Citizen Participation & Actionable Knowledge in Food Systems Practice

By

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Introduction

When I began the Planning and Landscape Architecture PhD program, the decision was rooted in my passion for researching interaction among people, place, and policy in everyday life and my aspiration for building communities through land use and food systems activities. I have nurtured these goals by taking classes on the doctrinal and pragmatic elements of research methods and social-legal theory and by leading research projects on a range of land use and food systems issues. For example, my primary research projects include:

- Urban composting programs and policies;
- Farmer legal consciousness of federal, state, and local food systems policies;
- Farmland access; and
- Farm 2 Facts citizen science research program.

I have led the last two projects for the past five years, either independently or collaboratively, and each one constitutes a dissertation because I was primarily responsible for conceptualizing the research design, establishing project objectives, implementing the research activities, managing daily operations, and documenting the results. I performed these responsibilities in light of the objectives that I set for the project (farmland access) or that a team of people set for advancing subject-specific knowledge (Farm 2 Facts). Together, the farmland access and Farm 2 Facts projects demonstrate the range of research experiences and analytical skills that I honed throughout my graduate education, so my dissertation comprises two articles – one article for each project.

Both projects and articles reflect my disposition for inductive research methods and pragmatic social-legal theory. That is, they establish personal experience as the basis for

theory, they analyze how different social processes operate together and what conditions reproduce or change individual actions, and they view program interventions as emergent features of human behaviors. I collect data that embodies the perspectives of the people experiencing the issue and analyze the individual experiences and social processes that produce particular phenomena. The results represent the meanings that people have towards the issue, which is vital for understanding incremental and systemic change and for developing interventions that tackle the big picture yet stay connected with real people. I apply the findings to planning and policy-making professions.

The two articles include: *Conceptualizing Land Access in Research and Practice and on the Farm* and *Scientists Managing Farmers Markets: Systematizing Aspects of the Citizen-Manager's Role*. Each article develops actionable knowledge through different citizen participation processes (i.e., grounded theory interviews and observations v. citizen science engagements and collaborations) and studies distinct land use and food systems issues (i.e., farmers v. farmers markets). The following sections describe the scope, objectives, and findings of each article.

Abstract: Conceptualizing Land Access in Scholarship and Practice and on the Farm

From a strict legal perspective, land access is a set of rights and responsibilities to an object. While this description may seem sufficient, it implies that meaning and behavior are determinant and it assumes people interact with land in a neutral and objective manner. Yet, we know this is not true. I define land access by three actions: renting, purchasing/selling, or transferring land because the terms orient people to the rights and responsibilities they have with their land. Farmers integrate social, environmental, cultural, and economic relations into their land access decisions, and these relationships represent

behavior about past, present, and future users and the activities that bring them together – they are embedded.

The objective of this article is to develop a pragmatic understanding of farmland access by studying the meanings and behaviors around the three actions for accessing land. In a contemporary US context, I accomplish this objective through two types of analysis: (1) a literature review that evaluates how scholars and practitioners define 'land access' and conceptualize the issues in their work, and (2) empirical research that explains how farmers perceive the issue and that develops a systematic understanding of farmers actions and interactions associated with it. That is, I examine how farmers engage personal relationships with family members, friends, and acquaintances and how they navigate institutional programs and policies with accountants, financial planners, estate lawyers, business consultants, government planners, resource conservation specialists, etc. The study area focuses on Southern Wisconsin because it is a major agricultural region in the state. It includes a variety of farm production systems, beginning, mid, and senior career perspectives, and rural, peri-urban, and urban geographies, and it is nested in a constant policy context at the state level.

I organize this data into a conceptual model that illustrates the many different experiences and processes for navigating social, political, and economic institutions. Farmers and agricultural service providers consistently defined land access by their ties to people that own and operate farmland and their exposure to farming. The presence or absence of a farmland connection and farming background implies four trajectories for accessing land: 'farmland connection + farming background,' 'no farmland connection + farming background,' 'farmland connection + no farming background,' and 'no farmland connection + no farming background.' Each trajectory conceptualizes access within the

context of starting a farm operation and maintaining it amidst changing rural communities, farmland real estate markets, and agricultural industries, and within each trajectory, the cases describe the personal relationships, social networks, and farm finances that affect rent, purchase, and transfer arrangements. Thus, the results explain the distinct variations between broad land access experiences and the consistent differences within each land access trajectory.

The article defines land access by the interactive nature and constant change associated with the various experiences and processes for renting, purchasing, and transferring land. Compared to existing land access scholarship and practice, the primary contribution of this study involves how I designed the analytical frame to study systematic interactions and how I organized the data to illustrate behavior patterns, and the approach is valuable because it produces more realistic and actionable findings.

Abstract: Scientists Managing Farmers Markets: Systematizing Aspects of the Citizen-Manager's Role

Farmer markets perform multiple functions and weave diverse interests. Existing farmers market research advances two extremes (academic research agenda v. market decision-making), and neither follow processes that enable detailed, systematic analyses or generate information that produces practical evaluation. I apply a citizen science research design to address issues with existing knowledge and scholarship on farmers markets. The objective was to develop resources that uphold social science research standards and honor the unique characteristics of markets in order to fill a knowledge gap and to support market decision-making. Farm 2 Facts (F2F) provides farmers markets with the resources to collect descriptive data on their organization, vendors, and visitors and to communicate their social-economic impacts. In the process, it develops a longitudinal panel database that

enables comparative understandings of individual markets and multiple markets in time and over time.

The article describes the processes and methods that constitute this innovation – a fee for service research program that empowers markets through data. It explains how I conceptualized research at farmers markets, how I created citizen science research tools, and how markets interacted with the tools, and it discusses the implications for future research. This process evaluated interaction among individual actions, physical environments, and research methods and it is relevant when performing research *with* people to develop a systematic understanding of phenomena. Currently, farmers markets contract with F2F to evaluate specific aspects of their market that are important to their goals and F2F simply provides technical resources to collect, interpret, and report data. They have complete ownership over their partnership with F2F because they formulate their research questions, align the findings with their priorities and needs, and generate solutions within the context of their market and community.

Markets can use the data to make business operations decisions and to promote themselves to partners, stakeholders, and community members, and public officials. Public officials and private stakeholders can use the information when making decisions to allocate resources to particular programs or services like SNAP incentive programs and pedestrian-oriented transportation infrastructure. Researchers can combine F2F data with datasets from entities like USDA Economic Research Service, USDA Census of Agriculture, US Economic Development Agency, US Census Bureau to analyze the social and economic impacts of farmers markets within a community.

Conceptualizing Land Access in Scholarship and Practice and on the Farm

Introduction

Land is an essential component of agricultural production and accessing it is a universal challenge among all farmers in all regions of the US because problems associated with renting, purchasing, and transferring farmland are pervasive and persistent (Freedgood & Dempsey, 2014; Von Ruden, 2018). Scholars and practitioners refer to this issue as 'land access' or 'farmland access,' and they distinguish it from 'land tenure' research by not only recognizing the rights and responsibilities that people have with their land but also the social, environmental, cultural, and economic relations that are embedded within their land access decisions and their farming practices. They typically illuminate the gravity of the issue through two statistics: according to the 2014 Census of Agriculture, 33 percent of farmers are over the age of 65 and 93 million acres of farmland (10 percent) is expected to change owners between 2015 and 2019 (Ackoff, Bahrenburg, & Lusher Shute, 2017; Allen & Harris, 2005; Beckett & Galt, 2014; Bigelow, Borchers, & Hubbs, 2016; Freedgood & Dempsey, 2014; Iroquois Valley Farms, 2017; Katchova & Ahearn, 2016; Opheim, 2017; Parsons et al., 2010; Ruhf, 2013; Shute, 2011; United States Department of Agriculture, 2014; Wittman, Dennis, & Pritchard, 2017).

More nuanced explanations weave together characteristics of the agricultural industry with data on who owns and operates farmland. They describe the opposing directions of industrial scale farms and community-based operations. They characterize the former as consolidation, data-driven decisions, genetic modification, global competition, automation, and innovation and the latter as specialization, experience-driven decisions, regional collaboration, global cooperation, automation, and innovation (Holman, 2018; Rotz, Fraser, & Martin, 2017). More colloquial terms characterize this as "get big or get out" versus "buy local" and "know your farmer."

These statistics identify the amount of tenant- and owner-operated land, the percentage of operator and non-operator landowners and landlords, and the likelihood of renting or owning land at different career stages. For example, the US has 911 million acres of farmland and

- 61 percent is owned by farm operators, 31 percent is owned by non-operator landlords, and 8 percent is rented by operators that own land.
- 39 percent of all farmland is rented. Non-operator landlords own 80 percent of rented farmland and retired farmers compose 38 percent of this category.
- 27 percent of farmers under 34 years old rent all of their land and 8 percent own all of their land, but 8 percent of farmers over 65 years old rent all of their land and 43 percent own all of their land.

(Bigelow et al., 2016)

Furthermore, in February 2018, the USDA Economic Research Service (ERS) published a report evaluating the trends and factors that affect farmland values, land ownership, and farmland returns (Burns, Key, Tulman, Borchers, & Weber, 2018). Given the recent appreciation in farmland, the macroeconomic analysis provides contextual information on the financial conditions associated with renting, purchasing, and transferring land. Between 2000 and 2015, farm real estate value increased from $1,483 per acre to $3,060 per acre. Aside from the sheer expense of farmland, the values are relevant to the access issue because farm real estate (land and structures) accounts for over 80 percent of farm sector assets so the price of land is an indicator of financial wellbeing and market supply. In 2016, the total value of farm real estate was $2.44 trillion and the

total debt on real estate was $226 billion, which represents more than 60 percent of total farm debt (estimated figures).

Traditionally, real estate represents a substantial share of farmer household wealth and it is a primary source of equity to secure public, private, and cooperative financing. Consequently, appreciation and depreciation in land prices affects their level of borrowing costs and access to credit – that is, when land values rise, landowner wealth increases from the appreciation, which provides additional collateral for loans and increases their borrowing capacity. Renters do not experience increased gains from land appreciation but the fundamental factors that increase land values also increase rental rates. The ERS estimated the change in land wealth from land appreciation and they found that for the average farm, real estate appreciated by 6 percent between 1997 and 2002 and by 28 percent between 2002 and 2007. These rates imply that a dollar more in initial land wealth would have caused wealth to increase by 6 cents in the first period and by 30 cents in the second period. Thus, it is reasonable to believe that changes to the land value (and, by proxy, household wealth) influence landowner decisions about whether they hold, purchase, sell, or transfer their land, which affects the supply of farmland for rent or sale (Burns et al., 2018).

These explanations demonstrate the importance of the issue by quantifying the broad structural trends associated with accessing land, yet farmers emphasize other aspects of the land access issue. In 2014, the Wisconsin Department of Agriculture, Trade, and Consumer Protection (DATCP) surveyed beginning farmers to gather more comprehensive and nuanced insights about their demographics, farming experience, farm operations, land access arrangements, and educational experiences. 44 percent of beginning farmers cited accessing land as the primary barrier to starting a farm, and it was most important for diary

and cash grain farmers (respectively, 63% and 60%) and less important for fruit and vegetable farmers (respectively, 18% and 27%). Accessing land might be particularly difficult because, according to the survey, most beginning farmers are not generating sufficient income to cover their farm operation and daily living expenses. Financial knowledge is a fundamental component of owning and managing a farm business, and most beginning farmers learn farm finances from their mentor, who is usually a family member (Paine & Sullivan, 2015).

More specifically, when you ask farmers what land access means to them, they describe a confluence of conditions such as farm consolidations, increased land competition, rising land costs, low interest rates, price volatility, farmer age and experience, landowner characteristics, family dynamics, estate planning, non-kin interpersonal relationships, community viability, etc. They view renting, purchasing, and transferring land as stages that evolve throughout their career and they recognize that their actions affect the viability and characteristics of family farms and rural communities. Both descriptions identify the complex nature of accessing farmland but compared to scholars and practitioners, farmers allude to a critical analytical perspective that is missing from existing work: experiences and processes. This prompts questions about how farmers understand access, how they develop their understanding, how their understanding influences their actions, and how they interact with social, political, and economic institutions. The answers are essential because they produce conceptual findings that can translate into actionable resources.

The objective of this dissertation article is to develop a pragmatic understanding of farmland access by studying the meanings and behaviors around three actions for accessing land: renting, purchasing, and transferring. I accomplish this objective through two types of analysis: (1) a literature review that evaluates how scholars and practitioners define 'land

access' and conceptualize the issues in their work and (2) empirical research that explains how farmers perceive the issue and develops a systematic understanding of farmers actions and interactions associated with it. That is, we need to understand how farmers engage personal relationships with family members, friends, and acquaintances and how they navigate institutional programs and policies with accountants, financial planners, estate lawyers, business consultants, government planners, resource conservation specialists, etc. because the information describes the many experiences and processes for accessing land. The study area focuses on Southern Wisconsin because it is a major agricultural region in the state, it includes a variety of farm production systems, farm generation perspectives, and rural, peri-urban, and urban geographies and it maintains a constant policy context at the state level. I organize this data into a conceptual model that illustrates how farmers navigate social, political, and economic institutions, and, therefore, the findings explain the interactive nature and constant change associated with the various experiences and processes for renting, purchasing, and transferring land.

Pragmatic social-legal theory is the intellectual framework for this study because it establishes personal experience as the basis for theory (reported and observed) and views policies as an emergent feature of communities. From a research design perspective, it represents a reasonable or logical way of conceptualizing problems and framing research and I followed grounded theory methods to develop an intimate relationship with participants and data and to systematically discover, analyze, and explain the systems of practices that affect access. Land access is one of the most important issues in agriculture today. The issue is at the forefront of many planning and policy conversations and initiatives, so it deserves a research agenda that aligns intellectual pursuits with practical applications. Our methods must embody the perspectives of the people that are

experiencing the issue and our findings must translate into resources that are useful for farmers and service providers.

This study will provide a more robust understanding of the behaviors and contexts associated with accessing farmland. The findings can inform not only current initiatives to develop programs and policies that address the issue but also future research to evaluate specific aspects of the issue. In particular, scholars can use the conceptual model to ground their hypothesis tests in real world examples – the contexts and characteristics of different land access arrangements.

Methods

Grounded theory is the process of discovering and verifying how people understand their actions and experiences. It involves flexible guidelines for collecting and analyzing inductive data and iterative strategies for interacting with data. Consequently, it is less of a step-by-step research method and more of a style for doing qualitative analysis that evaluates the situational and structural contexts of an issue and reveals concepts on how behavior reflects choice, chance, and structure. It studies human behaviors and relationships by analyzing how different social processes operate together and what conditions reproduce or transform rules. The results represent the meanings that people have towards the particular issue so scholars and practitioners can use the information to understand incremental and systemic change (Charmaz, 2014; Strauss, 2003).

I applied these principles to the literature review and the empirical research. Both evolved through two sampling phases: Open sampling at the beginning of the study to select appropriate articles, documents, participants, and events, to identify pivotal characteristics of renting, purchasing, and transferring land, and to facilitate analytic direction. Theoretical sampling to seek and collect data that elaborates, connects, and refines categories revealed during open sampling. Throughout the phases, I coded, memoed, and diagramed the data to discover relationships within it and to move from a descriptive to an analytical frame. The coding processes varied between the literature review and the empirical analysis, but fundamentally, both involved (1) line-by-line document or transcript review to produce concepts and dimensions (2) focused analysis to reveal properties within each piece of data, and (3) systematic coding to verify findings across the data (Strauss, 2003).

Within these techniques, I operationalized land access from a framework of programs and policies that address the planning, market, and finance elements for renting, purchasing, and transferring land and that recognize their potential interactions. Here, planning includes land use policies and regulations, farmland protection programs, and tax incentives; market includes business ownership structures and tenure arrangements; and finance includes estate regulations and lending options. Each element is a dependent variable, so the framework drove my sampling decisions for identifying relevant articles and documents and for selecting appropriate interview participants and observation events. The inductive nature of grounded theory is ideal for discovering how participants identify individual elements and combine multiple to address their situation, so I also examined mixtures and interactions within the framework such as planning programs that change the market value of a property. Table one lists examples of each element.

Table One. Technical Framework: Land Access Elements

Planning	**Market**	**Mixed**	**Finance**
Comprehensive planning	Fixed rent	Conservation easement	Estate transfer
Zoning & subdivision ordinances	Share rent	Public and private purchase of development rights & transfer of development rights programs	Public financing
Agriculture districts	Fee simple		Private financing
Deed restriction / restrictive covenant	Land contract	Payment for ecosystem services	Public-private financing
Property tax fees	Common ownership		Owner-seller financing
Income tax credits	Joint ownership		
	Trust ownership		
	Squatting		

(California Farmlink, 2008; Daniels, 1999; Parsons et al., 2010; Rosenberg & Ventura, 2016)

The framework is useful for identifying the range of options but it also means that the details are distinct and stagnant. In other words, the technical framework outlines how farmers *technically* can use policy to access land and my objective is to describe how they

realistically navigate social, political, and economic institutions. Thus, the objective of my literature review and empirical research is to evaluate interaction among the actions and elements for accessing land and to illustrate those relationships in a conceptual model. The following sub-sections explain how I conducted these analyses.

The study incorporates two types of land access professionals: (1) national or regional organizations that expressly address land access issues (hereafter 'practitioners') and (2) local service providers that help farmers make decisions (e.g., accountants, financial planners, estate lawyers, business consultants, government planners, resource conservation specialists, etc.) and that serve as professional and information networks (e.g., Farm Bureau, Farmers Union, FairShare CSA Coalition, National Young Farmers Coalition, Organic Valley, etc.) (hereinafter, 'service providers'). The literature review evaluates how practitioners define and conceptualize land access in their educational resources, and the empirical research evaluates how service providers interact with farmers about renting, purchasing, and transferring land and about using the various planning, market, and finance elements.

Literature Review

The literature review focuses on two types of existing written work: peer review articles by academic scholars or government analysts that name land access as a direct or indirect aspect of their study (hereafter 'scholars') and educational resources by practitioners that address the land access issue as a part of their organizational mission. The objective of the literature review is to analyze the context and characteristics of land access articles and resources and specifically how scholars and practitioners define the term and conceptualize the issues in their work. I identified the appropriate documents through two processes: searching for land access articles and resources in academic

database searches, government websites, and organization websites and identifying relevant citations within this body of literature.

I found relevant academic articles by searching multiple variations of the land access term in the Web of Science and ProQuest databases and the University of Wisconsin Library Article Search system on four separate occasions between August 2016 and March 2018. The search terms included: "land access," "farmland access," "farmland access AND USA," "farmland tenure," etc. I selected articles that either established land access as the primary or secondary issue in the study or discovered a relationship between accessing land and their primary question. For example, articles that met the former criteria evaluated the experiences and conditions for accessing land within a specific geographical region (Horst & Gwin, 2018; Parsons et al., 2010), within particular lease arrangement (Beckett & Galt, 2014), or with certain demographic characteristics (Calo & De Master, 2016). The latter asked questions about the viability of farm businesses or the dynamics associated with land use decisions (e.g., crop varieties, production practices, conservation strategies, etc.) and identified the future of farming or farm decision-making depends on various land access elements (Esseks, Oberholtzer, Clancy, Lapping, & Zurbrugg, 2009; Jackson-Smith & Sharp, 2008; Oberholtzer, Clancy, & Esseks, 2010; Paül & McKenzie, 2013; Petrzelka & Marquart-pyatt, 2011). If one of these articles referenced additional sources, I added the document to my reading list. Between the two processes, I identified 45 articles or book chapters.

I found the educational resources by identifying the organizations that work on land access issues[1] and by combing through their websites for explanations of land access and

[1] Organizations include: American Farmland Trust, Land For Good, National Young Farmers Coalition, Iroquois Valley Farms, Southwest Badger Resource Conservation and Development Council, University of Wisconsin-Extension, and Midwest Organic and Sustainable Education Service.

for resources on renting, purchasing, or transferring farmland. The University of Wisconsin-Extension publishes various peer-reviewed fact sheets about different actions and elements of accessing land and I categorized them as an educational resource because the purpose is to educate farmers, landowners, service providers, or local government officials. This produced numerous anecdotal definitions and over 60 reports, fact sheets, and guides. This content is helpful for understanding how practitioners define land access and address the issue 'on the ground.'

I reviewed these documents through a two-step process: First, I created a codebook that categorized each document as scholar or practitioner described the author's definition of land access, listed the associated actions or elements (if applicable), and summarized their approach for evaluating the issue or providing information on it. Second, I used this information to analyze how scholars and practitioners define land access and conceptualize the issue in their work. This involved identifying the assumptions and values that underlie their research questions and their organizational missions and following the logic that embeds those assumptions into their research designs and educational resources. Given the emerging awareness of the land access issue, there is a limited number of targeted peer-review articles and educational resources and in most cases, the authors advance general concepts or anecdotes about the conditions that affect how farmers access land. Consequently, it was difficult to conduct a systematic evaluation of the intellectual merits associated with the authors behavioral and structural assumptions that undergird existing land access scholarship and practice, and, instead, I developed a stepwise analysis of what people mean when they operationalize 'land access.'

Empirical Research

From an empirical perspective, the purpose of grounded theory methods (i.e., the purposive sampling strategies and the iterative the coding, memoing, and diagramming processes) is to increase the analytical power of the research and to move the inductive inquiry from descriptive characteristics to explanatory concepts. I did this by asking 'what is this a study of' and I answered the question by making connections between the qualitative data and the theoretical concepts that interpret and explain core human experiences. This produces results that represent fundamental views and values on human nature, self, moral responsibility, legitimacy, and truth and findings that are generalizable beyond the study sample area and participants. Since the objective of my study is to explain the meanings and behaviors that farmers have towards the actions and elements, the research design focuses on collecting data that embodies the perspectives of the people experiencing the issue and analyzing the experiences and processes that produce particular land access arrangements. Developing a pragmatic understanding of land access requires exploring variation about how farmers conceptualize land access within the context of their everyday lives, which includes farm operations, rural communities, farmland real estate markets, and agricultural industries.

I focused on 'family farms' because the term encompasses a broad range of characteristics and scales. The USDA defines a family farm as an operation owned and controlled by a group of individuals related through blood, marriage, or adoption. Their ties extend across households and generations (United States Department of Agriculture Economic Research Service, 2017). Farmers may organize the business as a sole proprietorship, partnership, or family corporation but it excludes non-family corporations or cooperatives and hired managers (United States Department of Agriculture National Institute of Food and Agriculture, 2017). According to the 2012 Census of Agriculture,

family farms account for 97 percent of the 2.1 million farms and it includes most of the 68,700 farms in Wisconsin (United States Department of Agriculture National Agricultural Statistics Service, 2015, 2018).

The USDA Economic Research Service classifies family farms into homogeneous groups that are based on the farm size (i.e., gross cash farm income – GCFI), the operators' primary occupation (i.e., farming or non-farming), and the business incorporation (i.e., sole proprietorship, partnership, family corporation, or non-family corporation). The groups range from small family farms with less than $350,000 in GCFI to midsize family farms with $350,000-$999,999 GCFI to large-scale family farms with $1,000,000 or more GCFI (Hoppe & MacDonald, 2013). From a methodological perspective, this definition of a 'family farm' is a general qualification for participating in the study, and significant variables within this unit include production types (e.g., commodity crops, produce, forage crops, livestock, dairy, trees, etc.), experience farming (i.e., beginning, mid, or senior career and multi- or first-generation), farmer demographics (i.e., race/ethnicity, gender, and age), and geographical location (i.e., degree of rural, peri-urban, or urban land use influences). Again, these variations identify broad differences among family farm operations and farmers, and the following discussion explains how I addressed them through the sampling and analysis strategies.

Sampling Strategy

The sample included people that owned or controlled a family farm operation and people that provided professional services for family farmers. Since my objective was to evaluate how farmers perceive the issue as a whole and to develop a systematic understanding of famers actions and interactions associated with it, I included the four significant family farm variables (i.e., production types, experience farming, farmer

demographics, and geographical location) and I limited specific characteristics and scales to preserve the feasibility and validity of the study. I included all variations of production types and experience farming because the former represents fundamental descriptive characteristics of agricultural production within the US and because the latter identifies natural progressions and current trends of farming careers. But, I limited farmer demographics and geographical location to ensure that I could reasonably implement the study and accomplish my objectives.

More specifically, farmer demographics include race/ethnicity, gender, and age and I expressly excluded immigrant farmers from the sample population because of the language barriers and their past experiences. Many immigrant farmers are Hmong or Hispanic and, even though they may speak English, I would need a translator to conduct the interview because the questions involved open-ended explanations about their farming background, farm operation, and land access arrangements. English words and phrases do not always translate directly to other languages and, since I only speak English, I would either discover these discrepancies through trial and error or not discover them at all, which decreases the accuracy of my data and the reliability of my findings. In addition, compared to people that are born and raised in the US and that grow up in American families, they have unique life experiences that may affect how they understand land access and consequently, how they use the elements to rent, purchase, and transfer land. Immigrant farmers have an important role in US food systems, but it takes time and focus to develop valid and reliable comparative insights and the comparative analysis is beyond the scope of my research objectives.

However, geographical location is an important aspect of land access because cities grow by expanding their land base and the easiest way to expand is by developing open

land adjacent to existing urban areas, which is active farmland in most cases (Molotch, 1976). Since the mid 1900s, investors proactively purchased open land around urban areas by offering farmers market value, which is much higher than the agricultural value. We usually associate this process with the sprawling land use patterns and distributed transportation networks, but it also established two general categories of traditional agricultural land uses: rural and peri-urban. Both are vital components of our food systems, so I considered the degree of rural, peri-urban, or urban land use influences when I selected the study area and the interview participants and when I developed the interview guide.

The study area includes 20 counties within southern Wisconsin. USDA National Agricultural Statistical Service (NASS) divides the state into nine geographical regions: central, east central, north central, northeast, northwest, south central, southeast, southwest, and west central. I combined the three southern regions into one area because it provides variation in terms of rural, peri-urban, and urban land uses. The area includes Metropolitan Statistical Areas, Micropolitan Statistical Areas, and Non-Metro Areas as defined by the US Census Bureau and USDA Economic Research Service urban influence codes 1, 2, 3, 5, 6, 7, and 9.[2] Table two identifies the 20 counties and the corresponding statistical area and urban influence code.

[2] The ERS classifies counties on a scale from one to 12, where one has the highest degree of urban influence and 12 has the lowest amount of urban influence. Scholars operationalize the peri-urban as counties that are between one and three.

Table Two. Sample Area

County	Statistical Area	Urban Influence Code
Columbia	Madison Metro SA	2
Crawford	Non-metro SA	9
Dane	Madison Metro SA	2
Dodge	Beaver Dam Micro SA	3
Grant	Platteville Micro SA	5
Green	Madison Metro SA	2
Iowa	Madison Metro SA	2
Jefferson	Whitewater-Elkhorn Micro SA	3
Kenosha	Chicago-Naperville Eglin	1
Lafayette	Non-metro SA	7
Milwaukee	Milwaukee-Waukesha-West Allis Metro SA	1
Ozaukee	Milwaukee-Waukesha-West Allis Metro SA	1
Racine	Racine Metro SA	2
Richland	Non-metro SA	6
Rock	Janesville-Beloit Metro SA	2
Sauk	Baraboo Micro SA	5
Vernon	Non-metro SA	6
Walworth	Whitewater-Elkhorn Micro SA	3
Washington	Milwaukee-Waukesha-West Allis Metro SA	1
Waukesha	Milwaukee-Waukesha-West Allis Metro SA	1

The degree of rural, peri-urban, and urban land uses is important because they impose forces that, in turn, affect the social, political, and economic conditions of the area (Lichter & Brown, 2011), the availability, affordability, and security of farmland, and the experiences and processes for accessing land. Forces include, but are not limited to, jurisdiction powers and characteristics, land use regulations, public decision-making processes, building densities, development patterns, property values, property taxes, personal lifestyles and occupations, land suitability for agricultural production, and real estate markets (Clark,

Inwood, & Jackson-Smith, 2014; Masuda & Garvin, 2008; Paül & McKenzie, 2013; Sharp & Clark, 2008). During my interviews, I asked open-ended and targeted questions to collect data about how they understand and experience these forces.

Based on these variables and limitations, I developed a sampling frame of potential interview participants and observational events and I collected data through conversational interviews with farmers and service providers and field observations at trainings, workshops, conferences, and public meetings. I developed my initial list of participants by reviewing public databases that list farms within Wisconsin, searching Google for organizations that provide technical, educational, financial, or legal assistance for farmers, that protect or conserve land, and that represent groups of farmers, and scanning the Wisconsin Department of Agriculture, Trade, and Consumer Protection (DATCP) and University of Wisconsin-Extension websites for people that work on farmland or farm business issues. When I reviewed the organization and government websites, I also looked for events that I could attend to either integrate myself into Wisconsin's farming community or observe how farmers learn about actions or elements associated with accessing land. I conducted this type of event search three times between January 2017 and May 2018. Throughout the study, I used snowball sampling to identify additional interview participants and observational events for the sampling frame.[3]

[3] To my knowledge, all of the farmers were white and most were male, married, and heterosexual, but I did not prioritize these demographic characteristics when selecting interview participants. As stated below, my objective was to collect data on the range of land access experiences and arrangements so, beyond immigrant farmers, I did not overtly exclude someone because of their race/ethnicity, gender, relationship status, or sexual orientation. See Mitchell *Reforming Property Law to Address Devastating Land Loss* (2014) to learn more about racial inequality in property ownership and Leslie *Queer Farmland: Land Access Strategies for Small-Scale Agriculture* (2019) to learn about the specific land access experiences of queer farmers.

When collecting data, the purpose was to discover information about the participant's or event's relationship with renting, purchasing, or transferring land and with the program and policy elements and to gain a comprehensive understanding of the land access issue. Initially, my goal was to talk with people and attend events that represented each land access element and to describe each action and event, but, over time, it shifted to focus on elements or actions that were particularly problematic and to narrate stories about the range of experiences and arrangements within rural, farming communities. This was possible because, once I developed a theoretical awareness towards the distinct perspectives, I wrote memos about each perspective that outlined their experiences and processes for renting, purchasing, or transferring land and their interactions with other perspectives. The analytical memos helped me identify gaps within my dataset and areas that needed more robust information. Appendix one discusses how my interview questions evolved throughout the study.

During the open sampling phase, I selected a range of people and events to identify the multiple perspectives towards land access and their descriptive characteristics. Here, the beginning, mid, and senior career and multi- and first-generation farming stages emerged as pivotal characteristics of land access so I focused my sampling decisions on collecting data about a range of farming experiences and, within each experience range, their relationships to the planning, market, and finance elements. I identified these characteristics by researching every farm (i.e., business and people), service provider (i.e., organization, department, and position), and event (i.e., organization and workshop) within the sample frame and, if possible, noting their relationship to the (1) renting, purchasing, and transferring actions, (2) planning, market, and finance program and policy elements, and (3) beginning-, mid-, and senior career farmers.

For example, I interviewed farmers that rented all or a majority of their land through short- or long-term leases, purchased land through bank financing or a land contract, or transferred land through a family estate planning process (i.e., they owned and transferred land to their children or their parents owned land and transferred it to them). When selecting service providers, I interviewed people that could provide a comprehensive overview of the issue based on their professional experiences. They included one division administrator at the Wisconsin Department of Agriculture, Trade, and Consumer Protection and five staff members at two farmers associations (i.e., staff who interact with farmers to understand their strengths and challenges and who develop programs to support their needs). I attended events that educated farmers on key elements or provided an overview of multiple elements associated with one action. The former included a workshop on Farm Service Agency loan programs and services, a field day by a farmer association on cooperative land ownership, a farm tour and two conference presentations by a regional organization on different arrangements for owning and managing farmland, a workshop by a farm credit association on transferring a farm business and land, a conference presentation by a UW-Extension specialist on interpersonal aspects of farm transfers, and a workshop by legal service providers on estate planning. The latter included a land access 101 boot camp that outlined the technical characteristics of particular elements (e.g., zoning ordinances, rental contracts, land contracts, public v. private financing, etc.), a conference presentation that listed the steps to accessing land as a beginning farmer, and a farm association workshop that educated their members about state and local policy priorities for rural, farming communities.

During the theoretical sampling phase, I asked targeted questions to elaborate and refine the descriptive data and to connect it with the larger contexts of farm operations, rural communities, farmland real estate markets, and agricultural industries. Here, I

collected data that described the characteristics of distinct land access arrangements and that evaluated how those characteristics evolve among multiple farmers and within individual operations. I identified most of these farmer and service provider participants through snowball sampling and by attending field days.

Initially, I attended the field days to integrate myself within Wisconsin's farming community but I quickly learned it was an opportunity to talk with multiple farmers about their land access arrangements in a short time span. These conversations were short and did not discuss sensitive personal information, and, instead, the purpose was to get a general understanding of many different arrangements and to identify farmers that would provide more detailed information in an interview setting. Such as, personal relationships with their farming and/or non-farming parents and/or siblings, social networks for finding farmland to rent or purchase, and farm finances that affect the viability of their farm operation and land access arrangement. I interviewed service providers that could provide a professional perspective about specific aspects of these experiences and arrangements. For example, an agricultural salesperson who, as part of his selling strategy, facilitates rent or purchase opportunities among farmers, a farm financial planner who assists farmers with the financial aspects managing a farm business, and a county conservation commissioner who helps farmers adopt state mandated land management practices.

Between the two phases, I conducted 36 interviews with 40 people – 25 farmers and 15 service providers. The farmer sample included commodity crop, produce, livestock, dairy, wheat, and hops producers, beginning, mid, and senior career and multi- and first-generation experiences, white males and females between approximately 22 and 75 years old, and rural and peri-urban locations. The service providers included financial planners, business managers, land brokers, product cooperatives, membership associations, and state

and local government staff members. Six of the interviews had multiple people and three of the people had two interviews.

I conducted field observations at 27 different trainings, workshops, and conferences. 24 of these events targeted farmer audiences and addressed topics like business management, conservation practices, estate planning, Farm Service Agency loans, and lease arrangements, and three of the events engaged service providers in discussions about the current economic, environmental, and legal issues within rural communities and agricultural industries.

Analysis Strategy

The process of moving from open-ended to targeted data collection strategies increased the analytical power of the qualitative data because it facilitated the inquiry from gathering descriptive characteristics to developing explanatory concepts. The conversational interviews allowed me to develop an intimate relationship with farmers and service providers. When I met with farmers, we discussed various aspects of their farming backgrounds, business plans, interpersonal relationships, and future goals and I triangulated and elaborated this information during the service provider interviews. This set the stage for analyzing how renting, purchasing, and transferring land functions within the overall context of their farming livelihood and lifestyle.

Similar to the sampling strategy, I adjusted my data analysis as I discovered what the data was about and it evolved through two phases: First, line-by-line coding that identified explanatory variables and distinct perspectives of land access and that answered who, what, when, where, and how questions for each sampling and explanatory variable and for each farmer perspective. The core explanatory variables include personal relationships, social networks, and farm finances. They correlate with the goals that

farmers have for their operation and family, which implicate how they define land access and realize their rent, purchase, and/or transfer arrangement. This phase allowed me to understand the similarities and differences among the variables and perspectives and to describe how the variables operate within a perspective and how the perspectives relate with each other.

Second, systematic and concerted coding that organized the distinct perspectives into larger, cohesive groups of similar life experiences and land access trajectories. Each perspective has a unique experience and process for accessing land and their particular arrangement is the product of those characteristics. When I compared the characteristics within each perspective, I discovered norms, traditions, and interests that are inherent within farm operations, rural communities, farmland real estate markets, and agricultural industries as well as common trends among their personal relationships, social networks, and farm finances. The norms, traditions, and interests provide the rational basis for developing a conceptual model about land access, and I organized the trends into composite characters and grouped the characters into four trajectories for structuring a farm operation and for accessing land. The trajectories are proxies for the behaviors, elements, and institutions that farmers engage to rent, purchase, or transfer land so we can use the conceptual model to interpret how farmers access land.

Literature Review

My objective is to evaluate how scholars and practitioners define 'land access' and conceptualize the issue in their work. Land access scholarship includes peer review articles that name 'land access' as an issue and the educational resources came from organizations that establish land access as part of their mission and relevant University of Wisconsin-Extension programs. Land access is one of the most important issues in agriculture today. It is the forefront of many conversations and initiatives, so it is vital to understand what people mean when they use the term and study the issue. This analysis provides the basis for my empirical research on how farmers define 'land access' and how they invoke various elements and navigate social, political, and economic institutions to rent, purchase, and transfer land.

Scholars and practitioners have studied the actions and elements associated with accessing farmland for decades but the term 'land access' is a relatively recent phenomenon. Historically, scholars define rent, purchase, and transfer actions or planning, market, and finance program and policy elements as a distinct problem and evaluate the patterns of behavior associated with it. For example, they review:

- Tenure structures to analyze how the characteristics of lease arrangements affect landlord-tenant relationships, land security, and conservation practices (Carolan, Mayerfeld, Bell, & Exner, 2004; Cox, 2010, 2011; Petrzelka & Marquart-pyatt, 2011);
- Farm succession/transfer characteristics to evaluate changes within farm families and businesses (Cox, 2012; S. M. Inwood & Sharp, 2012; Lobley & Potter, 2004);
- Land use regulations to evaluate how the policies affect the presence and viability of agriculture (Castillo et al., 2013; Celio, Flint, Schoch, & Gret-Regamey, 2014; Deaton

& Vyn, 2010; Munroe, Croissant, & York, 2005; Oberholtzer et al., 2010; Richardson, 2007; Saudubray & Scherer, 2007);

- Land tenure adjustments to determine whether easements are an effective means to preserve farming and to conserve farmland (Brabec & Smith, 2002; Duke et al., 2016; Gottlieb et al., 2015; Liu & Lynch, 2011; Lynch & Lovell, 2003; Richardson, 2007; Schilling, Attavanich, Sullivan, & Marxen, 2014; Stoms, Jantz, Davis, & DeAngelo, 2009); and
- Land trusts to understand their role in promoting agriculture (Beckett & Galt, 2014; Rosenberg & Yuen, 2012).[4]

Within the agricultural industry, professionals provide a variety of services (e.g., topics include financial, business, legal, training, conservation, planning etc.) and they represent two different perspectives: national or regional organizations (hereafter 'practitioners') or local consulting businesses (hereafter 'service providers'). In many, but not all cases, the practitioners develop educational resources about land access actions and elements for farmer and service provider audiences, and the most well-known entities include American Farmland Trust and Extension. Compared to scholars, their work typically concentrates on farmland preservation and farm succession.

American Farmland Trust's mission is "to save the land that sustains Americans by protecting farmland, promoting sound farming practices, and keeping farmers on the land" (American Farmland Trust, 2018b). Since the 1980's, they have fulfilled this mission by studying best practices for farmland preservation policy programs and more recently, by managing an online clearinghouse for information about farmland protection and

[4] The citations in this list identify the salient articles on each issue – it is not comprehensive.

stewardship and by forming an land access curriculum that agricultural educators and service providers deliver to beginning farmers (American Farmland Trust, 2018a, 2018c). In comparison, cooperative extension translates research and education from land grant universities into practical information for farmers, consumers, and families. Extension programs develop resources to help agents understand specific issues and to increase their capacity for assisting people, businesses, and communities. Within this purpose, many extension programs provide information about the financial and estate elements of transferring land and oftentimes, they refer to the issue as 'farm succession' (University of Wisconsin-Extension, 2018).[5]

These organizational purposes are valuable for understanding specific contexts and conditions of land access but their outputs treat each action and element as distinct processes, so the content does not recognize interaction and change. Professionals may recognize these characteristics but organizational roles, resources, and timelines can constrain their educational resources. Yet, my farmer legal consciousness pilot study demonstrated that their actions towards renting, purchasing, and transferring land and their interactions with program and policy elements are connected. Farmers integrate social, environmental, cultural, and economic relations into their land use decisions, and these relationships represent behavior about past, present, and future users and actions – they are embedded (Curry, 2002; Freyfogle, 2003; Furman, Roncoli, Nelson, & Hoogenboom, 2014; Geisler, 2000; Hann, 1998; S. Inwood, Clark, & Bean, 2013; Parker, 2013; Parker, Moore, & Weaver, 2007; Weber, 2007). Here, embeddedness is a construct for

[5] Farm succession refers to processes of transferring the farm business and the farmland. Many people use the terms 'transfer' and 'succession' interchangeably but since this study focuses on land, I use 'transfer' to describe passing the farmland from one generation to the next and focus the review on those resources.

operationalizing my definition of 'land access' in the pragmatic social-legal theory tradition and comparing it to existing scholarly articles and educational resources. Land access scholarship and practice requires a multi-faceted and interactive perspective.

