from FARMS provided them with the most useful support throughout the program. Farmers most frequently identified long-term practitioners (LTP) as providing the most support (67%) (See Figure 4). This was followed by administrative staff (46%), then transitioning practitioners (TP) (29%), with technical assistants (TA) least frequently cited (13%).

When asked what, specifically, was helpful about the support these individuals provided, farmers said that long-term practitioners were helpful for the knowledge they shared related to soil health practices. Both long-term and transitioning practitioners were helpful because they provided other perspectives and allowed farmers to bounce ideas off one another and provide moral support. Administrative staff was helpful in that they facilitated communication between other practitioners and provided much-needed administrative support to farmers.

"I liked the farm tours...Those farm tours and those networking deals, the deal out in Holyoke...was really good, because it allowed you to sit there and talk to people at lunch. You talked to them on the bus. You talked to them standing around the field watching [them] dig around in the soil, or whatever it is. You can talk about specific things."
Most Valuable Aspect of FARMS

Farmers were asked what they perceived as the most valuable aspect of participating in the FARMS program. Farmers named a variety of benefits from participation, but the most popular benefit was building social networks through the program (58%) (see Figure 5). This mirrors the findings in the FARMS impact section of this report, where farmers felt that the social network component of the program was most helpful in alleviating farming-related stressors or challenges. Farmers attributed the value of the social network to the fact that it allowed them access to information sharing opportunities, moral support, and access to like-minded people.

Some farmers also pointed to the soil testing and analysis that was performed as part of FARMS as the most valuable aspect of the program (33%). This was closely followed by the financial incentives, which 29% of farmers said were most valuable. The incentives are linked to the fourth most frequently cited benefit of the program, which was the flexibility to try new soil management techniques (17%). Farmers said that the incentives provided an added level of financial stability that allowed them to experiment with new soil health systems.

Job Satisfaction

The majority of farmers interviewed said that their overall job satisfaction was high (54%, n=13) compared to 38% (n=9) saying their job satisfaction was moderate, and only 4% (n=1) saying they had low job satisfaction. Those that said their job satisfaction was high attributed this to feeling like they were providing a service to the community, feeling engaged with the work they do, enjoying the farming lifestyle, and sharing that lifestyle with future generations. These were similar attributes that farmers discussed in 2020 as related to their satisfaction with farming. Farmers in Year 1 also said that learning from and sharing information with other farmers would increase their job satisfaction. As discussed in the FARMS impact section, farmers felt as though the program facilitated these types of interpersonal information sharing, likely resulting in the high percentage of farmers reporting high or moderate job satisfaction.

Those that said their satisfaction was moderate shared positive and negative attributes of farming. Some farmers shared challenges such as low crop production, farming-related emotional stress, and weather-related challenges. The only farmer to say that their job satisfaction was low discussed the repetitive nature of farming, saying “I guess that whole repetitive motion of just moving fences all the time, somehow it’s just not very fulfilling.”
Motivation to Continue

All 24 producers said they would or were likely to continue to use soil health management practices in their farming. The most frequently cited reason that farmers gave for their plans to continue was that they experienced the benefits of healthier soil (54%) (see Figure 7). They mentioned specific improvements related to better water infiltration, healthier soil structure, weed resistance, and reduced soil erosion due to wind. They noted that healthier soil was more resilient than unhealthy soil, and leads to increased productivity.

I can see changes, positive changes... We have more wildlife. We have more birds. We’re using less herbicides, so there’s obvious things that I can see that have changed, but I’m still not satisfied with the complete end result. For me, I want to get there. Whatever that looks like, I want to try to get there.

Figure 7. Farmers most frequently cited soil health, financial resiliency, and environmental improvements as their reasons for planning to continue healthy soil management practices.

<table>
<thead>
<tr>
<th>Reason</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soil Health</td>
<td>54%</td>
</tr>
<tr>
<td>Financial Resiliency</td>
<td>46%</td>
</tr>
<tr>
<td>Environmental Improvements</td>
<td>38%</td>
</tr>
<tr>
<td>Improved Crop</td>
<td>29%</td>
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<tr>
<td>Legacy/Family</td>
<td>17%</td>
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<tr>
<td>Limiting Exposure to Chemicals</td>
<td>17%</td>
</tr>
<tr>
<td>Engagement with Farm</td>
<td>13%</td>
</tr>
</tbody>
</table>

Farmers also said that they were planning to or likely to continue with soil health practices, because they felt it increased financial resiliency (46%). For example, they discussed the ability to cut down on the costs of fertilizer, herbicides, and other input costs as a result of implementing healthy soil practices. Financial resiliency is also related to increased productivity.

