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Connecting People and Place: Farmers, Resilience, and the Future of Smallholder Farms in Albuquerque

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THESIS

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ABSTRACT

This paper compares scholarly concepts of resilience with primary factors influencing Albuquerque's smallholder farmers' decisions to continue farming. In doing so, it highlights the voices of local farmers and critically examines the scope and limitations of resilience theory. Although resilience theory has gained popularity as a tool for understanding complex social-ecological systems, recent scholarship questions the applicability of resilience to social systems. In particular, questions have been raised as to whether current resilience theory adequately addresses issues of power and agency. By focusing on farmers as decision makers, this paper seeks to evaluate these claims by examining the utility of resilience theory in a case study involving smallholder farms in Albuquerque, New Mexico. Qualitative research methods were employed in the form of farm visits and semi-structured interviews with ten Albuquerque smallholder farms. Interviews were transcribed and then coded for analysis. Overwhelmingly, farmers plan on continuing to farm though three factors were identified which would alter these decisions. Furthermore, connection to place and self-sufficiency emerged as key motivators for continuing to farm. Although basic resilience concepts may be useful tools

for understanding the general context of farmers' experiences, farmers' connection to place and expressions of power and agency are not adequately addressed using basic resilience concepts. Research findings illustrate that fully comprehending farmers' decision to continue farming requires thoughtful attention to connection to place. Potential remedies to these limitations are addressed by looking at, and expanding upon, resilience theory as it is used in real world assessments by way of the Resilience Alliance Workbook (2007).

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1.1 Introduction

While the dominant food system is touted as an exemplary method of increasing food production, there are many who feel that this success comes at the expense of the environment, social justice, and personal health. Perhaps because of these concerns, more people are beginning to engage in discourse about food in America. Allen (2008, 157) argues that, "Never before has there been so much popular interest in food in America-food as culture, food as economics, food as politics." However, even with this active dialogue on food taking place, there are some who continue to feel disconnected from their food and the global system that provides it. Although more than ten years have passed since Kloppenburg, Hendrickson, and Stevenson (1996, 34) shared the following sentiments, they are still pertinent today: "What is eaten by the great majority of North Americans comes from a global everywhere, yet from nowhere that they know in particular." Others share these thoughts with a push towards alternative food models occurring as a result. Hassanein (2003, 80) describes these alternative food movement advocates as "...sustainable agriculturalists, local food advocates, environmentalists, food security activists, and others" who are all engaged in the process of eliciting change in the current food system.

Agricultural alternatives, such as the local food movement, seek to reestablish connections between people and place (Kloppenburg, Hendrickson, and Stevenson 1996).

These alternatives often involve direct-marketing models such as farmers' markets, CSAs (community supported agriculture), and farm-to-school programs. Farmers' markets are, generally, gatherings of produce, value-added food, and craft vendors on a seasonal to year round basis. CSAs operate by individuals or families purchasing memberships to receive weekly or bi-weekly produce boxes. Although there are many different CSA models, the basic idea is that upfront membership fees help farmers cover costs before peak season production and sales. Farm-to-school programs also operate in various capacities, but typically involve collaboration between local farms and schools to provide locally sourced produce for school lunches. Spaces such as these are believed to facilitate equitable interactions and venerate various forms of knowledge (Kloppenburg 1991). The number of farmers' markets in the United States experienced exceptional growth from 340 in 1970 to over 3,000 markets in 2000 (Lapping 2004). Growth of farm-to-school programs has also occurred. By 2009, around 2,050 such programs existed in the United States, which was nearly double from the year 2005 (Martinez et al 2010).

Though the alternative food movement continues to gain ground and participants, scholars caution against making broad sweeping environmental, social, or economic assumptions about the emerging alternatives (Born and Purcell 2006, Allen 2010, DeLind 2011). While a critical assessment of alternative food models is certainly warranted, one of the challenges becomes developing a way to assess their success. A core issue is whether it is possible to evaluate these alternatives in the same capitalist context as the dominant conventional agriculture system. It is out of this dilemma that the current research emerges.

This paper explores factors of success and longevity for smallholder farms in Albuquerque using the concept of resilience. Through the use of interviews and farm visits, the following question is explored: how do scholarly defined elements of "resilience" compare to the primary factors identified by Albuquerque's smallholder farmers which influence their decisions to continue farming? Although resilience theory has gained popularity as a tool for understanding complex social-ecological systems, recent scholarship questions the applicability of resilience to social systems. In particular, scholars question whether or not current resilience theory adequately addresses issues of power and agency (Adger 2000, Harrison 2003, Hornborg 2009, Davidson 2010, Cote and Nightingale 2012, Chandler, 2012, Davidson 2013). By focusing on farmers as decision makers and looking at farms as a social-ecological system, this paper explores these claims. Although basic resilience concepts may be useful tools for understanding the general context of farmers' experiences, social factors influencing decisions to continue farming are not adequately addressed using such basic resilience concepts. Fully comprehending farmers' decision to continue farming requires thoughtful attention to connection to place. Potential remedies to these limitations are addressed by looking at, and expanding upon, resilience in action by use of the Resilience Alliance Workbook (2007) instead of continuing to focus solely on theoretical concepts.

