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# An Evaluation of Social Networks within a Federally Funded Research Project

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**Abstract**

*Social networks play an important role in creating positive outcomes for members of social structures, for example, highly networked individuals experience increased performance, productivity, and scholarly outputs in academia. Social network analysis (SNA) provides researchers with an effective method to evaluate the functionality of teams and, consequently, goal achievement through documenting self-reported connections among team members. Therefore, the purpose of the research reported here was to present an evaluation approach for capturing the development and structure of social networks among members of a large USDA, NIFA funded research and Extension project housed at an R1 land-grant research institution. We concluded that: (a) team members were informally and professionally acquainted prior to the project, (b) mentor – mentee relationships established a framework for developing the next generation of scientists, (c) subgroups existed within the network as information and data sharing was centralized around a few participants, and (d) there was a communication gap between university graduate students and industry representatives who served as advisory board members for the project Recommendations for improving team functionality include: (a) improving communication among team members, and (b) implementing a mentoring program to pair university students with industry representatives to improve the relevance of academic research products among growers.*

***Keywords*:** social network analysis; team performance; research collaboration

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## Introduction and Problem Statement

Many funding agencies in the United States (U.S.) promote the integration of multi-institutional teams of biological, physical, and social scientists in order to further scientific research and create long-term solutions to scientific and social challenges (Defazio, et al., 2009; U.S. Department of Agriculture, 2019). For example, the National Institute of Food and Agriculture (NIFA) provides funding for agricultural projects that are essential for solving critical issues through systems-based, multidisciplinary approaches (U.S. Department of Agriculture, 2019).

By requiring multidisciplinary teams to apply for grants, federal agencies such as NIFA encourage social networking among scientists, graduate students, Extension staff, and industry representatives to expand their professional networks and increase productivity. Expanded professional networks increase one's access to resources, facilities and ideas, which leads to improved scientific productivity over time and as one's network grows (Adams, 2012; Contandriopoulos et al., 2018; Defazio et al., 2009; Lee & Bozeman, 2005; Levi, 2017).

A number of studies have concluded that social networks play an important role in positive outcomes of the social structures in which they are embedded, for example, increased performance,

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productivity, and scholarly outputs in academia (Biancani & McFarland, 2013; Contandriopoulos et al., 2016, 2018; Defazio et al., 2009; Lin, 2001; McKee et al., 2016; Scott & Carrington, 2011).

Specifically, academic researchers who collaborate experience greater access to resources and cognitive approaches, resulting in increased productivity as indicated by the number of publications produced and successful grants won. Large and heterogeneous networks result in greater productivity over time for most members of the network (Porac et al., 2004). Lee and Bozeman (2005) found that grant funding was positively related to both productivity and collaboration. Defazio et al. (2009) found that the timeline of collaboration within the funding cycle was a significant variable in predicting researcher productivity within funded teams. During the funding period, collaboration did not account for increases in research productivity; however, after the funding-period, the number of collaborations decreased but the team's research productivity increased significantly. While scientists formed an initial network to win grants, smaller in-network individuals discovered colleagues to partner with for longer-term collaboration, resulting in increases in overall productivity in the long-run among the total network. Furthermore, Garcia et al. (2020) investigated the effect of collaboration between researchers and industry and concluded that this type of collaboration had a positive impact on scientific productivity, both in the short- and long-term. The authors noted that the beneficial influence of collaboration on productivity was greater in the long-term but benefits were limited to particular research groups.

Nevertheless, the literature is not clear which specific variables impact goal achievement among multi-institutional teams (Contandriopoulos et al., 2016), or which conditions correlate with success (Abramo et al., 2009; Hughes & Terrell, 2007; Lee & Bozeman, 2005). Therefore, it is advantageous for federal funding agencies to better understand the antecedents of research collaboration by employing novel research tools designed to measure social networks as a means of enhancing productivity (Borgatti et al., 2018; Contandriopoulos et al., 2018).

Social network analysis (SNA) provides researchers with an effective method to evaluate the functionality of teams and, consequently, goal achievement through documenting self-reported connections among team members. By understanding the structure and position of members within the network through self-report measures, researchers are able to gain insight into causality processes and hidden patterns (Borgatti et al., 2018). Therefore, the purpose of the research reported here was to present an evaluation approach for capturing the development and structure of a social network consisting of a large federally funded agricultural research and Extension project administered at an R1 land-grant university.

This research fits into the American Association for Agricultural Education's (AAAE) Research Priority Area 1: Public and Policy Maker Understanding of Agriculture and Natural Resources (Roberts et al., 2016) by informing policy makers about the antecedents to research collaboration.

## Theoretical Framework

The study was underpinned by social network theory (Borgatti et al., 2009) and weak ties theory (Granovetter, 1983), which explain how network outcomes and social structures are shaped by a member's position within a given social network and the strength of ties between members. Social network theory builds on relational states or how members relate to each other in terms of location (e.g., occupying the same space and time) as one's position in a network determines their constraints and opportunities. Therefore, knowing one's position is important for predicting outcomes, such as work productivity and access to resources and ideas.