Scholar's definition of land access.

Targeted 'land access' research began around 2010 and it emerged within community and regional food systems scholarship (CRFS). As a body of research, CRFS examines "alternative, local, and sustainable systems designed to combat some of the problems of large, industrial food systems" (Community and Regional Food Systems, 2018). Compared to industrial food systems, CRFS strengthen local economies, improve individual and community health, create ecologically sustainable systems, and foster equitable and just social systems. CRFS scholars identified 'land access' as an important issue through research on two aspects of CRFS production: (1) the viability of farming within peri-urban geographical areas and (2) the challenges for farmers with specific social or cultural characteristics. In most cases, these studies start from the basis that CRFS supply chains differ from industrial food systems and that, consequently, enhancing farm viability and addressing farmer challenges requires understanding the conditions at each point and interactions throughout the chain.

Overall, when they address land access, they emphasize the salience for community systems because, compared to industrial, the farmers are more likely to not only require close proximities between production, distribution, and sales markets but also begin their US farming career as a first-generation or socially disadvantaged farmer. The studies identified the challenges for accessing land but the arguments are abstract research conclusions. They define the issue as the ability to access farmland that is available, affordable, and appropriate for production needs and farm finances, but they do not

comprehend specific details about the various experiences and processes for accessing land. These conclusions are an excellent way to start investigating emerging issues because they outline areas for targeted research, but the information does not provide descriptive and explanatory details that are necessary to develop actionable resources for farmers, service providers, and policy makers.

Consequently, a handful of scholars have applied these conclusions to expressly investigate land access. The overall objective is to develop a better understanding of how farmers access land by evaluating policy contexts, farmer experiences, and/or structural conditions. Compared to the aforementioned studies, they are more likely to evaluate the issue within community and industrial food systems. In this body of research, understanding and evaluating the land access issue has evolved from two bodies of work: (1) a national study that explained conditions of entering and exiting farmland to develop a thorough understanding of the issue and (2) a peer-reviewed, thought article that described the experiences of non-profit organization specializing in land access (i.e., Land For Good) (Parsons et al., 2010; Ruhf, 2013). From here, scholars have applied various analytic approaches to studying the issue and they have created a body of subject-specific land access research.

As the first comprehensive land access study, Parsons et. al. (2010) took an inductive approach to examining context and barriers of the issue. They define land access as farm tenure and transfer and as entry or exit. Here, tenure means 'acquiring' or 'holding' rights to land and the authors use the term to reference either both renting and owning or just renting. Conflating renting and owning is consistent with the purpose of the term 'tenure' but it can be confusing when authors use the term to reference two distinct actions. So, similar to my approach, they conceptualize land access as three actions of renting,

purchasing, and transferring farmland, but, in contrast, they evaluate entry and exit through two separate objective statements and research processes.

The objectives were twofold: First, to describe traditional (i.e., rent and own) and non-traditional (e.g., conservation investors, leasing federal, state, or local public land, intentional communities, etc.) arrangements that increase the affordability and security of accessing land and in turn, the profitability of small and medium size farms. Second, to identify promising or successful approaches for transferring a family farm with a focus on senior, exiting farmers.[6] The research process divided project members into teams, one for each research objective, and each team worked independently. That is, each team reviewed the literature on their subject matter, interviewed experts working in different aspects of entry or exit, and analyzed the context, issues, and approaches of their objective statement. Parsons et. al. conducted focus groups to gather additional knowledge from "special populations" (e.g., non-operator, absentee landowners, elderly women, immigrant/refugee farmers, public landowners, land trusts, etc.) and based on the report content, each team applied the information that was relevant into their analysis.

Thus, the project findings explain renting, owning, and transferring farmland and entering and exiting farming as distinct issues – they did not combine data from each team to evaluate interaction. For example, the basic patterns and perspectives of renting and owning farmland are set within the Jeffersonian, agrarian ideal so the processes of entering farming are embedded within the economic, political, cultural, and interpersonal dynamics of acquiring land. They describe the barriers of availability and affordability as a function of structural conditions within the agricultural industry that trickle down to rural

[6] The project included a third objective (i.e., environmental impacts associated with farmland tenure and transfer) but it is beyond the scope of this study so I do not include it in the literature analysis.

communities. That is, as a whole, agriculture is experiencing increases in the number of very large farms, changes from labor- and capital-intensive operations to capital- and management-intensive corporations, and concentrations in business and land ownership, and at the local level, it means greater competition for land, higher land prices, and more capital to secure financing. Parsons et. al. explain how the conditions are challenging for all farmers and they emphasize the difficulties for socially disadvantaged farmers.

The report provides details on specific 'approaches' to renting, owning, and transferring land for entering and exiting farmers. Each approach corresponds with a program or policy element listed above so the report is a fleshed-out version of the technical framework, but they do not connect the elements to institutional aspects of accessing land or identify connections among the approaches or elements. More specifically, rental approaches range from characteristics of a good lease (e.g., written contracts, specific timeframes, etc.) to alternative lease structures like lease with option to purchase, share-leasing, ground lease, and agricultural use rights. Owning farmland may involve state and local easement programs, federal beginning farmer and rancher loan programs, traditional financing mechanisms, and individual development accounts.

Building on Parsons et. al., Ruhf (2013) defines access as acquiring land through rent/lease and own/purchase arrangements and transfer as passing land through succession processes. She uses the terms 'access' (i.e., acquiring), 'tenure' (i.e., holding), and 'transfer' (i.e., passing) as distinct concepts, and she argues that they are intrinsically connected because how people acquire, hold, and pass land touches the economic, cultural, aesthetic, and livability characteristics of communities. In the article, Ruhf discusses the current challenges and opportunities, and the content is based on 20 years of professional experience with a regional small farm institute, the USDA, and Land For Good. From her

perspective, acquiring land is a complex and persistent challenge because our culture of property ownership is deeply engrained in a tenure system that idolizes independent, landowning farmers. However, she fails to acknowledge that farmers integrate a range of interpersonal meanings and social, environmental, and cultural relations into their farm operation and land use decisions (Curry, 2002; Furman et al., 2014; Granovetter, 1985; Hann, 1998; C. Clare Hinrichs, 2003; S. Inwood et al., 2013; Liffmann, Huntsinger, & Forero, 2000; Lincoln & Ardoin, 2015; Reimer, Thompson, & Prokopy, 2012; Wolf, Blahna, Brinkley, & Romolini, 2013).

To her, improving access involves moving beyond traditional views of property and practices for holding it and creating alternative mechanisms for renting, purchasing, and transferring land. She calls for evaluating access from a systems perspective, which means looking at the problem from multiple angles, contexts, and levels and evaluating the connections among them. Within land access, systems thinking involves considering the various stakeholders and elements that influence how farmers acquire, hold, and pass farmland and analyzing them within local, regional, and national contexts related to agricultural industries, food sectors, public policies, and socio-economic livelihoods. Despite this argument for an inductive approach to land access scholarship and practice, Ruhf promotes a deductive conceptualization and analysis of the issue. She defines access as available, affordable, appropriate, and equitable conditions, which directly corresponds with the four terms and descriptions that the American Farmland Trust uses to characterize issue (i.e., available, affordable, appropriate, and secure) (American Farmland Trust, 2018a), and she analyzes how it guides Land For Good's work with four stakeholder groups.

- Farm seekers — new and beginning farmers who want to access land for the first time and established farmers who want to expand or relocate their farm;
- Land owners — people who farm and people who do not;
- Service providers — agricultural specialists, attorneys, land use planners, mediators, affordable housing experts, lenders, real estate agents, etc.; and
- Communities / policy makers — civic leaders, conservationists, planners, economic developers, neighbors, etc.

She explains how suitable access depends on a variety of factors, such as the farmer's goals, values, and experience, the product type, the community social and economic conditions, the local, state, and federal regulations, the cultural context, etc., and she identifies how the stakeholders interact at program and policy levels. Again, similar to Parsons et. al., Ruhf emphasizes the unique challenges of beginning farmers that do not come from a farming family and that are within the USDA's definition of socially disadvantaged (i.e., a farmer who has been subject to racial or ethnic prejudices because of their identity as a member of a group without regard to their individual qualities (U.S.C. Title 7. Agriculture, 2002)). She also identifies the unique role of non-farming landowners (i.e., private and public entities, retired farmers, and absentee landlords) and anticipates that they are a neglected yet important part of the land access issue.

Scholars have built from these comprehensive studies by focusing on components of the issue and maintaining the premise that current understanding is insufficient to properly

address it. Pursuant to the findings about particularly important people or elements, the next wave of land access research concentrates on the farmer characteristics that have unique challenges and the access mechanisms that provide an alternative to traditional lease or own arrangements. Relevant farmer characteristics include beginning (Beckett & Galt, 2014; Calo & De Master, 2016; Katchova & Ahearn, 2016; Wagner & Ruhf, 2013), immigrant (Calo & De Master, 2016), women (Pilgeram & Amos, 2015), and community food systems (Horst & Gwin, 2018; Pilgeram & Amos, 2015; Wittman et al., 2017). Innovative access mechanisms include land trusts (Beckett & Galt, 2014; Wittman et al., 2017) and land incubators (Calo & De Master, 2016). However, each subject-specific analysis assumes that if we want to support the specific characteristic or mechanism, we need a better understanding of their experiences and the structural conditions associated with renting, purchasing, and transferring land. So, similar to Parsons et. al. and Ruhf, they evaluate broad characteristics of land access, but they go beyond the comprehensive descriptions by conceptualizing the issue either as a function of social/cultural relations or as a symptom of larger agricultural factors.

Table Two. Analytic approaches to subject-specific land access research

	Farmer Characteristics					Land Access Mechanism		
	Beginning Farmers	**Immigrant Farmers**	**Women Farmers**	**CRFS Farmers**	**No Preference**	**Land Trusts**	**Farm Incubator**	**Traditional Rent & Own**
Petrzelka & Marquart-Pyatt (2011) Land tenure in the US: Power, gender, and consequences for conservation decision-making					Dynamics between landlords and tenants in land use decisions.			Social relations of tenure and changing patterns of farmland ownership.
Beckett & Galt (2014) Land trusts and beginning farmers' access to land: Exploring the relationships in coastal California	Experiences working with land trusts as a means to access land.					Reciprocal relationships between conservation and agriculture land uses in trust mandates.		
Pilgeram & Amos (2015) Beyond inherit or marry it: Exploring how women in sustainable agriculture access farmland			Social locations of women and their farming opportunities.					Structural conditions of accessing land.
Calo & De Master (2016) After the incubator: Factors impeding land access along the path from farmworker to proprietor		Social relations that condition access for immigrant farmers.					Strategies for enhancing the efficacy of farm incubators.	
Katchova & Ahearn (2016) Dynamics of farmland ownership and leasing:	Experiences of entering agriculture and							Expansion and contraction patterns in

Implications for young and beginning farmers	accumulating capital.	leased and owned land holdings.

Wittman, Dennis, & Pritchard (2017) Beyond the Market? New Agrarianism and Cooperative Farmland Access in North America			Land trusts as a land access opportunity for CRFS farmers.	Land trusts as a means for constructing diverse, socially just, 'beyond the market' land economies.	
Horst & Gwin (2018) Land Access for Direct Market Food Farmers			Experiences accessing land as a direct market farmer.		Deducts 'access' to for concepts: affordable, appropriate, available, and secure (American Farmland Trust, 2018a)
Key	Function of Social/Cultural Relations	Symptom of Larger Agricultural Factors			

Table two identifies the analytic approaches to subject-specific land access research. Each cell states the research objective associated with the farmer characteristics and access mechanisms, and the shading identifies how the author conceptualized the issue. When scholars conceptualize land access by farmer characteristics, they evaluate the conditions that not only affect how farmers acquire land but also are embedded in how they hold land. They develop their understanding by studying the structural conditions that create social networks and by analyzing how these relationships shape farmer experiences for accessing land.

- Calo and De Master (2016) study the social/cultural relations associated with acquiring land. They define 'access' as the ability to benefit from a natural resource stream and, within farming, it references the productive capacity of the farmland and the formal legal rights to benefit from it. 'Accessing land' involves navigating complex social relationships that affect formal rights to benefit from farmland. For example, interpersonal dynamics between landlords and tenants affect the processes for negotiating leases (i.e., formal, semiformal, or tenuous agreements) and the formal terms of their relationship (e.g., housing, infrastructure improvements, water, maintenance, etc.). Socio-cultural relations mediate processes for finding a suitable parcel, negotiating a lease, and securing financing because landowners and service providers judge farmers by their cultural identity.

- Pilgaeram and Amos (2015) conceptualize land access within the context of women farmers and they emphasize the social norms and structural conditions that affect who acquires and holds property. Accessing land is a product of past experiences that affect one's socio-economic location and that embed people into particular social networks. Socio-economic locations and social networks create structural

opportunities that influence how women access land. For example, women can access land through marriage, as an independent individual, or with an equally committed partner and each life course correlates with social characteristics and relationships that dictate their cultural roles within the farm operation and legal rights to the land.

- Petrzelka and Marquart-Pyatt (2011) frame the issue as 'tenure,' but they conceptualize it as the social, cultural, and economic relations embedded in who holds land so I include it here. Tenure refers to the different ways people have rights to land and it is particularly important for farmers because the rights determine their ability to use and benefit from the land. The social relationships associated with tenure (i.e., the people that have rights and the rights given to each person) establish who has power in rent, purchase, and transfer situations. That is, relations between an on-farm landlord and a tenant, between an off-farm landlord and a tenant, or between co-landowners and a tenant create different authority and decision-making dynamics.

On the other hand, when scholars conceptualize the issue as a symptom of larger factors, they emphasize the structural conditions of the agricultural industry that create challenges for specific farmer characteristics (i.e., beginning or CRFS production) and access mechanisms (i.e., land trusts or traditional rent and own). They collect detailed data about research subjects and they analyze it within the context of broad economic and political conditions. They develop this logic through three steps.

First, they present the problem as a distribution issue that results from economic conditions that facilitate farm consolidation, low farm returns, and low farm capital and from political conditions that favor large-scale and technology intensive production

systems. Second, they identify the land use conditions that affect how farmers access land through traditional or alternative access mechanisms. Proximity to urban markets is important for many beginning and CRFS farmers and accessing land means competing with non-farming land uses and landowners. Consequently, the authors identify urban development patterns and farmland protection policies (e.g., zoning, conservation easements, farmland trusts, etc.) as important structural conditions. Third, they present a solution that calls for fundamental changes to the agricultural industry or to existing property ownership systems.

- Beckett & Galt (2014) define lack of land access as a symptom of low farm returns, low capital and equity, and proximity to urban markets. Current socio-economic conditions of the US agricultural system 'stack the deck' against beginning and small farmers. Renting land is difficult because landlords give preference to established farmers and they execute short-term lease contracts. Purchasing land is prohibitive because high land prices increase the amount of collateral required to secure financing and it is beyond the means of most beginning farmers. Farmers want a land access arrangement with housing and basic infrastructure because they assume it is necessary for building a viable operation.

- Katchova & Ahearn (2016) describe the issue as an aging farmer population, transferring a farm operation and land, changing farmland ownership, and educating farmers about operating a farm. 'Access' is the proportion of leased or owned land per farmer and the rate of change throughout a farming career. Authors evaluate the distribution of leased and owned acres by farmer age and experience to understand interaction among beginning, mid, and late career farmers. Accessing land becomes an issue when farmers start or expand their operation because

acquiring land requires inventorying their capital and land resources. Distributions of farmer age and experience describe interaction

- Wittman, Dennis, & Pritchard (2017) describe the issue within the context of neoliberal, capitalist systems that reinforce individual property ownership, facilitate consolidation within farm operations and the agriculture industry, and remove people and capital from rural, farming communities. Technically, 'access' is the legal rights, responsibilities, and interests in land and it orients relations between people and land. The processes for 'accessing land' reveal structural conditions about who holds power over farmland. Power refers to the identities and citizens that have secure access to land and their interests in holding land for farming or non-farming uses (e.g., speculation, investment, development, etc.).

- Horst & Gwin (2018) connect land access to the economic and political realities of community and industrial food systems. CRFS farmers generate reasonable revenue from their products (i.e., per item) but their production expenses are high (i.e., costs for land, labor, marketing, processing/packing, and distribution). Industrial food systems favor large-scale, technology intensive production systems and consolidated supply chains, which put downward pressure on all farmer profits. Planning addresses access through policies that protect agricultural land bases (e.g., state land use planning and growth management regulations, exclusive agricultural use zoning district, use value taxation, etc.).

As a whole, these studies elaborate upon the challenges identified in Parsons et. al. (2010) and Ruhf (2013) and they outline the multi-faceted nature of the issue. Individually, each subject-specific study describes how the author defines land access and, collectively, the two 'function of' and 'symptom of' conceptualizations describe how they operationalize the definitions within general academic doctrines. Information about what scholars mean when they use the term and when they analyze the issue contributes to a pragmatic understanding of land access because it provides a more robust understanding, of the subjects, contexts, and conditions for renting, purchasing, and transferring land. But, the picture is incomplete because, as a body of literature, the articles are isolated studies on the same topic. Consequently, the research does not produce an evolution of knowledge that is necessary for connecting intellectual pursuits with practical applications.

In most cases, the authors do not apply the findings from previous land access articles to their study so our understanding is not building from one article to the next. Given the current state of land access scholarship (i.e., nine peer-review articles within nine years), this is reasonable but, given the practical implications of the issue, it is necessary to recognize 'land access' as a body of literature and to use it as a means for building theoretical and practical knowledge. Furthermore, we should transition our attention from comprehensive descriptions and subject-specific evaluations to interactive and process-oriented explorations. Accessing land is a dynamic process that engages multiple actors, actions, and elements within particular situations *and* throughout a farming career – they interact in time and over time. If our goal is to improve our understanding of the issue so we can develop policies and programs to address it, then we must conceptualize the issue as interaction among people, place, and policy and evaluate it through process-oriented frameworks.

Practitioner's definition of land access.

As identified above, there are two types of professionals: (1) national or regional organizations or (2) local service providers. This analysis focuses on the former group because, within agricultural communities, they have established reputations for addressing land access issues throughout the US or within the study area. In particular, I evaluate resources from three national organizations: American Farmland Trust (AFT), Land For Good (LFG), and National Young Farmers Coalition (NYFC) and four study area organizations: Iroquois Valley Farms, Southwest Badger Resource Conservation and Development Council, University of Wisconsin-Extension, and Midwest Organic and Sustainable Education Service (MOSES). This might seem like a limited scope but it represents current land access practitioners. My objective is to examine how the practitioners define land access and conceptualize the issue in their work.

The seven organizations share a common objective to protect the future of farming. They accomplish it by conducting research that develops actionable knowledge about land access actions and elements, by providing education that communicates their understanding with general and targeted audiences, or by providing direct assistance to people that either own farmland or are looking to rent or purchase it. The educational resources vary from informational fact sheets that organizations publish on their websites to trainings that they provide for farmers, service providers, policy makers, and community leaders. The direct assistance actualizes their research and education objectives because people pay the organizations for individual support, but it is beyond the scope of a literature review to analyze how national and regional organizations provide these services so I do not include this aspect of their work here. The following analysis evaluates how they conceptualize land access in their research reports and educational resources. However,

since I attended several of their regional conference presentations and local workshops and had informal conversations with their staff, those conversations are a subconscious part of the following analysis.

Overall, the organizations define and conceptualize land access as an aspect of their missions and objectives and, compared to the scholars, they are more likely to identify the distinct actions and elements and to recognize the interconnections. In this capacity, they fill a unique role because they simultaneously generate applied knowledge about the issue and promulgate it to the general public. Consequently, practitioners have a key role in how we understand the issue.

Among the organizations, targeted 'land access' work is rooted in AFT's pioneering farmland preservation initiatives. In the 1980's, a small group of farmers and conservationists banded together over their common concern about the rate in which we were converting farmland to urban land uses and the consequences to our food security and rural communities. All of their work assumes that urban development is the biggest threat to the viability of US agriculture and that conservation easements are the best way to protect farmland and to ensure the future of farmers. The numbers have changed since the organization started, but, between 1992 and 2012, we lost approximately 31 million acres of farmland, which is 175 acres per hour or 3 acres per minute, and 11 million of those acres were some of the most productive farmland in the US (Sorensen, Freedgood, Dempsey, & Theobald, 2018). They have built national support for conservation easements by (1) working with local and state governments to develop, adopt, and fund farmland preservation programs, (2) lobbying the value of farmland to federal legislatures, and (3) documenting connections between urban sprawl, smart growth, farmland protection, and sustainable agricultural production in informational reports and on their website.

This work is significant in its own right, but it is particularly important here because it has influenced how AFT and other organizations conceptualize land access. In this review, most practitioners integrate AFT's assumptions about urban development pressures and their preference for land use policy interventions into their initiatives. That is, they express concern about the future of farming, name urban development and land markets as primary challenges to accessing land, and recommend conservation easements as a fundamental solution (Ackoff et al., 2017; Iroquois Valley Farms, 2017; Midwest Organic & Sustainable Education Service, 2018; Olson, Ruhf, & Brown-Lavoie, 2018; Shute, 2011; Wagner & Ruhf, 2013). This logic is either overt or subtle but, in effect, it means farmland preservation concepts and land use regulations have become key elements of land access practice. Thus, it is necessary to be mindful of how the national perspectives filtrate into regional educational resources. The following discussion considers how the national perspectives filtrate into educational resources through three analyses: (1) how AFT, LFG, and NYFC define land access, (2) how the study area organizations conceptualize the issue in their work, and (3) how AFT, LFG, and NYFC educate farmers and service providers.

AFT, LFG, and NYFC conceptualize the issue as accessing available, affordable, appropriate, and secure/equitable land:[7]

- Available — adequate supply of land in reasonable locations;
- Affordable — rent or purchase price is economically viable for farmers (i.e., it consistent with the value of agricultural land uses);

[7] AFT uses the term 'secure' and LFG uses 'equitable.'

- Appropriate land conditions are suitable for farming operations and infrastructure; and
- Secure/Equitable stability in the tenure arrangement (i.e., clear rights and responsibilities).

(Ackoff et al., 2017; American Farmland Trust, 2015; Land for Good, 2017; Shute, 2011; Wagner & Ruhf, 2013). They explain these dynamics in the following manner: The future of farming depends on the ability of farmers to start and grow their farming operations and to take over active farms, but many beginning farmers do not come from farming backgrounds. They enter agriculture with high start-up costs, without the position of inheriting land, and with significant student loan and credit card debt. Consequently, the viability of their business depends on their ability to build capital and invest it in renting or purchasing land (Freedgood & Dempsey, 2014; Shute, 2011).

On the other end of the spectrum, most senior farmers are aging without a plan for transferring their farm business and farmland, which prompts questions about what will happen when they retire or die. Transfer plans are a critical component of how beginning farmers secure land from senior farmers because it is a process of passing a farm operation and assets (i.e., land, infrastructure, and equipment) from one owner to another (Land For Good, 2018a). Most senior farmers want to see their land remain in farming but it is overwhelming to understand the multiple components of a transfer plan, identify the appropriate service providers, communicate needs and desires with family members, and execute the paperwork. Thus, accessing land is an interplay among beginning and senior farmers, and appropriate solutions must understand and balance their unique challenges and they may require different approaches for each demographic. Without a plan, the land

is more susceptible to converting to a non-farm land use (American Farmland Trust, 2016; Land For Good, 2018b).

Urban development creates a market for converting farmland to urban uses and increases land prices beyond farming profits, which makes it increasingly difficult for farmers to find affordable land. Since 2004, development pressure, competition from established farmers, and speculation from non-farm buyers has more than doubled the cost of farmland. This is most prevalent around cities where proximity to markets is desirable for farmers. Farmers might be able to find land that meets their production needs in terms of soil quality, number of tillable acres, water resources, and location, but it is too expensive because either the cost per-acre or the size of the parcel makes it unaffordable for some farm enterprises to cash-flow. If agricultural rents were the sole return from farmland, in 1951, a farm would pay for itself in 14 years but, in 2007, it would take 33 years (Gloy, 2017). The relationship between farmland values and production values is important because it determines whether farmers can afford a land payment (i.e., rent or mortgage) or get financing to make the investment (Ackoff et al., 2017).

Conservation easements remove the development rights and speculative value from the land, which decreases the market value and competition for farmland and increases the ability for farmers to rent, purchase, or transfer farmland. Specific policy solutions include increasing funding for the federal Agricultural Land Easement program and for state Purchase of Agricultural Conservation Easement programs. In particular, LFG & NYFC advocate for conservation easements that include option to purchase at agricultural value provisions. Traditional conservation easements assume that, without the development rights, the market value will correspond with the agricultural value so the agreements do not address how a landowner should price the farmland if they sell it. Affordability

provisions add requirements about how the landowner should value the preserved land in the case of a sale (Ackoff et al., 2017; Shute, 2011; Wagner & Ruhf, 2013).

In practice, AFT, LFG, and NYFC explain how conservation easements operate in conjunction with other policy solutions and how landowners can use them to address their situations in a more comprehensive manner. Thus, they recognize the complex and interactive nature of accessing land. LFG recommends institutional changes such as developing legal frameworks for executing long term leases and investment models for supporting farmers beginning farmers (Wagner & Ruhf, 2013). NYFC identifies policy solutions that generate opportunities for young farmers, which include: providing tax incentives to landowners who rent or sell farmland to beginning farmers, making public lands available for agricultural production, offering long-term leases to beginning farmers, and increasing the organizational capacity of land trusts to implement programs that offer secure rent or purchase situations (Ackoff et al., 2017; Shute, 2011). For example, land trusts can receive federal funds to implement a conservation easement program or state funds to preserve specific parcels of their land, they can purchase the development rights from private landowners to help them pay off debt or enter retirement, and they can lease or sell the protected land to beginning or expanding farmers at reasonable rates.

The regional organizations apply a variation of this logic. They express concern over the future of farming, name the structure of the agriculture industry as an inherent condition of land access, and provide educational resources as a programmatic solution. From their perspective, industrial agriculture systems affect who holds farmland and how they manage it and family farmers need direct assistance when renting, purchasing, or transferring farmland at the beginning and end of their career. In other words, they assume farmland ownership and management is the biggest threat to US agriculture and their

objective is to build the capacity of individual farmers. The Land Stewardship Project describes the issue in the following manner:

> *Land is the basis for our food system, our lives and our society. Land must be held and stewarded by many people, not consolidated and exploited by a few powerful agribusinesses. Beginning farmers need affordable, secure access to land. Beginning farmers are a powerful force for change. The Farm Beginnings program is organizing beginning farmers to hold elected officials and public institutions accountable to their values. Currently, Farm Beginnings is shaping a long-term campaign for deep reforms of federally subsidized crop insurance. Crop insurance, as it exists today, guarantees profit and enables agribusinesses to out compete family farmers and buy up available land, fueling the harmful trend towards fewer and larger farms in our region. LSP seeks reform to crop insurance that will bring that program back to its original intention: to help farmers survive a bad year. Farm Beginnings creates change by empowering farmers to meet their goals, by facilitating community support for new farmers, and by building a powerful base of beginning farmers who are demanding structural change. These strategies are all necessary and support each other.*
>
> (Land Stewardship Project, 2018)

The following analysis describes how the regional practitioners conceptualize land access. Each organization addresses problems related to a particular aspect of agriculture and they define access within the context of this niche. This is evident by the fact that they do not write out a formal definition of the issue and, instead, they demonstrate their perspective through the design and delivery of their educational resources. Thus, the definitions are an innate part of their missions and objectives and taken together, they explain the multifaceted nature of accessing farmland.

Iroquois Valley Farms is as "a restorative farmland finance company [that provides] land access to organic family farmers, with a focus on the next generation" (Iroquois Valley Farms, 2017).[8] They describe the issue as a crisis where more young people are interested in farming careers but renting and purchasing farmland is becoming prohibitively expensive and complex, and they address it by creating affordable, appropriate, and secure paths to ownership. In this capacity, Iroquois Valley operates by acquiring farmland and offering long term leases to next generation farmers (i.e., young first or multi-generation farmers) and (2) financing mortgages where farmers purchase land from them or from another landowner. The website does not explain the specific conditions associated with the land access crisis or relate their mission and operation to other aspects of accessing land so it is difficult to evaluate the assumptions that are embedded within their work, but since they essentially operate as a socially-responsible, for-profit land trust and a farm lending organization, it is reasonable to believe that they assume traditional processes and existing institutions for renting and purchasing land are not sufficient for family farmers. They view farmers as productive assets and build their capital by creating paths that circumvent existing social and financial networks - "members trade 'stock,' not land" (Iroquois Valley Farms, 2017).

Southwest Badger Resource Conservation & Development supports rural communities in nine Wisconsin counties by developing programs that advance "wise development and use of local resources" (i.e., Crawford, Grant, Iowa, LaCrosse, Lafayette, Richland, Sauk, and Vernon). The organization provides education to farmers and

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[8] The organization is based in Iroquois Valley, Illinois. As a financial investment and mortgage lending company, it can operate throughout the US, but it has primarily worked in Illinois and Indiana. They have recently purchased farmland in Vermont, Minnesota, Iowa, New York, and Illinois and actively lease it out to young farmers.

landowners through group trainings and one-on-one assistance on topics like managing soil and water quality, controlling invasive species, and building farmer networks. Similar to Iroquois Valley, Southwest Badger views land access as an investment in people and environments, but they describe the issue as an opportunity to build relationships among private parties and to decouple the ownership and management of land and livestock. They implement this approach through their Grazing Broker service, which has two distinct yet complementary components: mentorship for livestock farmers and contract grazing. The mentorship program helps beginning farmers plan, launch, and expand their grazing operation by connecting them with experienced farmers and service providers that provide one-on-one feedback. Contract grazing separates the people that own and manage land and/or livestock into three roles: landowner, livestock owner, and system manager, which creates five land access arrangements.

Table Three. Contract Grazing Roles per Scenario

	Roles		
Arrangement	**Person 1**	**Person 2**	**Person 3**
Traditional Farmer	Landowner Livestock owner System manager		
Herdsmen	Landowner Livestock owner	System manager	
Landowner & Land Renter	Landowner	Livestock owner System manager	
Contract Grazier	Landowner System manager	Livestock owner	
Cowboy	Landowner	Livestock owner	System manager

(Bauer, 2017)[9]

The programs have separate application processes, but the Grazing Broker engages the applicants in the same Investment Risk Assessment and Land Rental Assessment processes and matches the farmers according to the three roles (EE, 2017). Consequently, a mentorship relationship can also be a contract grazing arrangement. The Investment Risk Assessment lists five discrete variables that measure different aspects of investing in a farm operation and/or farmland (i.e., investment objectives, actual investment being considered, farming experience, net worth, and timeframe for investment) and it categorizes each variable into five levels of risk (e.g., from low to high risk: actual investment being considered = cash, land, perennial crop or infrastructure, livestock or forage crop, and livestock or forage crop; farming experience = no experience, classroom training or book learning, internship or hired farm job, hired farm manager, and independent owner and

[9] Model courtesy of Laura Paine, who is the former Grazing Broker at Southwest Badger and currently the Program Director for the Dairy Grazing Apprenticeship Program.

manager; etc.). Farmers and landowners score themselves according to the investment considerations and the number of points that they accumulate correspond with viable contract grazing roles and arrangements. The Land Rental Assessment evaluates their preferences for various stewardship practices, communication methods, production expectations, financial readiness, and logistical needs.

In both programs, the Grazing Broker organizes people into land access arrangements that allocate costs and benefits among landowners, livestock owners, and system managers and that have similar substantive interests. The objective is to engage producers and landowners in reciprocal relationships that address the primary challenges of starting a farm operation (i.e., accessing land, building capital, and developing experience). The programs describe access as leasing or owning land, but the assessment process follows a systems approach because it organizes interrelated actions by evaluating how renting and purchasing land correspond with different investment types and risk levels and by anticipating how those variables evolve throughout a farming career. Here, renting, purchasing, and transferring land represent stages within a farming career and farmers circulate through the stages over time. Farmers build their personal and professional capacity in a stage by assuming one or more of the contract grazing roles and interacting with peers to form a practical, working arrangement.

Each stage provides unique opportunities to invest in the farm operation and prepares farmers to move onto the next stage. For example, the annual overhead costs of owning pasture land are similar to the annual rental rates, and, as a beginning farmer, renting land is an opportunity to build assets because it requires less cash to acquire land and start their operation and it provides security for short term operating loans (EE, 2017; Southwest Badger Resource, Conservation, & Development, 2018; Southwest Wisconsin

Grazing Broker, 2018). Decisions about whether to rent, purchase, or transfer land involve understanding the costs necessary to run the operation and the opportunities to expand it, and practitioners address land access issues by integrating the roles and actions into farm financial and business planning processes.

UW Extension has a long-standing practice of providing family farmers with research-based education about production practices, business planning, financial management, and farm succession. Traditionally, this work focuses on engaging senior farmers to discuss elements of transferring a farm business to the next generation (University of Wisconsin - Extension, 2018a). The Farm and Risk Management (FARM) Team and the Center for Diary Profitability describe the process as a puzzle with four major components that have specific pieces:

Table Four. University of Wisconsin Extension Farm Transfer Planning Components

Business Planning	**Retirement planning**	**Succession Planning**	**Estate Planning**
Operations	Timing	Grooming successors	Valuing assets
Marketing	Life after retirement	Fairness to heirs	Liquidity needs
Personnel	Income needs	Succession strategies	Planning needs
Finances	Income sources	Financing succession	Planning the will
Risk management	Farm withdrawals	Taxes	Taxes

Farmers complete the puzzle by considering fundamental characteristics of their operation and livelihood, such as goals for the farm and retirement, needs and expectations of older and younger generations, financial viability of the farming operation, physical inventory of the farm assets, and objectives of the estate plan. Transferring farmland is an elusive topic within this process because the resources identify where land fits into the puzzle and what tools execute a transfer but they do discuss how land interacts with other aspects of a farm operation and family.

For example, the Family Estate Planning in Wisconsin report educates farmers about the different types of property, the regulations and taxes that affect disposition, and the tools that can manage property during life and after death (Meehan-Strub, Goebel, Harris, & Roberson, 2017). Naturally, the report includes farmland but the content is isolated to specific aspects of the estate plan. It does not explain how disposing farmland interacts with other social and economic conditions of farming operations, rural communities, farmland real estate markets, and the agriculture industry, how those dynamics influence the estate planning processes, and how farmers can evaluate them within the context of their situation. This approach is common throughout the printed materials and trainings about business, retirement, and succession planning (Center for Dairy Profitability, 2017; University of Wisconsin - Extension, 2018a, 2018b; University of Wisconsin-Extension, 2018).

Thus, UW-Extension conceptualizes land access as stages within a farming business and provides information to help senior and beginning farmers understand the technical elements of exiting (i.e., transferring) or entering (i.e., renting or purchasing) farming. The educational resources are descriptive in two capacities: first, they focus on specific aspects of the issue and second, they identify and explain the elements that are directly associated with an action. They do not consider the contexts and interactions that affect how farmers access land. However, given the bureaucracy within university systems, it is possible to view this characteristic as an institutional condition and not necessarily the view of the specialists that deliver the educational resources.

MOSES reinforces these definitions because subject matter experts help them fulfill their education mission. The organization promotes organic and sustainable agriculture by providing farmers with opportunities to learn about the subjects that they need to succeed,

which include an annual conference on a range of farming topics, full-day 'university' courses on specific issues, an 'all-in-one' beginning farmer conference, a farm finances workshop, and field days about specific farming practices. During this study, MOSES addressed land access (i.e., the topic as a whole and specific aspects of it) at their annual educational events. In 2018, LFG and Renewing the Countryside taught a full-day university course on land access for beginning farmers and the annual conference included four land access sessions:

1. Renting land for Managed Grazing by the Grazing Broker at Southwest Badger;
2. 127 Easy Steps to Land Ownership by staff at Land For Good and Renewing the Countryside;
3. Farm Transfers of the Non-Family Variety by the executive director at Kansas Rural Center and two farmers that successfully navigated non-kin farm transfers; and
4. Financing Options for Your Farm by loan officers at Farm Service Agency and Compeer Financial.

(Midwest Organic & Sustainable Education Service, 2018; Olson et al., 2018)

At the 2017 conference, National Young Farmers Coalition facilitated a roundtable discussion on accessing land as a young, first-generation, beginning farmer (Midwest Organic & Sustainable Education Service, 2017). In every case, the presentation content provided information that the organizations publish in their reports and on their websites. So, as a practitioner, MOSES provides opportunities for the national and regional organizations to communicate their understanding of and solutions for accessing land to an in-person audience and they do not necessarily have a unique perspective about the issue.

AFT, LFG, and NYFC also develop applied educational resources that advance their organizational missions and objectives and compared to the regional practitioners, they deliver services to farmers, landowners, service providers, policy makers, and the general public throughout the US. More specifically, AFT provides targeted land access education through two programs: (1) Farmland Information Center and (2) Farmland for the Next Generation. The Farmland Information Center is a national clearinghouse about farmland preservation and stewardship and it actively works to save farmland by compiling resources, responding to information requests, analyzing key data sources, and developing reports. The objective is to offer a comprehensive collection of resources about protecting farmland and to organize the content into topics that are relevant for farmers, agricultural landowners, concerned citizens, policy-makers, and service providers. AFT distributes the content in two ways.

First, subject-specific pages under the homepage headings: landowner options, planning for agriculture, and policies and programs. The landowner heading has separate pages for leasing, protecting, transferring, and finding land and the policies heading has an 'improve access to land page' that lists the federal and state programs that connect farmers with land. Second, they also assemble the subject-specific resources into a dedicated and searchable 'land access' page and re-organizes the content into seven topics: exploring options, leasing land, purchasing land, finding farmland, evaluating farmland, policies and programs, and accessing capital. Here, accessing land involves making decisions about renting or purchasing farmland, finding programs that connect farmers with landowners, assessing conditions of your land access situation (e.g., lease terms, zoning requirements, land preservation options, etc.), and working with public agencies and private conservation organizations to protect farmland. The resources provide technical information about specific actions and elements of accessing land (American Farmland Trust, 2018d, 2018a).

Most recently, they developed Farmland for the Next Generation to collaborate with Extension educators and service providers that address access issues with beginning farmers and to build a national network of land access trainers that can provide direct and ongoing support. AFT trains trainers on how they can guide beginning farmers through processes of securing land from senior farmers and from institutional or non-operating landowners. The curriculum uses inquiry-based learning to cultivate student agency on what they can do as a result of their experiences and to reinforce technical information within the lesson plans. That is, the lessons present scenarios and students use their observations to ask critical questions, investigate relevant conditions, and generate practical conclusions about their prospects for accessing land. The course content discusses three paths to land access: renting, purchasing, and inheriting/gifting and financial skills necessary to make informed land access decisions (American Farmland Trust, 2018c).