1.2 Resilience and its critics

The concept of resilience is utilized by many fields, including mental health/psychology and defense/security (Walker and Salt 2012). In this paper, focus is given to resilience as it has developed out of the field of ecology and the work of C.S.

"Buzz" Holling (Holling 1973). From this context resilience emerged as a tool for better understanding the capacity of ecosystems to cope with changes and maintain basic functions (Folke 2006, Folke et al. 2010).

Resilience, as employed here, refers to "the capacity of a system to absorb disturbance and reorganize so as to retain the same function, structure, and feedbacks – to have the same identity" (Walker and Salt 2012, 3). It is vital to point out that resilience is neither good nor bad (Walker and Salt 2012). Resilience theory is merely a lens through which the world can be viewed. As such, assumptions about the desired state of a system can vary drastically depending on who is viewing the system. Furthermore, there are two main ways in which we can talk about resilience: general resilience and specified resilience (Walker et al. 2004, Walker and Salt 2012) Specified resilience describes the resilience of a specified part of the system to particular shock (Walker and Salt 2012). In other words, specified resilience is the resilience *of* what *to* what. General resilience, on the other hand, is the capacity of the system as a whole to deal with a variety of disturbances. Instead of planning for one particular threat, general resilience may be enhanced by elements such as diversity, redundancy, and tight feedback loops which foster learning (Walker and Salt 2012). Building specified resilience may hinder general resilience, since focus on a particular disturbance can limit attention to other potential threats (Walker and Salt 2012). Utilizing resilience to understand agricultural systems, this research is concerned with the general resilience of Albuquerque's smallholder famers.

Adaptive capacity is simply the ability of a system to mitigate disturbance (Berkes and Folke 1998). As noted above, diversity, redundancy, and learning are essential to enhancing a systems adaptive capacity. However, sometimes shocks prove too substantial for a system to manage. When a system is no longer able to deal with the changes experienced it may shift into an entirely different state, with a new identity (Folke et al. 2010, Walker and Salt 2012). Such a shift in the identity of the system is known as transformation and the breakpoint between the two regimes is the threshold (Walker and Meyers 2004, Walker, et al. 2004). Resilience moves beyond concepts of sustainability, which are static and limiting, to acknowledge the dynamic character of ecosystems (Davidson 2010). From this basic ecological foundation resilience theory has expanded to address social-ecological systems (Adger 2000, Folke 2006, Davidson 2010, Folke et al. 2010).

Within resilience research, social-ecological systems research emerged in response to the fact that many of the changes or pressures on ecosystems were caused by humans (Folke 2006). Research topics from a social-ecological perspective are incredibly diverse and include topics such as assessments of urban resilience, urban design, crisis facing fisheries, farmers' markets as learning spaces, agroecosystem resilience, and the role of climate change on global resilience (Ernston et al. 2010, Milestad et al. 2010, Folke et al. 2010, Ahern 2011, Coulthard 2012, Cabell & Oelofse 2012). Also within this literature is a theoretical expansion of its utility, as proponents of resilience clarify and develop key concepts, such as adaptability and transformation, and assess the limitations

and challenges to applying ecological theory to social systems (Adger 2000, Davidson 2010, Lof 2010, Folke et al 2010, Cote & Nightingale 2012).

While resilience has certainly proved a useful tool in many circumstances, is has not gone without critique. One of the most common critiques that emerges is that resilience research often fails to adequately acknowledge the political context of and power structures at work in the systems studied (Hornborg 2009, Cote and Nightingale 2012, Chandler, 2012, Davidson 2013, Brown 2013). For example:

> ..reliance on ecological principles to analyse social dynamics has led to a kind of social analysis that hides the possibility to ask important questions about the role of power and culture in adaptive capacity, or to unpack normative questions such as 'resilience of what?' and 'for whom?' when applied to the social realm(Cote and Nightingale 2012, 479).

As the above quote demonstrates, lack of attention to the politics of problems can facilitate making normative assumptions about desired states or conditions of systems (Nadasdy 2007, Hornborg 2009, Cote and Nightingale 2012, Welsh 2012, Reid 2012).

