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Exploring Interactions Between Arkansas Urban Producers: Social Networks and Modes of Information Seeking

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The purpose of this study was to explore the social networks and interactions between urban producers in Arkansas through a social network analysis. Using a mixed-methods approach, the current study collected data about participants' social network interactions and methods of seeking information for urban farming. Results indicated how and where participants preferred to obtain information, peer-to-peer interactions within the network, and key players or opinion leaders in the network. The methods used in the current study may serve as an example of social network articulation for populations without a formal network to assist with outreach to communities potentially underserved by Extension.

Keywords: social network analysis, urban agriculture, information seeking, local food, Extension

Introduction

An essential component of successful programming is understanding and identifying the target audience and stakeholders (Kelsey & Mariger, 2002). Extension programming has increased its reach among urban producers, due to the positive environmental, social, and economic impacts associated with urban agriculture (Diekmann et al., 2017). For Extension, understanding how urban producers gather information is important to develop programs which address their needs (Kopiyawattage et al., 2018). Urban producers engage in various information-seeking behaviors and identifying these sources of information is important for Extension professionals to expand programming and resources in this area (Kopiyawattage et al., 2018). Urban farming is an information-intensive process; as most urban producers are first-generation farmers without familial, traditional, or generational knowledge of agriculture, they are highly dependent on a variety of sources for information (Dobbins et al., 2020; Kopiyawattage et al., 2018). However,

limited research is available describing the information needs of these producers, which are contextually and regionally specific (Kopiyawattage et al., 2018; Reynolds, 2011). Determining the information-seeking behaviors and relationships between urban producers yields an understanding of how the knowledge within this community is constructed and how they are influenced by different information sources (Kopiyawattage et al., 2018). Additionally, Extension often is not the most preferred source of information by these producers (Dobbins et al., 2020); however, by understanding their information-seeking behaviors, Extension can position themselves as a resource for agriculture-related knowledge specific to sustainable, organic, and small-scale farming.

One method for understanding the context of regional urban farming audiences is social network analysis. Social network analysis (SNA) is a sociological approach that aims to describe the patterns of social relationships between individuals and groups (Scott, 2000). SNA is informed by the social theory of learning (Wenger, 2009), which posits four components in a social environment that impact learning: meaning, practice, community, and identity. Meaning refers to the perception of a specific experience to understand learning. Practice refers to experiencing learning as doing, bringing a collective understanding to group members. Community encompasses learning as belonging signaling the importance of participation. Identity is the process of how learning changes individuals and creates meaning through a shared experience (Roberts et al., 2010). Communities of practice (CoP) result from these components, defined as a network in which members develop relationships around their shared identities, understandings, or practices (Crowley et al., 2018). CoPs consist of a joint enterprise, mutual engagement, and a shared repertoire of community resources developed by the members over time (Wenger, 2009). CoPs develop around what matters to a group of people; thus, their practices reflect members' perceptions of what is important.

Key terms used within SNA include nodes and edges. Nodes are points on a network representing people and edges are connections representing the interactions between nodes (Borgatti, n.d.). Additionally, networks can be closed, indicating a high degree of interconnectedness between most members of the network with a defined boundary (Derr, 2021), usually stemming from an institutional-based setting such as students in a classroom (Roberts et al., 2010). Networks can also be open, indicating network members are more disconnected and spread out, often due to the lack of institutionalization or familiarity with the network (Derr, 2021). Open networks have no predefined boundary and thus identifying membership in the network requires investigation. For the current study, the population of Arkansas urban producers is an open network because there is no aggregate list of membership and not every member is closely connected to each other, either based on geography or personal/professional relations. The two terms (open and closed) refer to the boundaries of the network and aid in the interpretation of analytical results.

