Seeding resilience: Building knowledge and capacity through relationships among Black and Indigenous women farmers

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Abstract

Black and Indigenous women farmers face concurrent complex challenges in their farming operations such as a changing climate, institutional discrimination, and a historic wealth gap. The compounding nature of these challenges provides opportunities for agricultural technical assistance providers to create innovative educational

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approaches to support and build capacity towards greater resilience. American Farmland Trust, North Carolina Extension, and Black Family Land Trust piloted a "Get Climate Smart Food and Agricultural System's Resilience Training" with 30 Black and Indigenous women farmers in North Carolina during 2023 and 2024. The training's focus was to engage historically underserved women producers to (a) actualize conservation skills and climate smart practices, including monitoring and implementation; (b) improve technical skills regarding diversifying production and marketing systems for greater economic and food system resilience; and (c) develop leadership and mentoring skills to build community and social resilience around food and agriculture. All sessions were structured using a learning circle model that fostered collaborative, participant-driven learning compared to traditional instructor-led sessions; enrolled participants engaged in virtual, in-person, asynchronous, and hands-on activities. After the program concluded, the team conducted 18 in-depth semi-structured interviews with a subset of participants. Findings revealed that the program's learning circle model and cohort network were highly effective for beginning and experienced Black and Indigenous women farmers, particularly by sustaining relationships and implementing climate smart practices on their land beyond the program timeframe. This article will review the program's model and discuss how this type of program and its learning outcomes foster social sustainability by boosting individual, farm-scale, and local food resilience.

Keywords

Black farmers, climate change, cohort training, farmer training, peer networks, social-ecological resilience, sustainable agriculture, underrepresented farmers, women farmers

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Introduction

Climate change impacts agriculture in multiple ways, as it can cause more extreme and unpredictable weather events that threaten the viability and sustainability of farms. This project focused on the Southeastern U.S., where climate change has had, and will continue to have, a disproportionate impact on people of color, who are especially vulnerable due to historical and ongoing inequity and racial discrimination (Hoffman et al., 2023). This region has already experienced sea level rise and extreme changes in precipitation. It is projected to face higher and more dangerous temperatures, increased humidity, greater risks of disease and pest pressures, and both water and heat stress, which may heighten crop and livestock production risks while reducing yield and quality (Lengnick, 2022). Indeed, increased temperatures have been associated with a decrease in crop productivity in Southeastern states, including in North Carolina (Eck et al., 2020). Amid these climate challenges facing agriculture, there is a growing movement to cultivate greater resilience on farms. We define resilience as agroecosystems where adaptation, innovation, and learning can occur to provide more social, economic, and ecological capacity to respond to extreme and unexpected events (Lengnick, 2022).

Resilience, however, is hampered by the history and current reality of agriculture in the United States, which is founded on exploitation, violence, and land dispossession involving Black and Indigenous people as well as other farmers of color. Indigenous land was stolen and redistributed to white settlers through the Homestead Acts (Carlisle, 2022; Horst & Marion, 2019). Black farmers' agrarian experience, including the experience of land loss, is also shaped by and born out of racial discrimination. By 2000, Black farmers had reportedly lost approximately 90% of the 12 mil-

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lion acres of farmland they owned in 1910 (Armstrong, 2024). Yet Black and Indigenous farming communities have been cultivating resilience and resistance for centuries (White, 2018) in the face of ongoing issues around land dispossession (Lamb, 2023; Penniman, 2018), discrimination from social and government systems (Carter & Roesch-McNally, 2024; Presser, 2019), and challenges with land access for aspiring landowners (Figueroa et al., 2020; Horst & Marion, 2019). From overcoming the painful legacy of slavery and sharecropping to acquiring and stewarding land, the roots of Black farmers in American agriculture are deep and a testament to their resilience and persistence (Hinson & Robinson, 2008). Black farmers continue to show resilience by holding on to their land, farms, and desire to farm, despite limited access to resources and smaller farming operations that hinder economies of scale (Carlisle, 2022; Gilbert et al., 2002), all while facing the additional challenge of a changing climate. There are, however, opportunities to build greater resilience with social and ecological resilience at its core.

Despite a lineage of knowledge and practice in resilient agriculture, many Black and Indigenous and other farmers of color face challenges and experience isolation in their efforts to run their farm operations. Women farmers, particularly women of color, experience greater inequities related to their gender (Horst & Marion, 2019) and encounter intersectional challenges that cut across race, gender, and their diversity of identities, which can hinder their ability to manage their land or even access farmland. Yet many women farmers, including Black and Indigenous women farmers, are seeding resilience through their resistance and response to these systemic and interpersonal barriers by cultivating community and social resilience on their farms (Bowens, 2015; Penniman, 2024). However, institutional support is needed to ensure their success, including fostering access to peer networks and improving access to financial and technical resources. To address that need, American Farmland Trust, Black Family Land Trust, and North Carolina Extension collaborated on a "Get Climate Smart" peer cohort pilot program to support Black and Indigenous women farmers in accessing resources for climate resilient goals on

their farms. Following the completion of a nine month program with 30 women farmers across North Carolina, our team conducted in-depth interviews with 18 program participants to learn about the impacts associated with the program.

This paper represents a collective effort on behalf of the program designers, facilitators, and evaluators to answer the question: how can a cohort training model, centered on peer-to-peer network building, support Black and Indigenous women farmers' efforts or actions towards maintaining and improving social and ecological resilience on their farms and in their communities? In the following section, we explore literature that helps us understand what we know about how farmers are fostering social and ecological resilience and the role peer networks play in that process. We then describe the cohort network and training protocol and share our methods and results. We conclude with discussion and recommendations to guide future programmatic and research-based efforts to support climate resilience among women farmers of color.