A network consists of a web of members who are directly or indirectly connected through relationships, known as ties (Borgatti et al., 2018). How members are tied to each other creates a connected web, leading to indirect connections that also affect each other. For example, Art knows Bill, who knows Carol; therefore, Art and Carol are tied through Bill. Eventually, Art and Carol may connect and form a meaningful partnership because of their shared social network (Borgatti et al., 2018). These relational states predict the timing of flow, or relational events, occurring between members based on their position in the network. Flow is defined as something of value that is transmitted between members, such as information, beliefs, or resources (Borgatti et al., 2018).

Network members who are centrally located in the network can be expected to give and receive information, beliefs, and resources in greater quantity and at a faster rate than those at the outer edges of a network (Borgatti et al., 2018). Ties among members serve as "conduits through which things flow" such as resources, values, and ideas (Borgatti et al., 2018, p. 8). Characteristics of these relationships (e.g., frequency, length of time, similarity, reciprocity, and specificity) are criteria that define the nature of ties, which can be strong or weak based on the intensity of the relationship (Granovetter, 1983).

Most often ties among members are strong; however, Granovetter (1983) discovered that if social networks were only focused on strong ties and close connections, the information would remain restricted in small circles, which would hinder the adoption and delivery of new information and access to resources outside of strong ties. Therefore, weak ties, or acquaintances, are essential for expanding social networks and sharing information and resources (Granovetter, 1983). Similarly, Lin et al. (2001) found that extensity of contacts rather than closeness of ties resulted in better social capital overall as weak ties were useful for accessing specific types of social capital such as jobs. Additionally, Briers (2007, p. 3) called attention to the importance of diverse social connections, both ethical and cultural, as a means of furthering agricultural education "as the general public drifts further and further from agrarian roots."

Burt (2004) built upon Granovetter's (1983) weak ties theory by proposing that structural holes in networks existed due to a higher homogeneity in opinion and behavior within versus between groups. More specifically, Burt (2004) stated that good ideas were developed by people who stood near the structural holes in a network and that brokerage across structural holes, or the establishment of ties between previously disconnected groups, accounted for greater social capital. Contandriopoulos' et al. (2016) research was underpinned by Burt's and Granovetter's theories, whereby they suggested that a researcher's position within a collaborative network is correlated to their scientific performance.

## Purpose of the Study

The purpose of the study was to present an evaluation approach for capturing the development and structure of a social network consisting of a federally funded agricultural research and Extension team conducted at an R1 research university. Research questions were to: (1) identify the existence of social ties before the project started, (2) visualize the current social network within the project and determine its density and centrality, (3) determine if subgroups existed within the project, and (4) determine if past networks among members reformed to build new networks.

## Methods

Data were collected using a mixed-methods evaluation design (Greene, 2007). The SNA method was used to collect data on member' social relationships, interactions among the team, and flow of information and resources (Borgatti et al., 2018). Interviews and participant observations were conducted to triangulate the SNA survey data (Creswell & Poth, 2018).

All members of a large, interdisciplinary federally funded grant team ($N$ = 54) were included in the study, including the project director ($n$ = 1), co-project directors ($n$ = 14), project manager ($n$ = 1), advisory board members (i.e., industry representatives) ($n$ = 11), graduate research associates (GRAs) ($n$ = 26), and post-doctoral researcher ($n$ = 1). After receiving IRB approval, all 54 members were invited to participate in the study informally during monthly team meetings (pre-notice of impending solicitation to participate) and emailed up to three follow-up solicitations to complete the online survey (Dillman et al., 2014).

To collect SNA data, we developed a self-report survey delivered online through Qualtrics® to determine whether ties existed between team members and the nature of the relationship between ties (e.g., mentor, employee, seeks advice from, gives advice to, etc.). Survey questions were based on recommendations from the literature for determining professional connections and position within the team (Borgatti et al., 2018; Lin et al., 2001). Forty-three team members completed the survey, for a 79.6% response rate.

To triangulate the survey data, we conducted participant observations (Patton, 1990) during Extension outreach events and at annual, quarterly, and monthly team meetings. In addition, the lead author is a doctoral student in the academic department where the project was housed, offering a unique positionality for participant observation. Borgatti et al. (2018, p. 54) highlighted the importance of conducting an "ethnographic sandwich" by collecting observational data before and after administering the survey. We attended all significant events throughout the first year of the project and made ethnographic field notes (Creswell & Poth, 2018). We conducted a content analysis to triangulate the SNA results regarding actor relationships and interactions. Ethnographic field notes focused on identifying outcomes related to establishing and building research networks that contributed to communities of practice within the project. Making observations before conducting the SNA study gave us an initial understanding of the network web and helped to develop valid survey questions, while conducting observations after analyzing the SNA data allowed us to note consistency between the three types of data.

We invited selected members via email to participate in interviews. Interview participants were selected from the population using extreme case sampling method (Patton, 1990). The criteria for selection was information-rich individuals who were able to elaborate on how participants with a varying degrees of social connections could increase their productivity. We selected one researcher, three advisory board members who were also growers, three graduate students, and one post-doctoral researcher with high, medium, or low connectivity for comparison (Table 1). Connectivity was determined by the sociograms (Figures 1, 2, 3, and 4).