In contrast, LFG expressly adopts a systems approach by recognizing the multiple actions and elements associated with accessing land, and it is evident in how they construct and deliver their educational resources. More specifically, they provide technical information and services through three program areas: farm seekers, farm legacy, and working lands. LFG distinguishes among these programs by naming three target audiences: farm seekers, farm families, and communities and by organizing their resources into six toolboxes: leasing farmland, farm seekers, farm transfer planning, landowners, educators and advisors, and communities. On the website, each program area, target audience, and toolbox is a distinct webpage with standalone fact sheets, informational reports, and model templates. This construction demonstrates a detailed understanding of the structural elements that affect how farmers rent, purchase, and transfer land and offers resources for examining the issue more completely, but it does not explain how the actions and elements

interact in time and over time or how people actually use the online content to understand and address their particular situation.

Land Access is a top priority for NYFC so it is a fundamental component of their educational services. They offer full-day, in-person workshops to farmers and land trusts. The farmer trainings deliver technical information about the processes for accessing land through a land trust, which includes descriptive information about land trusts, lease agreements, financing operation expenses, and building assets. The land trust trainings explain the mutual benefits of conserving land through sustainable farm production and identify innovative strategies and tools for working with farmers. Topics include funding strategies, legal considerations, and model templates for securing conservation easements and executing farmland leases.

Other well-known professional organizations include California FarmLink, Farm Beginnings Collaborative, Farm Commons, Farm Service Agency, Land Stewardship Project, Renewing the Countryside, and Practical Farmers of Iowa. These organizations expressly address one or more aspects of land access but similar to UW-Extension, they do not frame the resources into a cohesive discussion. For example, Farm Service Agency helps farmers achieve economic stability within their businesses by providing direct and guaranteed loan programs for purchasing a farm, making a down payment, securing a land contract, and financing operating expenses and by offering various support programs for stabilizing commodity crop prices, managing risk (crops and natural disasters), sharing organic certification costs, and conserving sensitive land (Farm Service Agency, 2012; United States Department of Agriculture Farm Service Agency, 2014). Farm Commons develops educational resources that empower farmers to take action over the legal situations that affect their farm operations and they indirectly address land access issues through their

trainings on zoning, sales and contracts, estate taxes, and health insurance (Farm Commons, 2017). The Farm Beginnings Collaborative is a network of 13 organizations throughout the US that provide training and mentor services to help new farmers start their business, which includes information on renting, purchasing, and transferring land (Farm Beginnings, 2018; Land Stewardship Project, 2018).

To summarize, practitioners have an important role in how we understand land access because they generate applied knowledge and publish it as a research report or educational resources on their websites, but, pursuant to this analysis, their contribution has two limitations: First, even though the national and regional organizations recognize that accessing land involves multiple, interconnected elements and actions, they do not advance a systematic conceptualization within their research reports or educational resources. With the exception of Southwest Badger, practitioners provide detailed information about distinct actions and elements but the content does not discuss how the they interact within a land access arrangement. However, it is reasonable to believe that they deliver a systematic and interactive conceptualization through their direct assistance work so further research should investigate these services to understand how national and regional organizations help farmers access land.

Second, the practitioners have years of working experience but they do not explain the methods that substantiate their understanding of the issue. That is, they do not explain how their work experiences translate into objective, valid, and reliable conceptualizations, how their conceptualizations influence the content within their research reports and educational resources, and how farmers and service providers actually use their educational resources to rent, purchase, or transfer land. Again, greater insight into their

direct assistance work will provide a more thorough and comprehensive understanding of their role within the land access issue.

Literature Review Conclusion

The literature review describes the current state of land access research and practice. It demonstrates that existing land access scholarship and practice starts from the premise that accessing farmland is the primary barrier to farm viability. On one hand, scholars evaluate specific actions and elements of the land access framework and they rarely addresses how the elements interact. On the other, professional organizations are more likely to take a systems approach by recognizing the various actions and elements in their websites and educational resources, but similar to existing research, their research and education work is isolated to specific actions and elements. Furthermore, with the exception of Southwest Badger, scholars and practitioners do not addresses how beginning, mid, and senior career farmers interact within land access arrangements, how individual arrangements change over time, and what those interactions and changes mean for the social, political, and economic institutions that they engage to rent, purchase, and transfer land.

However, despite this limitation, the analysis contributes to a pragmatic understanding of land access by providing a basis for comparing how scholars, practitioners, and farmers conceptualize the issue. Academic and professional perspectives can differ from everyday experiences. When we combine this literature review with the empirical research, we can develop programs and policies that integrate larger scholar frames, distinct practitioner resources, and detailed farmer realities and that provide actionable resources for people experiencing the issue.

Results

When I asked farmers and service providers to explain what "land access" means to them or what comes to their mind when they hear the term, everyone started with comments about the unique challenges for young, first generation, beginning farmers and their responses evolved into discussions about the ability to find and afford land amid changing conditions of farmland real estate markets. From their perspective, the changes are occurring because the trend towards fewer and larger farms and the increase in non-farming landowners are inflating farmland values and are re-writing informal social rules that have guided rural, farming communities for decades. The inflated cost of farmland creates a conundrum where small- or mid-sized farmers, including beginning and established operations and first- and multi-generation, can go broke purchasing farmland from their relatives and neighbors and where landowners can become overnight millionaires selling their farm to the highest bidder. Informal social rules have guided who is next in line to rent or purchase a piece of property, how farmers communicate their plans to rent, sell, or transfer their property among neighbors, and how someone becomes a 'neighbor,' but large farms and non-farming landowners do not feel beholden to these community expectations and see farmland in strictly financial terms. Together, these characteristics mean that the relationships and capital necessary to start and maintain a viable farming operation defines how farmers access land.

The following analysis presents how farmers conceptualize land access in two ways: first, the initial response about starting an operation as a beginning farmer and second, the experiential knowledge about changing agriculture and community conditions. The data associated with these responses comes from interviews where farmers described their experiences renting, purchasing, or transferring land and service providers explained their

interactions with various farmers, and the analysis portrays the meanings that they have towards the actions and elements. Every farming situation is unique so it is impossible to organize land access situations into exhaustive and mutually exclusive categories, but farming has sufficient norms, traditions, and interests to develop a conceptual model where each situation characterizes processes about how farmers structure their operation and how they access land. Existing literature identifies the various aspects of land access and the technical details of the actions and elements, but the deductive approach means that our understanding is limited to distinct and stagnant explanations. Thus, the findings provide a systematic understanding because the conceptual model and the corresponding cases explain the interactive nature associated with the various experiences and processes for renting, purchasing, and transferring land.

Respondents defined land access as the ability for a beginning farmer to start a farm by renting, purchasing, or transferring land. It can be 2, 20, or 200 acres, just something that satisfies the type and size of operation they desire. The term conjured a negative feeling because it is seemingly impossible for many farmers and particularly when they do not have a connection to farming. It can take many different forms but when accessing land, it consistently involves their ties to people that own and operate farmland and their exposure to farming, and the presence or absence of a farmland connection and farming background implies four trajectories for accessing land (table five). Here, 'connection' refers to the interpersonal relationships and community networks that a farmer can utilize to access farmland and 'background' refers to the life experiences that are associated with farming lifestyles. Relatives can mean parents, grandparents, and aunts or uncles so the beginning farmer can be a child, grandchild, or nice or nephew.

Table Five. Land Access Trajectories

	Farmland Connection	**No Farmland Connection**
Farming Background	high economic and high social embeddedness	low economic and high social embeddedness
No Farming Background	high economic and low social embeddedness	low economic and low social embeddedness

Connection to farming is significant because, since the 1950s, it has functioned as a legacy industry, which means the operating experience and knowledge (i.e., managing the land and business) and the physical assets (i.e., animals, equipment, infrastructure, and land) are passed from generation to generation. However, since the late 1990s and early 2000s, there has been a renascent interest in farming among people that grew up with little to no interest or awareness in the profession and they follow different trajectories for starting an operation and accessing land. Table five presents an analytic scheme where 'farmland connection + farming background' and 'no farmland connection + farming background' describe the experiences and opportunities that are common among legacy farmers, and 'farmland connection + no farming background' and 'no farmland connection + no farming background' represent farmers that are detached from farming by varying degrees. The conceptual model summarizes the issue according to the underlying norms, traditions, and interests that structure meanings and frame behaviors within family farms. The four trajectories identify characteristics of the explanatory variables that are more or less present depending on one's tie to farmland and exposure to farming.

Consequently, each cell is a proxy for the fundamental behaviors, elements, and institutions that farmers engage to rent, purchase, or transfer land and the following examples describe these details as well as the variation within a cell. A trajectory is not a homogenous set of examples. Consequently, it is possible to think of 'farmland connection' and 'farming background' as axis and to locate the examples at different places along the

axis within a cell, but, since I followed Grounded Theory methods, it is not appropriate to assign each example with a specific degree of 'farmland connection' and 'farming background' and plot them in the contingency table. Thus, we can use the trajectories and examples to interpret how farmers access land.

'Farmland Connection + Farming Background'

'Farmland connection + farming background' involves trajectories where the beginning farmer grew up on a family farm and access family land – they are legacy farmers. In these cases, they consistently help their parents with farm chores throughout their childhood and generally understand the realities of farming livelihoods and lifestyles. The beginning farmer takes over the family farmland by either continuing the existing operation or changing it to fulfill their farming dreams, and their parents actively build their ownership in the operation and land by renting, selling, or transferring farm assets to them. Consequently, farmers with 'farmland connection + farming background' have a secure land access arrangement because they can leverage the personal relationships, social networks, and farm finances associated with the legacy operation.

John[10] is a third-generation dairy farmer and has wanted to milk cows since the day he was born. His father is the primary operator, his mother works off the farm and manages the books, and his two sisters do not want anything to do with farming and moved away for college. However, John never really left the farm – people in his situation either transition from full-time high school to full-time farming or attend a 2-year agricultural science,

[10] John is a composite of the following interviews:(CC, 2017; H, 2017; I, 2017; T, 2017). The data from each of these interviews is consistent with the conditions and characteristics of having a 'farmland connection + farming background.'

business, or equipment program before formally joining the family operation. His parents have been planning for this moment since he was in junior high.

Most of the time, adding the next generation is a four- to five-year process that involves building the herd, acquiring equipment, finding parcels to rent or purchase, and evaluating the business finances. The farm needs to expand at a rate that can feasibly accommodate another full-time manager, support multiple families, and minimize risks. Farmers view everything as a risk but price volatility is particularly important because agricultural prices are cyclical and many farmers get out because of the instability. One out of every five or six years is a good year and the other years are a struggle, so the question is how you make it through the bad years to get to the good one.

> *If prices had been more stable over the last 25 to 30 years, we would probably still be in the 30,000 to 35,000 dairy farms in the State of Wisconsin versus the 8,500 that we have today. Simply because stability in prices would have meant that more kids would have been allowed to stay on the farm and more kids would have wanted to farm too. Versus the negativity of 'go to town and get a job – even if it is at WalMart or McDonalds, you are going to be better off at the end of the week than you are on the farm.*
>
> (T, 2017)

Similar to many family farms, his parents incorporated the farm operation as a limited liability company and own the farmland under their personal names. When John started farming full-time, his parents added him as a partner to the LLC and set up a salary where he primarily worked for shares of the business and earned a modest monthly income. The business shares provide capital that he can leverage to purchase his own

equipment or start a side enterprise and the monthly income is just enough to afford everyday living expenses like food, clothes, and bills. His parents will formally retire when he owns 100 percent of the LLC but they will own the farmland until the day they die. Between retirement and death, he will rent the land from his parents for a 'fair value' – he does not get a deal just because he is family.

Farm land is expensive and it will always be expensive, and farmers define 'fair value' as the amount of money that an average family farm could make from working the land. A fair rental rate pays the taxes and basic living expenses and, depending on the farm operation and lease relationship, a portion of the utility bills and maintenance fees. Landowners determine fair rental rates by asking: (1) how the tenant will use the land and who is responsible for costs associated with the type of farming and (2) what the landowner would make farming the land and what they would passthrough for family living expenses. A fair sale price includes the gross income necessary to cash flow the operation, pay debt obligations, provide regular maintenance, replace capital assets, and afford family living expenses. In other words, production costs and product values are rolled into farmland values. Farmers get information about average rental rates and sale prices per county from their local Extension office and from appraisers and lenders that track comparable sales.

There are a million different ways to structure an estate plan and transfer land ownership, and the particular details depend on variables like the family size, number of on-farm and off-farm children, acres owned, land values, liquid assets (e.g., cash, stocks, bonds, etc.), debt payments, and life insurance balances. Today, when farmers take the time to set up an estate plan, their attorney, accountant, and financial planner help determine an appropriate way to address key issues (e.g., how to value the land, how to divide fixed and liquid assets, etc.) and arrange the legal documents according to their wishes. Thus, the

four trajectories and the corresponding cases do not comprehend every possible land transfer arrangement because the particular nuances are unique to each family farm and the potential options vary by the farm operation, rural community, real estate market, and agricultural industry contexts and by the personal relationships, social networks, and farm finances variables. That is, the characteristics of a family and their operation determine and limit how farmers actually transfer land. The cases do illustrate the complexity of transferring land under different social and economic conditions and they describe how the conditions are embedded within the family farm.

John's parents do not share many details about their estate plan with him or his sisters but they are adamant about two things: First, they do not need to worry about probate because the will transfers the land ownership from the last surviving spouse to a revocable trust. Second, everyone inherits an equal share of the land. The farm's success and John's livelihood relies upon the ability to farm all of the ground that they own so he feels entitled to receiving all of the land or, at a minimum, a larger allotment, but, as family members, his sisters also believe that they are entitled to an equal share – traditionally, past farming generations gave the child that took over the family farm a larger share of the land. This entitlement dialogue causes many difficult conversations between John and his sisters and it puts a burden on transferring farmland ownership.

Even though taking over a legacy farm provides a secure, long-term land access arrangement, the arrangement changes over time and maintaining stable access requires navigating personal relationships with family members. The specific characteristics of family relationships will vary, but John's situation demonstrates that everyone within a legacy farm has an emotional connection to the family land and that those emotions play out during farm transfers. Owning land is psychologically important for both farming and non-

farming family members because it signifies their experiences on the farm and it associates them with their family's farming legacy. Consequently, everyone feels like they have a right to inherit farmland, but farmers in John's situation will differentiate their inheritance by the fact that they work the land day in, day out and that it is an intrinsic component of the operation and their livelihood. In addition to the emotional connection, they recognize the economic value of the land and its role in their financial wellbeing.

As a farmer, John understands the inconsistency between the current market values and farming incomes so he is primarily concerned about whether his sisters will let him rent or purchase the ground from them for a fair value. He would like the estate plan to include terms that give him first right of refusal to rent or purchase the land from his sisters and establish guidelines for determining a rental rate or sale price. However, his sisters believe that the market values the land appropriately and they view his terms as a ploy to use his role in the family farming operation to get a larger share of the family inheritance. His parents are sympathetic to John's situation, but they are not willing to change their estate plan because they are afraid that his sisters will contest it. When it comes to family interactions, they take a passive approach to the disputes among their children by avoiding conversations about inheritance and entitlement, which creates an underlying tension between John and his sisters. These tensions are a manifestation of the economic value of farmland.

> *Conversations with my sisters are not open and honest, not forthright. It is hard to believe there is something we don't talk about. It is hard to believe we are not supposed to air our dirty linens in public and we are not supposed to say things bad about each other, so we do not talk about those things. We just sort of suck it up and*

put up with it. It is difficult, we all have dysfunctional dynamics in all of our communication, in all of our family relationships.

(CC, 2017)

Given these circumstances, John is planning to purchase the land from his sisters because he would rather pay for a piece of land over time and own it after 20, 30 years versus paying annual rent and never having anything to show for it (i.e., owning the property and transferring the asset to his children). Most farmers in John's situation feel the same way towards owning land so they would do the exact same thing. But, this situation is problematic for two reasons: first, it means that he will take on a significant amount of debt in his 60s or 70s and pay for it until his 80s or 90s, and second, it affects how and when he can feasibly transfer his ownership in the farm operation and farmland to his children. Two of his children love helping out on the farm and he wants to make it conceivable for both of them to pursue their farming dreams on the family land and to own part or all of it at an earlier age. In other words, he does not want his timeline for inheriting land and his debt from purchasing it to dictate their experiences and limit their opportunities.

If John owns the family farmland, it creates more options for his children to start their own enterprises, use the land in new creative ways, and invest in their future. Many legacy farmers hoard the responsibilities and assets associated with managing the business until they retire, which means the next generation is 50 or 60 years old before they make any decisions about the budget, cash flow, employees, etc. and before they accumulate any equity in the animals, equipment, and land. As beginning farmers age into the senior generation, they mimic this timeline with their own children because it is familiar, and, over time, the process has become an unspoken norm within legacy farms and in farming

communities. Owning land is culturally important within rural, farming communities because it implicates behaviors for transferring land, and, regarding land access, existing customs prompt questions about how to involve beginning farmers in financial aspects earlier in their career and how to build their equity throughout their career.

> *We don't look at handing the farm down soon enough in the generation thing and I am trying to buck that tradition. I want [my son] to take ownership earlier in life. We have had different guys that know [my son] is buying the cattle and machinery say "well you better keep ahold the checkbook," and I am like "no, he's got to have his own experiences, he has got to be able to make his own mistakes." They say I am crazy for doing it but how else do you learn. They say it because they were not allowed to take over the farm until they were middle aged or getting close to retirement age.*
>
> (T, 2017)

Farmers dedicate a lot of energy and attention into starting, expanding, and maintaining a viable operation, but many do not think about how they will exit until they are ready or forced to stop farming. Financial planning service providers encourage farmers to develop their business and exit plans simultaneously and to revisit the plans regularly because many circumstances can bring both plans to the forefront quickly and unexpectedly. For example, death, divorce, and disability can require re-working the daily operations and re-allocating inheritance, or too much debt and a downturn in agricultural markets can compel a full-time farmer to get an off-farm job or can force a property sale. Few farmers actually engage in the legal work and family discussions that are necessary for transferring assets and liabilities from one generation to another according to their wishes, and the longer they avoid the work and discussions, the more they limit their options. Going through the steps can help avoid uncomfortable interpersonal and economic

situations like probate court, capital gains tax, nursing home liens, etc. (G, 2017a, 2017b; U, 2017).

John's situation demonstrates how beginning legacy farmers access land by becoming part of and taking over the family operation and how they create a secure, long-term arrangement by navigating personal relationships with their parents and siblings, by building equity in the operation before renting, purchasing, and/or inheriting land, and by acquiescing to rural, farming community norms. Here, everyone has a psychological, economic, and cultural interest in owning the family land because ownership is a fundamental part of farming legacies. Again, the particular characteristics vary for each family farm but the desire to own land is consistent.

Another legacy farm permutation includes situations where beginning farmers take over the operations and acquire ownership shortly after they start farming with their parents. Pete[11] started farming with his parents full-time after he graduated from high school, and, within four years, milk prices dropped to a value where the existing farm could not support two families. His parents did not have any working capital to expand so someone needed to get an off-farm job, and, since Pete has always preferred running through pastures with the cows over attending school, his parents decided it was better for them to change careers and move into town. They sold everything to Pete through two phases: first, he bought the cattle and equipment through an operating loan and rented the land from his parents, and, second, once he completed the operating loan, he purchased the land through a land contract. Given the bad farm economy, his parents financed both loans, which helped Pete avoid hurdles associated with formal financing institutions (i.e., a down

[11] Pete is from the interview: (U, 2017). The data from each of these interviews is consistent with the conditions and characteristics of having a 'farmland connection + farming background.'

payment to reduce the total loan amount, the capital to secure the loan, and the experience to demonstrate ability to pay-off debt) and it gave them a steady stream of income for 28 years (i.e., an eight-year operating loan and a 20-year land contract).

Overall, it was process where he paid for one thing before he bought anything else. The goal was to make sure that both parties were treating each other fairly on prices and that Pete did not fall flat on his face during his first year in business. His parents really wanted the farm operation and land to stay in the family so they worked with him to make the payments affordable. He struggled to keep up with the farm work and to learn the budget and cash flow spreadsheets during the first two years, but his in-laws helped out on the farm until he was more self-sufficient and his banker made sure his finances were in a row. In any farming situation, farmers must manage their finances to make sure they have adequate cash flow and working capital because they indicate the stability of the whole farm – the operation and the family. Cash flow means generating a gross income that covers all of the operating expenses, debt payments, and family living costs, and working capital measures the current assets minus current liabilities and a minimum amount is 15 percent of the gross farm income (i.e., current assets minus current liabilities yields a minimum of 15 percent free working capital).

Here, land access means managing the farm finances to maintain a secure arrangement. Beginning legacy farmers start by purchasing operating assets and renting land and, once they have built equity within their crops, livestock, and equipment, they use it as collateral to purchase land. Pete had a land contract but other legacy farmers in this situation purchased farmland through private bank, farm credit association, or Farm Service Agency financing. This process describes how farm finances and land access

arrangements interact and evolve over time and the case indicates that finances measure the viability of farm operations and land access arrangements.

'Farmland connection + farming background' also includes situations where a child grows up on a farm, leaves the rural community for a non-farming career, and returns to do things differently. They use their parent's experience, equipment, infrastructure, and land to transform their farming ideals into a reality, which involves either starting an independent operation on the family land or transitioning an existing operation. Thus, compared to John and Pete, the beginning farmer leverages their farmland connection and farming background to change the legacy operation, and the process of change affects the personal relationships and social networks that characterize their land access arrangement. Throughout his childhood, Nate watched his parents work tireless hours growing commodity crops and raising grain-fed livestock and struggle selling into co-op and auction markets and negotiating cash contracts. Their experiences eroded any interest he had in farming so he moved away for college, earned a counseling degree, married a city girl, and started a family in the suburbs.

Once a year, Nate and Molly[12] bought a butchered cow from his parent's and sold portions of it to friends. Friends raved about the quality of the meat and begged for more, so they started buying multiple cows from their parents every year to keep up with demand and visiting on the weekends to help around the farm and facilitate their direct sales enterprise. At the same time, they were looking into health food and local food movements and it spurred their dream of raising grass-fed livestock on Nate's family farm. Before they

[12] Nate and Molly are a composite of the following interviews: (AA, 2017; T, 2017; Z, 2017). The data from each of these interviews is consistent with the conditions and characteristics of having a 'farmland connection + farming background.'

expressed this dream to Nate's parents, they attended the annual Midwest Sustainable Education Service (MOSES) conference to learn about grazing animals and organic certifications. The experience emblazoned their goal of producing food that is healthy for people and the environment and affirmed their decision to change careers.

> *It was like the big excitement that "wow we can do this, here is a way to do this, the dream can come alive." We were all way up high going to conferences, doing research, and making these plans and we still didn't even move to the farm for another six years. So, we had a phase of selling our meat to friends and neighbors and getting more involved with the farm on weekends. … So, seven years of that phase – farming on weekends and learning to farm – and now, it has been another seven years since we moved to the farm.*
>
> *We have learned a lot of lessons in that waiting. It has been 14 years to get to the point where we are realizing/accomplishing our initial dreams/goals.*
>
> (AA, 2017)

When they moved to the farm, Nate had a full-time, off-farm job to ensure their family had a stable minimum income and Molly managed the daily operations and taught a class at the local community college. They invested their own money to buy the input costs associated with their operation (e.g., seed, chickens, cattle, etc.) and rented one third of their parent's land. Initially, they envisioned transitioning 100 percent of the cropland to organic pastures and doing grass-fed beef and pastured poultry, but was a slow, shaky process because "it is hard to just jump on to the acreage and just suddenly plant it all, change it all, do it all in a different way … it has been met with more resistance because it is an unknown to his dad and he owns the land" (Z, 2017). His farming generation views

pasture as the leftover scrubby land so it makes him nervous to take 200-bushel corn acres out of production. They were not always patient when Nate's dad rejected their ideas, but they quickly learned that, if they demonstrated the practical benefits of their approach, it helped his dad understand their perspective and, eventually, it became normal and no one cared.

> *His dad probably held on to some things a little longer than he needed to. We were excited to get going so maybe we needed to be more patient. He tempers my excitement of 'let's do it yesterday' in a good way. We balance each other out well in that if I were in charge, we would be bankrupt and I kick him so we can do some things.*
>
> (Z, 2017)

Regardless of his personal opinion, he supported them by teaching them how to manage a farm, sharing his equipment and barns, and giving them a fair rental rate. For example, if they planted all of the land in pasture, transitioned it to organic, and raised 40 grass-fed cattle without a market for their product, they could go bankrupt within two or three years, but, if they planted a portion of their land in pasture, raised 40 grass-fed chickens on it, and raised 40 grain-fed cattle with his dad, they would spread out their investments and risks and have a higher probability of generating money that they could reinvest into the animals and land. Meanwhile, if they dedicated energy into building their markets and reputations, they were more likely to realize the returns on their investments. It was a long process but they avoided a lot of mistakes and learned a lot of lessons by building their operation incrementally and developing markets simultaneously.

Molly: It has been 14 years to get to where we are. We are finally feeling like we are reaching those big goals we set when we first started. We would have gone faster sometimes if it was just us or if the other players weren't involved. But, his dad gives us a much better rate on rent than some other random landowner so without his dad, we probably wouldn't be where we are.

Nate: We use a lot of his equipment and his barns so he is definitely supporting us through those actions even if it is not how he treats me face to face. He always gives even though sometimes it seems like he is reluctant.

(AA, 2017; Z, 2017)

They pay 160 dollars per acre, which is about 100 dollars less than the market rate in their area. From their perspective, farmland values are skewed because the trend towards fewer and larger farms is raising prices above what small- or medium-sized family farms could actually afford to pay from their farm income. As large farmers rent or buy the smaller farms in a neighborhood, they reduce competition for accessing farmland, they develop a reputation for paying above fair value, and they create an expectation among landowners that their land is worth the inflated amount. Historically, when farmers were ready to retire and they did not have an heir to take over the operation, they would let their friends know that they were looking to rent or sell their land and the opportunity would spread by word of mouth – general conversations in town; church talk or bar talk.

Hey, I hear what's his name is retiring this year so he is looking for somebody to rent. I know you are looking for some extra land so maybe you want to give him a chat tomorrow or something.

(T, 2017)

Two or three farmers would submit a closed bid and the land owner would select the highest offer.

However, today, rural, farming communities have situations where there are only a handful of farmers in the whole neighborhood and everyone knows that the large farmers will pay outrageous amounts of money for accessing land. This creates two types of situations: Either, a retiring farmer will offer their land to the largest farmer in their neighborhood before telling anyone else and people learn about the transaction after it occurred. Or, a retiring farmer shares their land access opportunity by word of mouth, a small or medium farmer submits a bid, but the large farmer doubles their offer and, in rental situations, pays the annual fee upfront. Next thing you know, the remaining landowners see their neighbors rent land for 300 dollars per acre or sell it for 10,000 per acre and think their land is worth the same amount or more. These conditions not only artificially increase land values but they also make it nearly impossible for a small or medium sized farmer to access land unless they have an existing relationship with the landowner and unless money is not their primary objective.

People are vultures because there will never be more land.

(DD, 2018)

Nate and Molly are not actively looking to rent or purchase more land, but they are nurturing relationships with landowners that will be potentially renting or selling their land. They develop farmland connections in many different ways but, fundamentally, the relationships evolve by participating in the community, being friendly and respectful, and demonstrating care for it. Participation includes things like serving on town committees, volunteering with local issue-oriented organizations, attending a community church, being

a patron at local stores and bars, etc. Family farmers are all very different from each other, but they bond over their common commitment to being honest, hard working people and to protecting their way of life. They recognize that fundamental characteristics of farm operations, rural communities, farmland real estate markets, and agricultural industries create similar circumstances and conditions across all family farms. However, in their experience, developing the bond requires time and patience because, even though Nate grew up in the neighborhood and his parents are established residents, some people view them as outsiders so they have to earn their own keep within the community.

In rural, farming communities, established residents know general happenings about people and families in the township and they talk to each other about what is going on in their neighborhoods. For example, who is expanding their operation and looking for land, who is getting ready to retire and looking for a renter or buyer, who is not happy with their current renter, etc. They are hesitant to share information with new residents because there is a common assumption that they do not and never will understand the community and, consequently, their ideas are bad. Traditionally, established residents only interact with the people that have been around for decades, so it can take six, eight, ten years before a new resident is embedded within the community. During that time period, if a parcel becomes available by word of mouth, they probably will not hear about the land access opportunity (T, 2017).

Land access also means fostering relationships with friends and acquaintances and participating in the community's social networks. Nate and Molly understand this aspect of accessing land so they both do their part in the community. Nate likes the 'neighbors helping neighbors' aspect of rural, farming communities or what he calls the old school way of developing relationships. For example, he has a triangle of friends that help each other

make hay, fix fence, or repair machinery and they share equipment, and he spends time with people that are curious to learn about their farming philosophy.

One of their customers owns 300 acres and rents it to a conventional crop farmer but would like to see it farmed organically. Nate bonds with the landowner by explaining how they approach farming, how they steward the land, and how the landowner could integrate those principles into his land. He creates a vision for a different way of farming and encourages him to pursue tenants that will honor his particular land management goals. Other times, he demonstrates the economic sense of grazing pasture by comparing the input and overhead expenses and average returns to conventional commodity crops – that is, how farmers can make more money grazing pasture than growing commodity crops. The ongoing conversations and relationships create a potential land access opportunities.

> *Land access is so tied up with the values of how we see land. Like, when people talk about regenerative farming principles or philosophies for how they see the world, they explain why do what they do – farming is an expression of their values. Owning land is an expression of value towards the place, community, or family. Value can mean soil, water, and woodland quality, personal memories, or cold hard cash.*
>
> (EE, 2017)

On the other hand, Molly is more of an advocate for protecting small- and medium-sized family farms and for conserving soil and water quality. She volunteers with a farmer-led, non-profit organization that promotes sustainable stewardship of natural resources. The organization hosts field days to educate farmers about specific conservation practices and monitors water quality to preserve their quality of life, and Molly helps the organization collect water samples from private land owners in her neighborhood. By going door to

door, "[she] [has] met more neighbors than ever – [she] didn't even know any of those neighbors before [they] had some sort of common cause" (Z, 2017).

Given the relatively early stage of their business and the current land values, it would be difficult for them to afford a monthly mortgage payment and earn an income so they prefer renting land. But, if they keep increasing the returns from their existing land base, they anticipate that they will reach a point where they can afford to buy some land, which emphasizes the fundamental relationship between farm finances and land access arrangements.

Farmers need a certain amount of land to maintain a viable farming operation, and, once they have their minimum basis, it becomes easier to exceed it. From a financial perspective, before farmers expand their land base, they should (1) own equipment and infrastructure and have personnel that can manage additional land and (2) earn consistent, positive returns that can cash flow an additional fixed asset. The objective is it to cash flow additional rent or purchase payments from existing operating assets and returns. That is, they do not need to invest in equipment, infrastructure, and personnel to work the additional land and they do not need to rely upon the additional acres to afford the land payments. Their annual input costs will increase but they can spread out their existing investments and new expenses over more land, which decreases the amount of money that they make per acre of land yet increases their total returns.

Since the 1950s, two conditions made it feasible for farmers to expand by maximizing their economies of scale: First, technology improvements made it physically possible for a family farm to increase the size of their operation with the same number of people, so, once a farm invested in new equipment and infrastructure, they could easily work more cropland or milk more cows. Second, federal policies incentivized production

increases by providing crop insurance subsidies that covered losses from over production. Here, legacy farmers have an inherent advantage because every generation starts with a preexisting basis that they can leverage it to rent or purchase additional land throughout their career. Within the agricultural industry as a whole, this expansion process grew the basis of the average family farm and perpetuated the trend towards fewer and larger farms. In Wisconsin, the number of farms has decreased from 47,000 in 1978 to 9,000 in 2018 and families own 97 percent of those 9,000 farms (G, 2017b).

> *"Farmers with a legacy foothold in agriculture by owning a farm or growing up on a farm had the production expertise, the machinery, the livestock, and the equity to borrow against what they already own to expand their farms. That is why our farm numbers have gone down but our production goes up, and when that happens those who are outside of agriculture and want to get in, become more marginalized. This is not to blame anybody, it is simply the socio-economic and cultural changes over time that have allowed this to occur."*
>
> (G, 2017b)

Nate and Molly's case demonstrate how farmers that change the legacy farming operation navigate personal relationships and build social networks to not only maintain their land access arrangement but also expand it. Similar to John and Pete, farmers in this situation start their operation on family farmland, but, compared to them, they secure rent and purchase arrangements by explaining the environmental and economic benefits of particular farming practices and product types to their family members as well as friends and acquaintances. These personal relationships become help them gain access to the rural, farming community's social networks.

Overall, 'farmland connection + farming background' trajectories describe the characteristics and conditions that affect how legacy farmers access land. This trajectory does not mean 'free' land access because: On one hand, if a beginning legacy farmer continues the family's existing operation, they operate the farm with their parents until they exit, they rent the land until their parents sell or transfer it to them, and, in some situations, they rent or purchase land from non-farming siblings who also inherited family land. On the other hand, if a beginning legacy farmer starts a new enterprise, they rent family land until their parents transfer it to them and some situations include other on- and off-farm siblings that have an interest in the family land and that complicate the transfer process (like John's land transfer experiences). Therefore, interpersonal family relationships are important characteristics of accessing legacy farmland because they determine and limit specific market and finance elements that one can use to rent, purchase, and transfer land.

In every case, beginning farmers may eventually rent or purchase additional land from a friend or acquaintance to expand their land base, which involves having the social networks to hear about available land and the farm finances to afford a land payment. From a financial perspective, affording a land payment involves the ability to cash flow an annual rental fee or a monthly principal and interest payment and to leverage operating equity for securing financing and managing additional land. The 'farmland connection + farming background' cases demonstrate this principle but it applies to every family farm.

'No Farmland Connection + Farming Background'

Sometimes growing up on a farm does not produce a farmland connection. 'No farmland connection + farming background' includes trajectories where the beginning farmer cannot access family land. In these cases, beginning farmers have a similar childhood as John and Pete but their experiences diverge when they start farming full-time

with their parents. They grew up on a family farm, they demonstrated an interest in farming at a young age, and they never really left the family farm to pursue an off-farm career, but compared to John and Pete, their parents circumvented conversations and decisions that would build their ownership in the operation and land or that would let them take over the farm. Consequently, their land access arrangements are more precarious than 'farmland connection + farming background' cases.

This trajectory describes how particular characteristics of legacy farms determine and limit the potential options for transferring family operations and land and for renting or purchasing land without intergenerational support. The cases emphasize the reciprocal relationship between farm operations and land access arrangements and identify the characteristics of personal relationships and farm finances that determine and limit farm transfers. This information reveals the social and economic conditions that occur when a family transfer does not work out and when a beginning legacy farmer attempts to rent or purchase land without the support of the family operation.

Joel[13] was born on a legacy farm in Iowa, but his dad, Matt, lost everything during the 1980s farm crisis. Matt moved the family to Wisconsin and got a job at the local farm co-op, and, after ten years of working in town, he started farming again. He rented land for about five years before he could afford to purchase it – affording farmland requires equity in operating assets, experience in managing farms, and markets for selling products. Joel has two siblings: one older brother, Frank, who lives and works on the family farm and one younger brother who lives in Chicago and wants nothing to do with farming. As the older

[13] Joel is a composite of the following interviews: (BB, 2017; DD, 2018). The data from each of these interviews is consistent with the conditions and characteristics of having 'no farmland connection + farming background.'

brother, Frank graduated college and returned to the family farm first, and, when Joel returned, the farm did not need another full-time operator so he got a job in town and helped farm on nights and weekends.

After three years of working off and on the farm, Matt asked Joel to come back and buy the farm operation and land because he wanted to retire in five years. The offer was a gentleman's father-son agreement with vague details about the process for transferring ownership and management from Matt to Joel and Frank. Joel and Frank have always gotten along because one likes to tinker with equipment and cropland and the other prefers milking cows, and Joel describes it as the perfect farming marriage. At this point, Frank has been farming for five years and has acquired some ownership in the operation by investing his farm income into expanding the dairy herd and milking infrastructure, but Joel had no investment so he needed to buy-in. The initial conversation had three aspects: (1) Joel would by buy crop equipment and rent it to the farm whenever they used it, (2) Joel and Frank would get part of the milk check – a symbol of their owner-manager roles and partnerships in the business, and (3) if other things came up, they would simply discuss them at that time. There was never an option where Joel would invest by paying his dad X amount of dollars for X number of shares.

Throughout the next few years, Joel took out a couple of loans to buy used equipment (i.e., a tractor, combine, chisel plow, and round baler). At the same time, milk prices improved and his dad bought new equipment that duplicated several of Joel's investments. They relied on Joel's equipment at first but Matt started pushing Joel to use his equipment because it was nicer. Meanwhile, Matt never paid Joel rent money for using his equipment so Joel never earned income that he needed to pay the operating loans and the investments never built his ownership in the operation.

> *He says well what I will do is you can use my tractor, my planter, all of that stuff plus use your combine and round baler to do the crops and you won't have to pay me nothing for it. Instead of him paying me for my tractor and my chisel plow, and stuff he wanted to trade on equipment. Well that would be fine, but he has built up ten to 20 thousand dollars' worth of debt on my equipment that he has never paid me for. How do I go about charging him for the last eight years of using my equipment? I will never get it.*
>
> *I have a few things that are on a balloon payment at the end of the year – stuff that we have been using but he hasn't paid me anything for. I started doing custom farm work on the side to make up for the money that my dad isn't paying me and I got enough business to make the loan payments the last few years, but this was a tough year.*
>
> (BB, 2017)

Furthermore, Matt slowly removed Joel and Frank from ownership and management responsibilities. In particular, his dad stopped sharing the milk check and started paying them as hourly employees and even though Matt explained it was for liability insurance purposes, Joel viewed the decision as being demoted from an owner-manager to a farmhand and as eliminating his ability to build sweat equity. Matt reinforced this perspective by ending their regular planning meetings and by making significant business and financial decisions without involving them.

When Joel returned, they had weekly meetings to discuss tasks, timelines, and goals associated with managing the farm. The conversations primarily focused on farming operations (e.g., when to cut hay, whether they should switch fertilizers, who would fix the fence or run an errand, etc.) and rarely addressed topics associated with transferring the

farm (e.g., how Joel was buying into the farm, when Matt was planning to retire, how their parents arranged their estate plan, etc.), but Joel was okay with it because he was part of decision-making processes. Now, the conversations only occur if they see each other in passing, and it frustrates Joel because he does not know anything about the business operations, financial situations, or ownership transfers. For example:

- With the business, he does not know what tasks are important for the day or week, what are the future goals for the operation, and whether anyone will be away from the farm;
- With the financials, he does not know what the budget, cash flow, balance, and income statements look like, how the businesses manages operating expenses, debt payments, and living costs, what is paid for versus what is borrowed against, and what is the working capital; and
- With the ownership, he does not know whether he actually owns a portion of the operation, whether his parents have a will, and if they have a will, what it says, what happens when one or both of his parents die, how it divides assets among the three children, and how it distinguishes farming and non-farming heirs.

Sometimes Joel becomes so fed-up with the communication and decision-making dynamics that he confronts his dad about specific issues, but it never accomplishes anything.

> *I'd just go into his office and jump about it and say 'hey, we need to figure this out' and he'd just push it away, 'we will talk about it later, talk about it later, talk about it later.' Well later has never come.*
>
> (BB, 2017)

These interpersonal characteristics create uncertainty about his ongoing land access arrangement and invoke existential questions like whether his parents trust him, how he will provide for his own family, and whether he needs to find a new job. If Joel has the opportunity to take over the farm operation and farmland, he would like to know when and how it is going to happen so everyone can plan their finances accordingly. In ideal world, he would write a plan that transfers ownership through two phases (i.e., farm operation and farmland) and that formalizes communication and decision-making processes. Compared to John and Pete, Joel would incorporate the operation and land as two separate LLCs and the companies would transfer ownership shares according to specific timelines and expectations. More specifically, on January 1st of the upcoming year, Joel and Frank would become business partners with Matt, they would earn a set number of shares every year as a payment for their work, and, on December 31st ten to 15 years later, they would own 100 percent of the operation and Matt would retire.