The third most common reason farmers cited for their likeliness to continue with soil health practices was the environmental improvements they experienced on their farms (38%). Farmers talked about the increase they have seen in biodiversity on and around their farms and the idea that they are stewards of their lands. Some farmers also discussed the desire to go farther with their soil health practices in order to see even more positive impacts on the natural environment.
Other motivations to continue soil health practices included noticeable improvements to their crops and harvests (29%), the positive legacy they feel they are leaving for the families and communities (17%), limiting themselves and others to exposure to harmful farming-related chemicals (17%), and increased engagement with their farms and work (13%).

Interestingly, the motivations to continue implementing soil health practices vary somewhat from the motivations farmers cited for joining the FARMS program originally, as discussed during Year 1 interviews. In the Year 1 interviews, farmers said that they were motivated to join the program because of intrinsic motivation, including a desire for social connection to other producers and involvement in the soil health community. They also said they were motivated by access to the financial and technical resources available through the program. These motivating factors are more related to inputs (intrinsic motivation and resource availability), while the motivations to continue are more outcome-related: healthier soil, financial resiliency, improved harvests, etc. This demonstrates the positive impact that the FARMS program had on participants, in that they are recognizing real-world impacts of soil health management, and this in turn is motivating them to continue these practices.

Social Network Analysis

Social network data was first collected in April of 2021 and then in January – February 2023. The spring 2021 survey established a baseline of the existing support network prior to the FARMS program and the growth of the support network over the first year (Figure 8). The spring 2021 survey also captured the learning, mentorship, leadership, and friendship networks at the end of the first year of the program. The winter 2023 data captured the state of all the networks in the third and final year of the program. All twenty-four participating FARMS farmers, consisting of six long-term users of conservation practices (LTPs) and 18 new or transitioning users (TPs), completed the social network questionnaire to inform a social network analysis showing the growth of the network over time.

In the survey, the 24 participating farmers rated fellow FARMS program farmers as well as technical assistance and administrative staff in a series of social network categories. The resulting data is summarized in the sections below, including measures of density and average degree. Density measures the percentage of the potential connections in a network that are actual connections. Average degree measures the average number of connections per person.

Farmer Support Network

The network maps in Figure 8 show support networks where respondents identified at least one of the following types of connections: “talk with,” “ask for assistance,” “ask for advice,” or “discuss changes with.” The baseline map shows this network prior to the beginning of FARMS. The Year 1 map shows the network after one year of FARMS programming. The Year 3 map shows the network at the end of the FARMS program. The maps show the average number of
support-type connections between people in the network has increased substantially from 0.67 at baseline to 4.5 in 2021 to 10.25 in 2023. The network also increased in density from 3% at baseline to 18% in 2021 to 29% in 2023. A dense network suggests that support roles are shared among a group of core individuals, rather than falling to one or two central individuals. The structure of the social network evolved to a core-periphery network structure, with long-term practitioners taking on a central role in the network. A core-periphery network is the most sustainable network structure. These types of networks increase innovation within a network, they show dense core connections with nodes with less ties on the periphery.

Figure 8. Farmer Support Network
Farmer Learning Network

The Learning networks in Figure 9 pull data from the survey question “I learn from.” These network maps show that the average degree increased significantly from 1.55 connections in 2021 to 11.87 in 2023. The density of the network also increased, from 5% in 2021 to 32% in 2023. The maps also show that long-term practitioners are often nominated as individuals from whom network members learn. Some transitioning practitioners and technical assistants/admin are also nominated relatively frequently. Like the support network, the learning network has evolved in a core-periphery structure. In this network some transitioning practitioners have joined the core in addition to the long-term practitioners and technical assistants/admin. The periphery members remain mostly transitioning practitioners.

Figure 9. Farmer Learning Network

Year 1: 2021

Year 3: 2023

Farmer Mentorship Network

The mentorship social networks in Figure 10 visualize data from the questions “___ is an unofficial mentor to me.” Comparing the 2023 network map to the 2021 network map, the average degree of the mentorship network has increased from 1.03 mentors per person, on average, in 2021 to 4.65 mentors per person in 2023. The density of the mentorship network also increased significantly from 3% to 14%. One long-term practitioner, in particular, is more often nominated as a mentor than other central network members; however, a dozen individuals representing all three categories (LTP, TP, and TA/Admin) were nominated as mentors in the 2023 network. Five individuals in the 2023, still do not have any informal mentorship relationship with others in the network. Compared to the learning network above, respondents seem to consider about half of the individuals they learn from an informal mentor.
Farmer Leadership Network

The **leadership** networks in Figure 11 are visualized based on the question: “____ is a leader in soil health practices.” Comparing the 2023 to the 2021 network visualization, the network members in 2023 nominated more members as leaders in soil health practices. The average degree has increased from 0.58 to 9.35, while the density has increased from 2% to 28%. Interestingly, some transitioning practitioners have emerged in this final year as leaders in soil health practices, in addition to some long-term practitioners and technical assistants/admin.