Interviews lasted approximately one hour each and were audio recorded with consent. We developed interview protocols specific to the member's role in the project to gather customized data. Probing questions were asked when necessary to further elucidate our understanding of social networks among the population.

**Table 1**
*Interview Participants, Occupation, and Connectivity*

| Team member | Occupation | Connectivity |
|---|---|---|
| 31 | GRA | Medium |
| 41 | GRA | Low |
| 44 | GRA | Low |
| 9 | Principal investigator | High |
| 5 | Researcher | Medium |
| 52 | Post-doctoral researcher | High |
| 23 | Advisory board member | High |
| 24 | Advisory board member | Low |

Survey data were downloaded from Qualtrics® and examined in detail to address missing data and isolates. A codebook was kept to convert non-numeric data into numeric data (e.g., yes = 1, no = 0) and to protect participants' confidentiality (e.g., list of identifiers associated with numbers). The data were then imported into UCINET 6 software (Borgatti et al., 2002) to calculate the structure and position of the network. The metrics calculated were: (a) the total number of ties, (b) the average number of ties per member, (c) degree centrality, (d) density, and (e) dyad reciprocity.

The overall cohesion of the network was indicated by the density measurement. Density was measured as the number of existent ties in relation to the maximum possible ties. Borgatti et al. (2018) emphasized that density was a relative measurement, low or high network density values will depend on each particular case. Reciprocity refers to the number of reciprocated ties between two members divided by the total dyad ties (i.e., ties between pairs) and was used to quantify the reciprocity rate of each relationship (Borgatti et al., 2018). Degree centralization referred to the sum of in-degree (i.e., ties that are directed to the member) and out-degree connections (i.e., ties that the member directed to others). Interview and observation data were transcribed verbatim utilizing Otter.ai (Lang, 2020) and cleaned. Once deidentified, the text was uploaded into ATLAS.ti Version 8.0 for analysis. We reduced verbatim transcripts into 134 significant statements through horizontalization (Creswell & Poth, 2018).

### Validity and Trustworthiness

Survey questions were written to mitigate validity issues of emotional sensitivity, clarity, burden, and cognitive demand. Providing a roster of all team members reduced recall error and limited potential biases affecting the probability of a member forgetting about others in the team. We obtained approval from the university Institutional Review Board and followed ethical procedures outlined by Creswell and Poth (2018) and Tracy (2010) when working with human subjects, such as engaging members in the conception and implementation of the research study, including member checking of findings by sharing the research report with the team.

### Researcher Reflexivity

The first author works as an evaluation specialist at the Impact Evaluation Unit and was pursuing a Ph.D. in Horticulture at the University of Georgia at the time of the study. Due to her proximity to researchers and graduate students in the project, her role was that of a participant observer. The second author was a co-investor on the grant project and served as the lead evaluator of the project. Researcher bias was minimized by peer debriefing between the authors, the principal investigator, and bracketing to emerge novel findings (Creswell & Poth, 2018).

## Findings

### Social Network Analysis

#### *Finding 1: Members Were Informally and Professionally Acquainted Prior to the Project*

We explored the degree of acquaintance, personal and professional, among members prior to the project to determine how the team was formed (Figure 1). All participants, except graduate student #33, were acquainted prior to the project. On average, members were acquainted with six others prior to the project. The network density, a relative measurement used as a means of comparison, was .126, meaning that from all possible ties, only 12.6% existed. This finding address our first research question.

The existence of clusters is evident in Figure 1. A cluster of eight researchers (green nodes) is highly connected to nearly all advisory board members (blue nodes). As the team was interdisciplinary, advisory board members were more acquainted with researchers working within their field of study (e.g. horticulture) than with researchers from different fields of study (e.g. computer science). Network centrality was .644, meaning that 64.4% of the network was centralized around a few participants. Researcher #9, the principal investigator, was the central member with a degree centrality of 42, meaning that he was acquainted with 42 out of 53 participants prior to the project.

In regard to the survey question "who have you worked with prior to the project" 30.5% of the network was centralized around a few members (Figure 2). Researcher #9 remained central, with a degree centrality of 20, and connected three clusters of participants who had worked together prior to the project. If researcher #9 was removed from the network, either the three clusters would be disconnected or the central member would shift to researcher #52 and the cluster involving researcher #2 and graduate student #42 would be completely disconnected from the network. Therefore, researcher #9 was essential for the foundation of the team, unsurprisingly, as the principal investigator of the project, he brought the team together based on his knowledge of colleagues and their talents.