Then, starting January 1st of the following year, Joel and Frank would become partners in the land LLC, the operating LLC would pay rent the land LLC, and the land LLC would pass the payments to their parents. If his parents die before they finish paying for the land, he anticipates two estate planning scenarios: First, the remaining payments pass through to his off-farm brother and the will divides the other assets equally. Or, second, a decision-tree that (1) prioritizes allocating Matt's remaining LLC shares to Joel and Frank and his parents' other monies to his off-farm brother and (2) ensures each child receives an equal value of their total assets. Essentially, Joel understands that death does not forgive debt and that, if his parents die, his off-farm brother may inherit shares of the land LLC and, hence, receive the land payments. But, he also has a sense of entitlement to the farmland so he has a problem with an estate plan that gives his off-farm brother a portion of the farmland (i.e., his parents own 120 acres and every child gets 40 acres).

> *If I owed mom and dad 300,000 dollars and they both passed away, I would have no problem instead of paying mom and dad, paying each of my three sisters 100,000 dollars. I have heard too many stories about people that don't have enough in writing and then the sister from Chicago inherits a 40, comes back to tell everyone how to farm, the people that have been there for 30 years, and sells the land and the house. I never want to deal with that. … I hope my parents would have something in their will – I wouldn't want them to say "well, you get 100 [acres], you get 100, you get 100, you get 100," and my sisters demand half a million dollars for 100 acres and sell to someone else. I hope my parents would do their best to avoid that but I don't think they have done anything yet.*
>
> (DD, 2018)

Furthermore, if Joel was in charge, the owners-managers would communicate and make decisions through four types of meetings:

1. Every weekday they would meet in the garage for 10 minutes to discuss what they need to accomplish in the next 24 hours and to write who is responsible for each task on a board that everyone can see.
2. Once a week they would sit down at the kitchen table to outline the major tasks for the coming month and to develop plans for managing them on a daily and weekly basis.
3. Four times throughout the year they would sit down to comb through their cash-flow and budget spreadsheets, to review the ownership transfers, and to discuss how short-term operations coordinate with their medium- and long-term goals and timelines.

4. Once a year they would invite their service providers (e.g., the banker, accountant, lawyer, veterinarian, nutritionist, etc.) to evaluate their current productivity and efficiency levels and future expansion/growth opportunities and they would update their business, finance, and transfer plans accordingly.

The meetings not only provide regular opportunities to offer ideas, ask questions, and brainstorm solutions but they also facilitate conversations that build trust among each other. From Joel's perspective, this process for transferring ownership is financially sound and economically fair because it builds equity over time, provides a retirement plan for his parents, separates the farm's assets from his parents' personal assets, and establishes standard operating procedures for managing the operation. Unfortunately, this plan is a dream and not a reality, but it does identify the characteristics of personal relationships that are fundamental to managing a viable farm business and to accessing family land.

Joel's family situation demonstrates the reciprocal relationship between farm operations and land access. It shows how poor interpersonal communication about the farm operation and the family estate create social conditions that threaten the security of family land access arrangements. In particular, when Matt removes Joel and Frank from the everyday business decisions and delays retirement indefinitely, Joel loses confidence that he is a valuable part of the family farm. Similar to many legacy farmers, he measures value by the work he does for the family farm day in, day out and by the ownership he accumulates over time, and he gains confidence through open communication about short-, medium-, and long-term aspects of managing the operation and of his role in it.

After multiple confrontations with Matt about transferring ownership and management of the operation and land, Joel decided to leave the family farm and become an hourly employee for a large dairy farm in the area. He negotiated an arrangement where he

manages the cropland with his equipment and the farmer pays him according to the state custom farming rates. State Extension programs calculate the average rates for specific types of farm work (e.g., chisel plow, chopping, combining, planting, tilling, etc.) and farmers use the figures to determine how much they should charge for those services. They write the custom labor rates into their employment contracts.

> *The UW system or the Iowa college system have what they consider is their custom rates for the state average. He printed off that and says we will just go across the line on what it says for custom combine and that is what I will pay you. Just go off of that. IT is going to be better for me because I will be able to get a little more money – like the custom rate of combining is like 30 to 35 dollars an acre where I have been charging 25. So, for that aspect it is going to actually work out in my favor.*
>
> (BB, 2017)

So, the working arrangement is similar to the deal he had with his dad but instead of earning sweat equity he gets paid a flat rate for his labor.

Ultimately, Joel's goal is to farm a few thousand acres himself and to pass his operation onto his children, but he has to establish a farmland connection before he can plan their farming future. From his experience, accessing land is all about who you know and right now, you want to know the land managers that are proxies between investor landowners and farmer renters. Investment groups and wealthy individuals are buying a lot of farmland and they hire land managers to find farmers that will rent their land and to negotiate arrangements that give them a positive return on their investment. Joel calls it the inner circle because, if you are on good terms with land managers, they will tell you about land that is coming up for rent and give you the first right of refusal before anyone

else knows it is available. His new employer is part of this inner circle and he hopes that he can leverage their relationship to become part of it – "once you are in the inner circle, you know who is in the know, you have a step above everybody else just because you know somebody" (BB, 2017).

Similar to Nate and Molly, Joel doesn't necessarily like these conditions because they make it nearly impossible for farmers to own land, but compared to them, he will play their game if means accessing farmland. Consequently, these land managers have an increasingly important role in rural, farming communities and their social networks. Whoever owns the land controls the land, and as more large farms and financial investors own farmland, they are not only inflating farmland values but they are also changing how family farmers compete for and get access to it. The land managers leverage their financial means and community connections to purchase farmland and, by doing so, they are making it normal for landowners to sell to the highest bidder – opposed to their neighbor or a long-term renter. The traditional manners and tacit understandings about who has a right or expectation to rent, purchase, or inherit a parcel of land are diminishing, and it is problematic because less people view land as an embedded asset and more see it in strictly financial terms.

> *They already have a few thousand acres that they are living off of and they add more land as long as it is a positive return on investment. It doesn't have to be a margin that supports a family. They are expanding or investing so they can pay more for it because they don't have to make much money off of it. They don't need to make a living off of it. [Wife's name] and I need to make a lot more if we are going to live.*
>
> (AA, 2017)

In farming, land is capital that is tied to the social, environmental, cultural, and economic processes of the physical place, which means land access is a community development and an individual financial asset.

> *You cannot farm perennial agriculture with one hired man and a giant tractor and a thousand acres. It takes more people. You have to train more people to do it. You actually accumulate capital, which is, that is what is missing from the land – human capital. … More eyes looking at problems, more brains out there to figure out how to make this even better. Get people, bring the people back.*
>
> (AA, 2017)

Joel's case identifies the importance of personal relationships in transferring family farmland and, potentially, in preserving legacy farms. His process for finding and securing his own land access arrangement indicates changes within rural, farming communities that determine and limit how farmers access land and who owns and controls it.

Other cases that fit into the 'no farmland connection + farming background' cell generally involve one of three scenarios and they are ubiquitous within rural, farming communities.[14] First, parents push their children away from farming because they do not want them to experience the volatile agricultural economy. Parents tell their children "go to town and get a job, even if it is at a Wal-Mart or McDonalds, you are going to be better off at the end of the week than you are on the farm" (T, 2017). They reinforce this mentality by leaving farming and selling their operating assets before the children can start full-time farming. This was particularly common in the 1990s because the parents survived the

[14] The other cases are a composite of the following interviews: (G, 2017a, 2017b; O, 2017; P, 2017; Q, 2017). The data from each of these interviews is consistent with the conditions and characteristics of having 'no farmland connection + farming background.'

1980s farm crisis and they did not want to expose their children to the same financial struggles. Downturns in the agricultural economy can push whole generations of young people away from farming.

> *We had three of them in [county name] within four miles of each other. The kids graduated in the late 90s and they just sold lock, stock, and barrel. The barns, the structures shook for a couple of years and pretty soon those are down too because they just didn't want their kids coming home and milking cows. Financial struggles is what it is. I don't think any farmers are afraid of the work aspect of it – it is the financial part of it. Not knowing what is going to happen from day to day sometimes and whether you are going to be able to pay all of the bills at the end of the month.*
>
> (T, 2017)

Second, many experienced farmers have a lot of pride in their trade and they cannot bear seeing someone else manage their operation or work their land. They define themselves through their operation and they have a lot of expectations about maintaining it – even after they exit. From their perspective, the farm represents their knowledge, experience, and work ethic and consequently, its success or failure reflects who they are. Regardless of whether they are the primary operator. That is, if someone takes over their operation and makes a mistake, it reflects poorly upon them, so they would rather sell everything to a stranger than watch someone else manage their farm.

> *Passing something along to somebody else is difficult and some people are not willing to do it. They would rather just get rid of it all and be done or just fall over dead. They don't have to watch it and see what happens and be concerned with it all the time.*
>
> (Q, 2017)

Third, some farmers are greedy. Land is their largest, most valuable asset and they need or want to extract as much money as possible from it, so they will rent or sell to the highest bidder. Family connections do not mean anything to them. Historically, in rural, farming communities, the difference between the agricultural and market value of land was insignificant and the option of renting or selling to someone else for more money did not exist. That is, family members, neighbors, or acquaintances could offer roughly the same amount of money so there was no incentive to let the land leave the family. Now, the difference between agricultural and market values is huge and, if parents give their children a deal, it means giving up a significant amount of money and, potentially, diminishing their quality of life.

> *We want the farm to stay in the family but we can get 10,000 an acre for it if we sell it cash to someone else. Or, do we sell it to our children for 5,000 an acre or 3,000 an acre. Our entire retirement is tied up in the value of the farm and we need to get as much as we possibly can because we need to live on something in retirement.*
>
> (U, 2017)

Many farmers invested their money into land instead of social security so they cannot draw a lot of money from federal old-age programs. As a result, they must rely on their farm assets to generate cash flow in their retirement.

> *We dealt with it with my grandfather. My dad and I tried numerous times to rent the ground from him but he wanted more money for it. He wanted more rent and he got it, but he didn't get it from us. So, the family thing didn't really matter to him, it was who was going to pay more money. This is the kind of thing that you are dealing with and it is tough when you are blood and you have farmed the majority of this ground for the*

majority of your life and for a small section of time, somebody else comes in and does it.

(Q, 2017)

The 'no farmland connection + farming background' trajectory emphasizes the reciprocal relationship between farm operations and land access arrangements. That is, how farmers manage their operation determines and limits how they access land because the social and economic characteristics and conditions that are present in one are most likely present in the other. Furthermore, when we combine Joel's case with the findings from 'farmland connection + farming background,' we can extend this finding to both trajectories. In legacy farm situations, accessing land involves two separate yet interrelated processes: first, taking over the operation and, second, inheriting the farmland, and, in both processes, the characteristics of personal relationships and farm finances determine and limit the family's options for transferring the operation and land. Consequently, land access research and practice must evaluate interaction among business operations and estate planning.

'Farmland Connection + No Farming Background'

'Farmland connection + no farming background' includes trajectories where the beginning farmer is one or two generations removed from farming and they leverage their family's on- and off-farm experiences to access farmland. In general, their parents or grandparents grew up on a family farm, left after high school, and raised their children in a non-farming livelihood and lifestyle. Their grandparents or uncles and aunts actively owned and operated farmland and exposed them to farming throughout their childhood. So, even though farming was not part of the beginning farmer's everyday experiences, it has always been part of their life, and, in many cases, this type of farmland connection produced

a nostalgic perspective of farming that influences how they define land access. Beginning farmers with farmland connection and without a farming background rely upon pre-existing trust in their family relationships to establish their land access arrangement, so the characteristics of their interpersonal relationships determine their options for renting, purchasing, or transferring land.

Julie[15] grew up in a rural residential house about 45 minutes outside of a metropolitan area. Her dad left his family's centennial farm to work as a salesman for an agribusiness company, and her mom never set foot on a farm until she met her husband and she has no interest in farming. As a child, Julie participated in various sporting activities and took college prep classes so, even though she lived in an agricultural community, she did not participate in any youth farming programs like 4H or Future Farmers of America, but she always loved visiting her grandpa's farm. She played in the barns and hay mounds and he showed her how to raise livestock, and these experiences emblazoned her with a sense of pride and commitment to her family's farming legacy.

> *I am from this place and so I felt a commitment to the legacy of it. I buy into the narrative that it is part of the fabric of America. The romantic idea of family farming and the place, the specific geographic of it has a lot of nostalgia. Growing up here as a boy, I played basketball in the hay mound and I had a tree house on the edge of the field, and you know, these sort of personal spaces where they are romantic and nostalgic and I love them. I don't know exactly how much I love weeding a 400-foot bed of carrots but I do love the space of the farm and the geography and the history.*

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[15] Julie is a composite of the following interviews: (D, 2015; L, 2017; V, 2017). The data from each of these interviews is consistent with the conditions and characteristics of having a 'farmland connection + no farming background.'

The history is my history and it would be sad if it was lost. It would be sad if someone else took this on.

(N, 2017)

Her parents supported her interest in farming by taking her to grandpa's farm, but they viewed it as a hobby opposed to a career and reinforced the value of getting a college degree. They called it 'educational security' because it gave her more career opportunities and it provided a backup plan if she pursued a farming career. So, she went that route – she received a landscape architecture degree and nurtured her farming dream by taking elective classes in the agriculture department. After college, she got a job with a landscape architecture firm and started growing vegetables on the side, but she quickly lost her drive for an office job and realized that she would rather spend her days working the land. It was like an epiphany of "this is where I am spending all of my free-time, this seems to be what I enjoy doing, so maybe I should do that" (D, 2015).

Julie has a positive relationship with her parents so she immediately asked them if she could start her community supported agriculture (CSA) farm on some of their land. Their rural residential house is a 20-acre parcel that is zoned for agricultural use and that has eight acres of tillable land. They always rented the tillable ground to the neighbor for income but they were willing to let her use some of the land as long as she paid rent. There was not a lot of conversation about it. Her dad said, "well this is what I get for it now and, as long as you give me that, we are good," she agreed, and that was it (V, 2017).

Shortly after this conversation, he bought a tiller attachment for his tractor and gave her access to the equipment, which was essentially a 5,000-dollar gift to jumpstart her operation. She started small with one acre and 17 CSA customers, and within three years,

she was renting and managing all of the tillable land at her parent's house and she was selling produce to 200 CSA subscribers and vending at one farmers market. During this time, Julie married her college boyfriend and they bought a small house in town. They started looking to purchase their own farmland because Julie believes in the romantic and nostalgic idea of the yeomen farmer and because living in town and farming at her parent's made her eager to live on the land she cultivates.

As a child, she always wanted to live on her family's farmland and continue their farming legacy. Her grandpa offered to give her the land, but the location did not make sense for her and her husband and for her farming business so she declined.

> *It breaks my heart. My grandpa's land is in [town name], Wisconsin, which is up north near [city point of reference]. Growing up I always wanted to live there because I am a huge heritage person and I am the only one in the family that has any interest – out of 22 grandkids, I was the one that got it and I got it all for everybody. For a long time, my grandpa was nurturing me in hopes that we would take over that farm and when I graduated college, he asked me if we would be interested in taking that one. It breaks my heart because this is what I dreamed of doing but it wasn't right for us – it wasn't a good location for us as a couple.*
>
> (V, 2017)

Her family's farmland is in a remote rural area that is three hours north of her parent's home and four hours away from her husband's parents, and if they moved there, they would lose the intergenerational support of their parents. Furthermore, it would mean a one-way, three-hour commute to deliver CSA boxes and to vend at a neighborhood farmers market.

So, emotionally, the land fulfilled her childhood farming dreams but directionally, the location increased her distance to family and sales markets.

Julie and her husband focused their attention on finding a parcel that was in an agricultural township and county and that was a reasonable distance to both of their parents and to her sales markets in the metropolitan area. She had always monitored farm real estate listings so she started there, but she quickly realized the available properties were either five or less acres for $250,000 or 180-acre dairy farms for over one million dollars. The former option was within their budget but it did not provide enough land to operate a viable farming business. The latter had more than enough land and infrastructure for a direct-market vegetable farmer and it was outside their budget as a young, beginning farmer. It was impossible to find a small complete farm, which means a 40- or 80-acre parcel with a house and sufficient tillable land and building space to operate a farm.

Julie, along with many land seeking famers, did not have the patience to wait for a real estate listing, so she drove around looking for abandoned farms (i.e., parcels with a maintained home and dilapidated farm buildings), recorded the addresses, and searched the properties in the county assessor's database. She was looking for arrangements where landowner could sell them a 15- to 20-acre split right now and they could purchase additional land over time. They visited a few landowners but no one was interested in selling their land. One landowner explained that he does not need to sell land because he already split building lots for his children.

> *We approached him one Saturday morning, he was out getting the milk truck, and talked to him a little bit. He was very uninterested in selling the parcel. We talked to another couple in the [town name] area, same thing, just not interested. It kind of surprised me because we were asking to purchase non-tillable land, it was a hill, which*

> *is good for cattle and not good for crops, and the home and barn were complete trash. So, in my eyes, I am seeing a farm that you are obviously not using but we didn't have any luck with that approach.*
>
> (V, 2017)

Julie had a hard time understanding why the landowners would not sell a portion of their farmland and her best guess was twofold: (1) Farmers view their land as a whole parcel versus pieces that fulfill different purposes. (2) Farmers like to hold onto their assets. They will share their equipment or rent their land, but they maintain ownership because they never know what is going to happen with their health, the farmland real estate markets, and the agricultural economy and, consequently, when they could use the money.

Julie's land search process reveals that even small, direct-market vegetable farmers want to own a substantial amount of farmland and that they will always purchase as much farmland as they can find and afford. The amount of farmland is important because it dictates what they can do with their farming operation over time. For example, owning a substantial amount of land gives them ability to expand either by increasing the number of acres that grow produce while maintaining the crop rotations that build soil health or by building infrastructure that processes produce into value-added goods. However, even though Julie grew up in a rural, farming community, she is not part of the social networks people use to advertise and discuss land access opportunities with each other, and, consequently, accessing land involves finding and approaching random senior farmers that may not have someone to take over their operation. Her assessments of the senior generation indicate that beginning and senior farmers have different perspectives about what it means to hold and control farmland – that is, what renting/leasing, purchasing/owning, or transferring means to them at this particular stage in their career

and life and how land access functions within their long-term business, financial, and estate plans.

Eventually, Julie's dad became interested in their search because, even though they had location parameters, he did not want them moving far away. "He was thinking grandkids and just being involved in our lives" (L, 2017). One day Julie told him about a parcel that met her land and location requirements but that was outside of their pre-approved loan amount – it was 55 acres with a house and two small barns and within five miles of his home but it was listed at $600,000. Her dad wanted to see it immediately and shortly thereafter he was negotiating the purchase price with the seller and discussing financing options with his banker and Julie.

In this trajectory, a non-farming family member provides a farmland connection by helping the beginning farmer purchase land that they could not afford on their own. Consequently, land access means financial support to deviate from the two-part process described above (i.e., building equity in the farm operation and leveraging it to rent or purchase land). Julie and her husband could only qualify for a $250,000 real estate loan so purchasing the farmland through a private bank or farm credit association was not possible. Her parents provided a land access connection by buying the property from the seller and re-selling it to them on a land contract. The land contract identifies the purchase price, sets a fixed interest rate, separates property taxes from the annual principal and interest fee, and gives her parents the first lien position, which are standard terms in farmland agreements.

Land contracts are common within agriculture because they circumvent private bank, farm credit association, or Farm Service Agency financing processes and offer more flexibility than formal standards. In these cases, the seller functions as the bank and they

are generally willing to provide better terms because they have a pre-existing relationship with the borrower. Formal financing requires a down payment that is 30 to 40 percent of the purchase price but land contracts can finance 100 percent of the purchase price, or formal financing typically charges an adjustable interest rate but land contracts usually have a fixed rate. The Internal Revenue Service limits the flexibility by setting a minimum interest rate (i.e., the applicable federal rate), and when the federal funds rate is high, it can be significantly lower than private bank and farm credit association rates. For example, during the 1980s, the banking industry charged around 15 percent interest but sellers could provide around eight percent.

The pre-existing relationship means that the seller-financer and buyer-borrower interact with each other on a regular basis before and after the transaction (i.e., it is a non-arm's length transaction), which introduces unique risks and benefits for each party. The seller-financer assumes the risks of lending money to a family member, friend, or acquaintance so they may have to collect late or missing payments or enforce the default terms, but as the bank, they receive the benefits of earning income from the sale over 20 to 30 years and getting their land back if the borrower defaults. From the buyer-borrower's perspective, a land contract functions similar to a lease because they pay an annual flat fee to use a specific piece of land. However, since they are purchasing land, they take the risks of cash flowing principal and interest payments over 20 to 30 years versus an annual, three-, or five-year rental rate and they get the benefits of earning equity in the land as they make payments. In addition, the seller-financer may approve a land contract in situations where the buyer-borrower would not qualify for formal financing so at this stage in their faming career, it may be the only option for purchasing land.

At the time, it was difficult for Julie's dad to believe that anyone could make a living growing vegetables so the land contract was an apparent financial risk, but he was willing to do it because he trusted his daughter, which demonstrates the role of personal relationships in 'farmland connection + no farming background' trajectories. Trust can take many different forms and, in these situations, it correlates with educational security and relationship characteristics. On one hand, Julie does not have a farming background so she is teaching herself how to manage a farming operation while she is starting it. Her grandpa shares his experiential knowledge with her and she attends field days on specific farming practices, but, at this stage of her farming career, the daily work and annual planning was not second nature. Regardless, her dad trusts her because if the operation struggled or failed, Julie could always return to her landscape architecture career.

> *They trusted us to do this because we both had bachelors or masters degrees and were teachers. So, if this didn't work out, we could teach. We could do something with our – we had educational security.*
>
> (N, 2017)

On the other hand, she has a different vision of farming than her dad so, similar to Nate and Molly, they needed to build a common understanding of farming practices and principles. When Julie told her dad that she wanted to start an organic vegetable CSA farm he did not understand what it meant, and when she used terms like "restoration agriculture" and "regenerative farming" to explain the philosophical principles of building soil fertility, organic matter, and wildlife habitats, he called her a hippy. He patiently listened to her lectures because it was his daughter, but he does not necessarily know if he would have provided the same opportunity to an acquaintance.

> *There is an impulse with a lot of farmers, like "we don't want this to go to a big farm." That basic morality and sense of land ethic is there but to understand how – organic has created this sort of defensiveness amongst old style conventional farmers. When a young couple comes up smelling like hippies, talking about CSAs, and using language and trendy words that they don't understand, it would be hard to have a relationship. I don't know if they could connect in the same way if you didn't have a family tie. There could be lots of other pairings but it might be harder to bridge the cultural language gap with someone who grew up in the city and wants to have a farm – the farmer does not trust them in the same way.*
>
> (N, 2017)

When Julie was renting land from her dad, she remembers one instance where her father sprayed Roundup on the driveway before customers came to pick up their CSA boxes. In his defense, it was not near the vegetable fields, but the smell permeated the pick-up area and it created a tense argument about how her father managed his land within the context of her operation. From her perspective, customers bought into their organic farm and the Roundup smell damaged her credibility, so she perceived his actions as degrading her business and its principles. They resolved the dispute by discussing their individual perspectives of the spraying situation and the rental arrangement, but, again, they were willing to communicate their differences and develop a common understanding because of the underlying trust that they have through their father-daughter relationship. Thus, since land contracts are non-arm's length transactions, the interpersonal dynamics and the ongoing interactions between the two family members are important characteristics of the farmland connection because they determine the type of support that the non-farming

parent is willing to provide for their farming child. Here, trust is the cornerstone of the land access arrangement.

From Julie's perspective, there is an inherent financial risk of paying approximately 10,000 dollars per acre, which is above fair agricultural value, but it is feasible to cash flow the payments because, on average, she earns 20,000 dollars per acre. Consequently, to her, the land contract is an opportunity to realize her dreams of operating a direct-market farm and of living on the land she cultivates, and owning land is an indirect yet overt element of the dream. That is, her principle goal is to farm and to live on farmland and purchasing land is a necessary means for accomplishing it. Ownership is a psychological pre-condition for everything else. For example, even though her parents technically own the land because she is still paying the land contract, the agreement gave her the confidence to do capital improvements like adding electric well service, updating the barn, and building a pack shed. She would not make those investments on rented land.

As mentioned above, farmers build their operation by investing into the production assets first and the fixed assets second. Since capital improvements are tied to the land, farmers view them as fixed assets, and typically, they only make those investments on land they own because, barring a catastrophic event or economy, ownership means they can receive the returns on those investments for an indefinite period of time. However, if you ask a financial planner, capital improvements function like production assets so it can be logical to make those investments on land that farmers do not own but have control of for three to five years. In other words, in cases where farmers rent a significant portion of their land, they can receive a higher return when they build the improvement on their rented land versus cases where they leave a rental arrangement, purchase land, and build the improvement on it. The return corresponds with the type of farming operation, the period

of control, and the type of improvement and how an internal rate of return calculation evaluates how the investment will function within their existing business and financial plan.

For example, in a grazing operation, if a farmer has a five-year lease and builds perimeter and interior fences and a watering system, they can receive 20 to 30 percent internal rate of return on those investments, but, if they purchase the land and make the improvements, the return is closer to five percent because they are making principal and interest payments on the land debt. Defining 'land access' as ownership defies financial logic because farmers to not necessarily need to own land – they need control over it. Thus, financial service providers view land access as having the rights to use a specific piece of land for agricultural purposes and for a specific time period.

Other cases that fit into the 'farmland connection + farming background' cell have the same variables and similar characteristics as Julie's story but the relatives provide a farmland connection by selling their farmland to their child.[16] So, instead of helping them purchase a separate piece of land, the relatives split their land into two parcels: (1) their home and (2) the tillable acres, and the second split commonly has one development right so their child can build a home on the property. In this trajectory, accessing land evolves from the trust that family members have towards each other as people – opposed to trust in their ability to operate a viable farm business. The trusting personal relationship gives the non-farming parent confidence in their farming child and the parents demonstrate their trust by providing the financial means to purchase farmland. This type of investment is risky for both parties but they assume the risk because of their relationship, so the trust

[16] These cases are evident in the following interviews: (M, 2017; N, 2017; Y, 2017). The data from each of these interviews is consistent with the conditions and characteristics of having a 'farmland connection + no farming background.'

functions like equity that they have built over time and like collateral that secures the non-arm's length financial transaction.

The financial support is critical to the land access arrangement because, compared to beginning legacy farmers, people in Julie's situation are less likely to be members of the rural, farming community and to be embedded within its social networks. As a result, they find farmland by approaching random senior farmers that own dilapidated farm buildings and unmanaged land but, based on Julie's experience, beginning and senior farmers have different perspectives about what it means to hold and control farmland. For land access research and practice, this means that facilitating interaction among beginning, experienced, and senior farmers is critical for creating more land access opportunities and that the initiatives must engage farmers in conversations about how land access functions within their livelihood and lifestyle. That is, renting/leasing, purchasing/selling, and transferring farmland among farmers involves developing trust in each other – regardless of a family connection. Programs or policies should emphasize the relationship building aspect of accessing land.

'No Farmland Connection + No Farming Background'

'No farmland connection + no farming background' includes trajectories where the beginning farmer does not have any family ties to agriculture so they access land by navigating social networks of likeminded people. The social networks include things like listservs and trainings for farmers with specific demographic characteristics or with particular farming philosophies. Compared to 'farmland connection + no farming background' trajectories, they are more likely to grow up in a city or suburb and develop an interest in farming as an adult. Oftentimes, they had a life experience that freed them from the immediate confines of their everyday life and that made them more aware of

environmental issues. The type of life change varies significantly (e.g., study abroad, college class, health scare, etc.) but the situations consistently involve learning about industrial farming practices and principles and getting exposure to alternative methods.

Compared to 'farmland connection + farming background' and 'no farmland connection + farming background,' accessing land is one of the first major steps in their farming career and, oftentimes, they are simultaneously accessing land, establishing production, marketing their business, and learning farm finances. Compared to 'farmland connection + no farming background,' they are starting a farm operation without any intergenerational support. Thus, compared to the other three trajectories, they are developing and managing every aspect of their farming career and they are doing it on their own, which means participating in particular social networks to develop relationships with fellow farmers and potential customers and learning farm finances to build equity in their operation and to afford an annual rent or monthly mortgage payment. These characteristics place social and economic conditions that limit their land access options. To summarize, 'no farmland connection + no farming background' beginning farmers are pursuing their dreams without any intergenerational support and without a financial backstop.

Mike[17] is a young, first-generation farmer living in the downtown area of a metropolitan region. He grew up in a suburban community where the built environment removed him from the rural, farming communities that existed beyond the paved surfaces of his everyday life. In college, he developed an awareness about complex, global issues, such as the connections among humanity, nature, energy, and climate change, and he read

[17] Mike is a composite of the following interviews: (A, 2015a, 2015b; C, 2015). The data from each of these interviews is consistent with the conditions and characteristics of having 'no farmland connection + no farming background.'

popular books by Wendell Berry, Marion Nestle, and Michael Pollan. The authors framed the wicked problems that he learned about in his college classes within the context of food systems and they illustrated a dichotomy that diverged according to the philosophical beliefs that motivate production, distribution, and consumption decisions. That is, mainstream food systems facilitated through industrial agriculture and corporate consolidations and driven by capitalism versus community food systems facilitated through personal relationships and social networks and driven by environmental and cultural beliefs.

The literature helped Mike realize where food comes from and instilled ideals about what it means to be a farmer and to practice sustainable agriculture. This vision for tackling global environmental issues through agriculture became the model for his farming career and livelihood.

> *Over time, I got drawn more and more into food systems work because you can address these big picture questions of poverty and climate change – pretty unwieldy things in a very tangible way and a very interpersonal way. It is often very celebratory. So, you can be addressing these big heavy issues in a way that is very life giving as opposed to sort of telling people what not to do.*
>
> (C, 2015)

More specifically, he views farming as an opportunity to foster connections among people, food, and environments and sales as places to develop relationships with the people consuming his products. For example, his business focuses on selling CSA shares and vending at farmers markets because he interacts with every customer. He measures this objective by whether he can keep track of every CSA customer in his head and whether they can reasonably drive to the farm, and, if the answer to one or both of the questions is 'no,' he

likens the CSA shares to a magazine subscription and re-evaluates his production and distribution methods.

Mike learned how to farm by volunteering and working on several small diversified farms. During college, he volunteered on two five-acre vegetable farms. The first experience taught him about managing weeds and crops after several months of rain, and the second taught him about companion planting to increase efficiency and about displaying produce at farmers markets to attract more customers. He viewed the experiences and hands-on seminars that would build his ability to start his own farm. After college, he moved back to his hometown metropolitan area and found a full-time job on a farm just outside the city limits – it was a 20-minute commute from his apartment downtown to the farm. There, he managed the daily farming operations and learned about irrigation systems and CSA sales markets.

It was a lot of baby steps that exposed him to different farming systems and to new intelligent ways for addressing various challenges. The experiences were difficult because he did grunt work for little to no pay but it exposed him to the realities of community farming, so it tested whether it is a good career path for him. The work was tiring and muddy but, more importantly, a profound experience of being outside and working with his hands, and the latter feeling motivated him to rent his own land and start his own farming business. He met an established community farmer at a training for CSA vegetable farmers and they negotiated an agreement where Mike would rent one acre of land and they would share equipment and infrastructure. For Mike, these experiences were more than a starting point – they established the practice of accessing land through social networks for farmers that operate within community food systems and for consumers that support it.

Mike rented land from the same farmer for three growing seasons but, eventually, their emerging goals outpaced the space, so the landowner asked him to find a new location. Mike increased production from one to three acres while the landowner expanded from three to five acres and started a value-added enterprise, and the land and infrastructure could not accommodate the intensity. Next, he rented two acres of land from another community farmer who was renting land from a developer and was willing to share his space. Similar to his previous arrangement, he met the farmer at a training for CSA vegetable farmers, but, in comparison, the landowner is a separate person and they met because of the rental agreement. Mike did not have a pre-existing relationship with either person.

The arrangement was tenuous because both of the leases were verbal agreements (i.e., developer to community farmer and community farmer to Mike) and the distinct parties had different interests towards land (i.e., sustainable agricultural production versus residential real estate development).

> *[The lease is] informal. There is nothing in writing. There is not even a handshake really. I definitely am conscious of the possibility of something happening in our relationship that would make it really awkward – like if he got really mad at me for something and was like "get out of here." You know, I would have no legal standing to be like "no, I have a right to be here." … And, to be honest, this is my fifth year of farming and I have never had a lease.*
>
> (A, 2015a)

They had multiple discrepancies about not only who had control over specific areas of land but also how they could use it, and the constant miscommunications and

misunderstandings created hostile relationships among the three parties. The developer did not renew their lease, which forced Mike to find new land for the second year in a row.

> *Farming of this sort requires investment in the soil – you cannot just farm anywhere. You cannot just pick up and say, "oh well this land can substitute that land." Let's say the [landowner] doesn't renew your lease – then what do you do? … If you have spent five years building up the organic matter in your soil and then you have to start from scratch with heavy clay rather than sandy soil, you're not going to be able to do carrots anymore. So, if you're known for your baby carrots, then all of a sudden you cannot find land that has the same soil type as what you depend on. The tenuous land tenure is really a challenge if you are trying to maintain relationships, and so much about this work is about relationships.*
>
> (C, 2015)

This time, he sent an e-mail to a listserv of sustainable agriculture farmers in Southwest Wisconsin asking if anyone could rent him a few acres of land. He got one response, and it was from a livestock farmer that owned 100 acres of certified organic land and that was willing to lease one acre. He adjusted by downsizing his CSA sales market to accommodate the access arrangement, but it is one-hour outside of the city so he was concerned about how the location would affect the viability of his farm and quality of his life. Since Mike rents plots of farmland, he commutes between his apartment in the city, his farm in the country, and his sales markets throughout the metropolitan area almost every day during the growing season. He does not want to drive more than 45 minutes between each location because it is time that he could spend working and weeding the soil or planting, harvesting, and preparing crops – every minute is valuable so his location is almost priceless.

> *I have friends who live in the Northeast side, their vegetable land is in the south, and their [aggregating location] is way super far West so it is all over the map. That drive time, in order to really take good care of things, is challenging. It takes them like an hour and a half to go between all of those three places because they are so distributed.*
>
> (C, 2015)

Despite these challenges, Mike is still passionate about farming so he is looking for a rental arrangement where he has a sense of security with his soil, crops, and livelihood. An ideal situation includes: (1) a three- to five-year lease with the first right to renew, (2) a plot with enough tillable acres to rotate vegetable and cover crops and to expand production, with water access, and with buildings to store, clean, and pack produce, and (3) a house where he can live on the land. Living on the land is a vital component of farming livelihoods and lifestyles. As a young, beginning farmer, his goal is to develop a viable farm operation that has assets in his farming equipment, customer base, and experience and to leverage those assets with a farm credit association or Farm Service Agency for securing a farm real estate loan, but, since he does have a farming background, he also recognizes that he has no experience developing a financial plan and managing farm finances.

Many first-generation farmers have set ideas for how they want to farm, what they want to grow, and how they want to sell it, but they need help understanding the costs and benefits of making certain investments at specific junctures in their business plan and farming career. Compared to multi-generation farmers, they are more receptive to learning about farm financial management (i.e., understanding cash flow, drafting balance sheets, creating budgets, analyzing profits, and completing tax forms), but they are uncomfortable talking about their finances with other people (e.g., personal mentors, business advisors,

certified accountants, etc.). In addition, they are debt-averse and have student loans to they are hesitant to talk with lenders about how they could qualify for an operating or real estate loan.

It is difficult to find a rental or purchase arrangement that provides any of these land use needs and financial planning opportunities because demand is high and supply is low. Landowners have the upper hand and they rent or sell to whoever they want and charge whatever they want. These conditions affect how Mike can purchase farmland because lenders ask farmers to demonstrate that they can pay a farm mortgage through their production and sales records, but a sufficient and stable income oftentimes comes with secure land access. He describes it as the chicken-egg conundrum because building income and capital and accessing financing and land are tied together.

> *You cannot just buy land and start a farm and hope to pay for it. You have to be established with enough production to pay for it or have some other source of income to do it. So, it can be pretty tough. … According to my taxes, I did not have a positive income for the first five years of farming. … There is so much infrastructure that you need in terms of a tractor, equipment, walk-in cooler, washing/pack shed, that kind of thing – everything I was making, I was just putting back into the farm.*
>
> (D, 2015)

Rental arrangements have different characteristics within the four 'farmland connection' and 'farming background' categories. In each situation, farmers rely upon personal relationships and social networks to find land and to secure the lease arrangement and interpersonal dynamics are important aspects of the process (i.e., finding the land, negotiating the terms, interacting throughout the lease, and renewing the contract). But, they vary by how the rented acres function within the context of the whole operation –

particularly when farmers rent land from non-family members. When farmers have a farming background, they are more likely to rent land to spread their equipment and labor costs over more acres because it expands their operation and gives them an economic advantage. When they do not have a farming background, they rent land to enter the agricultural industry and to maintain their farming career, and, consequently, it is their only means of production.

In other words, the former has an existing land base or farm operation that satisfies their operating costs and family living needs and the latter invests their entire livelihood into farming the rented land. Thus, in 'no farmland connection + no farming background' situations, renting farmland is particularly precarious because the farmer does not have a safety net that they can fall back on or that they can leverage for additional farmland connections. Financially, it makes a lot of sense to rent land because rental rates are more receptive to market corrections and because they only include the agricultural or market value of the land opposed to the value (i.e., principal) plus interest. But, farmers in every category still want to own land because it is psychologically, economically, and culturally important. The land is part of who they are.

However, purchasing farmland requires a high amount of equity to qualify for a real estate loan and, consequently, it is easier to buy land when you already own it because lenders can use existing landownership as collateral to secure the loan. Many beginning farmers believe that banks are against them from the start because they have not established their farming record – experience and finances – and they may have student loans. So, a significant part of the land access issue involves financing beginning farming operations and particularly those without a farming background. Financing includes investments into the production and fixed assets.

> *One of the things about land, as a young farmer, how do you get access to land at all. A lot of folks my age really struggle with this because we are city kids and we like it … [Living] in or [farming] near a city like [city name] is ideal but land in this area is a fortune. It is almost impossible to buy unless you have a lot of money already or have someone that is willing to just give you land. It is really, really hard to get access to land.*
>
> (A, 2015b)

Thus, compared to the other three trajectories, farmers in Mike's situation are more likely to access land through social networks that engage people with specific values towards food and agriculture. The networks engage likeminded farmers and consumers through various mechanisms like educational trainings on specific farming practices, sales markets for particular products, and social media accounts or listservs with defined missions – opposed to physical spaces or public meetings within a township. In many cases, the people do not have pre-existing relationships, so accessing land involves developing new personal relationships with a fellow farmer or customer – opposed to navigating the dynamics of an existing relationship with a family member, friend, or acquaintance. The farmer and/or landowner have a mutual understanding about core food production land management principles, but it does not necessarily mean that both parties fully understand the messy intricacies and realities of farming. Consequently, creating a secure arrangement requires developing common understandings and expectations with, essentially, a stranger and learning how to interact with them.

When we consider the land access issue as a whole, this finding means that one trajectory pursues land access opportunities through one type of social network. They target farmers who have similar production types and farming experiences and consumers

who advocate for community food systems. These arrangements are beneficial because they remove contentious industrial v. community topics from the farmer-landowner relationship, but they identify a significant weakness of land access processes. Given the statistic that 33 percent of farmers are over the age of 65 and 93 million acres of farmland (10 percent) is expected to change owners between 2015 and 2019 (Bigelow et al., 2016) and the reasonable assumption that many of these farmers produce commodity crops for industrial food systems, it means farmers in Mike's situation significantly limit their opportunities to access land from senior farmers in the 'farmland connection + farming background' and 'no farmland connection + farming background' trajectories. However, expanding the land access search increases his competition with experienced family farmers and industrial farm operations that have established reputations and can offer more money.