Figure 11. Farmer Leadership Network

**Year 1: 2021**

**Year 3: 2023**
Farmer Friendship Network

The friendship networks in Figure 12 are based on the question “___ is a friend.” Comparing the 2023 data to the 2021 data, numerous friendships have emerged between network members in 2023. The average degree increased from 1.16 in 2021 to 9.61 in 2023, and the density increased from 4% in 2021 to 25% in 2023. Further, there were 16 isolates in 2021 and zero in 2023. Friendships have emerged between all categories of members in the network; however, the long-term practitioners and technical assistants/admin members seem to have a somewhat higher degree of friendship than between other role types. Two nodes, a long-term practitioners and a technical assistants/admin, are particularly central in the network and have developed many friendships among the network members.

Figure 12. Farmer Friendship Network

Year 1: 2021

Year 3: 2023
Quantitative Survey Findings

As part of the social network survey, farmers answered a series of close-ended questions in which they self-assessed their confidence in implementing soil health practices; their family’s support of them implementing new soil health practices; how connected they are to peers outside of FARMS that support them in implementing soil health practices; and how connected they are to other organizations that support them in implementing soil health practices. Respondents rated these items on a five-point Likert scale. Farmers’ confidence in their ability to implement soil health practices increased from 2021 to 2023, with 63% of respondents in 2023 saying they “strongly agreed” with the statement “I feel confident in my ability to implement soil health practices on my farm,” as opposed to 50% in 2021. The percentage of respondents that either somewhat or strongly agreed with the following statement also went up slightly from 2021 to 2023: My family supports me in taking on new soil health practices,” with 83% in 2021 and 88% in 2023. Farmers also reported feeling more connected to other organizations supporting them in soil health practices with 46% strongly agreeing with the statement, “I am connected to other organizations that support me in taking on new soil health practices” in 2023 as opposed to 38% in 2021. Interestingly, farmers reported a slight decrease in connection to peers outside of FARMS related to soil health from 2021 to 2023 with 48% strongly agreeing with the statement, “I am connected to peers outside of FARMS that support me in taking on new soil health practices” in 2021 as opposed to 42% in 2023.

While there were slight increases from 2021 to 2023 on most of these measures and a slight decline on one measure, there was not substantial change in any of these areas from 2021 to 2023. This is not particularly surprising, however, in that response shift bias is a common issue with self-reported measures in pre- and post-program surveys. Specifically, if farmers’ levels of knowledge or awareness around certain topic areas change as a result of participation in a program, their internalized standard of measurement is also subject to change. This phenomenon can make it difficult to assess true change in knowledge, confidence, or other measures from before participation to after (Sibthorp et al. 2007). The fact that there were slight increases in most measures, however, reflects positively on the effectiveness of FARMS in supporting farmers and increasing confidence and connections related to soil health management systems.

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Conclusion

Farmers overwhelmingly shared positive experiences regarding their participation in the FARMS program. While the financial support given as part of the program was identified as a valuable aspect of FARMS, farmers most frequently cited the social support they receive through their involvement in the program as the most valuable aspect of FARMS. Farmers valued the FARMS social networks primarily because they afforded opportunities to gain new farming knowledge and share ideas and struggles with other farmers.

The social network analysis further demonstrates the value of the social networking aspect of FARMS in that each of the topic-specific farmer networks exhibited significant development over the course of the program. The average degree of each of the networks – support, learning, mentorship, leadership, and friend – increased over time, with the learning network growing most significantly from 2.67 connections to 11.87 connections in 2023. The greatest change in network density over the program occurred in the support network, growing in density from 12% in 2021 to 35% in 2023. The denser networks of 2023 demonstrate a shift where the burden of fulfilling network roles moves from one or two individuals in the network to a core group of individuals. The shift in structure of the social networks from 2021 to 2023 to core-periphery networks also demonstrates positive network development in that core-periphery network structures are more resilient than other network structures.

Overall, the interview and social network survey findings point to a positive impact of the FARMS program on the participant farmers. While farmers continue to face challenges related to weather, financial and social issues among others, the overall job satisfaction was high among more than half the participant farmers and moderate among 38% of farmers. Further, 100% of participant farmers said they were or were likely to continue implementing soil health management practices. While other factors may have also resulted in this trend, it is notable that the vast majority of farmers (83%) stated that FARMS positively impacted their stress and 67% of farmers said that FARMS long-term practitioners provided them with valuable farming related support and advice.
Appendix A: Social Network Survey 2023

1. Please indicate which relationships you CURRENTLY have with the following people. Please check all that apply. If none apply, leave all boxes blank.
   a. Talk about farming practices
   b. Go to for technical assistance
   c. Go to for advice
   d. Discuss challenges

2. Please indicate which relationships you CURRENTLY have with the following people. (i.e., consider each statement with the individual’s names inserted in the blank.) Please check all that apply. If none apply, leave all boxes blank.
   a. I learn from ____
   b. ____ is a leader in soil health practices
   c. ____ is an official or unofficial mentor to me
   d. ____ is a friend
   e. ____ inspires me

Please indicate your level of agreement with the following statements about yourself.