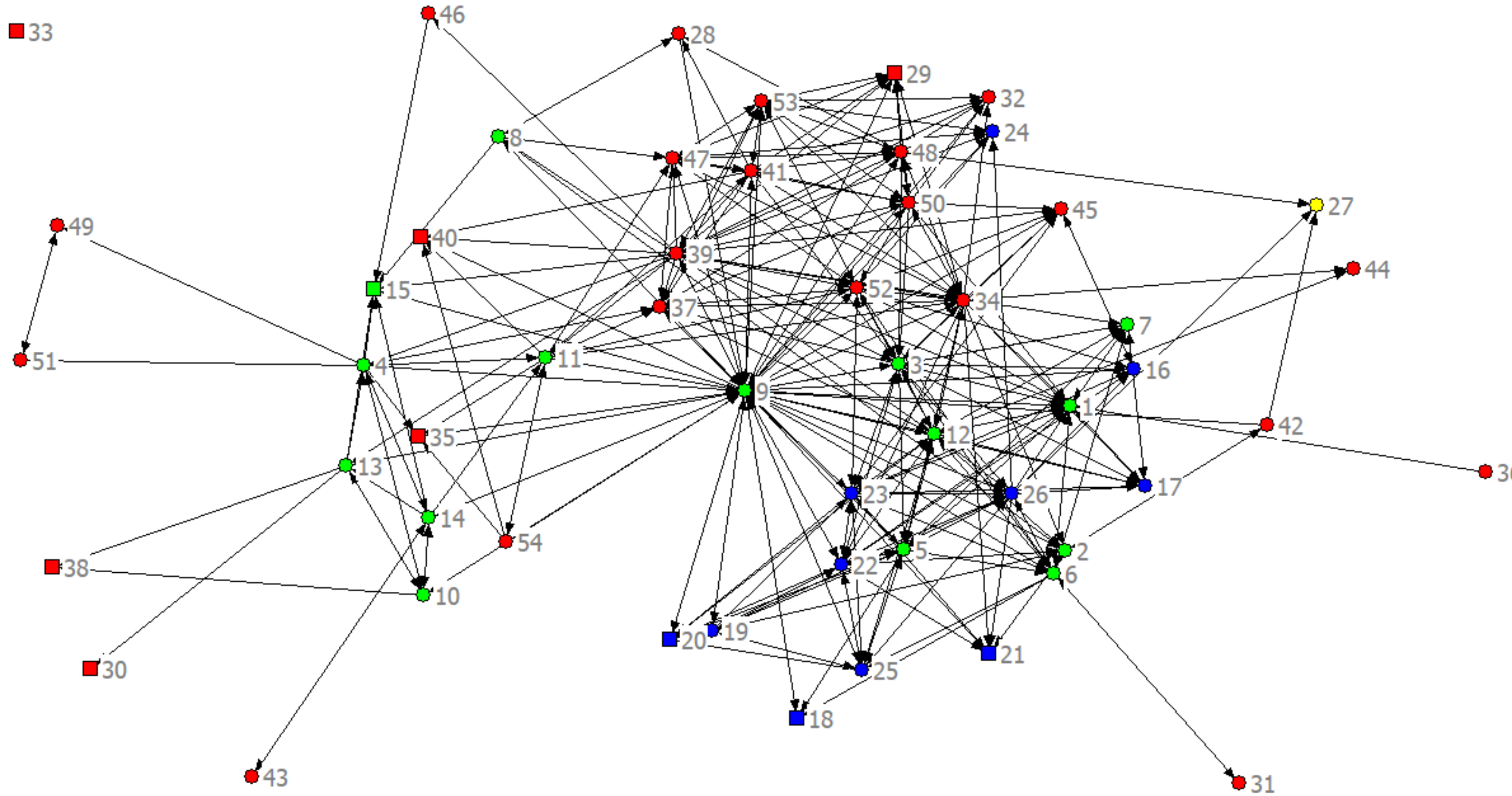
The network density was .058 for professional connections established prior to the project (Figure 2), whereby only 5.8% of the total possible professional connections were established within the network. Participants had worked with an average of three other participants prior. When compared to the acquaintance graph (Figure 1), the amount of previously established professional connections was lower as indicated by the corresponding densities (.126 and .058 respectively). This suggests that the project emerged mainly from personal rather than professional connections.

The majority of the students working on the project were clustered together, indicating strong personal connections as they formed an informal cohort. Non-connected students are displayed peripherally within Figure 2 and reported previously working with their respective advisors (i.e., researchers).

Survey data indicated that 76.2% of the GRAs and post-doctoral respondents who were hired to work on the project had previously worked with either their research advisors or other researchers within the team when earning their previous degrees. This pattern is supported by the social network theory, where social connections determine one's advantageous opportunities in life (Borgatti et al., 2009). Therefore, students' previous professional connections had a positive impact in their career path as the connections resulted in the opportunity to be a member of the project.