For land access research and practice, this means we need to explore interpersonal dynamics between farmers with different perspectives towards food and agriculture and to facilitate relationships between industrial and community farmers. Again, family farmers are very different from each other but they have a common commitment to working the land and protecting US food and agriculture systems, so it is feasible to foster farmland connections among farmers with different production types and experiences.

'No farmland connection + no farming background' also includes cases where first-generation farmers gain a farmland connection and develop farming experience through a farm link or mentorship program, a land cooperative, or a land trust. The sample did not include a sufficient number of farmers that accessed land through these arrangements so I cannot elaborate upon the characteristics of these cases. However, many service providers

described them as creative and innovative solutions so it is an important area for further research.

Results Conclusion

In conclusion, for farmers, accessing land involves figuring out how to start farming and how to leverage equity in production assets to finance investments in fixed assets. Current agricultural industry conditions make it easier to start farming through one of two ways: either entering into an existing family operation that has a preexisting basis of production and fixed assets or starting a high value crop operation that requires a small amount of overhead and land. A 250-cow dairy farm has different equipment, infrastructure, space, and location needs than a direct-market vegetable farm so there are fundamental differences in how they access land. Starting a commodity crop or dairy operation from scratch is next to impossible because the costs of acquiring the necessary equipment, animals, and land and the time for establishing a foothold is more than any beginning farmer can take on by themselves, but starting a CSA vegetable farm is feasible because it can produce a positive gross income with minimal equipment, labor, and land. Thus, the characteristics of farm operations determine the opportunities, barriers, and requirements for accessing land.

The four 'farmland connection' and 'farming background' trajectories explain the internally consistent and reciprocal relationships and understandings between farm operations and land access arrangements. That is, the details of a farm operation can determine the strength, stability, and resiliency of the land access arrangement and the details of a land access arrangement can determine the strength, stability, and resiliency of the farm operation. The cases illustrate how multiple farmers interact with each other to access land and how individual farmers access land throughout their career – accessing land

in time and over time. The characteristics of one's tie to farmland and exposure to farming are related to the personal relationships, social networks, and farm finances that they engage to rent, purchase, and transfer land. Consequently, when we conceptualize the land access issue, it is necessary to include the context of the farmer and their operation, the rural community, farmland real estate markets, and the agricultural industry.

Discussion

Farmland access is one of the most important issues in agriculture today because the challenges associated with renting, purchasing, and transferring land are pervasive and persistent among all farmers in all regions of the US. The issue is at the forefront of many planning and policy conversations but, as I demonstrate in the literature review, our knowledge comes from a nascent body of scholarship and practice. Consequently, the objective of this dissertation article is to develop a pragmatic understanding of the issue, which simply means following methods that embody the perspectives of the people experiencing the issue and producing findings that can translate into actionable resources. I accomplish this by evaluating how scholars and practitioners define land access in their work and how farmers access land in their everyday lives and by describing the processes of renting, purchasing, and transferring land and the relationships with social, political, and economic institutions. This approach produces a systematic understanding of land access.

Compared to existing research, it offers an alternative conceptualization of the issue – how farmers define land access and mobilize program and policy elements. The conceptual model illustrates the consistent differences between four land access experiences and the subtle variations within each land access trajectory. It is the universal challenge because, even though farmers have different production types, farming experiences, demographics, and geographical locations, the specific examples demonstrate that everyone struggles with accessing land in some way or another. Land access interventions must recognize and support this broad range of farmers, and they can serve multiple audiences by uniting farmers around the common desire to maintain family farm operations and landowners. That is, initiatives must emphasize this common appreciation for farming and farmland and must foster a common language for talking about land access

issues. We can use these results to interpret how farmers access land and to bridge barriers across farming audiences.

Defining Land Access

The literature review demonstrates the distinct and stagnant nature of existing scholarship and practice because they define and conceptualize land access as a collection of parts – opposed to interdependent parts – and explain the technical details of specific parts – opposed to interaction among parts. Here, systems thinking is evident in three ways: First, I operationalized land access as a system that includes three types of parts: (1) renting, purchasing, and transferring *actions*, (2) planning, market, and finance program and policy *elements*, and (3) beginning-, mid-, and senior career *farmers*. The three types and their constituent parts represent distinct aspects of land access and, together, they provide a comprehensive picture of it. Second, I evaluated the land access system through grounded theory methods because, in systems thinking words, it analyzes interrelations and interdependencies (i.e., interactions) among parts of a system and it identifies processes and structures that create specific conditions and circumstances. This methodological process reveals behavior patterns that are consistent under specific conditions and circumstances and, third, I organized these patterns into a conceptual model that illustrates four trajectories for accessing land.

More specifically, during the study, I sampled farmers and service providers that represented various parts of the system. I collected data to understand how farmers use the various elements to rent, purchase, and transfer land. Farmers described how those actions and elements function within the contexts of their farm operation, the rural community, farmland real estate markets, and the agricultural industry and how their land access arrangement changes over time, which means accessing land is embedded within

these three larger systems and it is a longitudinal process. Therefore, understanding the issue requires recognizing three types of interactions:

1. Interaction of parts within the land access system – the characteristics of 'farmland connection' and 'farming background' that affect the personal relationships, social networks, and farm finances;

2. Interaction of the parts within the context of the three larger systems – the contexts of their farm organization, the rural community, the farmland real estate market, and the agricultural industry; and

3. Interaction of the parts in time and over time – the evolutions of arrangements from interactions among multiple farmers and within individual operations.

Given this frame, I analyzed the data to identify the variables that explain various processes and structures for accessing land and the characteristics that correlate with different conditions and circumstances of land access arrangements. Fundamentally, land access is a relationship between 'farmland connection' and 'farming background' that varies by the characteristics of a farmers' personal relationships, social networks, and farm finances. The variables correlate with the goals that farmers have for their operation and family, which implicate how they define land access and realize their rent, purchase, and/or transfer arrangement. Assuming farming has sufficient norms, traditions, and interests to organize behavior patterns into a conceptual model, these methodological processes revealed four trajectories for accessing land and I organized them into a 2x2 contingency table. In other words, the characteristics of one's tie to farmland and exposure to farming are related to the personal relationships, social networks, and farm finances that they engage to rent, purchase, or transfer land and these behaviors are consistent with one of

four trajectories. Each cell is a 'trajectory' because every case explained the longitudinal nature of accessing land – farmers make decisions that affect their land access arrangement and those decisions play out over multiple years or decades.

Mobilizing Program and Policy Elements

Second, I operationalized land access from a framework of programs and policies that address the planning, market, and finance elements of accessing land (table one), and the 'farmland connection' and 'farming background' cases demonstrate that farmers mobilize the elements that they can manipulate. That is, some elements are active aspects of accessing land because farmers can use them in different ways to change their arrangement. Others are inactive aspects of their land access arrangement because the elements create conditions for accessing land but farmers cannot alter the element itself. Table six identifies the active (white cells) and inactive (dark grey cells) land access elements. The light grey cells identify elements that did not come up during my interviews with farmers so I cannot determine whether they perceive the elements as active or inactive.

Table Six. Active and Inactive Land Access Elements

Planning	**Market**	**Mixed**	**Finance**
Comprehensive planning	Fixed rent	Conservation easement	Estate transfer
Zoning & subdivision ordinances	Share rent	Public and private purchase of development rights & transfer of development rights programs	Public financing
Agriculture districts	Fee simple		Private financing
Deed restriction / restrictive covenant	Common ownership		Public-private financing
Property tax fees	Joint ownership	Payment for ecosystem services	Owner-seller financing
Income tax credits	Trust ownership		
	Squatting		
Key	Active element	Inactive element	Unknown

The Wisconsin's Working Lands Initiative includes a purchase of agricultural conservation easement program and a few local governments and private land trusts have purchase or transfer of development rights programs, so a future research project could evaluate relationships between the programs and land access arrangements – how farmers understand the programs, how they use the programs, and how they developed their land access arrangements. This type of study would focus on farmers that voluntarily participated in a conservation easement, purchase of development rights, or transfer of development rights program to preserve their parcel for agricultural uses or that lease or own land within one of these programs but did not enroll in the program itself. Practitioners and service providers could use these findings to improve upon farmland preservation programs.

These findings prompt questions about the appropriate role of planners and policy makers when addressing land access challenges because, fundamentally, farmers described land access as different ways of navigating social and financial processes and structures. Some of these experiences occur through public platforms like town boards, resident committees, educational trainings, sales markets, e-mail listservs, Farm Service Agency operating and real estate loans, and National Resources Conservation Service Environmental Quality Incentives Program grants, but farmers view them as private personal and financial matters. This suggests that successful and appropriate land access interventions may come from engaging farmers with different product types and experiences in social networks and from finance-focused programs or – opposed to regulatory interventions. Planners and policy makers work within the social-political dynamics of their community and the regulatory requirements of associated governments so any intervention must consider these limitations.

Given the emergent nature of farmland access, few planning and policy resources directly address this food systems issue so it is difficult to generate potential applications of these findings from existing work. However, when food systems was a burgeoning topic among planners and policy makers, the American Planning Association published the *Policy Guide on Community and Regional Food Planning* (2007) to strengthen connections between traditional planning practice and food systems. The guide does not directly identify land access as a food systems issue, but it does recognize farmland preservation and economic development as current planning activities that protect agricultural land uses, encourage local and regional food production, and mitigate decline in rural, farming communities. It outlines seven general policies that integrate food systems issues into core planning functions (e.g., land use, transportation, economic development, environment, etc.) and provides multiple specific policies that identify potential roles for planning practitioners. To summarize, the specific policies fall into one of three categories:

1. Integrate food systems activities (i.e., production, distribution, wholesale, retail, and waste management) into comprehensive and sub-area plans, community and economic development initiatives, and zoning ordinances;

2. Research existing conditions that constrain the ability to produce, distribute, and sell food at local and regional scales and develop solutions that increase the benefits of food systems activities to local communities; and

3. Develop public-private partnerships to advance the first two recommendations and to facilitate the work associated with building robust community and regional food systems.

From this perspective, planners and policy makers can integrate land access issues into their plans by naming renting, purchasing, and transferring farmland as a challenge to maintaining viable local and regional agricultural economies and food systems. They can use the conceptual model to inform how they define, investigate, and address the issue within their community. That is, the four trajectories provide fundamental background knowledge about the issue because it describes land access behaviors as a relationship between 'farmland connection' and 'farming background' and as a function of four contexts and three variables that are inherent characteristics in rural, farming communities and on family farms. By using the 2x2 contingency table, practitioners can recognize and include the range of experiences when they research the issue and develop partnerships and programs to address it. This is important because it moves applied land access conversations and interventions away from technical nuances of program and policy elements and towards a comprehensive and interactive perspective of farmer actions.

Furthermore, local government planners and policy makers can partner with service providers or with planning specialists to provide targeted land access services. For example, the government institution can partner with financial planners to teach workshops about the relationships between managing farm finances and accessing land – specifically, how to build capital and equity in the operation and leverage it to rent, purchase, and/or transfer land at various stages of farming careers. This type of training not only formally recognizes the connections between access and finances but it also emphasizes the interactive and longitudinal nature of accessing land. Other public-private partnership could address specific actions, such as (1) building relationships in rural, farming communities to learn about opportunities to rent or purchase land and (2) planning family farm estates to transfer the farm operation and land to the next farming generation. Many university Extension centers host workshops on various aspects of estate planning,

and local governments could bolster those partnerships to offer more trainings and to increase attendance.

Planner-to-planner partnerships include situations where a general planner works with the county conservation commissioner or with DATCP Farm Center or Farmland Preservation Program staff to evaluate specific behaviors and contexts of how farmers access land within the local jurisdiction. Combining general and specific planning knowledge is valuable to investigate reasons for producing specific products, following certain land management or conservation practices, and changing a parcel's land use category as well as reasons for using, circumventing, or violating zoning ordinances, agriculture districts, property tax fees (i.e., use value taxation), income tax credits, and conservation easement or purchase/transfer of development rights programs. This type of partnership emphasizes the fact that land access issues start from individual experiences within rural, farming communities but interventions span multiple disciplines and jurisdictions. Any program or policy interventions must recognize this interplay between the personal- and community-oriented characteristics and the local, state, and federal policy limitations.

Consequently, it is necessary to conceptualize rural planning as the practice of building partnerships with local service providers and planning specialists and as providing education or consulting services to their constituents. Many farmers oppose government regulations because they limit how landowners use and manage land and, by extension, they oppose planning professionals because they enforce the regulations. It is reasonable to believe that planners can make more progress if they promote themselves as a service to landowners and farmers – opposed to leveraging their enforcement mandate. This finding demonstrates the need for a more robust understanding of rural planning practice, so

future research should study the relationships and interactions between planners (general and specialized) and community members, planners and elected officials, and community members and elected officials. The purpose is to increase our understanding about the roles and functions of local governments within rural, farming communities, and targeted research questions include: first, how town boards and commissions function within a community, how residents become elected to boards and commissions and what keeps them elected, how elected officials make decisions, and how elected officials interact with residents.

Conclusion

Thus, the primary contribution of this study involves how I designed the analytical frame to study systematic interactions and how I organized the data to illustrate behavior patterns, and it is valuable because it produces more realistic and actionable findings. However, the approach also comes with four limitations: First, given my objective to develop a pragmatic and systematic understanding of land access, the conceptual model and its cases do not provide specific details that are common in more focused studies. Second, since the results explain land access within the contexts of their farm operation, the rural community, farmland real estate markets, and the agricultural industry, the findings are generalizable to areas with similar farming systems and land market dynamics as Wisconsin. Future research could evaluate how particular parts of the land access system function within the conceptual model and how the conceptual model works in different agricultural regions of the US.

Third, the sampling procedures expressly excluded immigrant farmers because of the language barriers and their past experiences. Future research could (1) evaluate how they understand the ability to hold and control land and, based on that understanding, how

they use the program and policy elements to rent, purchase, or transfer land and (2) analyze how the results function within the conceptual model. Immigrant farmers have an important role in US food systems, but it takes time to develop valid and reliable comparative insights. With the proper resources, this research would produce meaningful results and add content to cases that fit within each trajectory.

Fourth, as mentioned above, I did not saturate data collection and analysis on cases where farmers gained farmland connections and developed farming experiences through a farm link or mentorship, program, a land cooperative, or a land trust. The sample did not include a sufficient number of farmers that accessed land through these arrangements, but practitioners and service providers see them as innovative ways to address the issue. In particular, service providers see the arrangements as offering a flexible yet personal approach to establishing a farmland connection (EE, 2017; O, 2017; P, 2017; Q, 2017; U, 2017). These cases may have unique processes and structures for accessing land so future research could evaluate the specific experiences and processes of innovative land access arrangements.

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Appendix 1. Interview Guides

Farmers

Every farmer interview addressed four general topics: background experiences with farming, characteristics of the farm operation, details of their land access definition and arrangement, and participation in public or private program and policy elements. Within these topics, questions include:

Background

- Tell me about yourself.
    - Probe to get information about factors that lead to becoming a farmer.
    - Did you have any influential experiences during youth/adolescence or early adult life that drew you to farming? If yes, please describe. If no, move on.
- How long have you been farming?
- When did your family start {name of farm}?

Farm

- Tell me about your farm (e.g., the land, farming practices, tools, structures, etc.).
- Please describe the land around your farm.
- How did you find the land for your farm?
    - Describe your experiences.
    - Who did you interact with to find and rent or purchase this land.
- What are your plans for your farm as it relates to renting / purchasing or selling / transferring land?

Land access

- What does land access mean to you?
- Who do you talk to about your experiences accessing land?
- How …

Program and Policy Elements

- Do you interact with the local government?
    - Probe to see whether the farm is part of farmland preservation or incentive policies and to understand the nature of their interactions.
    - If yes: How did you learn about the policies? What policies do you use? Why do you utilize those policies? How do you like them?
    - If no: How do you learn about local policy initiatives? Are you aware of these policies? Why do you disengage from those policies?
- Repeat with state and federal government policies.

Here, "probe" means to ask the following types of questions: tell me about …, can you describe …, what do you mean by …, can you give an example of …, and others have talked about C, can you tell me about it.

As my sampling process evolved, my probing questions asked farmers to elaborate upon their personal relationships with family members, farming peers, or community acquaintances and upon the financial aspects of their farm operation. For example, when a farmer described who was part of their operation, I asked additional questions about their family dynamics and specifically, about their interactions with farming parents or siblings as well as with non-farming parents or siblings. When a farmer described how they found farmland, I asked additional questions about how they managed their money – that is, I wanted to get details about their financial records, lending options, debt to asset ratios, and business plan. If I interviewed someone who was a multi-generation farmer and a longstanding member of the rural, farming community, I asked how the local government makes land use decisions and how people become a community member. If I interviewed a first-generation farmer, I asked them to describe their interactions with other farmers and neighbors.

Service Providers

Every service provider interview addressed three general topics: background of organization, interactions with farmers, and details of their land access definition and work, and, in addition, I asked government service providers about land use regulations. Within these topics, questions include:

Background

- Please describe your mission.
- What kind of services or information do you provide?

Farmer interactions

- How do you work with agricultural land and/or farmers?
    - What kind of tools or approaches do you use? Please describe.
    - Probe to get more details about their experiences working with agricultural land and farmers.
- Describe your relationship with farmers.
    - How do you interact with them?
    - Describe your experiences with farmers.

Land access

- What does land access mean to you?
- How do you learn about land access?
    - How did you discover the issue?
    - Who talks to you about experiences of accessing agricultural land?
    - Who do you talk to in order to learn more about the issue?
    - What informational resources to you use to learn about the issue?
- Please describe the tools, workshops, trainings, or information that your organization produces to discuss or address land access issues.
    - Who participates in the programs or uses the resources?
    - When and where do you offer the programs and resources?

- How do you talk to others – specifically famers – about land access?

Government service providers

- How do you regulate agricultural land? Please describe.
    - Probe to get more details about policies and programs.
    - When did you adopt the policies or programs?
- Please describe how your office creates and evaluates the regulations.
    - What types of issues do you discuss?
    - Who do you consider?

The purpose of interviewing service providers was to get their professional expertise on specific actions and elements and to triangulate the farmer perspectives, and, consequently, these interviews focused on their roles and responsibilities within their organization and the agricultural industry and on their experiences working with farmers. Every service provider described the land access issue by telling multiple examples about how they helped a farmer develop their arrangement (e.g., write a rental contract, consolidate a parent-child land contract into formal lending, discuss land inheritance with farming and non-farming children, etc.), so, in order to understand the range of land access experiences, I probed to get another example of a similar situation.

Scientists Managing Farmers Markets: Systematizing Aspects of the Citizen-Manager's Role

Introduction

Many people view farmers markets as the pinnacle of local food systems because they perform functions such as creating safe and vibrant public spaces, providing sales opportunities for local farmers and businesses, and increasing access to healthy food (Morales, 2011). These activities weave together diverse interests and people, and as such, their environment and goals reflect the unique assets and issues of that place. Communities support farmers markets because they are a platform to generate economic development, address social justice and food access issues, raise awareness about environmental sustainability, and build interpersonal relationships (Jensen, 2010; Alkon, 2012).

Between 2006 and 2012, the number of registered farmers markets in the US increased by 180% (U.S. Department of Agriculture National Agricultural Statistics Service, 2007, 2012) and in May 2017, over 8,600 markets have registered in the National Farmers Market Directory (U.S. Department of Agriculture Agricultural Marketing Service, 2017). The increase is largely due to shifting consumer preferences for food and changing economics of agriculture but despite the surge, there is a relative absence of general knowledge about farmers markets. Existing research evaluates farmers markets from either an external or an internal perspective. 'External' refers to studies performed by academic or government personnel on one or multiple markets and published through peer review processes. 'Internal' refers to studies conducted by the market organization on themselves and posted through their website or social media page.

External studies support personal or institutional research agendas so they follow strict social science research standards, which implies long time horizons between research design, data collection, and report findings, and use scientific jargon to communicate the results to their peers, which limits the applied nature of the study. Thus, the articles have

little value to the markets that they study. Internal studies obtain actionable knowledge to inform decision-making. However, markets focus on measurements that are relatively simple to execute and not always reliable, such as informal estimates of visitor attendance or incomplete collections of vendor sales. To combat this, market associations (i.e., a network of farmers markets) have developed nascent measurement manuals to increase the validity of market data, but they focus on broad, macro impacts and they do not always translate the findings to help markets understand how they can use the data to advance their goals (Market Umbrella, n.d.; McCarthy, n.d.; Vancity Community Foundation, 2013). Existing farmers market research represents two extremes that follow scientific processes and generate useful information, but the findings do not target the appropriate audience or provide actionable information.

In addition to these methodological issues, there is a general dearth of farmers market data. Markets often know that collecting and interpreting data is important but they do not have the resources and training to integrate the necessary activities into their routine practices (Freedman et al., 2016; Miller & Roper, 2013; Morales, 2009, 2011; Ragland & Tropp, 2009). Miller and Roper evaluated the characteristics and outcomes of the Farmers Market Promotion Program[18] grantees between 2006 and 2011 and they found that markets lacked reliable and actionable knowledge that supports short- and medium-term decisions (Miller & Roper, 2013). Markets want resources that measure nuanced characteristics on a regular basis because they can use the information to understand their

[18] The Farmers Market Promotion Program (FMPP) is a competitive USDA grant. The purpose is "to increase [access to and consumption of] locally and regionally produced agricultural products and to develop new market opportunities for farm and ranch operations [that serve] local markets" (United States Department of Agriculture Agricultural Marketing Service, n.d.).

role within the community, develop relationships, and establish legitimacy. In other words, data can help them navigate interactions and leverage their goals.

Citizen science is a research method where scientists and members of the public engage or collaborate with each other to study communities and ecosystems through systematic processes that produce reliable data on real world phenomena (Bonney et al., 2009; Davies, Fradera, Riesch, & Lakeman-Fraser, 2016; McKinley et al., 2017; Riesch & Potter, 2014). The objective is to increase scientific and public understanding about issues or phenomena that span local, regional, and global scales by integrating applied perspectives and knowledge into the data collection, analysis, and interpretation processes (Ellwood, Crimmins, & Miller-Rushing, 2017; Loss, Loss, Will, & Marra, 2015). Projects balance scientific rigor with everyday conditions by designing the research questions and activities to accommodate non-scientific actors and objectives and by developing standard procedures to collect consistent and reliable data at distributed sites. It is a promising approach for studying complex issues because projects generate and manage scientific data at scales and resolutions that are unattainable through external research processes and because they empower public participants around data. Ideally, members of the public collect observational data on their immediate surroundings, scientists analyze it to understand issues that are relevant to them, and scientists help them interpret it within the context of their community. The literature review describes the different perspectives of and approaches to doing citizen science research and the various roles of scientists and members of the public.

The findings about existing farmers market research and the potential of citizen science prompted the desire to develop a toolkit that creates a longitudinal panel database on farmers markets and that empowers farmers markets through proven data collection

strategies, actionable interpretation information, and customizable summary reports. This became Farm 2 Facts (F2F).[19] Our objective was to develop resources that uphold social science research standards and honor the unique characteristics of markets in order to fill a knowledge gap and to support market decision-making. Overall, F2F collects descriptive information about markets (i.e., their organization, vendors, and visitors) and the database enables comparative understandings of an individual market over time and of multiple markets. The descriptive information includes average number of visitors per market day (estimated), total market sales, total market sales per payment method, total market sales by product category, average distance in miles traveled from product origin to market, total cultivated and grazed acres by market vendors, number of socially disadvantaged vendors selling at the market (USDA definition), percent of customers who were first time visitors (estimated), average dollars spent per visitor per visit (estimated), percent of visitors walking, bicycling, carpooling, ridesharing, or taking public transportation to the market (estimated), etc. (appendix one lists all of F2F's metrics).

We can combine these data points with datasets like USDA Economic Research Service dataset, USDA Census of Agriculture, US Economic Development Agency, US Census Bureau to analyze the social and economic impacts of farmers markets within a community, and public officials and private stakeholders can use the information when making decisions to allocate resources to particular programs or services like SNAP incentive programs and pedestrian-oriented transportation infrastructure. Markets can use the data to make business operations decisions and to promote themselves to partners, stakeholders, and community members. For example, markets can use data about the types

[19] Between April 2016 and December 2018, we refered to the project as Metrics + Indicators for Impact (MIFI), and in January 2019, we changed the name to Farm 2 Facts for branding and marketing purposes.

of available products to recruit farmers, businesses, or artists that would fill a niche and they can use data about the number of first time and repeat visitors to promote their presence within the community.

The project accomplishes this goal by guiding markets through three actions: (1) select metrics that measure various economic, social, and ecological aspects, (2) collect data according to scientific yet practical processes, and (3) communicate findings through technical graphs and infographic reports. The final step integrates the three actions by teaching markets how to interpret and use the metrics, data, and findings in ways that enhance their internal decision-making and external communication.

Thus, F2F is a methodological innovation because it applies a citizen science research design to address issues with existing scholarship and reports on farmers markets. This article describes the research processes and methods that constitute this innovation. More specifically, the literature review evaluates characteristics of existing farmers market research and conceptualizations of citizen science research, the methods explain the process for developing F2F, the results explain the data collection protocols (i.e., scientific standards and user actions/interactions), and the discussion anticipates the implications for future research at and on farmers markets. The content provides valuable information about how scholars can use citizen science to study complex social environments (i.e., the processes for designing and implementing citizen science research methods and instruments) and about how farmers markets, or other social entities, can participate in scientific research to advance multiple agendas (i.e., the need to develop a comprehensive dataset and the desire to advance organizational objectives through data). That is, the article explains how this type of citizen science project collects data that is useful for scholars and farmers market managers. As a theory for doing citizen science research, the

article is relevant for scholars and practitioners that perform research *with* people to develop a systematic and applied understanding of phenomena because the design focuses on interaction among individual actions, physical environments, and research methods.

Before I proceed, it is necessary to clarify two things: First, the terms "farmers market," "farmers market manager," and any iteration of the two refers to the paid or volunteer positions that represent the market and participate in operational decisions, such as the market manager and board members. Second, developing and testing F2F was a team effort that represented three perspectives: social science research, non-profit advocacy, and market organization and each perspective had different experiences with scientific research and farmers markets and different roles in the project activities.

Literature Review

Farmers Market Research

The objective of this literature review is to understand the context and characteristics of existing farmers market research and to evaluate the implications for a citizen science approach for collecting farmers market data. I conducted the review through a two-step process: First, I created a codebook that (a) categorized each article as external or internal; (b) listed the method, instrument, metric, population, and resources for collecting data; (c) summarized the methods discussion; and (d) described the claim associated with the whole study and if possible, each metric. The external/internal code was a proxy for the knowledge and experience with conducting social science research. Second, I used this information to identify the common methods and instruments that scholars and practitioners use for collecting data and to analyze whether the findings are valid and reliable and whether market managers can replicate the processes.

Both external and internal studies overwhelmingly relied on survey and observation research methods so it generates most of our data and knowledge about farmers markets. Surveys are a flexible way to collect a lot of data on various audiences and I evaluated the implications of existing designs by characterizing who and what they surveyed, how they conducted the survey, and the common issues. External studies primarily surveyed market vendors and managers and their metrics quantified the economic impacts of farmers markets (Brown et al., 2007; Kobayashi & Abi-Nader, 2010; Ragland & Tropp, 2009). For example, they estimated Keynesian-type multipliers associated with market activity (Hughes, Brown, Miller, & McConnell, 2008; Sadler, Clark, & Gilliland, 2013) and used multivariate regression equations to analyze the uptake of innovative practices due to local food markets (Cameron, 2007; C. Hinrichs, Gillespie, & Geenstra, 2004). Internal studies

targeted market visitors, stakeholders, neighboring businesses, and residents and they measured their role within the community by asking each party to describe their feelings about the market (Farmers' Market America, 2008; Inman & Davison, 2012; Market Umbrella, 1999, 2008). The questions emphasized the local context of markets, which supported their objective to identify and communicate their impacts to partners, funders, elected officials, and community members.

It is difficult to understand the differences between how scholars and practitioners conduct the surveys because they discussed their methods in different ways. Most of the external articles (77%) described their survey practices but few included the questions in the article (33%). They documented their survey processes by describing the peer review, ex ante pilot test, and ex post reliability verification steps. The strong attention to social science research standards demonstrated that they avoided potential bias but they had low response rates. Internal articles were less likely to describe the survey practices (57%) and more likely to provide the questions (43%), but this is because four of the 14 internal articles are market association manuals, which explain basic guidelines for conducting surveys but do not provide any information about how their process mitigates common methodological issues.

Most scholars and practitioners use convenience sampling because it assumes that the people within a particular location reasonably represent the study population so the surveyors can randomly select respondents in a given area (Alonso & O'Neill, 2011; Brown et al., 2007; Hunt, 2006; Market Umbrella, 2012). However, the strategy can misrepresent the population because (1) the surveyors can impose bias by approaching people with certain characteristics and avoiding others and (2) the researchers cannot calculate whether the sample is representative. As a result, it is difficult to make generalized findings

from convenience sampling data (Gray, Williamson, Karp, & Dalphin, 2007). For example, Hunt (2006) surveyed visitors from a booth in the market and they noticed that only dedicated market attendees voluntarily took the survey. Within this body of articles, the response rates varied from 30% to 68% and many articles stated that their rate was low or unusable or that they could not generate statistically significant results (Econsult Corporation, 2007; Ragland & Tropp, 2009).

Furthermore, many internal studies included questions that either assume the respondent has particular values or prime them. For example, questions like "on a scale of 1 to 5, to what degree do environmental factors influence your decision to purchase food products at the market" and "do you find shopping at the farmers market less convenient than shopping at a supermarket" might lead the respondent to connect environmental values and inconvenience with farmers markets even if they did not associate these things before (Alonso & O'Neill, 2011; Farmers' Market America, 2008; Hunt, 2006). Many markets use dot surveys to collect visitor data, which is a simple method involving the use of posters and stick-on dots. Visitors use the stickers to indicate their answers to a series of close-ended survey questions displayed on the posters. The ease of this self-service process is appealing to markets but it can produce social desirability bias (Furnham, 1986; Kalton, 1983). When the survey is an open public process, respondents are more likely to alter their answer to avoid looking bad.

Overall, existing surveys differ in their respective areas of strength and weakness. Scholars paid close attention to scientific credibility but their research designs often lacked market context, while practitioners tailored their studies perfectly to the market but neglected fundamental social science research design principles that ensure valid and reliable data. This illustrates a fundamental conundrum of doing basic versus applied

research and by extension, of the methods for doing citizen science research that integrates basic and applied research objectives. Our objective was to integrate systematic rigor into the everyday activities of market managers because when consistent, their actions produce valuable data on farmers markets and their role within local communities, economies, and food systems. In terms of surveys, it means doing three things: (1) developing a sampling plan and implementation process, (2) documenting the research methods, and (3) collecting data through multiple instruments to diversify the activities and information.

The annual number of visitors at a farmers market is a key data point because the metric provides valuable information in itself and it is the baseline for other important calculations and analyses. By itself, the number of visits indicates the economic influence and community-building capacity of the market and when combined with other metrics, it measures the specific economic and social impacts. Many of the external and internal articles circumvented a formal visitor count process by conducting an impact analysis that used vendor surveys to ask respondents to estimate total sales and number of visitors per day (Econsult Corporation, 2007; Hughes et al., 2008). This proxy can reduce or eliminate the need to collect sales information directly from vendors or to conduct a formal visitor count but it is not reasonable to assume that the average market can perform the work associated with implementing an impact analysis.

Two articles (one external and one internal) did a formal visitor count and described their process. Sadler, Clark, and Gilliland (2013) placed two people at every market entrance and counted every visitor for the entire market time period. Counting every visitor for the entire market time period (e.g., 8am to 1pm, 4pm to 7pm, etc.) produces a precise number for the particular market day but if you do it once per market season, it does not capture variation. Visitor attendance varies by agricultural growing

seasons, holidays, and special events. Unfortunately, the article does not address this issue (i.e., how often they conducted the count throughout the season) and it does not identify the number of people necessary to do the counts or their affiliation with the market (e.g., market representative, volunteer, hired researcher, etc.).

"Tools for Rapid Market Assessments" is a detailed and practical manual for collecting data at the market (Lev, Brewer, & Stephenson, 2008a; Vancity Community Foundation, 2013). The instructions include step-by-step directions for counting visitors and describe best practices and common pitfalls. For example, it suggests staffing each entrance, having consistent counting periods, recording the date for each visitor count, avoiding double counts and children, and performing the count three times throughout the market season. Many external and internal articles state that they followed this method for counting the number of visitors so scholars and practitioners view it as an accurate and feasible counting method (Donovan & Kinney, 2016; Claire C Hinrichs & Lyson, 2007; Lev et al., 2008a; Stephenson, McCarthy, & Wolnik, 2011; Vancity Community Foundation, 2013).

The literature demonstrates that there is an essential need for a set of methods and tools that blend the empirical rigor of external articles with the market context from internal studies. Given the growth in the number of farmers markets, we need a framework that facilitates consistent data collection at markets throughout the United States. Essentially, we need to combine the best practices of external and internal research and use them to create a system where markets can collect and interpret data on themselves.

Citizen Science Research

Citizen science is a broad term that people use to describe a range of research-oriented activities. Fundamentally, it describes projects where scientists and members of the public interact to study communities and ecosystems through systematic processes that

produce reliable data on real world phenomena (Davies et al., 2016; McKinley et al., 2017; Riesch & Potter, 2014). The method is not new but it is gaining attention among scholars and practitioners as a strategy for integrating local knowledge into scientific investigations that evaluate complex problems (Chandler et al., 2017; Ottinger, 2010; Silvertown, 2009).

The research method developed through two simultaneous yet independent origins. In the US, Rick Bonney used "citizen science" to describe projects where scientists engage members of the public to implement a formal research project. Scientists mobilize members of the public to collect and classify observational data and they organize it into a large dataset. Participation is voluntary, but participants indirectly benefit by learning about the issue they are studying and the process for conducting a scientific investigation. In the UK, Alan Irwin used "scientific citizenship" to describe the need for opening up scientific research and politics to the public. Scientists collaborate with members of the public to formulate new knowledge that integrates local perspectives into investigations and to make informed decisions. Projects democratize science to help communities collect data and influence timely policy processes and decisions. Between the two perspectives, citizen science is a method for doing research in- and outside of traditional institutions and settings (Davies et al., 2016; Kullenberg & Kasperowski, 2016; Riesch & Potter, 2014).

Contemporary projects either follow one perspective or combine elements of both. On one hand, the flexibility means that the method fulfills various informational needs and outcomes and that the perspectives are mutually supportive, but on the other, the many different applications have created a nebulous understanding of the method itself and contention over its characteristics and utility (Davies et al., 2016; McKinley et al., 2017; Riesch & Potter, 2014). This section explains fundamental principles and key considerations of citizen science – it is a theoretical analysis of the research method. Since

the term is relatively vague and people can apply it in numerous ways, the discussion focuses on elements of the research methods that are necessary for using citizen science to study farmers markets. The following sections will demonstrate how I led the project team in developing, deploying, testing, integrating these concepts into F2F's research process and methods. My formal analysis of citizen science research principles occurred after the project team conceptualized F2F, but since we followed an inductive process to develop (1) data collection protocols that are sensitive to market perspectives and (2) an online software program that provides markets with the resources to collect data on their activities indefinitely, we unknowingly created a citizen science research program.

I developed this theoretical understanding of the method through a combination of peer review journals and professional publications. In summer 2017, I searched "citizen science research" and "citizen engaged studies" in Google Scholar and selected articles that evaluated studies from a variety of disciplines, such as social science, environmental science, biology, and computer science. The articles described fundamental principles and common issues, explained a specific project, or analyzed impacts of the research process and results within a project setting. The content was helpful for understanding how specific projects define and apply the method and their outcomes, but the articles did not evaluate citizen science as a method for social inquiry. Consequently, I did a follow-up search to identify articles that analyzed the theory of doing citizen science research and discussed fundamental principles for developing a research design. In spring 2018, I searched "citizen science research design" in Web of Science and out of 134 results, I identified an additional 21 articles that met my qualifications. Most of these articles evaluated citizen science as a method for monitoring ecosystems to study various environmental issues but the analyses are relevant for many research questions that invoke basic and applied research principles and outputs. I organized the articles from both searches into a database and coded them

according to the primary objective (i.e., evaluation, literature review, or model) and subject matter (environmental research, methods standards, program development, and information technology).

Pursuant to the two origins, projects either define citizen science as a method for engaging the public or for collaborating with the public. Projects that emphasize "engagement" typically enlist members of the public in collecting large quantities of data across a range of places/habitats and locations over long periods of time. The purpose is threefold: (1) obtain scientific information at resolutions that are unattainable by individual researchers or research teams, (2) analyze issues that span regional, national, and global scales, and (3) advance scientific knowledge and public education (Bonney et al., 2009). Scientists view public participants as effective and detailed sensors on aspects of their local community and environment (Lukyanenko, Parsons, & Wiersma, 2011). Consequently, scientists distinguish their projects from other participatory research methods by emphasizing public participation as a research design strategy (i.e., citizen science is not a type of participatory research) (Loss et al., 2015; Riesch & Potter, 2014; Sprinks, Wardlaw, Houghton, Bamford, & Morley, 2017).

As a strategy, there are three key features of "engagement" citizen science projects: (1) financial resources for personnel to manage activities and engage participants and for tools to implement the project with individuals that span large geographic regions, (2) reliable *and* practical methods and techniques for recruiting, training, and retaining volunteer participants and for gathering, storing, and communicating results, and (3) multi-disciplinary team that develops the project tools and manages various activities (McKinley et al., 2017). When reviewing fundamental principles for F2F, the second characteristic is particularly important because most participants do not have formal knowledge or

experience with scientific research projects. They participate because they have a personal interest in the issue and have desire to contribute and interact with initiatives that share their hobby (Hinckson et al., 2017). Thus, in order to engage members of the pubic, scientists must develop a research design that recognizes and accommodates their skill levels (Bonney et al., 2014; Cooper, Dickinson, Phillips, & Bonney, 2007; Lukyanenko et al., 2011; Riesch & Potter, 2014). This involves formulating research questions that scientists can answer through simple data collection and analysis procedures and developing protocols that guide participants through every activity (Riesch & Potter, 2014).

The purpose of the protocols is to generate useful data that scientists organize into a large dataset for analyzing general phenomena or patterns (Bonney et al., 2009; Dickinson, Bonney, Louv, & Fitzpatrick, 2012). The ability for participants to collect and submit accurate data depends on three things: (1) clear instructions for collecting data, (2) simple and logical forms for managing data, and (3) trainings to ensure participants understand how to use the instructions and submit their data. The instructions and forms should collect data that populates the database itself (i.e., data points) and that organizes it (i.e., information on participant attributes and location) (Loss et al., 2015; Newman, Graham, Crall, & Laituri, 2011). The objective is to standardize key functions and actions of the project so within the project, the findings are valid and reliable and outside of it, the data is comparable to projects that follow similar methods (Loss et al., 2015). When scientists develop these resources, they must consider how participants could integrate bias through over- or under-reporting and when they could be reluctant to submit data that does not match their expectations. In addition, throughout the project, they should evaluate (1) the protocols to ensure that participants are collecting data that addresses the research questions and measures the phenomena and (2) the database to identify systematic errors

in the data points and statistical analyses that are appropriate for the sample size and scope (Bonney et al., 2009; McKinley et al., 2017).

In contrast, projects that emphasize "collaboration" describe citizen science as a partnership between scientists and members of the public (Wiggins & Crowston, 2010). Many collaborative projects start at the community level to study real-world issues that have a direct and immediate local impact. Partnerships can take three forms: (1) members of the public formulate a scientific question and then contract with scientists to conduct the research, or vice versa; (2) members of the public work with scientists to jointly develop a project, or vice versa; and (3) members of the public pursue scientific research on their own to fulfill needs unmet by scientists (Aristeidou, Scanlon, & Sharples, 2017; McKinley et al., 2017; Shirk et al., 2012). The purpose is to align the research design and outcomes with community priorities, values, and norms, so projects are inherently place-based (Chandler et al., 2017).