Literature Review

In this section, we discuss key concepts of sustainability and resilience in social-ecological systems, highlighting the role of social networks in supporting adaptive capacity and social sustainability among historically underserved farming communities.

Sustainability and Resilience in Social-Ecological Systems

Social-ecological resilience theory is founded on the notion that there is a connection between social and ecological components of systems (Guptill & SAR Quality-of-Life Working Group, 2021). Walker et al. (2006) define social-ecological systems as complex entities in which humans and ecosystems are integrated in such a way that their social and ecological aspects are inseparable, making it difficult to analyze or address them independently. Building sustainability and resilience within social-ecological systems means considering social and ecological components as intertwined. For this reason, this research project considers how social sustainability can be integrated and elevated within

more traditionally ecologically focused agriculture education programs. Social sustainability is related to the strength and health of social relationships, which is built across close and distant connections across the food system and can include relationships at the personal or household, the farm or ranch, the local community, the broader agrifood network, and broader society levels (Gosnell et al., 2021; Guptill & SARE Quality-of-Life Working Group, 2021; Lengnick, 2022). As Guptill and the SARE Quality-of-Life Working Group state, "just as sustainable agriculture promotes long-term ecological health and economic vitality, [social sustainability can foster] vibrant communities and regions and satisfying livelihoods of farmers, ranchers, and others in the food system" (2021, p. 1).

Gosnell et al. (2021) emphasize key indicators associated with social sustainability, including: the major themes of human health (mental and physical); learning or adapting to change; community relationships; equity and inclusion; land ownership, tenure, or succession; and broader structure of the agrifood industry. Although this social sustainability model has not been fully adapted from the ranching context to the farming context, it highlights essential elements of social resilience that need to be addressed to support resilient and healthy social systems, which are coupled with ecological systems in agricultural production. Key to social sustainability, community relations are based on the strength of connections at the local, farm, and household level; the broader agricultural community (consumers, producers, and resource providers); and connections to the broader agrifood industry (Gosnell et al., 2021). Figure 1 shows a conceptual framework of social sustainability that guided this research.

Networks as a Tool to Build Social Sustainability
Fostering connections for farmers and ranchers with peer networks at the community scale can result in positive social change and increased viability and sustainability of farms. Social networks can support farmers and ranchers in adopting new practices, particularly in the face of a more variable and extreme climate (Asprooth et al., 2023; Che et al., 2022; Hillis et al., 2018; Kelemen, 2022; Levy & Lubell, 2018; Pape & Prokopy, 2017; White et al., 2023). Peer networks can: (a) connect farmers, ranchers, and land stewards with new resources and new communities; (b) support land managers in responding to emerging needs in creative ways; (c) create deliberative spaces for collaborative learning and problem solving; and (d) form the foundation of mutual aid networks that can foster resilience to extreme weather events.

Mentor networks, social networks, and peer networks can facilitate local knowledge exchange

Figure 1. Conceptual Framework of Social Sustainability
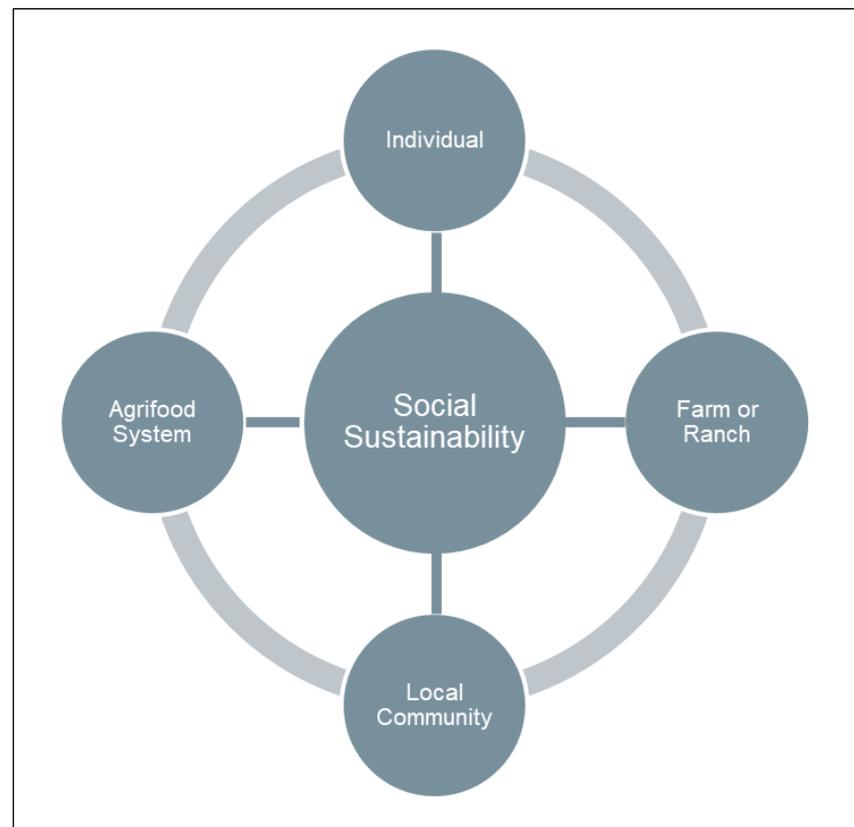
Source: Adapted from Guptill & SARE Quality-of-Life Working Group, 2021.

to enable adoption and problem solving (Carlisle, 2016; Kelemen, 2022; Pannell et al., 2020; Roesch-McNally et al., 2017), which can support farmers in adopting climate-smart practices by grounding them in place-specific information (Bates & Arbuckle, 2017; Brant, 2015; Kelemen, 2022; Mase et al., 2017) such as site and soil characteristics (White et al., 2023). Networks can be powerful in supporting a non-hierarchical learning environment that can appeal to historically underserved producers, including women, veterans, and farmers of color (Carter & Roesch-McNally, 2024). New and old ways of cooperative farming and the relearning of ancestral ways of knowing are founded on mutual relationships and have been fostered by improving networks of farmers of color (e.g., RAFI's Farmer of Color Network and Leah Penniman's SoulFire Farm).