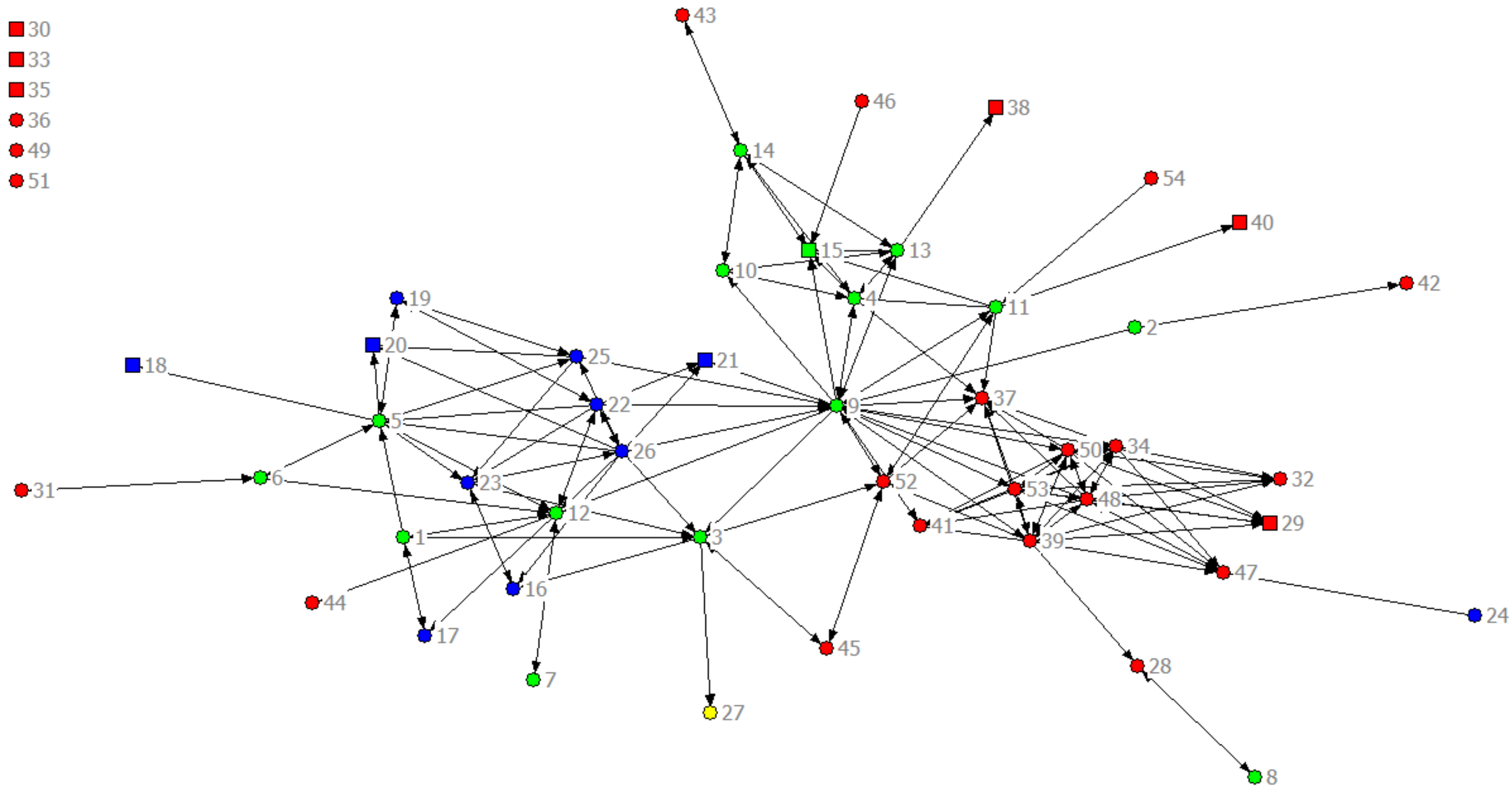
Advisory board member #24 reported social and professional connections with students and with researcher #9. She was a former graduate student of researcher #9 who had recently graduated and started a business in the same community, thus, she was able to parlay her social network beyond student life as a grower.

**Figure 1**
*Who Were You Acquainted with Prior to the Project?*




*Note*. Number of ties = 360; average number of ties per member = 6.66; density = .126; degree centralization = .644; reciprocity = .463. GRAs and post-doctoral researchers = red; researchers = green; advisory board members = blue; project manager = yellow. Square nodes represent non-respondents.

**Figure 2**
*Who Had You Worked with Prior to the Project?*




*Note*. Number of ties = 166; average number of ties per node = 3.07; density = .058; degree centralization = .305; reciprocity = .383. GRAs and post-doctoral researchers = red; researchers = green; advisory board members = blue; project manager = yellow. Square nodes represent non-respondents).

### *Finding 2: Information and Data Sharing was Centralized Around a Few Members*

The flow of information and data in the current network is displayed in Figure 3. Network density was .124, indicating that from all possible connections, 12.4% were made. In addition, 84.9% of the information flow was centralized around a few members, namely the project manager, and #9, the principal investigator. These findings address our second research question. Advisory board members are displayed peripherally to the graph, indicating that they did not occupy a central position of receiving and sharing information with the rest of the team when compared to the researchers, which are displayed as more central within the network. Students are also displayed peripherally, but highly connected with their respective advisors (i.e., researchers) and with other students. This finding addresses our third research question.

Data and information sharing connections were reciprocated in 36% of the cases. Weak reciprocity in sharing information is in line with strong centralization of the distribution of information because information is generated by central members who send it to peripheral members who did not necessarily return information.

We asked members who they sought advice from, averaging four other members (Figure 4). Researchers sought advice from other researchers and advisory board members. Advisory board members sought advice mainly among themselves and in some cases from researchers. Graduate students sought advice from their peers and advisors but not as much from advisory board members. This represented a communication gap mainly between advisory board members and graduate students.