The SNA approach described uses a hybrid personal and whole network mapping. Within personal network mapping, the focus is on the network surrounding a focal person (McCarty et al., 2007). Whole network mapping is a sociocentric analysis which focuses on the patterns of interactions within a focal group – in this case, urban producers in Arkansas. SNA has been used within Extension-based research, often to map reach within target populations (Bartholomay et al., 2011; Kumar Chaudhary & Radhakrishna, 2018). The authors build on Bartholomay et al. (2011), which described the potential of SNA within Extension to foster increased understanding of Extension outreach efforts. By understanding the relationships between urban producers, Extension can identify key players in these networks who can help inform program development and recruit participants in future programs. SNA provides information to help analyze problems and patterns between actors in a system by focusing attention on the relationships that comprise the system (Borgatti et al., 2013; Lamm & Lamm, 2017).

Purpose and Objectives

The purpose of the study was to describe the modes of information seeking among and explore the social network interactions of urban producers in northwest and central Arkansas. The following research objectives guided the study:

1. Describe the preferred modes of information seeking by urban producers.
2. Describe the methods of interaction among urban producers.
3. Describe the social network patterns of urban producers in Arkansas.

Methods

The study presented is part of a larger mixed-methods needs assessment of urban producers and agricultural Extension agents regarding programmatic and resource needs for both populations to inform program development related to urban and local food production (Dobbins et al., 2020, 2021; Sanders et al., 2021). The target population was commercial and nonprofit urban food producers in the northwest and central regions of Arkansas. The operational definition of urban farming used in the study, developed as part of a larger research project, was a small farm, fewer than 10 acres, located within city limits that actively engages with the market either through direct-to-consumer sales or through institutional, coordinator, or retail buyers (Dobbins et al., 2020). Traditional snowball sampling methods were implemented and began with the identification of an individual with desired characteristics, based upon the operational definition, who then recommended future participants within their social network (Sadler et al., 2010).

Data collection occurred between August and November of 2018 and utilized a semi-structured interview as well as a survey instrument immediately following the interview. A semi-structured interview protocol included a questionnaire asking about the frequency with which participants used specific sources to gain new information for their operations (information source use questionnaire). Participants were asked to rate how often they used the identified information

sources on an eight-point scale, ranging from 0 (*never*), 1 (*once a year*), 2 (*several times a year*), 3 (*once a month*), 4 (*several times a month*), 5 (*once a week*), 6 (*several times a week*), and 7 (*daily*). Participants answered the questionnaire during the interview through verbal responses based on the above eight-point scale. Descriptive statistics were used to determine the average use for each item in the scale. The authors pilot tested the interview protocol through three cognitive interviews prior to data collection, with two local, nonurban producers and an Extension county staff chair. The primary author conducted 16 interviews. Quantitative results from both the interviews and SNA surveys are presented in the current manuscript; qualitative results may be explored in Dobbins et al. (2020) and Sanders et al. (2021).

Participants completed the SNA survey immediately following the face-to-face interview. Out of the 16 qualitative interviews conducted, only 15 usable quantitative SNA instrument responses were collected. The authors modified a version of Roberts et al.'s (2010) social network analysis instrument for data collection. The instrument asked participants to write down the top six urban producers they interacted with personally and professionally. This helped determine the key players in Arkansas' urban producer population and assisted in the snowball sampling methods for participant recruitment. The SNA instrument consisted of four questions (Roberts et al., 2010). The first two questions determined the frequency with which each producer interacted with their peers, asking how often the producer contacted specific peers, and how often those peers contacted the producer. Participants responded using an eight-point rating scale that ranged from 0 (*never*) to 7 (*several times per day*). The third question asked participants to identify all the technological methods through which they communicated with their identified peers. The fourth question attempted to determine the reasons why each participant contacted their peers (Roberts et al., 2010). The University of Arkansas Institutional Review Board approved the study and related instruments prior to data collection (Protocol # 1809143362).