As a research design strategy, members of the public are active participants in every aspect of the scientific process – they conceptualize research objectives, develop the research methods, collect and analyze data, and disseminate results (Chase & Levine, 2016; Pandya, 2012). Scientists have a supportive role – they participate in deliberative discussions about the research design and process, provide a systematic methodology for collecting and analyzing data, and help project leaders generate solutions within the context of their community (Chandler et al., 2017; Hinckson et al., 2017; Pandya, 2012). That is, regardless of who initiates the project, scientists complement the deep, local knowledge that members of the public have about the issue within their community by informing or co-managing the project. Compared to engagement projects, articles that describe collaborative projects do not explain their methods for conducting the scientific research

(i.e., collecting valid and reliable data) so it is difficult to identify key features of their protocols. However, Hinckson et. al. (2017) identify four principles for developing collaborative research methods:

- Feasibility — Standards and procedures for collecting evaluation data are practical and non-disruptive but also produce valuable findings.
- Accuracy — Instruments that produce valid and reliable results and are sensitive to change.
- Propriety — Standards and procedures for implementing the research project are ethical. Collaborative elements of the research process regard the rights and interests of everyone involved and in an engagement setting, this includes the human subjects components of collecting data and reporting findings.
- Utility — Capture data in ways that avoid complicated cleaning and displays data in ways that are easy for anyone to interpret.

Successful collaborative projects not only facilitate meaningful relationships among members of the community and scientist to address real-world issues but they also follow systematic data collection procedures, which is a necessary feature of engagement projects.

Thus, the term citizen science incorporates various levels of public engagement and/or collaboration, but engagement projects apply the US perspective of citizen science and collaborative projects either follow the UK perspective or integrate features from the two perspectives. Based on the discussion above, balancing scientific standards with practical applications is critical to the utility and viability of F2F and it requires a thorough understanding of the conditions that influence their everyday actions and needs. Obtaining

this knowledge means the project team must engage markets in the research process to develop protocols that anticipate collaborative applications of the toolkit.

When articles discuss the theory of doing citizen science research, the authors develop constructs that conceptualize the research process according to key features of existing projects. The frameworks describe the breath of citizen science by creating exhaustive and mutually exclusive categories that identify the various types of projects. The literature review revealed three types of frameworks: (1) public participation level (Conrad & Hilchey, 2011; Davies et al., 2016; Dickinson et al., 2012; Shirk et al., 2012), (2) issue being studied (Chase & Levine, 2016; Kullenberg & Kasperowski, 2016), and (3) primary project goal (Wiggins & Crowston, 2011). The classification systems provide insight into the various characteristics of citizen science projects and we can use them to guide how we design, develop, and implement future projects. Public participation is a key feature of engagement and collaboration because it determines who (i.e., scientists or members of the public) drives the research (i.e., how they develop the questions, design the methods, and implement the protocols).

The issue frameworks categorize citizen science projects according to the phenomena being studied or the discipline initiating the study and the articles provide background information about how scientists apply the method to different fields or disciplines. The goal framework evaluates the organizational and macrostructural factors that influence how scientists design and manage public participation and the framework groups projects into five distinct categories that have consistent characteristics. The categories include action, conservation, investigation, virtual, and education and the characteristics include scientific issues, organizational issues, and technology issues. On the surface, this is appealing because it integrates the impetus behind the research with the

public participation process, but it is problematic because it asks researchers to develop a project around one primary goal and citizen science projects inherently have multiple, mutually supportive goals (Wiggins & Crowston, 2011). Since the purpose of F2F is to empower farmers market managers through proven data collection strategies, actionable interpretation information, and customizable reports and to build a longitudinal panel database on farmers markets, the issue and goal frameworks are not relevant to F2F's research process and methods. Consequently, the following review focuses on the various functions and characteristics of different participation frameworks.

Within citizen science, the term "public participation" invokes two important characteristics of the research design and method: degree of public participation and quality of public participation. Degree is the extent to which individuals are involved in the research process and when developing the research design, it involves considering relationships between the duration, type, quantity, and intensity of public engagement and the potential outcomes. Quality is the social and interactional dimensions that affect project outcomes, such as trust, fairness, responsiveness, relevance, and agency (Shirk et al., 2012). Dickinson and Bonney (2012), Shirk et. al. (2012), and Conrad and Hilchey (2011) analyzed the degree and quality of public participation in existing projects and each developed a linear framework to describe the various levels. The frameworks start with top-down engagement, move towards combinations of engagement and collaboration, and end with bottom-up collaboration. Their objective is to demonstrate how characteristics of public participation affect project outcomes and how the framework categories can inform research design choices.

The authors asked slightly different questions to develop their framework but their analyses yield similar results. More specifically, Dickinson and Bonney (2012) evaluate the

amount of control that participants have over the project steps and activities or in other words, what are the power dynamics between scientist and members of the public (Conrad & Hilchey, 2011). They analyzed existing public participation strategies and organized the various scientific methods into categories that describe how scientists use the method to reach new, large segments of the public.

- Contributory — Scientists develop project objectives and protocols and members of the public contribute data by following their instructions.
- Collaborative — Scientists lead the project and members of the public help design the research objectives, develop the data protocols, analyze data, and disseminate findings.
- Co-created — Scientists and members of the public actively work together to develop the project objectives and activities throughout the scientific process.

Shirk et. al. (2012) ask whose interests are being served to describe programmatic differences between projects:

- Contributory — Scientists design the projects and ask members of the public to contribute data.
- Contractual — Members of the public ask scientists to conduct a specific scientific investigation and write a report.

- Collaborative — Scientists develop the projects and members of the public help design the research objectives, develop the data protocols, analyze data, and disseminate findings.
- Co-created — Scientists and members of the public actively work together to develop the project objectives and activities throughout the scientific process. Level of public participation can vary among the participants and throughout the research process.
- Collegial — Members of the public conduct independent research and scientists may use the data for their own research purposes.

The contributory and contractual categories describe similar types of engagement (i.e., arm's length interactions) but they differ in the type of person initiating the relationship. In the article, Shirk et. al. list contractual as the first category and contributory as the second but given the minor differences in the framework categories and the general characteristics of engagement and collaborative projects, I modified their order for this comparison.

Conrad and Hilchey (2011) evaluate the internal and external values embedded within relationships between scientists and members of the public and their categories focus on how the two parties interact with each other:

- Consultive / functional — Scientists or a central agency asks for public input to increase their understanding of an issue or to help them make a decision.
- Collaborative — Scientists engage a board or group that represents the range of perspectives within the community in the project.

- Transformative Members of the public organize to address an emergent issue, and they may engage scientists in the research project but it is not a necessary condition. Here, the group sets an agenda and if they engage scientists in the research project, the scientists play an advisory role.

Table one illustrates how the frameworks overlap.

Table 1. Public Participation Frameworks

	Dickinson & Bonney	**Shirk et. al.**	**Conrad & Hilchey**
Engagement	Contributory	Contributory Contractual	Consultive/functional
	Collaborative	Collaborative	Collaborative
	Co-created	Co-created	
Collaboration		Collegial	Transformative

Despite the similar definitions and frameworks of citizen science, the authors do not articulate or argue for a common set of measures or protocols to guide projects. This is because citizen science is an appropriate method for evaluating a range of issues in various disciplines, and consequently, scientists and members of the public must develop the project to satisfy their unique needs and to follow appropriate scientific standards. As a result, in real life, the citizen science projects are much less categorical. One project can assume different participation levels and participant roles at different points in time and people can engage in the projects at different levels at any point in time. Given this flexibility, authors focus on identifying universal limitations and benefits of the method.

The primary limitation with all citizen science projects is the quality and reliability of data collected by members of the public. The scientific community assumes there is a trade-off between data quality and public participation (Lukyanenko et al., 2011) and questions the ability of public participants to perform project activities (Wiggins &

Crowston, 2010). As described above, many of the "engagement" citizen science projects argued that scientists can proactively address this limitation by designing public participation processes to accommodate their skill and interest levels, by developing protocols to standardize key functions and to guide participants through every activity, by integrating activities where participants verify and clean their data entries, and by cross-checking their data with existing information (Bonney et al., 2009, 2014; Loss et al., 2015; Riesch & Potter, 2014; Wiggins & Crowston, 2010, 2010). The participant activities and cross-checks involve quality assurance measures like bias analyses, random observation validation, inter-observer reliability, etc. Furthermore, scientists that manage existing projects identify a mismatch between the capacity of scientists and the availability of public participants, which means that the number of volunteers and their needs may be greater than the available staff time or that the number of volunteers and their locations may be insufficient to appropriately analyze the issue (Wiggins & Crowston, 2010).

The primary benefit of citizen science research methods is the capacity to increase understanding about issues or phenomena that have local, regional, and global affects (Loss et al., 2015). From a methodological perspective, this is possible because the projects integrate local perspectives and knowledge into scientific studies and conclusions and they facilitate public education and local action (Ellwood et al., 2017). Thus, building the capacity of citizen science involves creating practical tools for collecting, entering, and analyzing data and integrating professional development opportunities for participants within the project objectives and activities. The software programs that facilitate citizen science projects have a fundamental role in this process (Bonney et al., 2014).

Thus, given the methodological and data issues with existing farmers market research described above, citizen science is a valuable approach for addressing knowledge

gaps and supporting local decision-making within farmers markets. The following discussion explains fundamental features of citizen science that are embedded within the process of designing the F2F project and developing the data collection protocols.

Methods

F2F was developed through a three-year pilot project that was primarily funded by the USDA Agriculture and Food Research Initiative (AFRI) (2014-68006-21857). The project involved a partnership among Dr. Alfonso Morales (principal investigator) and myself (initially project research assistant and promoted to co-principal investigator) at the University of Wisconsin-Madison (UW), the Farmers Market Coalition (FMC), and 14 markets in three regions of the United States (Northeast, Southern, and North Central). Each market was affiliated with one of two contracts: the AFRI grant or a partnership with the Wisconsin Economic Development Corporation (WEDC). Each partner provided distinct knowledge and experience with social science research and farmers markets.

Morales and I have backgrounds in sociology, law, and urban planning; the purposes of these disciplines balance basic and applied research by analyzing the processes that relate individual and collective behaviors with social, political, and economic organizations. As the research partner, we used our experience with inductive and ethnographic research methods to ensure that materials maintained social science validity and reliability standards. FMC is a non-profit organization dedicated to strengthening farmers markets throughout the US. It accomplishes this by providing education and networking opportunities, promoting farmers markets in communities, and advocating for supportive federal policies.

The pilot markets represented different cases of farmers markets and different relationships for citizen science research. Cases varied between small, medium, or large size; rural or urban community; public, non-profit, or private business incorporation; low, medium, or high operation capacity; and independent organization or network affiliation, so each participant was an essential component of the research design strategy. Relationships

were either direct between the researchers and the market (AFRI) or indirect from the researchers to an organization that supports many markets in a geographical region (WEDC).

More specifically, the nine AFRI pilot markets were located in Crossroads, MD, Spotsylvania, VA, Williamsburg, VA, Ruston LA, Oxford, MS, Hernando MS, Athens, OH, Chillicothe, OH, Williamson WV, and the five WEDC pilot markets were affiliated with the Wisconsin Main Street Program for the following cities Viroqua, Fond du Lac, Beloit, Monroe, and Green Bay. Table two identifies the characteristics of each pilot market.

Table 2. Pilot Market Characteristics

	Size	**Community**	**Incorporation**	**Capacity**	**Affiliation**
Crossroads	Small	Urban	Non-profit	High	Independent
Spotsylvania	Medium	Urban	Non-profit	Medium	Independent
Williamsburg	Medium	Rural	Non-profit	High	Independent
Ruston	Small	Rural	Non-profit	Medium	Independent
Oxford	Small	Rural	Public	Low	Independent
Hernando	Large	Rural	Public	Medium	Independent
Athens	Small	Rural	Public	Low	Independent
Chillicothe	Medium	Rural	Non-profit	Low	Independent
Williamson	Small	Rural	Public	Medium	Independent
Viroqua	Small	Rural	Non-profit	Medium	Network
Fond du Lac	Medium	Rural	Non-profit	High	Network
Beloit	Large	Rural	Non-profit	High	Network
Monroe	Medium	Rural	Non-profit	Medium	Network
Green Bay	Small	Urban	Non-profit	Medium	Network

Morales, FMC, and I managed the project by coordinating activities with the pilot markets, developing research materials, analyzing the results, and creating the toolkit. The pilot markets participated by testing the research materials and providing feedback, which ensured the data collection materials understood their unique characteristics and contexts. The process balanced two worlds: research and practice. As research, F2F is a means to develop a longitudinal panel database on farmers markets through citizen science research methods, and as practice, it is a means to empower farmers markets around collecting and communicating data. In particular, the activities fostered engagement between the scientists (i.e., Morales, FMC, and I) and the participants (i.e., pilot markets). For the scientists, the purpose was to learn about the unique contexts of farmers markets, the job responsibilities of managers and board members, and the role of data collection within the various contexts and responsibilities, and for the participants, the purpose was to increase their understanding about the scientific standards associated with specific data collection methods and procedures.

The AFRI markets participated in an annual in-person meeting where the markets shared their past experiences with data collection and evaluated their strengths and weaknesses with running the market. We provided general trainings that described the general purpose and applications of collecting data (i.e., understanding key market functions and communicating market benefits) and targeted trainings that explained the scientific standards embedded within Farm 2 Facts and the step-by-step processes for collecting data. We also held a monthly conference call where markets discussed their experiences with F2F. In both cases, the markets learned from each other and from Morales, FMC, and I. In comparison, the WEDC markets had less in-person support from us because we only had the financial resources to offer a monthly conference call.

In year 1, we identified the metrics that are relevant to managers and the existing methods for collecting data at farmers markets. The project team reviewed over 60 external and internal studies and created a table that listed the metric, the type of author (i.e., academic, government, or market organization), and the data collection method. Morales, FMC, and I discussed the merit of each metric and the corresponding data collection method – that is, our conversations addressed how markets could use each data point to understand their daily operations and community-economic impacts, how markets would realistically collect valid data for each metric, and how each data point and method connects with USDA outcome indicators and measurement requirements. We eliminated metrics that prioritized academic interests and required resources to collect and analyze the data. The pilot markets reviewed the list of potential metrics (it did not list the author or data collection method) and identified the data points that correspond with their activities and goals and that provide interesting information, and based on this feedback, the project team identified 37 metrics and I operationalized them into 10 data collection instruments.

The metrics address various topics associated with business development, community development, food assistance, land use, and transportation. A successful method produces relevant and reliable information and involves an instrument that markets can realistically implement on a regular basis. Once I identified a list of viable methods and instruments, I coded the metrics by answering who is the subject and what evidence and periodicity does the metric measure (i.e., is the information constant throughout the market season or does it change). I grouped metrics with the same answers to both questions and identified the appropriate method and instrument. Table three identifies the three methods and ten instruments within F2F.

Table 3. Farm 2 Facts Methods and Instruments

Observation	Survey	Operations Research
Visitor Count	Vendor Sales Slip	Central Terminal Sales
Market Programs	Visitor Survey	Central Terminal Tokens
		Market Profile
		Vendor Application
		Vendor Attendance
		Volunteers

I integrated the same research design principles into the instruments by identifying the minimum collection period for each metric (i.e., daily, monthly, annual), classifying the daily and monthly metrics as a population or sample data point, and developing the instruments accordingly. For example, the metrics that collect descriptive information about vendors (e.g., number of acres in agricultural production, organic certification, amount of farming experience, etc.) is constant throughout the market season and the vendor application is an annual form so it is an appropriate strategy to collect some vendor data. In contrast, sales data varies every market day so it is necessary to collect the information from vendors and the market's central terminal on a daily basis.

The Visitor Count and Visitor Survey instruments collect sample data because most markets need to recruit additional assistance to implement the instrument and they are more likely to obtain volunteers three or four market days – opposed to every market day. These instruments use one sample interval to obtain consistent measurements and to enable more complex analyses within the database and it has four observations with specific criteria: the third market day, the third to last market day, a peak market day, and an average market day. Our goal was to change how markets perceived data and we did it by reframing data collection as part of their regular activities and emphasizing an operational view rather than extracurricular. The data collection package (described

below) provides the instructions for implementing each instrument and they describe when and how markets perform the actions associated with each instrument.

In year 2, Morales and I worked with a web developer (UW Teaching & Research Application Development (TRAD) to create an online portal for entering and analyzing data and the managers used the project materials to collect data at their market and provided feedback throughout the market season during monthly conference calls and surveys, one-on-one e-mails or calls, and site visits. Their comments described how they understood the data collection instructions, how they used the instructions, what were the challenges associated with each instrument, and how they used the metric data to inform their decision-making, promote their market, and write grant applications and reports. I organized this feedback into a spreadsheet that recorded their comment and coded it by the metric, method, and instrument and that evaluated the potential solutions for the metric list and the data collection processes. Overall, I evaluated this information to understand how markets understood the processes of selecting metrics, collecting data, and communicating findings and how they actually use project materials to perform those actions. The project team refined the list of metrics and revised the instrument instructions and worksheets to better accommodate the everyday realities of farmers markets, which increases the usability of F2F for managers and in turn, improves the quality of the data for scientists and members of the public.

For example, I studied how the managers completed the paper worksheets and entered data into the online portal. This process was particularly important for understanding how each market understood and used the Vendor Sales Slips. With some markets, the Vendor Sales Slip worksheets matched the data in the online portal – that is, each worksheet corresponded with a row of data and the numbers were identical in both

locations. With other markets, I could roughly connect a worksheet to a row of data but the numbers on the worksheet did not always match the data in the portal. In the latter situations, I talked with the market about how they interpreted the Vendor Sales Slip, how they instructed their vendors to fill out the worksheet, and how they entered data from the worksheet into the portal.

Initially, we asked vendors to provide their total gross sales and the sales for three product categories: farm products, value-added, and prepared food, and we expected the total product category sales to equal the total gross sales (i.e., farm product + value-added + prepared food = total gross sales). However, some of the markets and their vendors provided either total gross sales or the product category sales data, and others provided gross and product category sales data but the product category sales did not equal the gross sales. Markets said the four sales questions were too general and expressed the need for more specific questions about the sales per payment method. From their perspective, most vendors keep sales records about each payment method so it would be easier for them to provide more specific sales data – opposed to one total number, and we extended this logic to the product category sections. As a result, we changed the Vendor Sales slip to collect data on cash, credit/debit, SNAP, WIC FMNP, WIC CVV, Senior FMNP, and community voucher payment methods and on fruits & vegetables, meat & seafood, dairy, eggs, nuts & legumes, plants & flowers, value-added, prepared food, craft/art/services, and retail/storefront product categories.

In year 3, Morales, FMC, and I repeated the testing, evaluation, and refinement processes with the markets and expanded the portal to include more aspects of the research project. During year 2, I manually cleaned and analyzed the data for every market but I integrated those activities into the portal because of time and scale. That is, once markets

enter data, they could review it and fix any typos on their own and they can download a CSV file of the updated spreadsheet. The portal automatically analyzes the raw data into the metric points and displays them as tableau style graphics and promotional infographics, which they can integrate into reports to board members, partners, and stakeholders or use as standalone print and social media advertisements.

This web development work evolved over four years. It was an iterative process where we built a function (i.e., select metrics, download documents, enter data, analyze data, and generate reports), tested the software for accuracy and usability, and updated it according to customer feedback. Currently, F2F allows markets to collect data on up to 25 different metrics and the portal analyzes the data into over 200 data points that are relevant to markets and researchers (see appendix one for the full list of metrics and data points).

After the grant period, Morales and I transformed the grant funded project into a fee for service program, which moved the citizen science from scientist-driven engagement to participant-focused collaboration. Compared to the pilot markets, the fee for service users partner with F2F to evaluate aspects of their market that are important to them and F2F simply provides the resources to collect, analyze, and report data. They contract with F2F to access the online portal, which provides all of the standards and procedures for collecting, analyzing, and reporting data, and they conduct the research at their market. More specifically, it guides them through the processes of selecting metrics to inform their business operations and measure progress towards their goals, collecting data through systematic procedures to collect valid and reliable information, and communicating their findings to partners, stakeholders, and community members. They have complete ownership over their partnership with F2F because they formulate their research

questions, align the findings with their priorities and needs, and generate solutions within the context of their market and community.

Transitioning from engagement to collaboration required increasing participation from the 14 pilot markets to approximately 20 proof of concept markets to a national audience. We accomplished it by creating a website that explains how F2F works and who it is for and that executes online payments and contracts and by selling the program to farmers markets through an e-mail marketing campaign. The marketing campaign solicited farmers markets throughout the country at two times of the year: (1) when they are preparing to for their primary market season and (2) when the USDA announces Farmers Market and Local Foods Promotion Program, Food Insecurity Nutrition Incentive, and Community Food Projects grants. The former targets markets who recognize the need for data but do not necessarily understand the importance of data and markets who understand the importance of data but do not know about F2F. The latter solicits markets that are applying for a USDA grant and need to systematically evaluate their grant activities. In both cases, the e-mails promote F2F as a tool that first and foremost, serves their needs by empowering them to understand their business operations and community impacts through data.

In summary, our innovation is threefold: First, operationalizing discrete metrics according to how they interact with the market environment and how they relate to each other. The process ensured that each instrument collects data on as many metrics as appropriate, the instruments apply the same research design principles, and markets view the instruments as a cohesive set. As a result, we can relate and analyze data across the various instruments. Second, designing a research program that begins with descriptive data and that evolves into baseline numbers for more inferential statistics, analyses, and

applications, and third, increasing the scale of the grant project to a fee for service program that is available to every market in the US and Canada. Historically, farmers market research has been descriptive and over time, people have used the descriptive information to advance prescriptive objectives. F2F enhances the descriptive and prescriptive applications because any market can use the program to collect, analyze, and report data on their activities and the portal organizes the data into a longitudinal panel database that will enable inferential statistics.

Results

This section describes F2F's definition of the three research methods (i.e., observation, survey, and operations research) and by extension, it identifies the scientific principles embedded within each instrument. Since the primary user does not have any formal experience with social science research, it was necessary to minimize the amount of scientific jargon within the toolkit protocols – specifically, the instructions and worksheets that they use to collect data on their activities/at their markets. We translated the scientific descriptions of research methods into language that is familiar to the average market manager and I integrated those descriptions into the following explanations of observation, survey, and operations research. In general, observation refers to the process of monitoring ongoing behavior and they are specific to the project objectives, research questions, and physical conditions. Here, we designed the observational instruments (i.e., visitor count and market programs) according to the metric and the activities associated with the phenomena that the metric is measuring.

Surveys are the primary method for collecting data at farmers markets because it is easy to adapt the instrument for the audience and environment. External studies evaluate either the manager, vendors, and visitors at a single market or the managers from a random and representative national sample and their objective is to measure social, economic, and health impacts. When markets conduct a survey, they typically assess vendors and visitors in order to inform decision-making, project partners, and stakeholders (practitioners) (Jeong & Morales, 2015). The length, format, and frequency of surveys varies according to the respondent (i.e., manager, vendor, or visitor), the market under review, and the entity that is conducting the study. These differences reflect the diverse nature of farmers markets throughout the US as well as the complex environment within a market. Since

F2F's objective is to develop a toolkit that any market can use to generate meaningful information about their roles, responsibilities, and activities, the design is particularly important because it determines the data's relevance and imposes limitations on future stages and analyses. F2F has three survey respondents (i.e., markets, vendors, and visitors) so we designed separate instrument for each group. Each instrument integrates fundamental survey and sampling principles into the particular constraints of the respondent.

Operations research refers to the application of analytical methods for improving decision-making. It is common in computer science and management fields because it involves constructing mathematical models that describe the system or entity. However, in F2F, operations research refers to collecting data on the processes and actions that the market organization performs to accomplish their objectives (i.e., how they conduct everyday activities and implement special programs). From a scientific perspective, the procedures and spreadsheets that markets use to organize and manage their responsibilities are data that can measure their performance, relationships, and impacts. The observation research instruments provide step-by-step instructions for performing specific activities and worksheets for tracking them, and consequently, it turns their everyday activities into systematic and consistent data collection processes. The protocols balance scientific standards for quality data and practical limitations of real-world research environments by standardizing specific market functions and following fundamental market norms. Thus, from a market perspective, the instrument instructions and worksheets become standard operating procedures that make their daily work more efficient and effective. Collecting, analyzing, and reporting the data becomes an inherent component of their responsibilities.

Markets interact with these methods through the research instruments. The following sub-sections describe how each instrument collects and records data on the corresponding metrics.

Market Profile

People collect data on the market entities through national surveys. The surveys have two characteristics: population or sample baseline and national or regional geography, which create four types of surveys: (1) population baseline and national geography, (2) population baseline and regional geography, (3) sample baseline and national geography, and (4) sample baseline and regional geography. These surveys are relatively inconsistent in terms of the questions and frequency so we do not have a good idea about the fundamental characteristics of farmers market entities. In F2F, the purpose of the Market Profile is to capture a comprehensive set of information categorized by the various characteristics of markets into four topics: summary, management, vendors, accessibility, and community, and markets update their profile every year. Table four describes the questions associated with each topic.

Table 4. Market Profile Sections and Questions

Section	Question
Summary	The market location, hours, incorporation status, mission statement, and decision-making structure.
Management	The types, hours, and duties of paid and unpaid staff positions and the annual operating budget.
Vendors	The type and amount of vendor fees and the sales tax rate for non-exempt products.
Accessibility	The amenities (e.g., restrooms, storage, electricity, infrastructure, parking, etc.) and services (e.g., youth activities, live music, demonstrations, etc.) and the food assistance programs (i.e., SNAP, WIC FMNP, Senior FMNP, and WIC CVV).
Community	The board or steering committee, partner organizations, communication methods, and reporting methods.

Markets complete the Profile when they sign up for F2F and they update it every market season. Beyond the survey, it is a fundamental aspect of the research design because when markets complete a Profile for each season, day, or location, it becomes the basis for how markets enter data into the portal and is the key parameter for organizing the longitudinal panel database. For example, a market is open in a commuter lot on Wednesday and in a neighborhood business district on Saturday during the summer season. They fill out a Profile for both days/locations and they enter the data into the corresponding Profile. The portal facilitates this by automatically naming every Profile as the "market name – year – day – location" to create an intuitive way to manage their data.

Compared to existing surveys, the Profile only captures data from markets that self-select to participate in F2F. We can use the data to analyze changes within an individual market over time but there are limitations to comparing multiple markets. As markets join F2F, it is possible to develop a sample size that is representative of national or regional areas and if so, we can evaluate the national and regional characteristics of farmers markets and the extent to which an individual market is representative of national and regional conditions.

Vendor Application

Most farmers markets ask vendors to complete an application before they join. Since the form is similar to a typical survey, it is an opportunity to collect data from the vendors that is constant for the entire market season without imposing a separate pre- or post-season survey. It is a distinct operations research method because the vendors must complete the form in order to sell their products at the market, but given the underlying nature of the questions, it also gives markets the flexibility to implement it anytime during

the season. Table five lists the metrics and questions in the order that they appear on the vendor application.

Table 5. Vendor Application Metrics and Questions

Id	Metric	Survey Question
3	Average distance in miles traveled from product origin to market	Please provide up to three physical addresses for your business' primary point(s) of production. No P.O. Boxes. Primary production location Secondary production location Third production location
4	Total cultivated and grazed acres by market vendors	Use the table below to report your farm acreage information. Write "N/A" if not a *non-agricultural enterprise. Owned (current) Leased (current) Cultivated (anticipated) Grazed (anticipated) * Non-farm enterprises are businesses not involved I the production of raw agricultural products as their primary enterprise, but who are actively involved and invested in the processing of value-added foods, baked goods, or hot foods and are selling at the market.
	Clarifying question for all markets and for all vendor applications.	Identify the products that you will sell or the services that you will provide at this market in the upcoming season. Circle all that apply. Fruits & vegetables Meat & seafood Dairy Eggs Nuts & legumes Plants & flowers **Value-added ***Prepared food Crafts/art/services Retail (storefront) Information Sponsor * Value-added refers to products with two characteristics (1) The farmers make the foods from raw ingredients and primarily, from ingredients that they plant, grow or care for, and harvest. (2) They process the foods through baking, cooking, canning, drying, fermenting, preserving,

		or spinning techniques (e.g., baked goods, cheese, jams, dried fruit, viticulture, pickles, wool yarn, etc.) * Prepared food refers to products that agriculture or non-agriculture businesses make from ingredients that they primarily purchase. They made the food at the market for immediate consumption (e.g., sandwiches, brewed coffee, etc.).
22	Number of farm vendors with organic certification (or in 3-year transition) selling at market	Circle any certifications that your business presently holds (or in 3-year transition): Certified Organic Certified Naturally Grown Certified Biodynamic Food Alliance Certified Other certification No certifications
21	Average years in the farming industry per vendor	Think about all individuals chiefly responsible for day-to-day decisions in your farm business, including yourself. As of the most recently completed calendar year, for how many years have these owner/operators been farming? Respond for all chief owners/operators as applicable. Write "N/A" if non-agricultural enterprise. Owner 1: Owner 2: Identify the number of owners in your business. Ownership refers to the equity, interest, or stock of the business.
18	Total number of women-owned businesses selling at the market	What percentage of your business is women-owned?
19	Total number of socially disadvantaged vendors selling at market (USDA definition)	What percentage of your business is owned by: White Hispanic or Latino Black or African American American Indian or Alaska Native Asian or Asian American Native Hawaiian or other Pacific Islander Two or more Prefer not to answer
20	Percentage of vendors at market who are < 35 years old	How many owners are younger than 35 years of age as of the most recently completed calendar year?
17	Number of individuals employed by market businesses (estimated)	Including yourself, how many people worked for your business either seasonally or year-round in the most recently completed calendar year? Include family workers (paid and unpaid), hired production, market, or

		office workers, contract or custom hire labor, and paid interns or apprentices. If zero, please enter "0." Seasonal (worked 149 days or less): Year-round (worked 150 days or more): Do you anticipate fewer, the same, or more workers devoted to production and marketing for this market in 2015? *(Please circle one)*: Less Same More
23	Total number of different food products available for sale	Help us understand the variety of produce available at the market by completing the checklist on the next page. (See appendix 2 for the Produce Checklist)

Visitor Count

There are two strategies to counting the number of visitors at farmers markets: walking through the market to count the visitors inside and standing outside the market to count the visitors as they enter. The fundamental difference between counting visitors *in* the market or *entering* the market relates to tracking trends in visitor attendance versus estimating the number of visitors. The markets perform the first strategy on a sample basis and the second strategy on either a population or sample basis. Here, the population and sample references are loose definitions of the scientific terms; 'population' refers to counting everyone that enters the market on a given day and 'sample' refers to counting every adult that is in or enters the market at specific times throughout the day. From a social science perspective, population data is more accurate than sample data but from a market perspective, population counting requires more labor because the volunteers work for the entire market day – opposed to intervals throughout the day.

Most markets have severe resource constraints (i.e., personnel, time, and money) so they do not have the necessary capacity to build a dedicated volunteer basis. However, since a sample count can accurately estimate the number of daily visits (Stephenson et al., 2011), it is a practical strategy for any market that would like to collect data and it is more

appropriate for this project. The Rapid Market Assessment (RMA) protocol recommends that markets count all of the adults that enter the market during a ten- or 20-minute period for each hour that the market is open and provides equations to estimate the total number of visits on that day (Lev, Brewer, & Stephenson, 2008b). The counting time captures fluctuations in market attendance throughout the day and increases the sample size.

Visitor Survey

When developing a Visitor Survey that is appropriate for markets and avoided the issues described above, we loosely modified the probability strategy to develop an instrument that generates reliable data and produces meaningful conclusions about farmers markets. Here, systematic sampling uses the number of vendors as the sampling frame and calculates the minimum sample size and the selection interval. The minimum sample size is the product of a probability-based sample size calculation and the selection interval is the sample frame divided by the minimum sample size (Kalton, 1983). We identified this approach from Market Umbrella's SEED but we modified it in two important ways: First, we lowered the confidence interval and increased the margin of error in order to reflect the environment of farmers markets and the characteristics of the visitors. More specifically, people willingly attend markets so it is reasonable to believe that the target population and the survey population have similar views about farmers markets, and therefore, the sample size calculation can have a large response distribution.

Second, we set number of vendors as the sampling frame. SEED uses the average number of visitors per day (Market Umbrella, 2011), but people attend markets for a variety of reasons and sometimes it does not relate to the market at all. In contrast, vendors establish a formal relationship with the market, which gives them agency, and consequently, it is easier to understand actions and impacts by their relationship to the

market and visitors. Furthermore, most markets record the total number of vendors for the market season and for each market day so the distribution is more reliable. Oregon State University developed market size categories from their RMA studies and we slightly adjusted the ranges for the number of vendors to accommodate larger farmers markets (Stephenson, Lev, & Brewer, 2007). Table six identifies the sampling frame, the minimum sample size, and the selection interval for micro, small, medium, and large markets.

Table 6. Visitor Survey Sampling Information according to Market Size

	Number of vendors	Minimum sample size	Selection interval
Micro	5-9	34	4
Small	10-29	38	8
Medium	30-59	42	24
Large	60+	43	58

Table seven identifies the visitor survey metrics and the corresponding question(s). The table lists the metrics and questions in the order that they appear on the visitor survey.

Table 7. Visitor Survey Metrics and Questions

Id	Metric	Survey Question
14	Percentage of visitors walking, bicycling, carpooling, ridesharing, or taking public transportation to the market (estimated)	How did you arrive at the market today? Walking Biking Personal vehicle Carpooling Taxi or hired driver Rideshare program (contracted) Public transportation (bus, subway, etc.) Other
11	Percent of customers who were first time visitors (estimated)	(A) Is this your first time visiting the market? Yes / No (B) In general, how frequently do you visit the market?

		Every week Every other week Once a month Less than once a month
12	Average dollars spent per visitor per visit (estimated)	How much money have you spent or do you plan to spend at the market today? Money = cash, credit/debit, SNAP, WIC FMNP, Senior FMNP , and WIC CVV. $ _____
13	Average dollars spent at neighboring businesses by visitors (estimated)	(A) Did you or do you plan on doing additional shopping, eating, or other activities in this neighborhood/area today? Yes / No (B) How much money have you spent or do you plan to spend in the neighborhood/area today? $ _____
15	Percentage of visitors from represented zip codes (estimated)	What is your home Zip code?

Central Terminal Sales, Central Terminal Tokens, & Vendor Sales Slip

Sales information is arguably the most important yet difficult data to collect at farmers markets because the activity is dynamic and complex within a market and throughout the US (Low et al., 2015). The variation is the result of two factors: First, both the vendors and the market can, and in several cases, accept non-cash payment methods, which means that it is necessary to understand how the two entities work together to efficiently process and manage the transactions for their customers. These idiosyncrasies relate to the characteristics of each payment method. Second, collecting vendor sales data is particularly difficult because it is sensitive information and vendors are often reluctant to share their daily earnings with the market. Some markets have overcome this barrier and require the vendors to report their sales information at the end of every market day. As a

result, in order to capture this vital information, it is necessary to develop a survey instrument that not only protects vendor information and builds trust between vendors and data collectors (Otto & Varner, 2005) but also accommodates confidential and open data collection procedures.

As a result, I explain the Central Terminal Sales, Central Terminal Tokens, and Vendor Sales Slip instruments by (1) describing the important details of the payment methods and their implications for processing and managing sales data and (2) explaining how those conditions affect data collection and analysis procedures.

Payment Method

At farmers markets, payment methods include: cash, credit/debit, SNAP Electronic Benefit Transfer (EBT), WIC FMNP, Senior FMNP, WIC CVV, community voucher programs, and farmers market incentive programs. We define the various payment methods as 'primary' and 'incentive' for the markets in their data collection instructions. 'Primary payment' refers to the method that a customer uses to complete a transaction with the market or a vendor and an 'incentive payment' refers to the additional money that a customer receives when they use a particular primary payment. For the purposes of this discussion, I grouped the methods into four categories that reflect the money's format: cash, electronic card (i.e., credit/debit and SNAP), paper voucher (i.e., WIC FMNP, Senior FMNP, WIC CVV, community voucher programs), and incentive money (i.e., farmers market incentive programs).

Historically, markets have been a cash-only environment so it is the dominant payment method but given the advances in wireless technology and POS machines, electronic cards are becoming more common. From an operational/operations perspective, credit/debit and SNAP payments function in a similar manner because they use similar

technology to process the transaction but their presence at farmers markets differs. According to the *Nutrition Assistance at Farmers Markets* study by the USDA Food and Nutrition Services (FNS), 60 percent of the vendor respondents and 18 percent of the farmers market respondents accepted credit/debit cards. In contrast, markets are more likely than vendors to accept SNAP because the authorization to purchase an EBT machine and to process the transactions involves time, money, and training (Dixit-Joshi, Burke, Das, & Steketee, 2013). Vendors become a SNAP-authorized entity under two circumstances: (1) the market does not have an EBT machine at their central terminal and (2) they want the ability to process the SNAP transactions directly with the customer, even if the market is an authorized entity.

Farmers markets process two types of paper vouchers: (1) FMNP and CVV benefits and (2) community programs that promote farmers markets (e.g., prescription vegetables, farm fresh vouchers, etc.). Compared to SNAP, FMNP and CVV authorization requires less resources to accept the payment method so vendors are generally the approved entity to process the transactions. However, given the variation among farmers markets, we cannot assume that this general practice is true in every situation so the Central Terminal Sales and Central Terminal Tokens instruments include them as primary payment methods. Communities develop their own voucher programs from grant or stakeholder funds and the vouchers are an informal payment method that are only valid at participating farmers markets. A local business gives the vouchers to their customers and they redeem the voucher at the farmers market either through the market or the vendor to purchase products. Markets exchange the vouchers for tokens that the customer then uses as cash with the vendors, while vendors process the vouchers like cash.

Incentive payment methods refer to additional money that a customer receives when they use a particular primary payment method. Similar to the community voucher programs, communities develop the programs from grant or stakeholder funds but it differs because (1) customers can only receive the informal money from the market and (2) the program is generally tied to SNAP (i.e., SNAP customers are only eligible for the incentive funds). Customers initiate a primary SNAP payment through the central terminal and the market gives them extra tokens to spend as cash with the vendors.

Data Collection Procedures

Customers can initiate non-cash sales through the market or a vendor. Market transactions occur at their booth and they generally accept the payment methods that require specific technology and training because it eliminates the need for vendors to invest resources in order to capture the sales. Markets refer to these transactions as 'central terminal sales.' The market processes the transaction for a specific dollar amount and gives the customer tokens to use as cash with the vendors. Customers can spend all or a portion of their tokens on a given market day. At the end of the market day, the market reimburses vendors for the amount of tokens that they accepted from customers.

Markets report the central terminal sales in two different ways: the amount of money or benefits *redeemed* from the customer and the amount of cash *reimbursed* to the vendors for accepting tokens. The difference between redeemed and reimbursed is subtle but the meanings affect how we collect the sales data and how we calculate total market sales. Markets generally record the redeemed amount when they process the customer's transaction and the reimbursed amount at the end of the market day. According to the *Farmers Market Incentive Provider Study*, the reimbursed amount underestimates the amount of SNAP benefits deducted from EBT cards at farmers markets because customers

do not always spend all of their tokens. Consequently, FNS prefers that markets record and report the redeemed amount because it is comparable to their data (King, Dixit-Joshi, MacAllum, Steketee, & Leard, 2014). However, markets use the reimbursed amount as part of their accounting process. As a result, the Central Terminal Sales instrument collects data on the amount of money redeemed from the customer's electronic card or paper voucher and if applicable, the market's incentive program, and the Central Terminal Tokens instrument collects data on the amount of money spent with the vendors.