Advice seeking relationships were reciprocated in 29% of the cases, indicating that in 71% of the cases members who were sought out for advice did not seek advice back from those individuals. Thirty-two individuals reported seeking advice from #9, who had the highest number of ties and was central in the team. As expected, his high centrality stemmed from his present and previous connections, social as well as professional ties over many years in the profession. The SNA survey data was triangulated with participant-observation and interview data to further describe team functionality (Creswell & Poth, 2018).

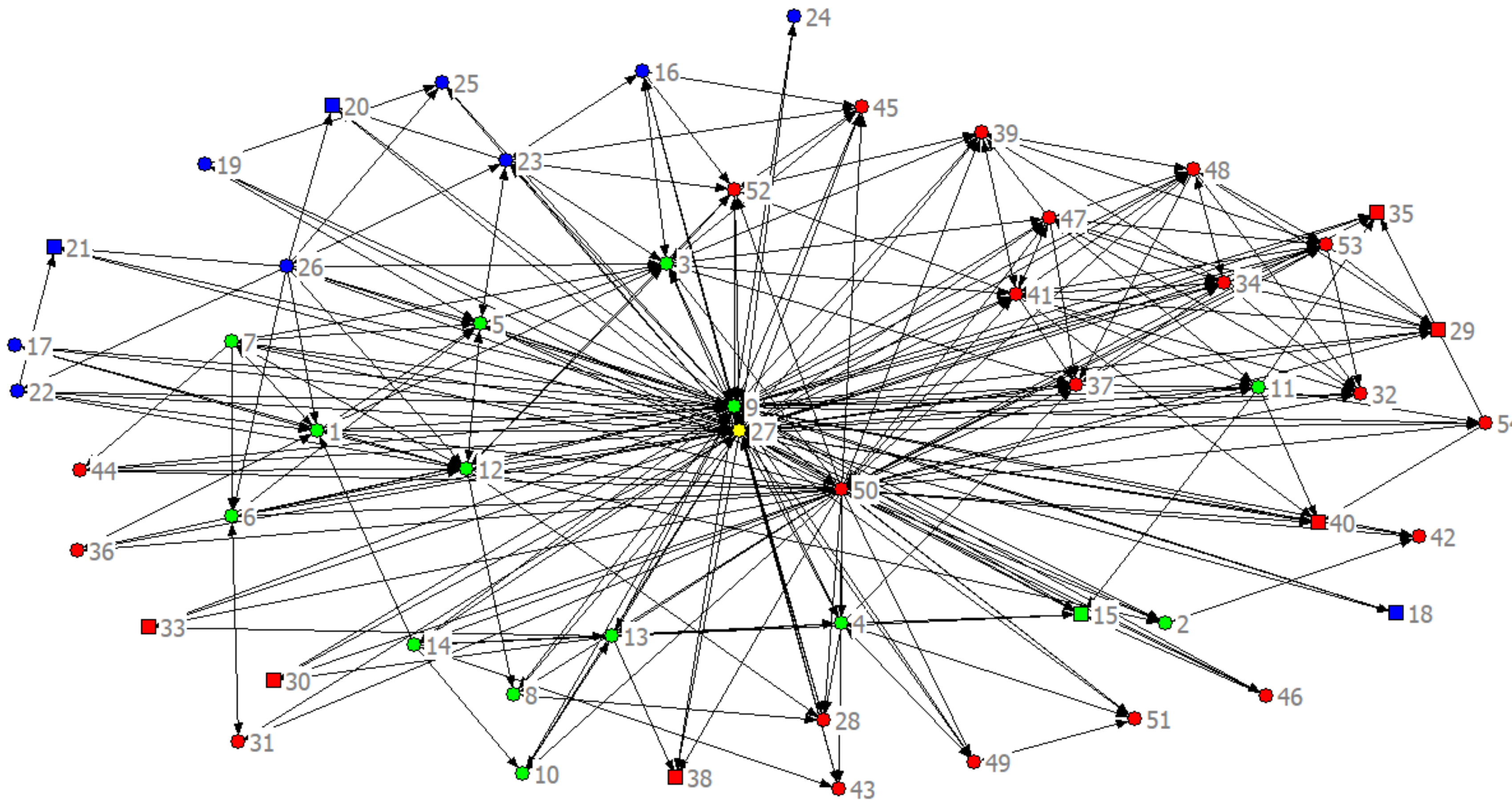
### *Finding 3: Members Valued Interpersonal Connections for Advancing Horticultural Science*

Members reported that their scientific endeavors were positively impacted by building interpersonal connections with other members who were invited to participate in the project as a result of personal and professional connections, primarily through researcher #9. Indeed, researchers and advisory board members reported getting involved in the project through contacts in common with researcher #9.

Advisory board members addressed how their affiliation with the team had impacted their professional lives, including: (a) gaining access to knowledge and resources, (b) creating connections among themselves to get help when needed, and (c) serving as important sources of advice regarding relevant topics to the controlled environment agriculture industry (Figure 4).