While researchers note the importance of university-based agricultural Extension programs (Levy & Lubbell, 2018), Garbach and Morgan (2017) found that connections with Extension alone did not have a statistically significant relationship with adoption of climate smart practices (e.g., diversified rotations, soil conservation practices, season extension, and irrigation efficiency). Levy and Lubell (2018) argue that it is not enough to "broadcast knowledge"; service providers and programmatic efforts must actually "assemble or weave networks" (p. 1244). Lubell et al. (2014) found that social networks among farmers and other stakeholders represent a "social learning pathway," where farmers learn from each other and from other system actors. Program participation catalyzes the formation of social networks by providing opportunities for social interaction. Conversely, existing social networks spread awareness about programs and provide mechanisms for persuading others to participate. The empirical evidence seems clear that social networks, particularly peer networks, can influence change and lead to tangible impacts for farmers, their communities, and the land they steward. They help farmers, particularly women and other underserved producers, feel connected to one another and a network of support (Beratan et al., 2014; Carter, 2017; Daigle & Heiss, 2020; Eells, 2010; Petrzelka et al., 2019).

Making the Case for Climate Resilience Education and Training within Black and Indigenous Women Agrarian Communities

Although the number of women farmers in the U.S. has increased over the years (Hoppe & Korb, 2013), they still face gender-based challenges in male-dominated agricultural spaces – within their families, with their peers, and within agricultural institutions. These challenges include struggling for legitimacy, difficulties inheriting family land, not being taken seriously by male farmers and staff at agricultural organizations, being pushed into traditional gender roles during agricultural internships, encountering discrimination when trying to access federal loan programs, and receiving less government support (Jett, 2020; Joseph et al., 2024; Keller, 2014; Trauger, 2004). The intersection of race- and gender-based challenges also characterizes the experiences of women of color who farm. Black women farmers must contend with being women farmers in male-dominated agricultural spaces and Black farmers in white-centered agricultural spaces. Nonetheless, Black women have and continue to play an important role in Black agrarian spaces. Historically, they have engaged in subsistence agriculture to feed their families and, along with their male counterparts, have provided food and venues for the civil rights movement (Payne & Green, 2003; White, 2018). They are strong advocates of community gardens to address food insecurity in Black neighborhoods and are strong leaders in food and agricultural policies (Carter et al., 2024; Gripper et al., 2022; Vaughan-Wynn & Jung, 2024; White, 2011).

Black farmers make up 1.4% of the farming population (U.S. Department of Agriculture, National Agricultural Statistics Service [USDA NASS], 2022), largely due to a long history of land loss and dispossession. While some Black farmers lost land due to economies of scale and economic downturns, many were pushed off their land as a result of institutional racism. In addition to experiencing racial hostility from white farmers and other agricultural institutions, Black farmers were actively denied loans by the USDA, which impeded their capacity to maintain their farming operations (Daniel, 2013). This phenomenon was particularly heightened during the civil rights movement but

lingered years later despite the Civil Rights Act. The *Pigford v. Glickman* case in 1997, in which Black farmers sued the Secretary of the USDA for racial discrimination by the Farmers Home Administration (Wood & Ragar, 2012), represented a small victory for Black farmers as it signified a recognition of harm done and allowed some farmers to obtain financial compensation.

However, Black farmers still encounter participation barriers when it comes to federal programs in the form of poor communication, low levels of transparency, and lack of standardization of practices across offices (Russell et al., 2021). During the COVID-19 pandemic, 73% of Black farmers did not receive information about federal relief programs due to poor outreach, and efforts to redress the situation by providing relief to socially disadvantaged farmers later were met with lawsuits from white farmers (Buechler, 2022). Indigenous farmers face similar barriers. A study on payment for ecosystem service programs found that Indigenous farmers encountered several barriers to participation, including lack of access to resources and communication from staff, and incompatibility of the program design with communal forms of land tenure (Johnson et al., 2018). Federal agencies need to address the barriers preventing Black and Indigenous farmers from taking full advantage of agricultural programs. Such a need is ever more critical given the increasing pressure of climate change.

The ways in which climate change disproportionately impacts communities of color have been well documented (Gutierrez & LePrevost, 2016; Shepherd & KC, 2015; White-Newsome, 2016; Wright & Nance, 2012). Farmers of color, particularly Black and Indigenous farmers whose access to resources has been compromised, need institutional support to strengthen their efforts to cope with climate impacts. Indeed, access to resources, including climate education and training, has been linked to an increase in farmers' adaptive capacity and farm resilience (Brown et al., 2018; Chepkoech at al., 2020; Maguire-Rajpaul et al., 2020). Understanding climate impacts and corresponding adaptation strategies can increase farmers' risk perception and improve their self-efficacy (Abid et al., 2019; Burnham & Ma, 2017; Li et al., 2017), resulting in greater adaptive capacity.

Researchers have also found that the integration of local traditional and Indigenous knowledge with scientific knowledge had positive impacts on farmers' adaptive capacity (Nkuba et al., 2020). Additionally, farmers' experiences and observations have been linked to greater awareness of climate impacts and the adoption of adaptive strategies (Hassan & Knight, 2023; Reddy et al., 2022; Salerno et al., 2022). Therefore, farmers' experiential knowledge of climate change and their collective agency can be buttressed with climate training that considers their localized experiences. The growing number of women farmers, evidence that women tend to favor environmentally friendly actions and policies (Briscoe et al., 2019; Ergas & York, 2012; Xiao & McCright, 2015), and increased likelihood of women farmers to practice sustainable agriculture (Jadhav et al., 2014; Trauger, 2004), make a compelling argument for supporting women farmers' efforts to cultivate climate adaptation practices. Moreover, climate training programs that center the experience of Black and Indigenous farmers have the potential to not only increase their climate resilience but also help them build or strengthen relationships with agricultural institutions. Black farmers' experiences in community resilience and Indigenous farmers' relationships with communal norms make a peer learning model for climate training particularly fitting.