Markets collect vendor sales data through a confidential process or by integrating the survey questions into their existing sales reporting procedures. In both cases, the markets collect sales data from each vendor on every market day but the confidential process allows vendors to return the slip in three different ways:

1) All vendors complete and return the slip at the end of the market day,
2) All vendors complete and return the slip on the following market day, or
3) Some vendors return the slip at the end of the market day and others return it on the following market day.

This flexibility maintains the scientific credibility of a panel study but the different actions affect how you can analyze the data to accurately calculate 'total market sales.' If the market has a confidential vendor sales reporting process, vendors intuitively include the token monies in their cash sales, but in open reporting processes, markets ask them to separate the amount of money that they accepted in tokens and in cash (Dudley, 2016; Krikau, 2016; Trivette, 2016). Since open sales is a contentious issue at many farmers markets, it is necessary to define total market sales as the reimbursed amount and to calculate the metric from the vendor sales slip data.

Within a market, the vendor respondents are consistent so the markets can directly and reliably compare the answers from each interval, and they can use the data to identify growth trends and plan for the future. However, collecting daily data from each vendor for the entire market season involves extra work so markets and overtime both groups may view the Vendor Sales Slip as a time burden opposed to an informational opportunity. We addressed this potential problem by asking a small number of straightforward questions. The length and detail of the survey varies according to the custom metrics that the market selects so they can develop their sales slip to accommodate the capacity of their vendors and data collectors (i.e., they can add metrics if they have a reasonable belief that the vendors will actually complete the questions). Table eight identifies the Vendor Sales Slip metrics and the corresponding survey question.

Table 8. Vendor Sales Slip Metrics and Questions

Id	Metric	Survey Question
2	Total annual market sales	Payment methods ($) Include all token sales as cash. Cash Credit/debit (own POS) SNAP (own POS) WIC FMNP WIC CVV Senior FMNP <voucher 1> <voucher 2> <voucher 3>
5	Total annual sales by product category	Product categories ($) Include all payment methods & token sales. Fruits & Vegetables Meat & seafood

		Dairy Eggs Nuts & legumes Plants & flowers *Value-added *Prepared food Craft/art/services Retail (storefront)
7	Total number of SNAP transactions	Number of SNAP/EBT transactions (#) Do not include token transactions.
10	Total pounds of food donated by vendors	Pounds of donated food (if applicable)

* Value-added refers to products with two characteristics

(1) The farmers make the foods from raw ingredients and primarily, from ingredients that they plant, grow or care for, and harvest.

(2) They process the foods through baking, cooking, canning, drying, fermenting, preserving, or spinning techniques (e.g., baked goods, cheese, jams, dried fruit, viticulture, pickles, wool yarn, etc.)

* Prepared food refers to products that agriculture or non-agriculture businesses make from ingredients that they primarily purchase. They made the food at the market for immediate consumption (e.g., sandwiches, brewed coffee, etc.).

Vendor Attendance

Vendor Attendance collects data on the number of vendors that participate each week and throughout the season. The market manager takes attendance any time after it opens but before it closes. Most markets already collect this information for their records so the instrument is normally already part of their daily tasks.

Volunteers Spreadsheet

Volunteer labor is particularly important because most, if not all, farmers markets use it on a regular basis regardless of whether their business is self-sustaining. According to the 2006 USDA National Farmers Market Manager Survey, nearly half (46.5%) of the

sample population was economically self-sufficient (i.e., the vendor fees covered the operating expenses), but only 39 percent of respondents indicated that the market manager is a paid position (Ragland & Tropp, 2009). This indicates that economic stability does not necessarily mean that farmers markets have enough money to compensate the people that represent the market. This information will increase understanding around how farmers markets function within the community context.

Market Programs

The project team was particularly interested in the number participants at different types of programs and specifically information on the number and characteristics of food education programs and of youth participants. The event specific information will help markets understand the type programs that their community members like to attend and develop strategies to increase attendance. F2F defines a 'market program' as a special affair hosted by the market organization, and the types of programs include demonstrations (e.g., cooking or planting), contests, skills workshops (e.g., physical or craft), other activities, and field trips to the market. Data collectors identify whether a participant is less than 18 years old by evaluating their physical characteristics. This is subjective because physical characteristics are not always an accurate measure of a person's age, but people often view age questions as sensitive information when they are in dynamic, social environments so it is the practical solution.

The data collectors will use this instrument at every market program throughout the market season. Compared to the Visitor Count instrument, it is reasonable to count every person at every program because (1) markets generally host a limited number of events throughout the season and (2) the events occur over a short period of time and with a small group of people. As a result, it is not a burden to collect data at every program.

Discussion

This article demonstrates how the F2F methodology builds upon existing data collection practices at farmers markets and refines the research into a comprehensive and cohesive set of instruments. I made a conscious effort to create instruments that are easy to implement at farmers markets with various sizes and capacities, and therefore, I am confident that F2F is appropriate for every market within the US and Canada. Given the variety of farmers markets and the fluid nature of their environments, it is necessary to review and revise this work over time. Social, economic, and political conditions will change, which can influence specific relationships among people, place, and method, but since we integrated fundamental citizen science features into the entire research process (i.e., conceptualization, creation, and implementation), the research design can respond to the generative nature of farmers markets.

F2F combines principles of engagement and collaborative citizen science but these characteristics emerge at different stages of the project – it transitions from a contributory research project to a co-created service program. The project team engaged the pilot markets in the research process to develop protocols that foster collaboration between F2F scientists and individual farmers markets throughout the US. Or in other words, the operationalization process is consistent with engagement applications because it produced standard data collection protocols that are appropriate for market participants and that build a longitudinal panel database. The implementation process embodies the collaborative perspective because the output (i.e., the toolkit) empowers participants around building their knowledge on issues that are directly relevant to them and creating opportunities to interpret and report the information to their stakeholders and communities. By combining the two perspectives of citizen science, F2F expressly advances

scientific knowledge and achieves a range of social goals, which is a gold standard for citizen science projects (Bonney et al., 2009; Chandler et al., 2017).

Regarding the research process and public engagement: When we developed F2F, the project team set the objectives, created the research design (i.e., how we selected metrics, developed, tested, and refined protocols, and interacted with the pilot markets), and facilitated the activities and the pilot markets tested the protocols in their communities and provided feedback on their experiences. The participants had a critical role in how we developed the protocols but it was contributory because the project team determined how and when they participated in the process. We organized and facilitated the annual meetings, monthly conference calls, and periodic feedback surveys. Thus, within the research design, public participation primarily supported the research objectives and participants experienced secondary benefits of collecting preliminary data on their activities, developing knowledge about their socio-economic impacts, and learning about scientific investigations.

However, the underlying objective of this process was to develop resources that uphold social science research standards and honor the unique characteristics of markets in order to fill a knowledge gap and to support market decision-making. Even though F2F provides standard resources, the specific applications start at the community level and participants align F2F resources with their priorities and values to study issues that have a direct and immediate local impact – opposed to aligning their priorities and values to F2F objectives. F2F accomplishes this by developing resources that markets can use to (1) select metrics that correspond with their local conditions and goals, (2) collect data that produces valid and reliable results, and (3) communicate findings through automated custom analysis and reporting. The toolkit is flexible to meet the various needs of farmers

markets so each participant uses F2F to create their own place-based project and has a stake in F2F implementation process.

For example, almost every customer explains how F2F gives them the means to do things that are unrealistic in their standard operating budget – specifically collect valid and reliable data and generate promotional reports. The Vendor Sales Slips help them track how much the vendors sell every week and what kind of products they are selling, and the average distance traveled from product origin to market is interesting to their visitors because it communicates where the farm products come from. Overall, they use the data to identify areas where they can make quick and easy improvements, respond to concerns from vendors, visitors, and stakeholders, and attract new vendors and visitors.

> *Being a part of the metric selection process allows us to communicate the health impacts of our market in the community. Our metric selection gives us the ability to show what fresh, local food is easily accessed at our market, how many people walk or bike to the market, and how the local economy is growing through farming, backyard farming and entrepreneurship.*
>
> (Matheny, n.d.)
>
> *The Williamsburg Farmers Market selected the Metrics considering what we already gathered and what information we did not currently collect. We really wanted to learn best practices on data gathering for what we did not already gather so we selected metrics that would be difficult for us to gather without assistance brainstorming.*
>
> (Herner, n.d.)
>
> *Williamson Farmers Market selected metrics by considering the type of information that stakeholders including funders, producers and consumers would be interested in.*

> *We were also concerned with the amount of work that would be required, and were careful to not select so many metrics that the data collection would detract from providing services at the market. The local foods group was made aware of the MIFI project and the type of information that vendors would be asked to provide. The general feedback was that they were willing to try collecting new types of data if it would positively impact our market.*
>
> (Arnot, n.d.)

Since markets lead the metric selection process, it is reasonable to assume that the metrics correspond with larger community interests and needs so the data can inform local government practices and policies. That is, F2F enables more robust partnerships between farmers markets and planners and policy makers.

Since the objective of this article is to evaluate the role of citizen science within the operationalization process, it is beyond the scope of this discussion to analyze how scientists implement citizen science projects at distributed scales and in individual cases, how those processes relate with collaborative perspectives and participation frameworks, and how they occur within F2F. Future articles will study those relationships and integrate theoretical analyses of public participation that occur in social science and planning articles.

To summarize, the operationalization process moved from idiosyncratic to systematic methods and thus, from one-off research findings towards a normal scientific practice in Kuhn's sense. This required reviewing what we know about farmers markets research, evaluating how it was discerned, conceptualizing what we want to know about farmers markets themselves, and testing how certain methods produce the necessary data. We evaluated existing work by identifying their assumptions to understand what scholars and practitioners already know about farmers markets and what they want to know. We

followed a similar approach with the pilot markets to understand their perceptions about collecting data, which helped us relate the list of metrics to practical research methods. The methods are consistent with basic social science research standards and produce data that is relevant for a variety of people, perspectives, and purposes.

Scholars and practitioners, specifically within planning and policy professions, can use data from this research in at least four ways. First, F2F collects data for understanding phenomena because it develops descriptive understandings about markets (i.e., their organization, vendors, and visitors) and enables comparative understandings of an individual market over time and of multiple markets. F2F customers have unlimited access to all of their data in the portal so they can analyze their activities along multiple time frame, but they can also partner with planners and food policy specialists to evaluate their data within the context of local government practices and policies. Second, from the market's perspective, F2F produces scientific data that amplifies their intimate knowledge about the market. Their everyday observations provide valuable context for the quantitative information.

For example, Hernando Farmers Market in Mississippi used F2F to understand who is attending their market, what proportion of sales are from food assistance vouchers, and how they get there. The manager collected data on the total market sales, the number and types of food assistance vouchers people use, the number of unique and repeat SNAP customers, the average number of visitors, the percent of first time visitors, and the percent of visitors walking, bicycling, carpooling, ridesharing, or taking public transportation to the market. The market's vendors always accepted Senior and WIC Farmers Market Nutritional Program vouchers but in 2016, the market became SNAP certified and started accepting SNAP through their market booth. According to the sales data, the vendors processed a

high amount of Senior FMNP vouchers and based on conversations with seniors in the community, the manager knew that they valued the weekly event. However, she also knew that they did not have consistent transportation for getting to the market, so she partnered with AARP, United Health Care, and a private transportation provider to write a successful $50,000 grant that established a monthly Senior Day and provided seniors with free transportation to the market on those days. The application combined the quantitative F2F data with her qualitative experiential knowledge to talk about a community issue in a factual and personal way.

In addition, the Wisconsin Economic Development Corporation (WEDC) used Farm 2 Facts to understand the role of downtown farmers markets in their Main Street communities. WEDC staff and the Main Street program managers had the technical expertise to evaluate investments into downtown areas, such as new businesses and jobs, rehabilitated buildings, public improvements, event attendance, new housing units, etc., but they did not have ways to effectively measure and communicate the impacts of farmers markets in Main Street communities. Farmers markets attract visitors that represent a key demographic for Main Street communities so they used F2F to evaluate how the market is performing, who attends the market, and how it interacts with other Main Street investments, specifically transportation infrastructure and downtown businesses. The process of using F2F helped WEDC and the Main Street program managers not only gave them valid and reliable statistical analyses about specific market activities but it also helped them become more attune with their farmers markets and downtown communities. WEDC used the insights to develop strategies that teach program managers how to promote farmers markets and increase vendor and visitor attendance. Program managers used the data to write grant requests and reports, recognize areas for quick and easy improvements, and respond to concerns from vendors, visitors, and downtown businesses.

Third, farmers markets interact with people and places in multiple ways so various disciplines, roles, and perspectives can use the data to study different market functions and their relationships to other aspects of the place (e.g., community development, economic impact, local governance, public health, etc.). This is possible because the metrics collect data on a comprehensive set of basic market functions and the markets enter all of their raw data into the portal. Consequently, F2F supports the American Planning Association's call for more accurate measures of food systems activities that connect with traditional planning practices such as land use, transportation, community-economic development, and environment (American Planning Association, 2007). For example, table nine identifies how groups of F2F metrics evaluate issues that are relevant to planners and policy makers:

Table 9. F2F Applications for Planners and Policy Makers

Planning Issue	F2F Metric
Food security	Total market sales, which includes SNAP, WIC FMNP, WIC CVV, Senior FMNP, incentive program, and community voucher sales
	Total number of SNAP transactions
	Total number of SNAP customers using benefits through the market on more than one market day
	Total number of unique SNAP customers using benefits through the market
Food access	Percent of visitors walking, bicycling, carpooling, ridesharing, or taking public transportation to the market
	Total annual sales by product category
	Percent of first time visitors
Community-economic development Placemaking	Average number of visitors
	Percent of first time visitors
	Average dollars spent per visitor per visit
	Average dollars spent at neighboring businesses
	Total programs held at the market
	Total number of visitors participating in market programs

Social entrepreneurship	Number of individuals employed by market businesses
	Number of women-owned businesses selling at the market
	Number of socially disadvantaged vendors selling at the market
	Percent of vendors at the market who are younger than 35 years old

Local governments can use the data to inform how they allocate public resources to their farmers markets.

Thus, local governments can benefit from F2F and engage in the citizen science by purchasing F2F for markets within their community. They can collaborate with the markets to identify metrics that support both of their goals, to facilitate data collection that requires additional resources or capacity, and to evaluate market impacts within the context of local plans and policies.

Fourth, over time, the seasonal data develops a longitudinal panel database on farmers markets and the consistent data collection and analyses support simple inferences about market functions. Thus, in relation to basic science objectives, the F2F database can function similar to other longitudinal panel databases (e.g., US Census, Agriculture Census, etc.) when developing research projects and evaluating issues in fields like planning, policy making, community-economic development, and public health.

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Appendix 1. List of Metrics and Data Points

Metrics

Common Metrics

Every F2F market collects data on four common metrics to establish baseline data that we can compare over time and among users.

Metric	Instrument
Average number of visitors per market day (estimated)	Visitor Count
Total annual market sales	Vendor Sales Slip Central Terminal Tokens Profile
Average distance in miles traveled from product origin to market	Vendor Application
Total cultivated and grazed acres by market vendors	Vendor Application

Custom Metrics

Most markets select 3 to 6 custom metrics that directly relate to their goals. Since they collect the metric data through one of 8 instruments, the amount of work corresponds with the number and type of instruments that they will implement. They will implement the instruments at different times throughout the market season so the amount of work will vary from week to week but the type of work will be consistent.

Metric	Instrument
Total annual sales by product category	Vendor Sales Slip
Total central terminal sales	Central Terminal Sales
Total number of SNAP transactions	Vendor Sales Slip Central Terminal Sales
Total number of repeat SNAP customers participating in incentive campaign	Central Terminal Sales
Total number of SNAP customers using benefits through the market on more than one market day	Central Terminal Sales

Total pounds of food donated by vendors	Vendor Sales Slip
Percent of customers who were first time visitors (estimated)	Visitor Survey
Average dollars spent per visitor per visit (estimated)	Visitor Survey
Average dollars spent at neighboring businesses by visitors (estimated)	Visitor Survey
Percent of visitors walking, bicycling, carpooling, ridesharing, or taking public transportation to the market (estimated)	Visitor Survey
Percent of visitors from represented zip codes (estimated)	Visitor Survey
Average number of vendors per day	Vendor Attendance Vendor Application
Number of individuals employed by market businesses (estimated)	Vendor Application
Total number of women-owned businesses selling at the market	Vendor Application
Total number of socially disadvantaged vendors selling at market (USDA definition)	Vendor Application
Percentage of vendors at market who are < 35 years old	Vendor Application
Average years in the farming industry per vendor	Vendor Application
Number of farm vendors with organic certification (or in 3 year transition) selling at market	Vendor Application
Total number of different food products available for sale	Vendor Application
Total number of volunteer hours contributed	Volunteers
Total number of market programs held	Market Programs

Metrics & Data Points

Common Metrics	Instrument
Average number of visitors per market day (estimated)	Visitor Count
Average number of visitors per market season (estimated)	Visitor Count
Total market sales	Vendor Sales Slip
Total dollar amount of credit/debit sales	Central Terminal Tokens
Total dollar amount of SNAP sales	
Total dollar amount of WIC FMNP sales	
Total dollar amount of WIC CVV sales	
Total dollar amount of Senior FMNP sales	
Total dollar amount of other incentive program sales	
Total dollar amount of community voucher money annually	
Total sales tax generated from market sales	Profile
Average distance in miles traveled from product origin to market	Vendor Application
Average distance in miles traveled from product origin to market for fruit & vegetable vendors	
Average distance in miles traveled from product origin to market for meat & seafood vendors	
Average distance in miles traveled from product origin to market for dairy vendors	
Average distance in miles traveled from product origin to market for egg vendors	
Average distance in miles traveled from product origin to market for nut & legume vendors	
Average distance in miles traveled from product origin to market for plant & flower vendors	
Average distance in miles traveled from product origin to market for value-added food vendors	
Average distance in miles traveled from product origin to market for prepared food vendors	
Average distance in miles traveled from product origin to market for crafts/art/services vendors	
Average distance in miles traveled from product origin to market for retail (storefront) vendors	

Average distance in miles traveled from product origin to market for information vendors	
Average distance in miles traveled from product origin to market for sponsor vendors	
Total cultivated and grazed acres by market vendors	Vendor Application
Total acres cultivated and grazed by vendors selling fruit & vegetable	
Total acres cultivated and grazed by vendors selling meat & seafood	
Total acres cultivated and grazed by vendors selling dairy	
Total acres cultivated and grazed by vendors selling eggs	
Total acres cultivated and grazed by vendors selling nuts & legumes	
Total acres cultivated and grazed by vendors selling plants & flowers	
Total acres cultivated and grazed by vendors selling value-added food	
Total acres cultivated and grazed by vendors selling prepared food	
Total acres cultivated and grazed by vendors selling crafts/art/services	
Total acres cultivated and grazed by vendors selling retail (storefront)	
Total acres cultivated and grazed by vendors providing information	
Total acres cultivated and grazed by vendors providing sponsor	
Total acres owned and leased by market vendors	
Total acres owned and leased by vendors selling fruits & vegetables	
Total acres owned and leased by vendors selling meat & seafood	
Total acres owned and leased by vendors selling dairy	
Total acres owned and leased by vendors selling eggs	
Total acres owned and leased by vendors selling nuts & legumes	

- Total acres owned and leased by vendors selling plants & flowers
- Total acres owned and leased by vendors selling value-added food
- Total acres owned and leased by vendors selling prepared food
- Total acres owned and leased by vendors selling crafts/art/services
- Total acres owned and leased by vendors selling retail (storefront)
- Total acres owned and leased by vendors providing information
- Total acres owned and leased by vendors providing sponsor

Total acres owned by market vendors

- Total acres owned by vendors selling fruits & vegetables
- Total acres owned by vendors selling meat & seafood
- Total acres owned by vendors selling dairy
- Total acres owned by vendors selling eggs
- Total acres owned by vendors selling nuts & legumes
- Total acres owned by vendors selling plants & flowers
- Total acres owned by vendors selling value-added food
- Total acres owned by vendors selling prepared food
- Total acres owned by vendors selling crafts/art/services
- Total acres owned by vendors selling retail (storefront)
- Total acres owned by vendors providing information
- Total acres owned by vendors providing sponsor

Total acres leased by market vendors

- Total acres leased by vendors selling fruits & vegetables
- Total acres leased by vendors selling meat & seafood
- Total acres leased by vendors selling dairy
- Total acres leased by vendors selling eggs
- Total acres leased by vendors selling nuts & legumes
- Total acres leased by vendors selling plants & flowers

- Total acres leased by vendors selling value-added food
- Total acres leased by vendors selling prepared food
- Total acres leased by vendors selling crafts/art/services
- Total acres leased by vendors selling retail (storefront)
- Total acres leased by vendors providing information
- Total acres leased by vendors providing sponsor

Total acres cultivated by market vendors

- Total acres cultivated by vendors selling fruits & vegetables
- Total acres cultivated by vendors selling meat & seafood
- Total acres cultivated by vendors selling dairy
- Total acres cultivated by vendors selling eggs
- Total acres cultivated by vendors selling nuts & legumes
- Total acres cultivated by vendors selling plants & flowers
- Total l acres cultivated by vendors selling value-added food
- Total acres cultivated by vendors selling prepared food
- Total acres cultivated by vendors selling crafts/art/services
- Total acres cultivated by vendors selling retail (storefront)
- Total acres cultivated by vendors providing information
- Total acres cultivated by vendors providing sponsor

Total acres grazed by market vendors

- Total acres grazed by vendors selling fruits & vegetables
- Total acres grazed by vendors selling meat & seafood
- Total acres grazed by vendors selling dairy
- Total acres grazed by vendors selling eggs
- Total acres grazed by vendors selling nuts & legumes
- Total acres grazed by vendors selling plants & flowers
- Total acres grazed by vendors selling value-added food
- Total acres grazed by vendors selling prepared food
- Total acres grazed by vendors selling crafts/art/services
- Total acres grazed by vendors selling retail (storefront)

Total acres grazed by vendors providing information	
Total acres grazed by vendors providing sponsor	

Custom Metric	**Instrument**
Total annual sales by product category	Vendor Sales Slip
Total annual produce vendor sales	
Total annual meat & seafood vendor sales	
Total annual dairy vendor sales	
Total annual egg vendor sales	
Total annual nuts & legumes vendor sales	
Total annual plants & flowers vendor sales	
Total annual value-added vendor sales	
Total annual prepared food vendor sales	
Total annual crafts/art/services vendor sales	
Total annual retail (storefront) vendor sales	
Total central terminal sales	Central Terminal Sales
Total dollar amount of credit/debit central terminal sales	
Total dollar amount of SNAP central terminal sales	
Total dollar amount of WIC FMNP central terminal sales	
Total dollar amount of WIC CVV central terminal sales	
Total dollar amount of Senior FMNP central terminal sales	
Total dollar amount of incentive program money distributed through the central terminal	
Total dollar amount of community voucher central terminal sales	
Total primary payment method accepted from customers	
Total credit/debit monies accepted from customers	
Total SNAP monies accepted from customers	
Total WIC FMNP monies accepted from customers	

Total WIC CVV monies accepted from customers	
Total Senior FMNP monies accepted from customers	
Total community voucher monies accepted from customers	
Difference between central terminal sales and central terminal tokens	
Difference between credit/debit sales accepted from and used by customers	
Difference between SNAP sales accepted from and used by customers	
Difference between WIC FMNP sales accepted from and used by customers	
Difference between WIC CVV sales accepted from and used by customers	
Difference between Senior FMNP sales accepted from and used by customers	
Difference between incentive program money distributed to and used by customers	
Difference between community voucher program sales accepted from and used by customers	
Total number of SNAP transactions	Vendor Sales Slip Central Terminal Sales
Total number of repeat SNAP customers participating in incentive campaign	Central Terminal Sales
Total number of unique SNAP customers participating in incentive campaign	
Total number of SNAP customers using benefits through the market on more than one market day	Central Terminal Sales
Total number of unique SNAP customers using benefits through the market	
Total pounds of food donated by vendors	Vendor Sales Slip
Percent of customers who were first time visitors (estimated)	Visitor Survey
Average dollars spent per visitor per visit (estimated)	Visitor Survey
Average dollars spent at neighboring businesses by visitors (estimated)	Visitor Survey
Percentage of visitors walking, bicycling, carpooling, ridesharing, or taking public transportation to the market (estimated)	Visitor Survey

Percentage of visitors walking to the market (estimated)	Visitor Survey
Percentage of visitors biking to the market (estimated)	Visitor Survey
Percentage of visitors driving a personal vehicle to the market (estimated)	Visitor Survey
Percentage of visitors carpooling to the market (estimated)	Visitor Survey
Percentage of visitors taking a taxi or a hired driver to the market (estimated)	
Percentage of visitors taking a rideshare program to the market (estimated)	Visitor Survey
Percentage of visitors taking public transportation to the market (estimated)	Visitor Survey
Percentage of visitors taking other modes to the market (estimated)	Visitor Survey
Percentage of visitors from represented zip codes (estimated)	Visitor Survey
Average number of vendors per day	Vendor Attendance
Average number of vendors selling fruits & vegetables per day	
Average number of vendors selling meat & seafood per day	Vendor Application
Average number of vendors selling dairy per day	
Average number of vendors selling egg per day	
Average number of vendors selling nuts & legumes per day	
Average number of vendors selling plants & flowers per day	
Average number of vendors selling value-added food per day	
Average number of vendors selling prepared food per day	
Average number of vendors selling craft/art/services per day	
Average number of vendors selling retail (storefront) per day	
Average number of vendors with an information booth per day	
Average number of vendors with a sponsor booth per day	
Total number of vendors who sold through the market at least once per year	
Percentage of vendors who sold through the market every week	
Number of individuals employed by market businesses (estimated)	Vendor Application

Number of individuals employed by fruits & vegetables vendors (estimated)	
Number of individuals employed by meat & seafood vendors (estimated)	
Number of individuals employed by dairy vendors (estimated)	
Number of individuals employed by egg vendors (estimated)	
Number of individuals employed by nuts & legumes vendors (estimated)	
Number of individuals employed by plants & flowers vendors (estimated)	
Number of individuals employed by value-added vendors (estimated)	
Number of individuals employed by prepared food (estimated)	
Number of individuals employed by craft/art/services vendors (estimated)	
Number of individuals employed by retail (storefront) vendors (estimated)	
Number of individuals employed by information vendors (estimated)	
Number of individuals employed by sponsor vendors (estimated)	
Number of seasonal employees (estimated)	
Number of year-round employees (estimated)	
Total number of women-owned businesses selling at the market	Vendor Application
Total number of women-owned businesses selling fruits & vegetables at the market	
Total number of women-owned businesses selling meat & seafood at the market	
Total number of women-owned businesses selling dairy at the market	
Total number of women-owned businesses selling eggs at the market	
Total number of women-owned businesses selling nuts & legumes at the market	
Total number of women-owned businesses selling plants & flowers at the market	

Total number of women-owned businesses selling value-added food at the market	
Total number of women-owned businesses selling prepared food at the market	
Total number of women-owned businesses selling crafts/art/services at the market	
Total number of women-owned businesses selling retail (storefront) at the market	
Total number of women-owned businesses with an information booth at the market	
Total number of women-owned businesses with a sponsor booth at the market	
Total number of socially disadvantaged vendors selling at the market (USDA definition)	Vendor Application
Total number of socially disadvantaged fruits & vegetables vendors selling at market (USDA definition)	
Total number of socially disadvantaged meat & seafood vendors selling at market (USDA definition)	
Total number of socially disadvantaged dairy vendors selling at market (USDA definition)	
Total number of socially disadvantaged eggs vendors selling at market (USDA definition)	
Total number of socially disadvantaged nuts & legumes vendors selling at market (USDA definition)	
Total number of socially disadvantaged plants & flowers vendors selling at market (USDA definition)	
Total number of socially disadvantaged value-added vendors selling at market (USDA definition)	
Total number of socially disadvantaged prepared food vendors selling at market (USDA definition)	
Total number of socially disadvantaged crafts/art/services vendors selling at market (USDA definition)	
Total number of socially disadvantaged retail (storefront) vendors selling at market (USDA definition)	
Total number of socially disadvantaged information vendors at market (USDA definition)	
Total number of socially disadvantaged sponsor vendors selling at market (USDA definition)	

Total number of Hispanic or Latino vendors selling at the market (USDA definition)	
Total number of Black or African American vendors selling at the market (USDA definition)	
Total number of Asian American vendors selling at the market (USDA definition)	
Total number of American Indian or Alaska Native vendors selling at the market (USDA definition)	
Total number of Native Hawaiian or other Pacific Islander vendors selling at the market (USDA definition)	
Total number of vendors that identify with multiple ethnic cultures selling at the market (USDA definition)	
Percentage of vendor businesses at the market with at least one owner < 35 years old	Vendor Application
Percentage of fruits & vegetables vendor businesses at the market with at least one owner < 35 years old	
Percentage of meat & seafood vendor businesses at the market with at least one owner < 35 years old	
Percentage of dairy vendor businesses at the market with at least one owner < 35 years old	
Percentage of egg vendor businesses at the market with at least one owner < 35 years old	
Percentage of nuts & legumes vendor businesses at the market with at least one owner < 35 years old	
Percentage of plants & flowers vendor businesses at the market with at least one owner < 35 years old	
Percentage of value-added food vendor businesses at the market with at least one owner < 35 years old	
Percentage of prepared food vendor businesses at the market with at least one owner < 35 years old	
Percentage of craft/art/services food vendor businesses at the market with at least one owner < 35 years old	
Percentage of retail (storefront) vendor businesses at the market with at least one owner < 35 years old	
Percentage of information vendor businesses at the market with at least one owner < 35 years old	
Percentage of sponsor vendor businesses at the market with at least one owner < 35 years old	
Percentage of vendors at the market who are < 35 years old	

Percentage of fruits & vegetables vendors at market who are < 35 years old (estimated annually)	
Percentage of meat & seafood vendors at market who are < 35 years old (estimated annually)	
Percentage of dairy vendors at market who are < 35 years old (estimated annually)	
Percentage of egg vendors at market who are < 35 years old (estimated annually)	
Percentage of nuts & legumes vendor businesses at the market with at least one owner < 35 years old	
Percentage of plants & flowers vendors at market who are < 35 years old (estimated annually)	
Percentage of value-added vendors at market who are < 35 years old (estimated annually)	
Percentage of prepared food vendors at market who are < 35 years old (estimated annually)	
Percentage of crafts/art/services vendors at market who are < 35 years old (estimated annually)	
Percentage of retail (storefront) vendor businesses at the market with at least one owner < 35 years old	
Percentage of information vendor businesses at the market with at least one owner < 35 years old	
Percentage of sponsor vendor businesses at the market with at least one owner < 35 years old	
Average years in the farming industry per vendor	Vendor Application
Percentage of farm vendors with <10 years farming experience	
Total number of farm vendors with organic certification (or in 3-year transition) selling at market	Vendor Application
Total number of farm vendors Certified Organic (or in 3-year transition) selling at market	
Total number of farm vendors Certified Naturally Grown selling at market	
Total number of farm vendors Certified Biodynamic selling at market	
Total number of farm vendors Food Alliance Certified selling at market	
Total number of farm vendors with other certifications selling at market	

Total number of farm vendors without certifications selling at market	
Total number of different food products available for sale	Vendor Application
Total number of different produce crops available for sale	
Total number of SNAP-eligible products available at for sale	
Total number of volunteer hours contributed	Volunteers
Total number of market programs held at the market	Market Programs
Total number of demonstration programs/events held at the market	
Total number of contest programs held at the market	
Total number of workshop programs held at the market	
Total number of other activities programs held at the market	
Total number of field trip programs held at the market	
Total number of food education programs held at the market	
Total number of food education demonstration programs held at the market	
Total number of food education contest programs held at the market	
Total number of food education workshop programs held at the market	
Total number of food education other activities programs held at the market	
Total number of food education field trip programs held at the market	
Total number of youth specific programs held at the market	
Total number of youth specific demonstration programs held at the market	
Total number of youth specific contest programs held at the market	
Total number of youth specific workshop programs held at the market	
Total number of youth specific other activities programs held at the market	
Total number of youth specific field trip programs held at the market	

Total number of visitors participating in programs held at the market

- Total number of visitors participating in demonstration programs held at the market
- Total number of visitors participating in contest programs held at the market
- Total number of visitors participating in workshop programs held at the market
- Total number of visitors participating in other activities programs held at the market
- Total number of visitors participating in field trip programs held at the market

Total number of youth <18 participating in market programs held at the market

- Total number of youth <18 participating in demonstration programs held at the market
- Total number of youth <18 participating in contest programs held at the market
- Total number of youth <18 participating in workshop programs held at the market
- Total number of youth <18 participating in other activities held at the market
- Total number of youth <18 participating in field trip programs held at the market

Appendix 2. Data Collection Package

The Data Collection Package (DCP) describes the processes that you will follow to collect data on the metrics that you selected. Each metric corresponds with one of 9 instruments, which refers to the tool that you used to collect data. The DCP offers tips for talking about your Farm 2 Facts (F2F) membership, lists the metrics that you selected, and it provides clear and concise instructions about what you need to do before, during, and after the market day.

The Data Collection Methods and Instruments subsections describe the instruments, the means to collect each metric (e.g., survey question, tracking worksheet, etc.), and the instructions to implement the instrument. Your work will vary from week to week but the type of work that you do for each instrument will be consistent throughout the market season.

Identify a 'data collection manager' to lead your data collection efforts on a regular basis or on a given day. The data collection manager may be a representative of the market or a volunteer. The DCP uses two terms to describe the people that will collect data: (1) 'data collector' refers to a single person collecting data and (2) 'data collection team' refers to the collective group of people that coordinate resources for data collection and implement the instruments. Similar to the data collection manager, the 'data collector' and the 'data collection team' may be a representative of the market or a volunteer.

Contact support@farm2facts.org if you have any questions.

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Project Overview

Farm 2 Facts (F2F), an online toolkit, empowers individual markets and market organizations through proven data collection strategies, actionable interpretation information, and customizable reports. By using F2F, you develop customized knowledge about your market that enhances your internal decision-making and external communication activities. There are three steps:

- Step 1 – Select Metrics

  Metrics are measurements for assessing progress. A metric compares two or more units of measurement. F2F guides you through selecting 25+ metrics that relate to different economic, social, and ecological aspects of your market. You can measure various market programs and activities, such as market sales, food assistance vouchers, etc. The metrics are also consistent with USDA and foundation grant reporting requirements (e.g., Food Insecurity Nutrition Incentive grant, Farmers Market Promotion Program, Community Food Projects, Rural Business Development Grant, Kellogg Foundation, etc.).

- Step 2 – Collect Data

  F2F follows everyday market functions so collecting data corresponds with the things you already do to manage your market. Our processes are sensitive to the unique characteristics of farmers markets and uphold basic social science research standards, which means you can realistically collect data and you get valid and reliable results. Once you enter your data into the portal through a batch upload process, you can review and edit it online.

- Step 3 – Communicate Findings

  Visualize your data through technical graphs and charts and communicate it through infographic reports. This step teaches you how to interpret and use the metrics, data, and findings in ways that enhance your internal decision-making and external communication. The portal automates data analysis and guides you through an interactive interpretation and reporting process. They are excellent resources for promoting your market to your community, stakeholders, and funders.

These actions build upon each other to identify descriptive details about the market and to track trends and impacts within a season and over multiple seasons. Consequently, by using the toolkit, you develop a robust understanding about the characteristics of your market, vendors, and visitors and about its role within the community and economy. Generally, you can use this information to understand your role in fostering local economic and community development and the content is relevant for writing reports and grants that:

- Improve internal decision-making and strategic planning; and
- Strengthen relationships with community partners, sponsors, vendors, and customers.

Suggested Talking Points

You can use the following talking points when you approach vendors and visitors to gather data from them. They are a friendly way to approach vendors and visitors and to overcome any hesitation for sharing information. The first point is appropriate to tell vendors and visitors:

> "This market was founded with an aim to engage the community in the improvement of our food system. Your participation in research helps us understand change, plan improvements to meet your needs, and help expand food security and access to fresh and healthy food for all members of our community."

When you speak with vendors or when they have any concerns about data, describe how the information that you are collecting from them relates to your goals:

> "Markets around the country often collect economic data from vendors and we need your support to develop an accurate picture of the market's overall contribution to the local economy and better plan for market growth. Your individual data is confidential. We are collecting vendor sales and business information for the market as a whole."

Approach visitors with engaging statements that emphasize their value to the market and the short length of the survey:

> "We are asking a few simple questions to learn more about the market's role in this community. Can you please participate?"

> "Excuse me! I am a volunteer, and today I am conducting research on ways to improve business at this market. It would be valuable to hear about your experience. Do you have five minutes to answer some questions?"

Always thank the vendor or visitor for their help:

> "Thank you for your participation in this research project. Your contribution will help us understand and strengthen the market's impact within our community."

Metrics

A 'metric' is a data point that compares two or more specific units of measurement and in F2F, a metric evaluates a general activity within markets and represents a specific component of the general activity. Each metric corresponds to one of 9 instruments, which refers to the tool that you used to collect data. This section identifies your common and custom metrics.

You may collect data on a single metric through two different instruments and this is necessary because it ensures that we gather all of the information on that specific metric. The metrics tables identify when you will collect a metric through more than one instrument. The next section will explain the logic behind collecting data on specific metrics through two different instruments.

Common Metrics

Every F2F market collects data on four common metrics to establish baseline data that you can compare over time and among members. The following table lists the common metrics and the data collection instrument(s) for each metric.

Metric	Instrument
Average number of visitors per market day (estimated)	Visitor Count
Total market sales	Vendor Sales Slip Central Terminal Tokens
Average distance in miles traveled from product origin to market	Vendor Application
Total cultivated and grazed acres by market vendors	Vendor Application

Custom Metrics

The following table lists your custom metrics and the data collection instrument(s) for each metric.

Metric	Instrument
Total annual sales by product category	Vendor Sales Slip
Total central terminal sales	Central Terminal Sales
Total number of SNAP transactions	Vendor Sales Slip Central Terminal Sales
Total number of repeat SNAP customers participating in incentive campaign	Central Terminal Sales
Total number of SNAP customers using benefits through the market on more than one market day	Central Terminal Sales
Total pounds of food donated by vendors	Vendor Sales Slip
Percent of customers who were first time visitors (estimated)	Visitor Survey

Average dollars spent per visitor per visit (estimated)	Visitor Survey
Average dollars spent at neighboring businesses by visitors (estimated)	Visitor Survey
Percentage of visitors walking, bicycling, carpooling, ridesharing, or taking public transportation to the market (estimated)	Visitor Survey
Percentage of visitors from represented zip codes (estimated)	Visitor Survey
Average number of vendors per day	Vendor Attendance Vendor Application
Number of individuals employed by market businesses (estimated)	Vendor Application
Total number of women-owned businesses selling at the market	Vendor Application
Total number of socially disadvantaged vendors selling at the market (USDA definition)	Vendor Application
Percentage of vendors at the market who are < 35 years old	Vendor Application
Average years in the farming industry per vendor	Vendor Application
Total number of farm vendors with organic certification (or in 3-year transition) selling at market	Vendor Application
Total number of different food products available for sale	Vendor Application
Total number of volunteer hours contributed	Volunteers
Total number of market programs held at the market	Market Programs

Data Collection Methods and Instruments

F2F is a comprehensive set of tools that are easy to implement in any situation. You will use paper worksheets to collect data at the market and you will enter the data into the online portal. The instrument and worksheet names correspond with each other – 'Visitor Count' instrument has a 'Visitor Count Worksheet.'

When you log into the portal, Step 2 – Collect Data will list the instruments. Click on the instrument hyperlink to enter data from your worksheet. Once you enter your data through the batch upload process, you can review and edit it online. You will analyze your data and generate reports in Step 3 – Communicate Findings.

Vendor Application

The vendor application is an opportunity to collect data from vendors outside of the busy market environment. If necessary, you can collect the vendor application metrics as a vendor survey.