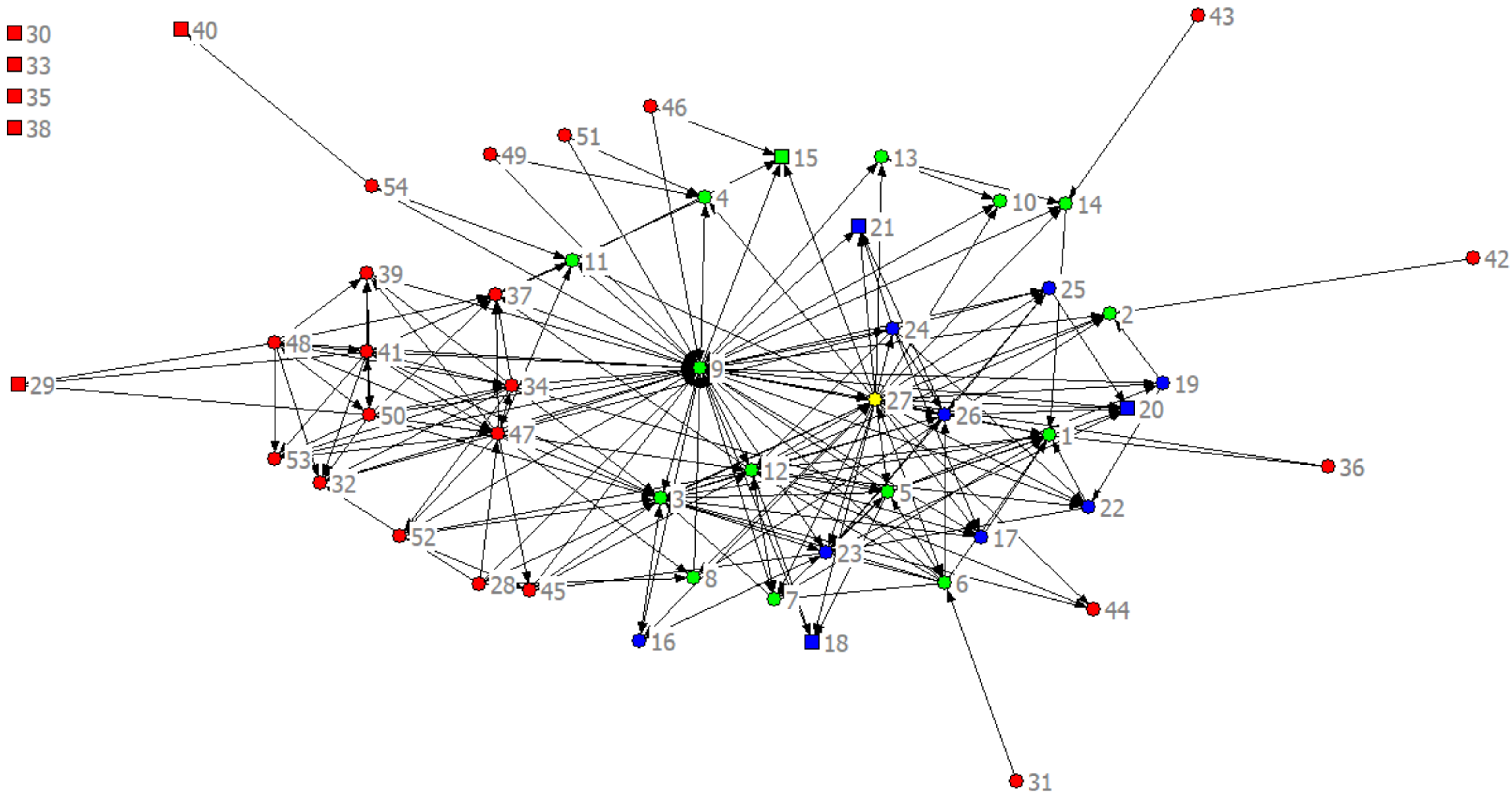
Researchers reported that being part of the team positively impacted their research productivity as working with colleagues inspired them to achieve greater progress with their experiments than working individually. Having synergy among team members with different areas of expertise, while remaining focused on the same end goal, was reported as one of the main outcomes of the project by researchers. Graduate students reported three benefits to being part of the team: (a) employment as a GRA, (b) ability to pursue a graduate degree, and (c) connections to researchers and advisory board members who otherwise may have been inaccessible without the grant project.

**Figure 3**
*Who Do You Share Information/Data With?*




*Note*. Number of ties = 355; average number of ties per member = 6.57; density = .124; degree centralization = .849; reciprocity = .360. GRAs and post-doctoral researchers = red; researchers = green; advisory board members = blue; project manager = yellow. Square nodes represent non-respondents.

**Figure 4**
*Who Do You Seek Advice From?*




*Note*. Number of ties = 249; average number of ties per member = 4.61; density = .087; degree centralization = .683; reciprocity = .290. GRAs and post-doctoral researchers = red; researchers = green; advisory board members = blue; project manager = yellow. Square nodes represent non-respondents.

These findings suggest that previous connections between members, both professional and personal, resulted in the formation of the team. By aligning the SNA data with the interview data, we found that some researchers and advisory board members had previous connections with researcher #9 that had been cultivated for years, indicating strong ties. Conversely, other members such as researcher #5 and advisory board member #23 had superficial connections with researcher #9, which stemmed from meetings at professional settings, characterized as weak ties. Strong and weak ties were both important as they brought the team together using both formal and informal venues, resulting in an expanded and resourceful network. These findings are in agreement with Granovetter's (1983) and Li et al.'s (2001) research on the value of week ties for increasing social capital. Additionally, these findings address our fourth research question.