3. I feel confident in my ability to implement soil health practices on my farm.
   a. Strongly disagree
   b. Somewhat disagree
   c. Neutral
   d. Somewhat agree
   e. Strongly agree

4. My family supports me in taking on new soil health practices.
   a. Strongly disagree
   b. Somewhat disagree
   c. Neutral
   d. Somewhat agree
   e. Strongly agree

5. I am connected to peers outside of FARMS that support me in taking on new soil health practices.
   a. Strongly disagree
   b. Somewhat disagree
   c. Neutral
   d. Somewhat agree
   e. Strongly agree

6. I am connected to other organizations that support me in taking on new soil health practices.
   a. Strongly disagree
   b. Somewhat disagree
   c. Neutral
   d. Somewhat agree
   e. Strongly agree

7. How many times did you participate in educational opportunities related to the FARMS project? This could include field days, webinars, conferences, and phone calls with mentors or hubs.
   a. 0
   b. 1-3
   c. 4 or more
Appendix B: Producer Interview Instrument 2023

Motivation
1. How did you hear about the FARMS Project?
   - What/who individual/group of people? How long ago? Ask them to be specific.

2. What motivated you to apply to participate in the FARMS project?
   - Listen for: Economic reasons? Is this a producer who likes to be challenged and try new things (innovative)? Was producer persuaded by someone else/others? Have any philosophical reasons (part of their views of the world or nature of their family)? If appropriate you can ask if they have a philosophy about farming. Belief system?

3. Did you encourage others to apply?
   - Ask who they encouraged and why? Listen for responses that key into their social networks.

Barriers to Adoption
4. When you applied for the FARMS project, what challenges were you facing when it came to being innovative with your farming practices?
   - Listen for and ask follow-up questions if you hear comments related to barriers or “best outcomes” such as:
     - Risky to adopt or risky not to adopt?
     - Cost associated with innovative practices and impact on profitability vs. new practice will improve farm net income
     - Level and type of technical support needed and time required to be part of the “group”
     - Time associated social support (e.g., peer working groups and peer mentors)
     - Soil health practices will be restrictive vs. flexibility in the past
     - Markets changes can be a barrier
     - Environmental factors as supporting or as a barrier (e.g. water, weeds, weather, bugs, etc.)
     - Infrastructure needs and supports
     - Helpful programs or policies?

5. Now that you’re adopting some new practices in FARMS, what challenges are you currently facing with implementation?
   - Identify specific feedback that can be used to improve the program at this point.

Well-being & Job Satisfaction
6. Through the FARMS Project, one of the things we are interested in learning more about producer stress. Can you share what you find to be the most stressful elements of being a farmer?
   - Listen for and probe if appropriate: financial, market fluctuations, equipment breakdown, family stress, natural disasters, ongoing risks of farming, emergencies, etc. Listen for stress tolerance level, i.e. high tolerance, and ability to “weather” through difficult times, listen for attitudes about stress.

7. How do you cope with that stress?
   - Listen for how much they feel in control of their stress. Coping strategies include professional help, talking with others, unhealthy behaviors, etc.
8. What impact has the FARMS project had on your stress so far? Was that what you expected of the program before you applied?
   • Did FARMS increase stress for them?
   • Have the practices they are learning increased/decreased stress?
   • If they perceive that the FARMS project has increased their stress—ask how and ask what can be done to mitigate that stress by them and by CCTA?

9. All things considered, how would you rate your job satisfaction as a producer? What do you think is the most fun or exciting thing about being a farmer? Do you think the FARMS project will have an impact on your job satisfaction?
   • Ask a follow-up on what is satisfying about their job and listen for any positive/negative impact(s) of participating in the FARMS project in relationship to their job satisfaction.
   • Have the practices they are learning or support they are receiving impacted job satisfaction?

Social Networks

10. Who do you generally go to for advice? How about for soil health practice advice? Why do you go to these particular people?
    • Be sure to make the distinction between “in general” and for farming advice.

11. Who was providing you the most support at the start of the FARMS project? What type of support do they provide? What is helpful about this support?

12. What kind of support have you received from FARMS? What do you need more of from FARMS?

Closing of Interview

13. Is there anything that you’d like to share with me at this time? Related to the FARMS project?
    • Become comfortable with a somewhat longer “wait time/silence” as some people need time to think