Methods
The following section outlines the design, implementation, and evaluation methods used to develop and assess the Get Climate Smart: Food and Agricultural Systems' Resilience Training for women in agriculture in North Carolina.

Overview of Training
American Farmland Trust's Women for the Land Initiative, Black Family Land Trust, and North Carolina Extension's Local Food Program developed and piloted the Get Climate Smart: Food and Agricultural Systems' Resilience Training for women in agriculture across North Carolina. Our aim was to reach farmers, technical assistance providers, and agricultural advisors to promote a more resilient food and agricultural system in the state. We adapted the Women for the Land's learning

circle education model to a cohort training model over a nine-month period. We focused on three objectives: (a) actualize conservation skills and climate smart practices, including monitoring and implementation; (b) improve technical skills regarding diversifying production and marketing systems for greater economic and food system resilience; and (c) facilitate leadership and mentoring skills to build community and social resilience around food and agriculture. Workshop topics included: climate change in North Carolina and responding to unexpected acute weather events; climate smart practices such as diversified rotations, soil health conservation practices, season extension, and irrigation efficiency; and goal setting and resilient farm business management. With the intention of empowering participants and meeting their needs, topics and learning objectives were identified and developed through an informal, iterative, and collaborative process with participants throughout the program.

The learning circle education model differs from traditional expert-led classroom education models by combining research-based, participatory methods to create peer-to-peer spaces for women in agriculture to share their expertise and experiences with each other, while connecting with resources that can assist in navigating challenges. In recent years, learning circles have been used across farming communities to reach women who have been underserved or excluded by existing agricultural networks. Researchers have found that these circles are powerful forms of information exchange that not only connect women to one another and service providers but also spur them to take action on their land (Carter & Roesch-McNally, 2024; Fairchild et al., 2022).

Our pilot program had 30 participants, all of whom identified as Black or Indigenous women farmers. The program included monthly virtual, asynchronous, and in-person workshops. We recruited women who identified as socially disadvantaged per the USDA definition,[1] as well as veteran farmers and new and beginning farmers, to participate. We also recruited women technical

assistance providers to support training and increase their efficacy in leading resilience efforts in local food and agricultural systems.

Participants were expected to take on a community or farm-based project to enable sharing with their community and foster mentoring relationships. We provided participant stipends to support projects that promoted climate, economic, and social resilience. Interviews were conducted post-program to further evaluate and understand program impacts.[2]

Research Methods

We chose to use qualitative research methods to understand a set of complex themes in context from multiple perspectives (Denzin & Lincoln, 2011). We conducted eighteen in-depth semi-structured interviews with a subset of program participants in November and December of 2023. Our primary research interest was to explore the experience of the program and the program's outcomes. All interviewees had intersecting marginalized identities (women farmers, Black and Indigenous farmers, in the Southeast), and the interview guide included questions about their experiences from the perspective of those intersecting identities. We did not, however, include further examination of demographic trends and intersectionality in our analytical process. The research team developed a set of six interview questions that were designed to understand the benefits or challenges of the program's cohort model, the impact of the program on land management practices, and participants' understanding of resilience in relation to themselves, their land, and their community.

Twenty-eight of the thirty program participants (two participants did not attend the majority of the workshops) were contacted by email and phone with invitations to participate, and eighteen agreed to an interview. Participation in the interview was voluntary, and no incentive was offered. This research project was conducted independently of the program, which had compensated participants for their involvement. However, interview partici-

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[1] Please refer to the USDA's definition here: https://www.ers.usda.gov/topics/farm-economy/socially-disadvantaged-beginning-limited-resource-and-female-farmers-and-ranchers/

[2] Post-session surveys were also collected to gather input on the program and evaluate sessions but were not analyzed for this paper.

pants were not compensated due to a lack of dedicated funding for this external analysis. This decision was also made to avoid creating a sense of obligation among participants and to ensure they felt comfortable sharing the full breadth of their experiences. As participation in the interviews was voluntary and without incentives, it is possible that those who agreed to participate were more engaged in the program or had stronger opinions, potentially introducing a self-selection bias in our results. Interviews were conducted by four members of the research team over the telephone or via Zoom. All participants gave verbal permission for recording. Interviews lasted an average of 36 minutes. The interview recordings were transcribed verbatim by a commercial transcription service. One interview recording failed and detailed notes were taken instead. All identifiers were removed from transcripts and notes, and pseudonyms were assigned to each participant.

One team member reviewed the transcripts and notes to identify themes, patterns, and key issues, resulting in an abbreviated code book with a list of 4 key themes and 20 sub-themes that addressed the research question and reflected emergent issues identified by participants. The entire author team reviewed and finalized the code book. One team member conducted a qualitative coding analysis using this code book and NVivo 12 Qualitative Coding software. The research team then met to discuss themes and findings. This research was approved by the North Carolina State University Institutional Review Board (Protocol # 25687).

Statement of Positionality
This program was developed through collaboration among three natural resource and agricultural organizations (one predominantly Black-led and focused and two predominantly White organizations), along with participating farmers and landowners, to build trust and co-ownership. Interviews were conducted by four female-identifying staff and contractors from the engaged organizations. One interviewer identifies as Black, and the others identify as White. We acknowledge the complexities and importance of reflexive practice when working with Black and Indigenous women landowners and farmers who have faced discrimina-

tion. Reflexive practice and deep long-term relationships with women in this community were key elements in facilitating the research phase of this project through a non-hierarchical peer-learning model. While interviews were conducted by these four individuals, the paper represents programmatic and empirical collaboration between the authors and project partners who have a diverse set of identities. Interviewed farmers were also asked to review and edit this manuscript before submission for publication to ensure the tone and content matched their lived experiences.