Instructions

Stage 1. Preparation

- Integrate the questions into your vendor application.
- If you are collecting the metrics through a vendor survey, print a vendor application worksheet for each vendor.

Stage 2. Implementation

- Distribute the vendor application according to your existing process.
- If you are collecting the metrics through a vendor survey:
    - Distribute the survey to each vendor at the end of a market day and ask them to complete it for the next market day.
    - Collect the vendor survey the following week.
- Once you finalize the list of vendors that will participate in your market, enter their application data into the Vendor Application webpage in the portal.

Stage 3. Data Entry

- Log into your F2F account: http://www.portal.farm2facts.org
    - Select the Step 2 - Collect Data function.
    - Go to the Vendor Application instrument webpage.
- Data upload
    - Download the data entry template.
        - Enter your data into the template. Dates should follow the Month/Day/Year format.
        - Save as .csv file (not .xls).
    - Use the Browse button to select the .csv file from your computer.
    - Press the Upload button to upload the data to the portal.
- Review, edit, and delete the data in the bottom screen.
    - Edit the data by pressing the Edit button and clicking on the cell that you would like to change.
        - Press the check button to save and the X button to cancel.
        - Turn off the editing feature by pressing the Edit button again.
    - Delete rows of data by selecting the ID box and pressing the Delete Selected button.

Worksheet

Name _____

Farm / Business Name _____

4. Provide up to three physical addresses for your business' primary point(s) of production. No P.O. Boxes.

Primary production location

Street Address _____

City _____ State _____ Zip Code _____

Second production location

Street Address _____

City _____ State _____ Zip Code _____

Third production location

Street Address _____

City _____ State _____ Zip Code _____

5. Use the table below to report your farm acreage information. Write "N/A" if not a *non-agricultural enterprise.

Owned (current)	_____
Leased (current)	_____
Cultivated (anticipated)	_____
Grazed (anticipated)	_____

*Non-farm enterprises are businesses not involved in the production of raw agricultural products as their primary enterprise, but who are actively involved and invested in the processing of value-added foods, baked goods, or hot foods and are selling at the market.

6. Identify the products that you will sell or the services that you will provide at this market in the upcoming season. Circle all that apply.

Fruits & vegetables	**Value-added
Meat & seafood	***Prepared food
Dairy	Crafts/art/services
Eggs	Retail (storefront)
Nuts & legumes	Information
Plants & flowers	Sponsor

** Value-added refers to products with two characteristics:

The farmers make the foods from raw ingredients and primarily, from ingredients that they plant, grow or care for, and harvest.

They process the foods through baking, cooking, canning, drying, fermenting, preserving, or spinning techniques (honey, maple syrup, baked goods, jams, dried fruit, viticulture, pickles, wool yarn, etc.).

*** Prepared food refers to products that agriculture or non-agriculture businesses make from ingredients that they primarily purchase. They made the food at the market for immediate consumption (sandwiches, brewed coffee, etc.).

7. Circle any certifications that your business presently holds (or in 3-year transition).

Certified Organic	Food Alliance Certified
Certified Naturally Grown	Other certification
Certified Biodynamic	No certifications

8. Think about all individuals chiefly responsible for day-to-day decisions in your farm business, including yourself. As of the most recently completed calendar year, for how many years have these owner/operators been farming? Respond for all chief owners/operators as applicable.

   Write “N/A” if non-agricultural enterprise.

Owner 1 _____

Owner 2 _____

9. Identify the number of owners in your business. Ownership refers to the equity, interest, or stock of the business.

_____

10. What percentage of your business is women-owned?

_____

11. What percentage of your business is owned by:

White	_____
Hispanic or Latino	_____
Black or African American	_____
American Indian or Alaska Native	_____
Asian or Asian American	_____
Native Hawaiian or Pacific Islander	_____
Two or more	_____
Prefer not to answer	_____

12. How many owners are younger than 35 years of age as of the most recently completed calendar year?

_____

13. Including yourself, how many people worked for your business either seasonally or year-round in the most recently completed calendar year? Include family workers (paid and unpaid); hired production, market, or office workers; contract or custom hire labor; and paid interns or apprentices. If zero, please enter "0."

Seasonal (worked 149 days or less)	_____
Year-round (worked 150 days or more)	_____

14. Do you anticipate fewer, the same, or more workers devoted to production and marketing for this farmers market in the upcoming season?

    Less Same More

15. Help us understand the variety of produce available at the market by completing the checklist on the next page.

Product Checklist

Name _____

Farm / Business Name _____

Circle the products you plan to sell at the market this season. Add an asterisk (*) next to any crops that will be Certified Organic, Certified Naturally Grown, Certified Biodynamic, Food Alliance Certified, or other third party certified in sustainable growing practices.

Vegetables

Artichokes	Chard	Kohlrabi
Arugula	Chipilín	Lambs quarters
Asparagus	Chicory	Lima Beans
Beans, green	Collards	Leeks
Beans, dry, shelling	Corn, sweet	Lettuce
Beans, Thai, string	Cress	Mesclun (mixed greens)
Beets	Cucumbers	Mushrooms
Beet greens	Dandelion greens	Mustard greens
Bok choy	Eggplant	Okra
Broccoli	Eggplant, Thai	Onions
Broccoli rabe	Epazote	Orach
Brussels sprouts	Fava beans	Parsnips
Cabbage, green	Fennel	Peas, English
Cabbage, purple	Garlic bulb	Peas, snow
Cactus	Garlic scapes	Peas, sugar snap
Cardoons	Herbs (fresh)	Pea shoots
Carrots	Hierbamora	Peppers, Hot
Cauliflower	Horseradish	Peppers, sweet, green
Celeriac	Jicama	Peppers, sweet, red
Celery	Kale	Peppers, sweet, purple
Peppers, sweet, yellow	Salsify	Sweet potatoes

Potatoes
Pumpkins
Purslane
Radishes
Rhubarb
Rutabagas
Scallions
Shallots
Spinach
Sprouts
Squash, summer
Squash, winter
Sunchokes
Sweet potato, greens
Tomatillos
Tomatoes
Turnips
Turnip Greens
Yacon

Fruits & Nuts

Apples
Apricots
Apriums
Avocados
Blackberries
Blueberries
Boysenberries
Cactus pears
Cherimoyas
Cherries
Citron
Currants
Dates
Feijoas
Figs
Grapefruit
Grapes, green
Grapes, red
Ground cherries
Guavas
Jujubes
Kiwis
Kumquats
Lemons
Limes
Loquats
Mandarins
Melons, bitter
Melons, canary
Melons, cantaloupe
Melons, honeydew
Mulberries
Nectarines
Olives
Oranges
PawPaws
Peaches
Pears
Pears, Asian
Plums
Pluots
Pomegranates
Pomelos
Quince
Raspberries, black
Raspberries, red
Satsumas
Strawberries
Tayberries
Watermelon
Wineberries

Nuts, Seeds, & Grains

Almonds	Hickory nuts	Walnuts, black
Amaranth	Peanuts	Walnuts, English
Chestnuts	Pecans	Wheat berries
	Popcorn	

Meat

Beef, all cuts	Goat, all cuts	Pork, all cuts
Beef, ground	Goat, ground	Pork, ground/sausage
Chicken, whole and cuts	Lamb, all cuts	Tofu or meat substitute
Chicken, ground	Lamb, ground	Turkey, whole and cuts
Duck, whole and cuts		Turkey, ground

Dairy & Eggs

Cheese, cow	Eggs, chicken	Kefir
Cheese, goat	Eggs, duck, quail, or other	Milk
Cheese, sheep		Yogurt

Baked & Value-Added Foods

Bread	Honey	Preserved/fermented vegetables
Bee pollen	Honey, comb	Pastries
Cereals	Honey, raw	Syrup, maple
Cookies	Muffins	Syrup, hickory
Crackers	Jams/jellies	

Plant Seeds & Seedlings

Herb seeds	Fruit trees/shrubs	Vegetable seeds
Herb seedlings		Vegetable seedlings

Visitor Count

F2F estimates the number of visitors per year by counting the adults that enter the market during a 20-minute period for each hour that the market is open and by implementing the instrument four times throughout the market season. The portal will calculate the estimated number of visitors per year.

Instructions

Stage 1. Preparation

- Sample days:
    - You will implement the visitor count and visitor survey instrument four times throughout the primary season of your market. Use the following conditions to identify your sample days:
        - Count the number of visitors on (1) the third market day and (2) the third to last market day.
        - Count the number of visitors on (3) a day when you host a popular event or around a holiday and (4) an average market day.
    - Do not conduct a visitor count during the first two market days or the last two market days.
    - Add the dates to your calendar.
- Market map:
    - Draw a map of the market that identifies the physical features in the market, such as the booths, seating areas, and other structures.
    - On the map, identify the market entrances and zones of responsibility.
        - Market entrances can be primary (designated entry points) or alternative (between booths).
            - Identify the alternative entrances that you can block off when you conduct a visitor count; and
            - Draw a line at each entrance and designate a spot for the data collector to conduct the count.
                - The line will determine when people formally enter the market for data collection purposes.
                - The spot should be slightly outside the market. The data collector will count visitors as they walk across the line and into the market.
            - If you are not familiar with your market entry points, you may need to make your map after the first market day.

        - Each entrance has a 'zone of responsibility.' Your market may have multiple zones and each zone may have multiple entrances (primary and alternative) to monitor.
            - Identify the number of zones at your market.
            - Draw the zones on the market map.
- Securing data collectors:
    - Every zone will need a data collector to count the number of visitors.
    - Determine the number of people you need to conduct the visitor counts, and if necessary, recruit volunteers.
    - Remember two things when you identify the number of data collectors:
        - (1) You will need a data collector for every zone of responsibility; and
        - (2) You will implement the visitor survey whenever you conduct visitor counts.
- Print a visitor count worksheet for each zone.

Stage 2. Implementation

- Sample times:
    - Count the number of visitors for 20 minutes of every hour that the market is open; and
    - Execute the first count 20 minutes after the market opens and the subsequent counts every 40 minutes after you complete the previous count.
        - If your market starts on the hour, you will count at XX:20, and if your market starts at the half hour, you will count at XX:50.
        - If people enter the market before it officially opens, count and record the number of early visitors shortly before the official start.
- Collecting the data:
    - Assign a data collector to every zone of responsibility and show them:
        - The area that they will monitor;
        - The line for formally entering the market; and
        - Their designated counting spot.
    - Explain the counting criteria:
        - Count adults (not children);
        - Count individuals (not pairs or groups); and
        - Do not count vendors.
    - Give each data collector a visitor count worksheet to record the sample counts for their zone.

    - Collect the worksheets from each data collector after the final sample count.
- If you are nervous or unsure about this process, you can conduct a 'trial count' on the first or second market day. This may help you address issues before you conduct a count for a required sample period.

Stage 3. Data Entry

- Log into your F2F account: http://www.portal.farm2facts.org
    - Select the Step 2 - Collect Data function.
    - Go to the Visitor Count instrument webpage.
- Data upload
    - Download the data entry template.
        - Enter your data into the template. Dates should follow the Month/Day/Year format.
        - Save as .csv file (not .xls).
    - Use the Browse button to select the .csv file from your computer.
    - Press the Upload button to upload the data to the portal.
- Review, edit, and delete the data in the bottom screen.
    - Edit the data by pressing the Edit button and clicking on the cell that you would like to change.
        - Press the check button to save and the X button to cancel.
        - Turn off the editing feature by pressing the Edit button again.
    - Delete rows of data by selecting the ID box and pressing the Delete Selected button.

Worksheet

Date	Zone	Name

Counting Criteria	Count adults (not children). Count individuals (not pairs or groups). Do not count vendors.
Instructions	Stand at your designated spot. Count the number of people who enter into the market from that point during the 20-minute counting period. Use tally marks to count. When the counting period has ended, count the tally marks and write the number in the corresponding cell. Reset the clicker to zero.

	Total	Tally
Time 1		
Time 2		
Time 3		
Time 4		
Time 5		

Visitor Survey

The visitor survey balances your need for simplicity and flexibility with social science standards for validity and credibility. The length is short and the questions are straight forward. The Visitor Survey Training Manual identifies the survey requirements and explains common survey practices.

Instructions

Stage 1. Preparation

- Sample days:
    - You will implement the visitor survey and visitor count instruments four times throughout the primary season of your market. Use the following conditions to identify your sample data collection dates:
        - Conduct the survey on (1) the third market day and (2) the third to last market day.
        - Conduct the survey on (3) a day when you host a popular event or around a holiday and (4) an average market day.
        - Do not conduct a visitor survey during the first two market days or the last two market days.
    - Add the dates to your calendar.
- Market map:
    - Draw a map of the market that identifies the physical features in the market, such as the booths, seating areas, and other structures.
    - On the map:
        - Identify an area in the market where you can consistently administer the survey. The area should be in a central location – such as the main entrance, the market booth, or a seating area.
        - Draw a line near the survey area.
            - The data collectors will count the adults that walk across the line and ask every ‘nth adult to take the survey.
            - The ‘‘nth adult’ refers to your selection interval, described below.
- Selection interval:
    - In social science research, the selection interval identifies the number of records that one skips between each selection. In this case, ‘records’ means the adult visitors that cross the survey line and ‘selection’ refers to the adults that you survey.
        - For example, if the visitor survey selection interval is 8, you will survey every 8th adult that crosses the survey line.

- Your selection interval is based on the size of your market. The following table categorizes markets according to micro, small, medium, and large and it identifies the selection interval and the minimum sample size for each market category.
    - Identify the total number of vendors that will attend your market this season.
    - Use this information to determine whether you are a micro, small, medium, or large market and to identify your sampling frame.
        - For example, if you have 15 vendors, you are a small market. Your minimum sample size is 38 people with selection interval of 8.
        - Micro and small markets have large minimum sample size and a short selection interval. Depending on the day and the number of volunteers, you may find it difficult to keep up with these standards, but please do your best.
    - The sampling frame is unique to your market and it is the same number for the entire market season.

Visitor Survey Sampling Frame

	Number of vendors	Selection interval	Minimum sample size
Micro	5-9	4	34
Small	10-29	8	38
Medium	30-59	24	42
Large	60+	58	43

- The surveys are short so they should not take much time to complete.
    - The survey administrator(s) should complete the survey for each visitor but if they are busy with a visitor, the survey counter can let a visitor complete the survey on their own.
    - If a visitor does not want to complete the survey, they do not count towards your minimum sample size. Identify the next participant through your selection interval – do not ask the next adult to complete the survey.
- The sampling frame will increase the accuracy of your survey results.
    - The selection interval eliminates bias in selecting participants and the minimum sample size creates reliable estimates of the visitor survey metrics.
    - If a visitor volunteers to complete the survey, circle ‘volunteer’ on the survey and let them complete the survey.
    - Only enter the selection interval responses into the portal.

- Securing data collectors:
    - Determine the number of people you need to implement the visitor surveys, and if necessary, recruit volunteers.
    - Two things to remember when you identify the number of data collectors:
        - (1) You will need the following people to execute the survey:
            - One 'survey counter' and 2-6 'survey administrators' – the data collectors that survey the visitors.
            - The number of data collectors will depend on the size of your market and consequently, your selection interval, but when you implement the visitor survey, it is always easier to have a few extra volunteers than not enough.
        - (2) You will implement the visitor survey whenever you conduct visitor counts.
    - Supplies:
        - Every data collector will require a clipboard, pen, and copies of the visitor survey sheet. They should also wear a nametag to inform visitors that they represent the market.
        - Obtain stickers that you can give to the participants. The stickers serve two purposes:
            - First, they show appreciation for their time; and
            - Second, they identify the visitors that have already completed the survey. The 'survey counter' should do their best to only count each adult once.

Stage 2. Implementation

- Before the market day, print enough copies of the visitor surveys to satisfy your minimum sample size plus extras.
    - For example, your minimum sample size is 38 and you print 50 copies of the survey.
    - Print extra surveys for the volunteer participants.
- On or before the market day, train the data collectors:
    - Go over the Visitor Survey Training Manual.
        - The manual identifies the survey requirements for this project and explains common survey practices.
        - Show the data collectors the area where they will administer the survey and the survey line for counting the selection interval.
    - The survey requirements for this project include:
        - Count adults (not children);
        - Count individuals (not pairs or groups);
        - Do not count visitors that already completed the survey; and

        - Do not count vendors.
    - Start the survey count 20 minutes after the market opens.
        - The survey administrator(s) should complete the survey for each visitor, but if they are busy with a visitor, the survey counter can let a visitor complete the survey on their own.
        - If a visitor does not want to complete the survey, asking them to participate does not count towards your minimum sample size and you should identify the next respondent through your selection interval. In other words, do not ask the next adult to complete the survey.
    - The data collection team should show the data collectors the area where they will administer the survey and the survey line for counting the selection interval.
    - Follow up with the data collectors throughout the day to answer questions and hear about their experiences.

Stage 3. Data Entry

- Log into your F2F account: http://www.portal.farm2facts.org
    - Select the Step 2 - Collect Data function.
    - Go to the Visitor Survey instrument webpage.
- Data upload
    - Download the data entry template.
        - Enter your data into the template. Dates should follow the Month/Day/Year format.
        - Save as .csv file (not .xls).
    - Use the Browse button to select the .csv file from your computer.
    - Press the Upload button to upload the data to the portal.
- Review, edit, and delete the data in the bottom screen.
    - Edit the data by pressing the Edit button and clicking on the cell that you would like to change.
        - Press the check button to save and the X button to cancel.
        - Turn off the editing feature by pressing the Edit button again.
    - Delete rows of data by selecting the ID box and pressing the Delete Selected button.

Worksheet

Date _____

Selection Interval / Volunteer

1. How did you arrive at the market today?

Walking	Taxi or hired driver
Biking	Rideshare program (contracted)
Personal vehicle	Public Transportation (bus, subway, etc.)
Carpooling	Other

2. Is this your first time visiting the market ever?

Yes No

3. In general, how frequently do you visit the market?

Every week	Once a month
Every other week	Less than once a month

4. How much money have you spent or do you plan to spend at the market today?

Money = cash, credit/debit, SNAP, WIC FMNP, Senior FMNP, and WIC CVV

$ _____

5. Did you or do you plan on doing additional shopping, eating, or other activities in this neighborhood/area today?

Yes No

6. If yes, how much money have you spent or do you plan to spend in the neighborhood/area this today?

$ _____

7. What is your home Zip code?

_____

Vendor Sales Slip

The vendor sales slip collects data on the total annual market sales metric so it involves sensitive information that vendors may be reluctant to share. F2F addresses this potential issue by allowing vendors to report their sales on a confidential sales slip. The goal is to protect vendor information and to build trust between vendors and the data collection team. You can also give your vendors the Why Collect Data flyer that explains the importance of collecting their sales information.

If you have an existing process that vendors use to report their daily sales, you can use that data for this project and transfer it to the Vendor Sales Slip webpage in the portal. In other words, you do not need to ask the vendors to report the same information on two different forms. However, if this vendor sales slip includes questions that you do not collect through your existing process, you still need to collect that data from your vendors on a daily basis. You can do this by adding the questions to your existing process or by asking them to answer those questions on this slip.

The Vendor Sales Slip includes two metrics that are also part of the central terminal sales instrument – total annual market sales and total number of SNAP transactions. It is necessary to collect the metric data through two instruments because credit/debit, Supplemental Nutrition Assistance Program (SNAP), Woman Infant Children Farmers Market Nutrition Program (WIC FMNP), Woman Infant Children Cash Value Voucher (WIC CVV), and Senior Farmers Market Nutrition Program (Senior FMNP) transactions can occur through either the market or the vendor. If your market manages any of the food assistance programs (your vendors cannot directly accept credit/debit, SNAP, FMNP, or CVV vouchers) or vice versa (your market does not have a central terminal but your vendors accept non-cash payment methods), please contact support@farm2facts.org so we can adjust your DCP accordingly.

Instructions

Stage 1. Preparation

- Inform your vendors about the importance of sales information several months before the market season – such as an annual pre-season meeting. If possible, also explain other data collection instruments that you will use for this project throughout the market season. Here is some sample language:

  > "As the market grows, we want to be able to inform new visitors and local decision-makers about our role within the community, and one of the ways that we can do this is by clearly explaining the positive social and economic impacts that we have on the community. Your sales and product information is vital to garnering support and will help us thrive."

- Make a small canister with a slit in the top.
- On or before the market day, print a vendor sales slip for each vendor, write the market date on the slip, and fold it in half.
  - You will ask the vendors to provide their information for the day that you distribute the slip – the current market day.

- Always print extra slips with (1) the current market date for vendors that misplace their slip throughout the day and (2) the previous market date for vendors that forgot to return a past slip.

Stage 2. Implementation

- Bring the canister to the market and set it out on the market table.
- Before the market opens or shortly after, distribute the vendor sales slips for the current market day.
  - When you visit with the vendors, (1) give them their slip and (2) ask whether they need to return a slip from the previous week. Carry the canister with you to make it easy for them to return past slips.
  - Tell them to complete it with their sales data for the current market day.
  - At the end of the market day, walk around to every vendor and ask for their slip. Carry the canister with you to increase confidentiality in their sales information.
    - Some vendors may fill out the slip at the end of the day but others may complete the form at home.
    - It may be overwhelming to manage vendor sales slips for two different weeks, but when you accommodate these preferences, it can help establish trust in the data collection process.

Stage 3. Data Entry

- Log into your F2F account: http://www.portal.farm2facts.org
  - Select the Step 2 - Collect Data function.
  - Go to the Vendor Sales Slip instrument webpage.
- Data upload
  - Download the data entry template.
    - Enter your data into the template. Dates should follow the Month/Day/Year format.
    - Save as .csv file (not .xls).
  - Use the Browse button to select the .csv file from your computer.
  - Press the Upload button to upload the data to the portal.
- Review, edit, and delete the data in the bottom screen.
  - Edit the data by pressing the Edit button and clicking on the cell that you would like to change.
    - Press the check button to save and the X button to cancel.
    - Turn off the editing feature by pressing the Edit button again.
  - Delete rows of data by selecting the ID box and pressing the Delete Selected button.

Worksheet

Date _____

Please fold & return this slip to the market manager before you leave the market.
Individual sales information is confidential and private. Thank you!

Payment methods ($)

Include token sales as cash.

Cash	_____
Credit/debit (own POS)	_____
SNAP (own POS)	_____
WIC FMNP	_____
WIC CVV	_____
Senior FMNP	_____
<voucher 1>	_____
<voucher 2>	_____
<voucher 3>	_____

Product categories ($)

Include all payment methods & token sales.

Fruits & vegetables	_____
Meat & seafood	_____
Dairy	_____
Eggs	_____
Nuts & legumes	_____
Plants & flowers	_____
*Value-added	_____
*Prepared food	_____
Craft/art/services	_____
Retail (storefront)	_____

Number of SNAP EBT transactions (#) _____

Do not include token transactions.

Pounds of donated food (if applicable) _____

* Value-added refers to products with two characteristics

(1) The farmers make the foods from raw ingredients and primarily, from ingredients that they plant, grow or care for, and harvest.

(2) They process the foods through baking, cooking, canning, drying, fermenting, preserving, or spinning techniques (honey, maple syrup, baked goods, jam, dried fruit, viticulture, pickles, wool yarn, etc.)

* Prepared food refers to products that agriculture or non-agriculture businesses make from ingredients that they primarily purchase. They made the food at the market for immediate consumption (sandwiches, brewed coffee, etc.).

Central Terminal Sales and Central Terminal Tokens

The central terminal sales worksheet includes two metrics that are also part of the vendor sales slip – total annual market sales and total number of SNAP transactions. It is necessary to collect the metric data through two instruments because credit/debit, Supplemental Nutrition Assistance Program (SNAP, Woman Infant Children Farmers Market Nutrition Program (WIC FMNP), Woman Infant Children Cash Value Voucher (WIC CVV), and Senior Farmers Market Nutrition Program (Senior FMNP) transactions can occur through either the market or the vendor.

If your market manages any of the food assistance programs (your vendors cannot directly accept credit/debit, SNAP, FMNP, or CVV vouchers) or vice versa (your market does not have a central terminal but your vendors accept non-cash payment methods), please contact support@farm2facts.org so we can adjust your DCP accordingly.

It is necessary to record the last eight digits of the SNAP number because the last four digits may apply to more than one SNAP account, particularly in dense metropolitan regions. A Washington State study on food access at farmers markets found that the minimum number of digits to identify the unique ID of each SNAP card is eight. The portal will include code that automatically identifies duplicate eight digit numbers in order to determine the number of repeat and unique customers participating in the incentive campaign per year and customers using their SNAP benefits at the market on more than one day. The coding will only work properly if every data point has eight digits so every market needs to record the last eight digits of the SNAP number regardless of their size.

Instructions

Stage 1. Preparation

- Use the central terminal sales worksheet to track the primary payment and incentive payment transactions that visitors complete through your market.
    - Primary payment methods include credit/debit, SNAP, WIC FMNP, WIC CVV, Senior FMNP, and other voucher programs within your community – such as, prescription vegetables, farm fresh vouchers, etc.
    - Incentive payment methods refer to additional money that a customer receives when they use a particular primary payment method at your market – such as, double up food bucks, fresh checks, grow your SNAP, etc.
- Use the central terminal tokens worksheet when you reimburse a vendor for their token sales.
- If you print new worksheets for every market day, label them with the appropriate date.

Stage 2. Implementation

- At the market, use the central terminal sales worksheet whenever:
    - A customer uses a primary payment method (credit/debit, SNAP, WIC FMNP, WIC CVV, Senior FMNP, or voucher); or
    - You distribute an incentive payment to a customer (double up food bucks, fresh checks, grow your SNAP, etc.).
- During the transaction, record:
    - The transaction date, the primary payment method, the customers first and last initials, the last eight digits of the SNAP number, the primary sale amount; and
    - If applicable, the incentive payment type and incentive payment amount.
- Fill out a row for each primary payment method transaction. One customer may have multiple transactions. For example:
    - (1) A customer uses their SNAP benefits and a 'prescription vegetables' voucher on the same market day. You process each primary payment method as a separate transaction and record the sale information on separate rows.
    - (2) A customer uses their SNAP benefits and you offer a SNAP 'double up food bucks' incentive payment. You record the SNAP transaction as the primary payment method and the 'double up food bucks' as the incentive payment type and amount.
- At the market, use the central terminal token worksheet when you reimburse a vendor for their token sales.
    - Record the vendor name and write the total amount of money that they received in tokens for each payment method (credit/debit, SNAP, WIC FMNP, WIC CVV, Senior FMNP, and incentive payments).
    - Fill out a row for each vendor.

Stage 3. Data Entry

- Log into your F2F account: http://www.portal.farm2facts.org
    - Select the Step 2 - Collect Data function.
    - Go to the Central Terminal Sales and Central Terminal Tokens instrument webpages.
- Data upload
    - Download the data entry template.
        - Enter your data into the template. Dates should follow the Month/Day/Year format.
        - Save as .csv file (not .xls).
    - Use the Browse button to select the .csv file from your computer.
    - Press the Upload button to upload the data to the portal.

- Review, edit, and delete the data in the bottom screen.
    - Edit the data by pressing the Edit button and clicking on the cell that you would like to change.
        - Press the check button to save and the X button to cancel.
        - Turn off the editing feature by pressing the Edit button again.
    - Delete rows of data by selecting the ID box and pressing the Delete Selected button.

Worksheet Central Terminal Sales

Complete this worksheet every time a visitor completes a transaction through your market. Transfer the information into the Central Terminal Sales webpage in the portal at the end of the market day.

> **Primary payment methods** include credit/debit, SNAP, WIC FMNP, WIC CVV, Senior FMNP, and other voucher programs within your community (prescription vegetables, farm fresh vouchers, etc.).
>
> **Incentive payment methods** refer to additional money that a customer receives when they use a primary payment method (double up food bucks, fresh checks, grow your SNAP, etc.).

Fill out a row for each primary payment method transaction. One customer may have multiple transactions.

Transfer this information into the Central Terminal Sales webpage in the portal at the end of the market day.

Id	Date	Primary Payment Method	Unique SNAP Id		Primary Sale Amount ($)	Incentive Payment Type	Incentive Payment Amount ($)
			First & Last Initials	Last 8 Digits of SNAP Number			
1							
2							
3							
4							
5							
6							
7							

Worksheet Central Terminal Tokens

Date _____

Complete this worksheet when you reimburse a vendor for their token sales. Transfer the information into the Central Terminal Tokens webpage in the portal at the end of the market day.

Record the vendor name and write the total amount of money that they received in tokens for each payment method (credit/debit, SNAP, WIC FMNP, WIC CVV, Senior FMNP, and incentive payments).

Transfer this information into the Central Terminal Tokens webpage in the portal at the end of the market day.

Id	Vendor Name	Credit / Debit	SNAP	WIC FMNP	WIC CVV	Senior FMNP	1 Voucher	2 Voucher	1 Incentive	2 Incentive
1										
2										
3										
4										
5										
6										
7										
8										
9										
10										

Vendor Attendance

Vendor attendance data provides valuable information on the number of vendors that participate in your market each week and throughout the season. If you have an existing process to track vendor attendance, you can enter that data into the Vendor Attendance webpage in the portal.

Instructions

Stage 1. Preparation

- Once all of your vendors have returned their vendor application for the current market season, enter the vendor name and owner's last name from each vendor application on the vendor attendance worksheet.
    - The paper worksheet contains two tables: use table 1 during weeks 1 through 18 and table 2 during weeks 19 through 36 (or the last week of your market), and you will need to fill out the vendor name and owner last name columns in both tables.
    - Decrease data entry errors by writing the names in the same order on the two tables and in the vendor attendance data entry template.

Stage 2. Implementation

- Take attendance every market day.
- Take attendance any time after the market opens but before it closes.

Stage 3. Data Entry

- Log into your F2F account: http://www.portal.farm2facts.org
    - Select the Step 2 - Collect Data function.
    - Go to the Vendor Attendance instrument webpage.
- Data upload
    - Download the data entry template.
        - Enter your data into the template. Dates should follow the Month/Day/Year format.
        - Save as .csv file (not .xls).
    - Use the Browse button to select the .csv file from your computer.
    - Press the Upload button to upload the data to the portal.
- Review, edit, and delete the data in the bottom screen.
    - Edit the data by pressing the Edit button and clicking on the cell that you would like to change.
        - Press the check button to save and the X button to cancel.
        - Turn off the editing feature by pressing the Edit button again.
    - Delete rows of data by selecting the ID box and pressing the Delete Selected button.

Worksheet

Use this worksheet to track vendor attendance throughout the season.

1. Once you receive all of your vendor applications, write the business/farm name and owner's last name from each vendor application onto this paper worksheet.
    - This worksheet contains two tables: use table 1 during weeks 1 - 18 and table 2 during weeks 19 - 36 (or the last week of your market) and you will need to fill out the vendor name and owner last name columns in both tables.
    - Writing the names in the same order on the two tables and in the portal will decrease data entry errors.
2. Print the worksheet to use at the market.
3. Please take attendance every day of the market and you can complete this task anytime after the market opens but before it closes.

Transfer this information into the Vendor Attendance webpage in the portal at the end of the market day.

Table 1. Weeks 1 – 18

Id	Vendor Name	Owner Last Name	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1																				
2																				
3																				

Table 2. Weeks 19 – 36

Id	Vendor Name	Owner Last Name	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36
1																				
2																				
3																				

Volunteers

F2F defines volunteer labor as "willing work without compensation" and at farmers markets, this means that volunteers can be responsible for periodic help at the market, day-to-day operations, and regular governance tasks. Occasional volunteers are usually community members or organizations that volunteer periodically throughout the market season. Regular volunteers are usually unpaid representatives of the market.

In order to obtain a complete understanding of volunteer labor at farmers markets, we include unpaid representatives of the market in the annual number of volunteer hours metric. It also enables you to identify and compare different groups of volunteers (occasional volunteers and regular volunteers), the number of hours that they work, and the type of tasks that they complete.

Instructions

Stage 1. Preparation

- Print the volunteers worksheet to record the hours that occasional and regular volunteers work during the market day and outside of the weekly event.

Stage 2. Implementation

- When people volunteer at the market:
    - Record the date, the first and last name of each person, and if applicable the organization name.
    - When they leave the market for the day, record the number of hours that each person volunteered and the tasks that they completed.
- When unpaid representatives of the market work outside of the weekly market:
    - Ask them for the number of hours that they worked and the tasks that they completed on a regular basis.
    - Record the information on the volunteers worksheet.

Stage 3. Data Entry

- Log into your F2F account: http://www.portal.farm2facts.org
    - Select the Step 2 - Collect Data function.
    - Go to the Volunteers instrument webpage.
- Data upload
    - Download the data entry template.
        - Enter your data into the template. Dates should follow the Month/Day/Year format.
        - Save as .csv file (not .xls).
    - Use the Browse button to select the .csv file from your computer.
    - Press the Upload button to upload the data to the portal.
- Review, edit, and delete the data in the bottom screen.

- Edit the data by pressing the Edit button and clicking on the cell that you would like to change.
    - Press the check button to save and the X button to cancel.
    - Turn off the editing feature by pressing the Edit button again.
- Delete rows of data by selecting the ID box and pressing the Delete Selected button.

Worksheet

A volunteer refers to a person that willingly works without compensation. At farmers markets, this means that volunteers can be responsible for periodic help at the market, day-to-day operations, and regular governance tasks. Please record the number of volunteer hours for occasional volunteers and for the unpaid representatives of the market.

Transfer this information into the Volunteers webpage in the portal at the end of the market day.

Id	Date	First & Last Name	Organization Name	Hours (.25)	Completed Tasks
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					

Market Programs

F2F defines a market program as a special affair hosted by the market and they include demonstrations (cooking or planting), contests, skills workshops (physical or craft), other activities, and field trips to the market. The market programs instrument characterizes each program as educational or youth-specific and identifies the total number of participants and the number of youth participants. You will determine whether someone is less than 18 years old by evaluating the physical characteristics of the participants.

Instructions

Stage 1. Preparation

- Print the market programs worksheet to use at the market whenever you host a program.

Stage 2. Implementation

- Classify each program as a:
    - Demonstration (cooking or planting);
    - Contest;
    - Skills workshop (physical or craft);
    - Other activity; or
    - Field trip to the market.
- If you can classify the program under more than one type, select the description that supports the main purpose of the event.
- Record the date and program type in the market programs worksheet.
    - If the program takes place at a distinct time during the market day, approximately half way through the program count (1) the total number of participants and (2) the number of participants that appear to be younger than 18 years old.
    - If the program is ongoing throughout the market day, count the total number of participants by (1) tallying the visitors when they join the program and (2) marking whether each participant appears to be younger than 18 years old.

Stage 3. Data Entry

- Log into your F2F account: http://www.portal.farm2facts.org
    - Select the Step 2 - Collect Data function.
    - Go to the Market Programs instrument webpage.

- Data upload
    - Download the data entry template.
        - Enter your data into the template. Dates should follow the Month/Day/Year format.
        - Save as .csv file (not .xls).
    - Use the Browse button to select the .csv file from your computer.
    - Press the Upload button to upload the data to the portal.
- Review, edit, and delete the data in the bottom screen.
    - Edit the data by pressing the Edit button and clicking on the cell that you would like to change.
        - Press the check button to save and the X button to cancel.
        - Turn off the editing feature by pressing the Edit button again.
    - Delete rows of data by selecting the ID box and pressing the Delete Selected button.

Worksheet

Please complete this worksheet every time you schedule a program at your market. A market program is a special affair that the market organization hosts and you will determine whether a participant is less than 18 years old by evaluating the physical characteristics of the participants.

4. Classify the program type within one of the following categories:
    - Demonstrations (cooking or planting)
    - Contests
    - Skills workshops (physical or craft)
    - Other activities
    - Field trips to the market
5. If you can classify the program under more than one type, select the description that supports the main purpose of the event.
6. Count the total number of participants and the number of people that appear to be less than 18 years old.

Transfer this information into the Market Programs webpage in the portal at the end of the market day.

Id	Program Date	Program Type	Education? (Y/N)	Youth specific? (Y/N)	Total participants (#)	Participants under 18 years old (#)
1						
2						
3						
4						

Conclusion

To summarize, the two articles create a cohesive dissertation because both projects reflect my disposition for inductive research methods and pragmatic social-legal theory and because they demonstrate my ability to apply those principles through different citizen participation processes and distinct land use and food systems issues.

More specifically, *Conceptualizing Land Access in Scholarship and Practice and on the Farm* uses grounded theory research methods to evaluate existing knowledge about farmland access and to conceptualize the issue within the contexts of farmers' everyday lives. To compare, existing scholarship and practice provides technical details about the actions and elements for accessing land, while this article explains the interactive nature associated with the various experiences and processes for renting, purchasing, and transferring it. Both types of information are necessary and valuable, but the systematic understanding from the farmers' perspective produces realistic and actionable findings. The conceptual model illustrates the consistent differences within four land access trajectories and the distinct variations between broad land access experiences: 'farmland connection + farming background,' 'no farmland connection + farming background,' 'farmland connection + no farming background,' and 'no farmland connection + no farming background.' Planners and policy-makers can use information from the conceptual model to develop interventions that tackle the big picture yet stay connected with real people, which may involve partnering with private entities to develop market-based and finance-focused programs and policies.

Scientists Managing Farmers Markets: Systematizing Aspects of the Citizen-Manager's Role follows citizen science research methods to fill a knowledge gap and to support market decision-making. The article describes the research process and methods that I employed

to develop Farm 2 Facts, which is a fee-for-service program that empowers farmers markets through data. The project had two distinct phases that employed different perspectives of citizen science. During the first phase, I evaluated interaction among individual actions, physical environments, and research methods to develop resources that uphold social science research standards and honor the unique characteristics of markets, and during the implementation phase, markets contract with F2F to evaluate specific aspects of their market that are important to them and F2F provides the technical resources to collect, interpret, and report data. Thus, the project moved from engagement to collaborative citizen science.

Together, these projects and articles demonstrate the range of research experiences and analytical skills that I honed throughout my graduate education, and I will advance this work by transforming the dissertation into a minimum of four publications that target a range of scholar, practitioner, and community member audiences. The following list identifies potential title, objective, and an outlet for each publication.

1. Conceptualizing land access in research and practice and on the farm

    a. Condense the dissertation article into a peer-review journal-length article. The purpose is to evaluate the different conceptualizations of farmland access and the implications for addressing the issue through programs and policies that address the planning, market, and finance elements of accessing land.

    b. Submit to Agriculture and Human Values or Journal of Agriculture, Food Systems, and Community Development.

2. Accessing Farmland: Farmer-focused definitions and interventions

   a. Edit the results to provide a more applied explanation of the conceptual model. The purpose is to explain how farmers conceptualize land access and how they actually rent, purchase, or transfer land and to identify appropriate interventions.

   b. Submit to Journal of Agricultural Education and Extension or Journal of Community Development.

3. Scientists managing farmers markets: Systematizing aspects of the citizen-manager's role

   a. Edit the literature review to report the outcomes of existing farmers market research and add more details about how pilot markets reacted to the tool and use the data collection, interpretation, and reporting features to advance their goals.

   b. Submit to Citizen Science: Theory & Practice or another social science research methods journal.

4. Two birds with one stone: How citizen science empowers everyday activities and evaluates program impacts

   a. Explain the history and purpose of citizen science research methods and use Farm 2 Facts as an example of a traditional citizen science program. The purpose is to dispel inaccurate understandings of citizen science among the general public – i.e., the differences between surveys and public participation and citizen science.

   b. Submit to Vox or to any newspaper as an opinion article.

As I complete my degree, I am pursuing opportunities where I engage my systems thinking, strategic planning, and leadership skills to develop programs and policies that integrate basic research principles and findings into applied settings. That is, I am going beyond the tenure track to work in a setting that uses the skills and experiences described here to expressly tackle real world problems and connect with real people. This dissertation sets the stage for this work because it embodies this research in action philosophy.