Audio recordings were transcribed and subsequently analyzed data with NVivo 10. Statistical Package for the Social Sciences (SPSS; Version 26.0) was used to calculate descriptive statistics and *Key Player 1.44*, a software program that identifies optimal sets of nodes within a network (Borgatti, n.d.), to analyze SNA responses. *Key Player* allows *Remove*, a function that identifies key nodes that if removed would cripple the network, and *Observe*, which identifies well-connected nodes that are likely to be influential opinion leaders (Roberts et al., 2010; Rogers, 2003). The *Observe* function was implemented, which aims to find the fewest number of nodes that connect and reach the greatest number of others within the network, as it is not sufficient to simply choose the node with the greatest number of connections because many of these connections are shared, redundant connections. The *Key Player* score represents the number of distinct, nonredundant connections (Borgatti, n.d.). For example, if one person has the largest number of connections, this is not sufficient to identify the individual as a key player. True key players within the network represent the number of nonredundant connections – they are not connecting the same third-party network members to each other (Borgatti, 2006). The KeyPlayer

analysis ran 10 rounds, with 2 iterations each, resulting in identifying 36 distinct persons reached within the network.

Results

Objective 1: Preferred Modes of Information Seeking by Urban Producers

The information source used questionnaire administered during the semi-structured interviews provided data for Objective 1. Table 1 presents participants' preferred methods of information-seeking and ways to receive new information relevant to their farming methods. A majority of participants expressed a preference for on-farm or on-site demonstrations with a face-to-face component. When online methods of communication were mentioned, it was usually a second preference to the on-site demonstration.

Table 1. Preferred Methods of Communicating Information by Participants

Communication Method	<i>f</i>
On-farm demonstration/ face-to-face	13
Online (Social media, website, videos)	11
Email	7
Workshop	6
Books/Publications	2

Participants indicated how often they used each type of source or communication channel to access information relevant to their operation (Table 2). The information source with the highest mean was YouTube ($M = 4.69$, $SD = 1.74$), followed by other producers ($M = 3.71$, $SD = 1.14$, mode = 4), and books ($M = 3.56$, $SD = 1.26$). Facebook was the social media platform most used by participants ($M = 3.50$, $SD = 2.53$).

Table 2. Information Sources Used by Participants

Source	<i>M</i>	<i>SD</i>
YouTube	4.69	1.74
Other Producers	3.71	1.14
Books	3.56	1.26
Facebook	3.50	2.53
Podcasts	3.13	2.83
Newsletters	2.75	2.08
Science-based Publications	2.67	1.73
Trade Publications	2.66	2.06
Magazines	2.56	1.59
Instagram	2.40	2.61
Bulletins	2.20	1.93
Radio	1.93	2.28
Newspaper	1.73	2.22
Blogs	1.50	1.56

Source	<i>M</i>	<i>SD</i>
Television	1.03	1.49
Pinterest	1.00	1.83
Twitter	0.33	1.29

Note. Participants were asked to identify on a scale how much they used each source. The scale consisted of 0 = *never*, 1 = *once a year*, 2 = *several times a year*, 3 = *once a month*, 4 = *several times a month*, 5 = *once a week*, 6 = *several times a week*, and 7 = *daily*.

Objective 2: Methods of Interaction among Urban Producers

Data for objectives 2 and 3 were collected through the social network survey following the interview. Participants listed up to six peers with whom they interacted for purposes related to their work in urban farming. This was not a closed network, meaning not all members of the network are known, as no network has been previously established for urban producers in Arkansas. Thus, some peers identified in these results were participants in the study and others were not, depending on if they fit the operational definition of urban farming used for snowball sampling methods. The maximum number of peers interacted with was six ($n = 4$). No participant(s) interacted with their peers daily (Table 3), and only one participant interacted with their peers more than once per week. Participants mostly interacted with their peers less than once per month ($n = 13$), followed by interacting with peers once per month ($n = 9$). If someone marked “never,” this could indicate those individuals could be someone whom the participant had observed and recognized as a key urban producer but may not have directly interacted with that individual.