Results
One of the central objectives of this program was to facilitate the formation of a social network that enables participants to share and gain knowledge, with the ultimate goal of this network remaining in place after the conclusion of formal programming. After completing a thorough analysis of the interview data, four key themes emerged:

- Creating a Peer-to-Peer Learning Network ($n = 17$);
- Individual Resilience ($n = 13$);
- Farm Resilience ($n = 16$); and
- Community/Network Resilience ($n = 14$).

Discussions of each theme follow below, with illustrative quotations from participants.

Creating a Peer-to-Peer Learning Network
Almost all participants discussed how the program's cohort model enabled peer-to-peer learning, thus forming a learning network, which is an initial step in building social sustainability.

Facilitating Knowledge-Exchange
Many described the cohort as a facilitator for knowledge exchange ($n = 17$), which enabled them to learn from the personal experiences of the other participants alongside the more structured content of the pilot program. Brianna, a farmer and landowner, described these knowledge exchanges among cohort members as a "tool" to use and a "well of information and knowledge" to draw upon. She further elaborated on how these exchanges functioned:

When we would come together … and we'd be talking about different things, the other ones [participants] would tell something that might be going on with them or something that they had experienced or done, and it would touch on something that maybe we were thinking about doing or was already doing it or hadn't started it up yet. … So it was like being able to reach out to somebody else that if they wasn't where you were or were at in your process of doing whatever you were doing … and say, "Okay, this is what I'm not going to do," and "This is what we encountered, so how did you do that? … Was it difficult for you?"

Overall, this knowledge and resource-sharing was done in the spirit of collaboration. Nia, a farmer and landowner, described these exchanges as equalizing, in which everyone participated: "You listen and you learn from others as well, because everybody got a chance to share and you were listening to what they were sharing. And you shared too." Mary, another participant, emphasized the elements of storytelling and non-competition: "Storytelling is such a powerful information exchange, but I also love that people are willing to share what they did not do well, because that's when you also learn. … I also really enjoyed that … there was a strong lack of competition. I did not feel uncomfortable sharing ideas."

Participants also offered suggestions as to how the program's structure could be modified to further support the cohort's cohesion. Several participants thought the program should include more hands-on activities to allow the women to practice and refine skills and concepts being covered by the program's workshops to learn together while interacting with each other. For example, Joanna said it was a "missed opportunity" to not have included a farm day where the women could get their "hands in somebody's soil" together. Participants also suggested more time built into workshop sessions for sharing and storytelling, particularly at the beginning of the nine month program, to further "expedite the growing process or the bonding process" (Joanna) among the women. Christine suggested including a regular "show and tell" element, in which participants discuss progress on a farming-related project. She also suggested the organizers break the cohort into smaller groups, based on the women's farming needs, then work with each group to establish their goals and tailor workshops to meet those goals.

Many participants described how beneficial it was for them to learn from a group of women farmers with varying experience levels and specialties, as it exposed them to new and different farming practices. Several participants emphasized that some of the farmland management changes that they made were due to knowledge gained from discussions with other women in the cohort, rather than from workshop speakers. For example, Brianna explained how learning more about companion planting from the other women "helped us to find out that it wasn't just us that was going through all of this. … They [other participants] were going through a lot of the same stuff that we were going through." Participants also mentioned getting farming advice, for example on how to best over-winter strawberries, from other women in the cohort and making changes accordingly.

Building Community and Social Capital

Almost all participants ($n = 17$) stated that they established new relationships or deepened existing ones as a result of the program, thus fostering a peer network that can be drawn on for support. In this way, they were able to build community and social capital with the other participants via exchanges of knowledge and personal experiences. Several participants described how, as women of color in agriculture, they often feel isolated, but this cohort of women made them feel less alone as they knew they could draw on it for personal and farming support. Evelyn said:

The workshop[s] gave me the motivation to not quit, and I knew that I had other women that were in the same situation that I was in. … So knowing that I was not out here alone, that really helped me and motivated me because you hear a lot about mental illnesses and mental stress. If you don't have that collaboration piece in there where you can talk things over with someone, then it can really get you down mentally. … So this cohort really helped me to

continue on because I knew I could reach out to someone to talk it out, and they would see some things through a different lens from what I was seeing and would help me understand it.

Many participants spoke of having gained lasting friendships with the other cohort members; they exchanged phone numbers and stayed in touch, sent holiday greetings, shared information and resources, ran into each other at other agricultural events, and visited each other's farms outside of the structured program meetings. One participant shared that she had proofread other participants' grant applications for them. These new relationships have, in Evelyn's words, "broadened our footprints across North Carolina." Some participants mentioned that they had established new relationships with the program organizers and felt comfortable contacting them for information or support. Erica spoke of the community built through the pilot program as a gathering of "people that are like-minded that can come together as a community to surround you to help you be more resilient when it comes to the farm." The program made visible a supportive learning network of women farmers with similar interests and goals that many were not aware of. As Malia described it, "We didn't know there was this network of farmers. … It's like who we were looking for, were looking for us."