### *Finding 4: Mentor –Mentee Relationships Established a Foundation for Developing the Next Generation of Scientists*

Relationships between researchers and graduate students were closely observed as one of the goals of the funding agency was to advance STEM education by promoting the next generation of agricultural scientists. Principal investigator #9 provided insights into the value of mentoring students in this project, as he stated:

> Our students are paying attention to how we [researchers] collaborate with people in other disciplines. They come to understand how these interdisciplinary collaborations can really add value to the research that we do in our area of expertise. They also get to see how a project like this is managed. I talked to them about how this grant project was put together, how we started out with the project [years ago]. I've shared the proposal with them and that was partly to make sure they can see how what they do fits into the bigger picture. But I think it's also important for the students to see what this kind of a proposal actually looks like because at least some of them will hopefully be writing proposals like this in the future.

All of the GRAs who were interviewed ($n$ = 3) reported having a positive professional relationship with their advisors and feeling supported in executing their research projects. GRA #48 reported that participating in the project impacted her understanding of controlled environment agriculture research and how it is applied globally. She said, "Knowing that the projects I work on are part of a larger project has given me the ability to see the larger picture. I understand the purpose of lighting research more." Understanding how individual research projects fit as part of the "larger picture" was cited by researcher #9 as one of the main challenges of mentoring graduate students in this project.

Researchers reported interacting with their respective GRAs more frequently than other graduate students in the project due to physical distance and lack of time. GRAs reported feeling comfortable working with their advisors and peers. These findings agree with the SNA data, which indicated that GRAs sought advice from their advisors and peers (Figure 4).

Connections (ties) between advisory board members and GRAs were lacking. A few students had advisory board members as part of their Master's thesis or doctoral dissertation committees, which was an opportunity to have "more frequent interactions" and listen to "a different perspective" (Student #41). Student #44 reported taking the initiative to reach out to an advisory board member and appreciating that "he wants to see good research but he also advises me to do something that will advance my Ph.D. [research], not drag something out."

Advisory board member #26 emphasized the role of researchers for creating avenues for GRAs to interact with industry representatives. In his opinion, if researchers were engaged with other researchers and with professionals from outside of academia, they should report those interactions to students so students can learn from industry professionals. Likewise, advisory board member #24 said that graduate programs could do a better job in providing students with opportunities outside of the academy to expose them to different types of growing operations.

### *Finding 5: GRAs Had Weak Ties with Advisory Board Members*

GRAs mentioned a disconnect between industry and academia and they feared not having enough opportunities to interact with growers and industry professionals to qualify for non-academic jobs. GRAs reported keeping abreast of industry interests through communication with their advisors; however, they said their advisors did not provide them with many opportunities to interact with industry representatives. GRAs mentioned that their advisors were busy and did not have time to include the students in field trips and outreach events. Student #41 did not feel qualified to work with commercial horticulture, although that was her intended career path.

## Conclusions, Discussion, and Recommendations

We conclude that: (a) team members were informally and professionally acquainted prior to the project, (b) subgroups existed within the network as information and data sharing was centralized around a few members, (c) team members found value in those interpersonal connections for advancing horticultural science, (d) mentor – mentee relationships established a foundation for developing the next generation of scientists, , and (e) there was a communication gap between advisory board members and GRAs.

Members formed ties within the social network to establish collaboration patterns that resulted in exchanges of information. Strong and weak ties between team members were both important as they brought the team together using both formal and informal venues and resulted in an expanded and resourceful network. This finding is in agreement with Granovetter (1983) and Li et al.'s (2001) research on the value of weak ties for increasing social capital.

Previously existing social networks among members impacted the formation of the team. According to principal investigator #9, the selection of team members was based on agreeableness and collegiality, and area of specialization to complement the research objectives. This finding is supported by social network theory (Borgatti et al., 2009), which suggests that personal connections are essential for gaining access to resources to advance one's professional status. The team was shaped by members' social capital and positions within their previous social networks and strengthened ties within this collaboration.

Mentoring relationships were a highlight for the team. GRAs previous professional network had a positive impact on their career path as previous networks resulted in additional opportunities such as winning graduate research assistantships at R1 land-grant universities and becoming a member of the prestigious project. These findings were consistent with the literature on the benefits of social networks such as performance and the flow of resources, knowledge, and experience among scientists (Abramo et al., 2009; Biancani & McFarland, 2013; Contandriopoulos et al., 2016, 2018; Lee & Bozeman, 2005). Nevertheless, GRAs mentioned a gap in communication with advisory board members and feared not having enough opportunities to interact with industry professionals to qualify for non-academic jobs.

Recommendations for improving team functionality include: (a) improving communication among team members, especially among members from different institutions, and (b) implementing a mentoring program for GRAs and advisory board members. Interdisciplinary and inter-institutional teams are likely to experience challenges in communication due to dissimilarity in research areas and physical distance. According to Burt (2004), members can benefit from connecting with each other across structural holes in the network by being exposed to different ideas. While challenging, it would be helpful to increase ties throughout the team.

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