Table 3. Frequency of Interaction Between Participants and Their Peers

Interacted with Peer:	Number of peers interacted with			
	Min	Max	Mode	Median
Several Times Daily ($n = 0$)	0	0	0	0
Once per Day ($n = 0$)	0	0	0	0
Few Times per Week ($n = 1$)	0	1	0	0
Once per Week ($n = 2$)	0	1	0	0
Every Few Weeks ($n = 9$)	0	3	0	1
Once per Month ($n = 9$)	0	4	0	0
Less Than Once per Month ($n = 13$)	0	4	0	2
Never ($n = 6$)	-	-	-	-

Note. Participants selected a frequency of interaction category for each peer identified.

Participants identified a variety of ways used to interact with and contact their peers. All participants ($n = 15$) indicated they interacted with their peers face-to-face (Table 4). Participants indicated a frequency of interaction for each peer they listed in the instrument and could select multiple methods of interaction for each peer identified.

Table 4. Methods of Interaction Between Participants and Their Peers

Method	Number of urban producers that used method		Number of peers interacted with				
	<i>f</i>	%	Min	Max	Mode	<i>M</i>	<i>SD</i>
Face-to-Face	15	100.00	1	6	2	3.13	1.77
Phone	12	80.00	0	6	1	2.13	1.96
Text	11	73.33	0	6	0, 1	1.87	1.85
Email	10	66.67	0	6	0	1.80	1.86
Social Media	8	53.33	0	5	0	1.20	1.57

Note. Participants selected a frequency of interaction category for each peer identified. Thus, 15 participants contacted their peers face-to-face, 12 via phone, etc. Participants could select multiple methods of interaction for each peer identified.

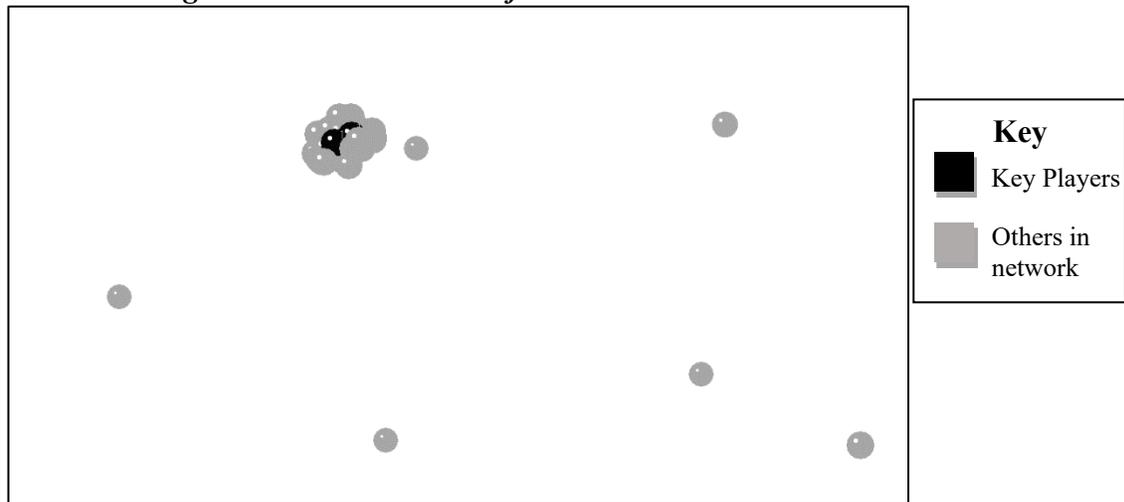
To determine how participants interacted with others, each was asked to describe the basis of those interactions from either information gathering, planning, and/or social/personal reasons. The majority of participants interacted with their peers for informational (defined as information related to their operation or farming methods; 93.3%), social or personal (defined as unrelated to specific operational purposes, or interpersonal/social interactions; 93.3%), and planning (defined as related to events or on-farm activities; 86.7%) purposes (Table 5). No participant listed fewer than two purposes (planning, information, social/personal) for contacting their peers.