Value of an Intergenerational Women's Network
One of the most powerful elements of this new community was the all-women network. The participants ($n = 13$) described how the cohort shone a light on the underrepresented work of women farmers. For example, Sarah stated, "Sometimes we don't know women farmers exist," but at the same time, "Some women are out front and getting it done." Mary spoke of how helpful it was to be in a group of women who resembled her, in that they all understood that "the challenges that we're experiencing are all similar." Coleen, a landowner and aspiring farmer, said the program was "a reminder that Black women are strong and empowered," and others spoke of how the series showed them the perseverance and passion of Black women. Several

participants spoke of the unique power of gathering a group of women together, for though women may not be as physically strong as men, they offer a different type of knowledge and strength. Alma described women as born nurturers (growers of children, plants, communities) who think more "spiritually" than men do and who carry "sacred seed knowledge" that the cohort network tapped into; spreading these seeds of knowledge will strengthen the community at large: "Resiliency is that through those little seeds that are poured into us, and then we can then disperse more to the masses, then that just … makes things more resilient." She concluded, "We [women farmers] just need to be heard and seen more, and that we can grow and we can pollinate just as good as anyone else can."

Connected to the powerful nature of the all-women network was the cohort's intergenerational make-up. Often when participants would speak of the benefits of gathering in a group of all women, they would also mention the women's varying ages; participants ($n = 8$) saw the cohort's mix of younger and older women as an additional strength. Erica took this mixed composition as a sign of the dedication of her "people" to take care of the land: "It was very inspiring to be in the room with so many different generations of people that are still wanting to be connected to the land, still desiring to be connected to the land, and to be good stewards of the land." The women also discussed how the different generations would share knowledge. Younger women tapped into the knowledge of older generations, and older generations were able to share with and influence the younger generations. For example, Joanna, a younger participant, discussed how some of the "elder" women "gave me seeds and taught me things that I'd never known existed." Hazel, an older participant, discussed how she was able to "show them [younger women] experiences, and show them different things, like I say, how we used to do it and how we do it today." Often this knowledge exchange, in particular when older women were sharing, served as a renewal of ancestral traditions and knowledge. As Alma described it, "To get that knowledge from them [older women] is just a blessing because with Mom gone,

with Grandma gone, it's good to be able to call on the female wisdom."

Resilience

Resilience was not a new concept for participants. In choosing to be a part of this pilot program, participants were trying not only to learn climate smart production practices, but also, they understood the weight of honoring their heritage, navigating discriminatory systems, and envisioning a just and climate-smart food and agriculture system. Participants actively engaged with the cohort to identify strategies to build adaptive capacity on their farms and within their communities.

When asked if the program changed their understanding of resiliency, many participants answered that their understanding did not change but instead the term was clarified or brought to the forefront. Sarah, a beginning farmer, said she already knew the term, but the program helped her feel more equipped to respond to the unexpected: "I think we already knew what resilience was but now we know what to do to prepare us to be more resilient and deal with changes we might face." Many participants discussed how they see resilience as a quality that has always defined Black and Indigenous communities, and women in general. For example, Coleen described the Black community as follows: "We are a resilient people. It is something that is just ingrained in us and being able to move forward no matter what adversity or whatever is thrown our way." The following subsections discuss how the pilot program built on these existing strengths on the individual, farm, and community level.

Individual

The participants ($n = 11$) found the topics of the pilot program and its cohort network helpful in supporting them to overcome challenges at an individual level from race or gender discrimination. Many discussed the challenges they have faced due to their gender or race in agriculture, including lack of information, access to resources, and being excluded from more traditional agricultural spaces. Christine described how when she first started farming ten years ago, she did not know that she was eligible for an FSA loan and attributed this to

"Just the lack of information and resources that are available for Black women." Coleen described meeting a white sweet potato farmer and learning about the large-scale nature of his business, which made her realize that "there's still so many levels that we [Black farmers] have not reached where I feel like we're still trying to catch up." Participants ($n = 5$) stated that the program inspired them to contact local agencies for support, in particular Extension and the USDA. Joanna said, "The biggest thing I gained from this cohort was learning about different ways that I could utilize the Extension office [which] makes it a lot less intimidating to go in there and actually utilize the sources and funds." Participants contacted these agencies to have their soil evaluated, for guidance on planting, to learn about funding opportunities, and for support in establishing a high tunnel. Many participants emphasized the importance of gaining access to resources and contacts at local agencies, including workshop organizers and speakers and how they felt more prepared to support their farms to overcome future challenges. A couple of participants noted how they learned that if they go into a local agency, such as an Extension office, "someone is required to help" them (Joanna). Hazel said she learned that agricultural lending agencies "cannot deny us [Black farmers]" the opportunity to apply for a loan, and if they try to, she can file a claim.

While the participants felt supported by the program in overcoming racial and gender discrimination, a couple women also had suggestions for how it could have provided more targeted content and data to help them more strategically address and confront discrimination. Erica asked for the inclusion of more "impactful data" on the inequities of agriculture in America to catalyze the participants into action: "If we only own one and a half a percent [of farmland] in America and we've been here since the conception of America, what is the problem? What is that about and how do we change that?" Erica also thought the site visits should include more Black-owned businesses "that look more achievable for us." A couple of participants asked for more information on Black land ownership and heirs property. Mary thought the program should address the hardships of farming

on the female body; she suggested a session on ergonomics of farming to help women make farming more physically sustainable.

Overall, the benefits of being part of a community of women of varying ages who shared their knowledge and experiences culminated in many participants (*n* = 13) stating they have increased confidence in their ability to succeed in agriculture. Participants described their time with the cohort as "inspirational" (Leila) and stated they were leaving "with a feeling of hope and possibilities" (Malia). Several participants described feeling better equipped with knowledge and resources to enter unfamiliar or intimidating spaces and territories to pursue their path forward in farming. For example, one participant described feeling more confident in all-men agricultural meetings, and another described feeling more prepared to go to her local bank to apply for a loan. Being part of this cohort ultimately built upon existing resiliency and formed a newly visible network to further improve social and ecological resilience. As Christine stated, "I'm glad to be around other women who are in the struggle. So if anything, the resilience comes from me seeing other women who want to do it and they're willing to fight."

Farm
The women participants discussed how they drew upon the cohort network and the resources available to them via the pilot program to adopt (or plan to adopt) sustainable agricultural practices to address the ecological impacts of farming (*n* = 14). Participants described how they felt more aware of and prepared for the disruptions of climate change after learning how to plan for and respond to acute weather events, protect the farm business through crop insurance, and diversify their farming practices. The participants spoke of how the cohort network could support the changes they made regarding management of their farm or garden, seeing it as a resource to draw upon in this work. As Malia shared, "Now that we know each other [cohort members] exist, it now becomes each individual's responsibility to tap into that resource, and tap into those tools, and utilize them for the benefit of the whole community which we support individually."

In terms of strengthening their farm's resilience, participants referenced specific actions taken to respond to the multiple effects of climate change. Many participants discussed a new awareness of and responsibility to the effects of climate change on their local environment and farming communities. For example, Evelyn stated, "So that climate change issue, I think is a very, very big point that I got out of the sessions because it created a greater awareness of climate change and how it really affects the food chain, the nutritional value of vegetables, the climate, the quality, the production, health issues, the mental stress." Participants offered examples of ways they planned to or had taken action to build ecological resilience due to knowledge gained from the program and from the cohort network. These changes included widening their farm rows to accommodate increased rainfall and to make watering easier during heat waves (*n* = 2); changing the types of plants grown (*n* = 3); no-till farming (*n* = 2); use of row covers (*n* = 2); vertical growing (*n* = 2); hydroponic growing (*n* = 1); and companion planting to defend against pests (*n* = 2). Mary explained her motivations for these alternative practices with the following rhetorical question: "How many different ways can we grow food, so that there's not a season if something changes climate-wise that we can't continue to endure, because we're utilizing more than one type of farming?" Brianna, a farmer and landowner, discussed how she enacted some new practices learned from the program and that she had drawn upon farming practices she knew from her family's farming experiences (specifically irrigation practices to help combat the heat of global warming). She described these older "instrumental" practices that she watched her father and grandfather perform as not dependent on expensive high-tech equipment. Instead, these men in her family were "creative" because they "paid attention." In this way, her participation in the program supported her efforts to build upon her existing family farming knowledge while providing her with resources and a network of support to increase her farm's resiliency. In her words, the program "reinforces implementing what we were already doing, but it helped us to find out that it wasn't just us that was going through all of this. … It was as if

we had more of a network … to discuss more things with others.”

Many participants discussed the impact of learning about soil science as one of the most impactful results of the pilot program. For example, Grace stated that despite growing up watching her family members work the land on their family farm, “I never for one instant thought about the soil, the ground, anything like that until I took this class.” Due to the program, she now knows the soil is “alive,” and caring for it has become one of her main focuses. She shared, “That’s what I’m doing now [taking care of the soil], sort of conserving, sort of protecting, sort of trying to take care of what we have. Because I realized we’ve got to have soil. We’ve got to have it, because that’s the live thing and that’s how we get plants, trees, everything.” Such an impact prompted many participants (*n* = 9) to make or plan changes to their farmland through soil amendments and cover crops. Participants discussed changes to their composting practices to improve their soil like using cover crops to “to increase the lifespan of certain crops” (Joanna), incorporating organic matter to fertilize their soil (including decisions to stop mowing and allowing leaves to accumulate), and researching what plants to add to parts of their land where nothing grew to revitalize that area’s soil.

Beyond production practices, some participants (*n* = 3) also discussed ways to strengthen their families through their farm by securing land ownership rights and seeing the farm business as a way to “creat[e] a legacy for the next few generations” (Evelyn). These participants described how the program prompted them to consider how to plan for the long-term security of their land in terms of securing ownership within their family and an established approach to land conservation. Christine stated, “The most important takeaway is that there are resources to help me to keep the land in the family if that’s my wish. … And whether it come[s] from collaborating with other farmers or just simply making sure that I’m a part of programs that are protective in nature.” Alma described how she saw the cohort network cultivating her own resilience and thus her family’s in kind: “When I’m around other women that are just as resilient, then that adds into not just my resiliency, but I’m going

to pass that on to my daughter and I’m going to pass that on to my granddaughters.”

Community
Interviews also revealed how the pilot program cultivated network ties between participants’ farms or gardens and their communities. These ties enabled participants (*n* = 14) to connect their farms to their communities and bring their communities onto their farms. This porous exchange offered opportunities to foster community network resilience in multiple ways. Erica summarized the main takeaway of the program for her as a clear connection between building resilience and building community ties: “That takeaway is that we are a community of resilient people. … Building community is my takeaway from all of this [pilot program].”

The pilot program helped participants envision their farms or gardens as centrally connected to their communities. Participants mentioned ways in which they were using their farms or gardens to improve the health of their community, a process that can heal and empower in an age when people are often disconnected from the land and lack skills to grow their own food. Brianna, who runs an herbal farm, spoke of her motivation to grow herbs to provide food and medicine for her community to restore “homeostasis,” as she described this age as one in which both people’s bodies and the Earth are “depleted” or out of balance. Participants also discussed how providing nutritious produce (sometimes for free) to help combat issues of food access and health disparities in their areas, educating people about food production, and involving them in gardening and farming will empower them and ultimately strengthen their community. As Marjorie stated, the program reinforced the belief that “we need to think beyond ourselves and think of community.” Mary said she developed “social resiliency” through the program, in that she realized she could not be successful in farming without community, and thus, she must work on “building social capital in order to actually sustain resiliency.” Several participants also expressed that this program helped them see a larger community movement in which there is, in Coleen’s words, “a rebirth of Black people being connected to the land.”