Table 5. Number of Peers Interacted with for Specific Purposes

Purpose for Interaction	Number of urban producers that cited purpose		Number of peers interacted with				
	<i>f</i>	%	Min	Max	Mode	<i>M</i>	<i>SD</i>
Information	14	93.33	0	6	5	3.40	1.72
Social/Personal	14	93.33	0	6	1	1.93	1.44
Planning	13	86.67	0	6	2, 4	2.53	1.85

Objective 3: Social Network Patterns of Arkansas Urban Producers

The network analysis identified three key players (Urban Farmer [UF] 1, UF 9, and UF 11). Those key players reached 72% of the network. The majority of individuals were clustered around the key players, yet some were not tied to these key players as seen by distance from the main cluster (Figure 1). Ties to the main network are nonexistent for these external network members. Dark grey spheres (Figure 1) represent the key players and light grey spheres represent others in the network.

Figure 1. Social Network of Urban Producers

Conclusions and Recommendations

Readers are cautioned not to interpret the results of the study beyond the sample due to the specificity of the network, but findings may be informative to other Extension outreach initiatives in the southeastern U.S. Analyzing social networks between Arkansas urban producers will hopefully reduce one of the primary challenges to Extension reaching this population—understanding who these producers are and from where they receive agricultural information. There were several key takeaways from the study.

1. *Information Delivery Preferences:* Participants preferred on-farm or face-to-face communication for receiving farm-related information, supporting findings from Kopyawattage et al. (2018). This highlights an important program delivery method for Extension. Further research should confirm or compare Extension agents' preferred methods for programming and communication (Dobbins et al., 2021). If these methods do not align, further research should be conducted to investigate potential programming avenues that are compatible with both populations.
2. *Information Source Preference:* Top information sources included YouTube, followed by other producers.
3. *Peer-to-Peer Interaction:* The frequency with which participants reported interacting with their peers in the social network ranged predominately from less than once per month to every few weeks. Social media was the least cited method for communicating with other peers, and face-to-face communication was the most cited method of communication.
4. *Key Players:* Results indicated a highly-clustered network with a few outliers without strong ties to the main network. We examined how social networks emerged within this population and determined potential opinion leaders within the community and built upon recommendations from Kopyawattage et al. (2018) to improve Extension

program delivery to urban areas. Extension can use these opinion leaders to disseminate information and resources to the less connected members of the Arkansas urban farming community. This information can assist in targeting programming and information dissemination for this network of producers.

In addition to helping with program development and participant recruitment, SNA can benefit Extension's evaluation agenda (Bartholomay et al., 2011). Monitoring and describing the relationships between urban producers and their interactions with Extension is vital for describing outreach efforts. Identifying key players is an essential component in both program development and evaluation (Bartholomay et al., 2011).

Future research would benefit from surveying urban producers without using a snowball sampling method, which may have been a limitation to the study by excluding other members of the social group. The small number of participants in the study was also a limitation to the social network findings. It is recommended that the instrument and its instructions be reviewed and improved for clarity in subsequent uses. This instrument was originally tested in a closed network (Roberts et al., 2010); however, the target population for the study was an open system, where no membership categories had been defined and no set number of individuals within the social system was known. Now that foundational knowledge has been constructed for this group, an SNA instrument for an open system is recommended.

The analysis reported here may be used to inform Extension of local food and community-based programming to strengthen urban farming networks in traditionally production agriculture-oriented regions. While the results of the current study are limited by a small sample size, implications include the importance of local information exchange within urban and local farming networks in the state, congruent with results found in similar communities (Loria, 2013). Network articulation, especially for communities traditionally underserved by Extension services, is a first step toward identifying stakeholders for local food programming as well as more commonplace resource provision (Loria, 2013). Clusters identified in the results allow for the identification of opinion leaders (Rogers, 2003), or key players, who have influence within the community and may act as gatekeepers for future interactions and participation of this population with Extension. This article serves as an example of a methodology for network articulation in open-network populations, such as urban producers in a predominately rural state, building upon the work of Bartholomay et al. (2011). Additionally, using SNA to think about local network communication is critical for program development within community-based food production networks, and Extension professionals are encouraged to use the framework to identify actors and key players within populations potentially underserved by Extension to improve outreach efforts.

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