Many women (*n* = 8) also discussed how they had taken actions towards realizing their vision for their garden or farm as a community center or gathering place. Participants spoke about how they hoped to involve their community in their farm or garden. For example, participants described how they were using or hoped to use their farm to host community events, such as educational youth workshops, movie nights, weddings/parties, farm to table meals, or "community days" for other local farmers to gather with each other. Rosa, a landowner, spoke of plans to create a community garden on her trailer park land. She explained these plans as a direct result of the program: "Because of this program, I definitely have an idea how I can see us growing this park and feeling like we're giving back to the community and the town."

Some participants (*n* = 6) spoke of deeper motivations behind bringing community members together on their farms to build a more permanent connection between their farm and community. For example, Mary said a long-term goal was a model of collective use of the land, in which "my farm is mine, but space for other farmers to come and work, and us [to] work collectively, is an ideal goal." Christine spoke of how she hoped to build the infrastructure necessary to establish a multi-family living model on her land so that it became "a thriving community with multiple people who are not only living, but working on the space and recreating on the space also." Coleen spoke of this model of a farm as a communal gathering place in which the boundaries between work, leisure, individual, and community overlapped as a renewal of a past tradition. She said, "When my great-grand-parents were farming, it was very community centered. There were always people coming by, stopping by to see what they had, or they were sharing produce with other people. The people were bringing things to them, and I hope that we see that same type of community gathering that starts again." These motivations align with a vision for agriculture that honors the past while supporting a more just and climate smart future.

Discussion

The Get Climate Smart Training program leveraged a participatory social network model that incorporated elements of social sustainability (Guptill & SARE Quality-of-Life Group, 2021) to build relationships between women farmers while increasing their knowledge about climate resilience on their farm and within their communities. This approach allowed women to build deep relationships with each other with the hope that these relationships would last beyond the program to support the resilience of the participants and their agricultural operations. In forming those relationships, cohort members engaged in contextually and locally informed knowledge exchange and problem-solving, which, as discussed in White et al. (2023), is valued by farmers who address and experience climate impacts. This model also worked to foster an environment in which participating farmers had an opportunity to establish trust and relationships with technical assistance providers from predominantly white institutions, building their confidence on accessing these institutions' services and resources. This echoes the importance of centering equity and inclusion by engaging women and underserved producers in decision making, as described in Gosnell et al.'s (2021) work on social sustainability in U.S. rangelands.

These interviews demonstrated that the objectives of the pilot program were met. In these interviews, participants expressed a new awareness of climate change and their responsibilities to care for the Earth and its soil, as well as how they learned new farming practices to thrive amid increasing change and instability. The women spoke of feeling hopeful and empowered through a sense of improved belonging and greater confidence after completing the program and of feeling supported by the collaborative network of other cohort members and resources offered through the program. These facets are critical components of social sustainability according to Janker et al.'s (2019) work which emphasizes that social sustainability is enhanced by meeting human needs such as belonging, esteem and self-actualization.

The major themes that emerged from these interviews reflect the concept of social sustainability, as shown in Figure 1, with the inclusion of the development of a peer-to-peer learning network. Like other sustainability efforts, cultivating and maintaining social sustainability takes intentional

effort. Results from this research show that facilitating peer-to-peer networks can be one method to support social sustainability. Our results demonstrate that the inclusion of this peer-to-peer network contributes to the other elements of social sustainability (individual, farm, and community). This suggests that technical assistance institutions, such as Extension, USDA, and non-profit organizations, would benefit from intentionally cultivating these networks as part of a strategy to meet their broader goals of supporting thriving agricultural and community systems. Additionally, our program participants appreciated the racial and ethnic inclusion within the network, in contrast with their experiences in predominantly white agricultural spaces, emphasizing the importance of inclusivity and diversity in future network-building efforts. In Gosnell et al.'s (2021) work with U.S. ranchers, community relations are emphasized by the importance ranchers placed on access to diverse social networks, which they describe as a key component of social sustainability. What constitutes a "community" can be broadly defined, but it is tied to how diverse social networks of other producers, community members, stakeholders, urban consumers and others with a stake in how farms and rangeland are managed can be included (see Gosnell et al., 2021). Ultimately, the main finding from this research is that building trust and community are key elements to supporting social sustainability, which can lead to greater climate resilience on farms by ensuring individuals have their diverse needs met, enabling them to adopt new practices and access additional resources to support their climate smart goals.

As a result, program designers, facilitators, and evaluators reflected on lessons learned and identified recommendations for others working in this field. First, the importance of building programs in partnership with communities, which means creating time for connecting and building relationships, should be prioritized alongside the distribution of technical content. It is important to be knowledgeable about local history and context when working with specific communities and understand how this context informs learning and interpretation of

information. This awareness will help technical assistance providers identify strategies to build a sense of belonging and shared values that Black and Indigenous women have often not been engaged in through most agricultural technical assistance programming. When conducting program planning and evaluation, consider how to gather qualitative and quantitative data to support participatory curriculum development and more robust and iterative evaluation opportunities that can guide the program during its design and implementation, not just at the conclusion. These practices may deepen relationships between historically underserved communities and technical assistance providers, hopefully resulting in a more equitable distribution of knowledge and resources.

Supporting resilient communities and landscapes will take a variety of strategies from technical assistance providers. Supporting social networks is one strategy that prioritizes relationships alongside technical knowledge delivery. We recognize that our findings are limited to one particular cohort in a study that does not provide a very longitudinal glimpse of the broader impacts. Additionally, our work was purely qualitative in nature and could be complimented by a quantitative approach, particularly if it could be intersectional in nature and explore differences along demographic characteristics. Therefore, future research efforts should explore the role of intersectionality and how it impacts engagement within farmer social networks, particularly in a way that helps us understand how to better foster enduring engagement and collaboration among network participants beyond the life of a specific project.

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