As the majority of critics note, extending ecological principles to social systems is quite problematic because doing so often ignores unique characteristics of individuals and or collective actions, i.e., the concept of human agency (Adger 2000, Harrison 2003, Ernston et al 2010, Davidson 2010, Brown 2011, Cote and Nightingale 2012). More specifically, it is humans' capacity to imagine and anticipate the future which allows us to develop innovative solutions to problems faces (Harrison 2003, Davidson 2010, Ernston et al2010). Furthermore, agency is enacted at multiple scales, from the individual to larger community, and resilience must address this complexity of agency as well (Ernston et al 2010, Davidson 2010, Davidson 2013). As Davidson (2010, 1145), states “...human

agency is the most contentious wrinkle in the application of an ecological framework to social systems."

Clear, consistent working definitions of power and agency are lacking from resilience literature. In this paper, the two terms will be used in the following way: agency asserts that individuals and communities are conscious decision makers while power implies the ability to actually be able to act on those decisions within the wider institutional, social, economic, and cultural contexts (Davidson 2010, Cote and Nightingale 2012). As such, power is not only influenced by formal regulations or institutions but is experienced in social interactions everyday (Cote and Nightingale 2012).

Lastly, the idea of resilient *subjects* arises consistently in critics' discussions of resilience and development, disaster management, and governance (Zebrowski 2009, O'Malley 2010, Welsh 2012, Chandler 2012, Reid 2012). Resilient subjects refers to the shift in governance strategies from top-down control to expectations of individual robustness and adaptability. Reid (2012, 74) demonstrates the problem with such a shift when he says, "In this sense the resilient subject is a subject which must permanently struggle to accommodate itself to the world."

1.3 Methods

This research investigates decision making processes of smallholder farms, defined as those operating on less than ten acres and whose gross farm income is $50,000 or less. There is no singular definition of smallholder farms which has complicated my own process of defining these terms. While the World Bank describes smallholder farms

as those occupying two hectares of land or less, this definition is derived from generalizations of farm size in developing countries (Nagayets 2005, Devendra 1993). Smallholder farms in the United States might not match the two hectare size constraints but still experience "limited resource endowments relative to other farmers in the sector" (Dixon, Tanyeri-Abur, and Wattenbach 2004).[i] Albuquerque farms are defined as those engaged in at least one form of direct marketing (CSAs, farmers' markets, farm-to-school programs, etc.) within the Albuquerque city limits.[ii] In doing so, this research draws upon a foodshed perspective (Kloppenburg, Hendrickson, and Stevenson 1996). Just as a watershed is made up of tributaries feeding into a larger river, foodshed describes the flow of food resources into a place, such as a city. By utilizing engagement in direct marketing within the city limits, the research incorporates farms which are functionally tied to the space.

Qualitative research methods were used in the form of semi-structured interviews and observational farm visits, similar in design to Pilgeram's (2011) work on Pacific Northwest farmers engaged in sustainable farming. Ten farms participated in the research, and interviews were conducted with twelve individuals from these ten farms. Interviews ranged in length from twenty-five minutes to over an hour, with majority of the interviews close to forty-five minutes in length. Interview questions inquired into the general background and current state of each farm and future plans of farmers (See Appendix A for full list of questions). Additionally, some questions were designed to address specific resilience concepts. For instance, asking farmers what limitations they experience was aimed at providing insight into the disturbances faced by the system.

Interviews were transcribed and then coded for analysis (Savin-Badin and Major 2013). The results from the coding process, which reflected themes from the interviews, were then compared with basic resilience concepts derived from the Resilience Alliance website (2005) and work by Walker and Salt (2012). Farm visits were conducted with seven of the ten farms and field notes were recorded during these occasions.

While six of the ten farms are located in Albuquerque's South Valley area, participating farms are situated as far north as Velarde, New Mexico and as far south as Lemitar, New Mexico (See Figure 1 and 2). The farms average 2.2 acres in size. All of the farms sell at at least one Albuquerque Growers' Market. Nine of the farms sell to restaurants. Three farms sell food to Albuquerque Public Schools and only two operate a CSA (Community Supported Agriculture). Six of the farms raise animals in additional to their fruit and vegetable crops. Only two of the farms have one or more greenhouses/cold frames.

Of the twelve individuals interviewed, only three identified as having a family history of farming. Experience farming ranged from three to fifty years. When put into groups, six individuals have been farming 1-10 years, three individuals have been farming 11-20 years, and three individuals have been farming 21+ years. Seven of the individuals who participated are male and five are female. Separated by age, three individuals are 20-30 years old, four are 31-40, three are 41-50, and two are 60+. Out of the twelve, four identify as Hispanic with the remaining eight identifying as White.

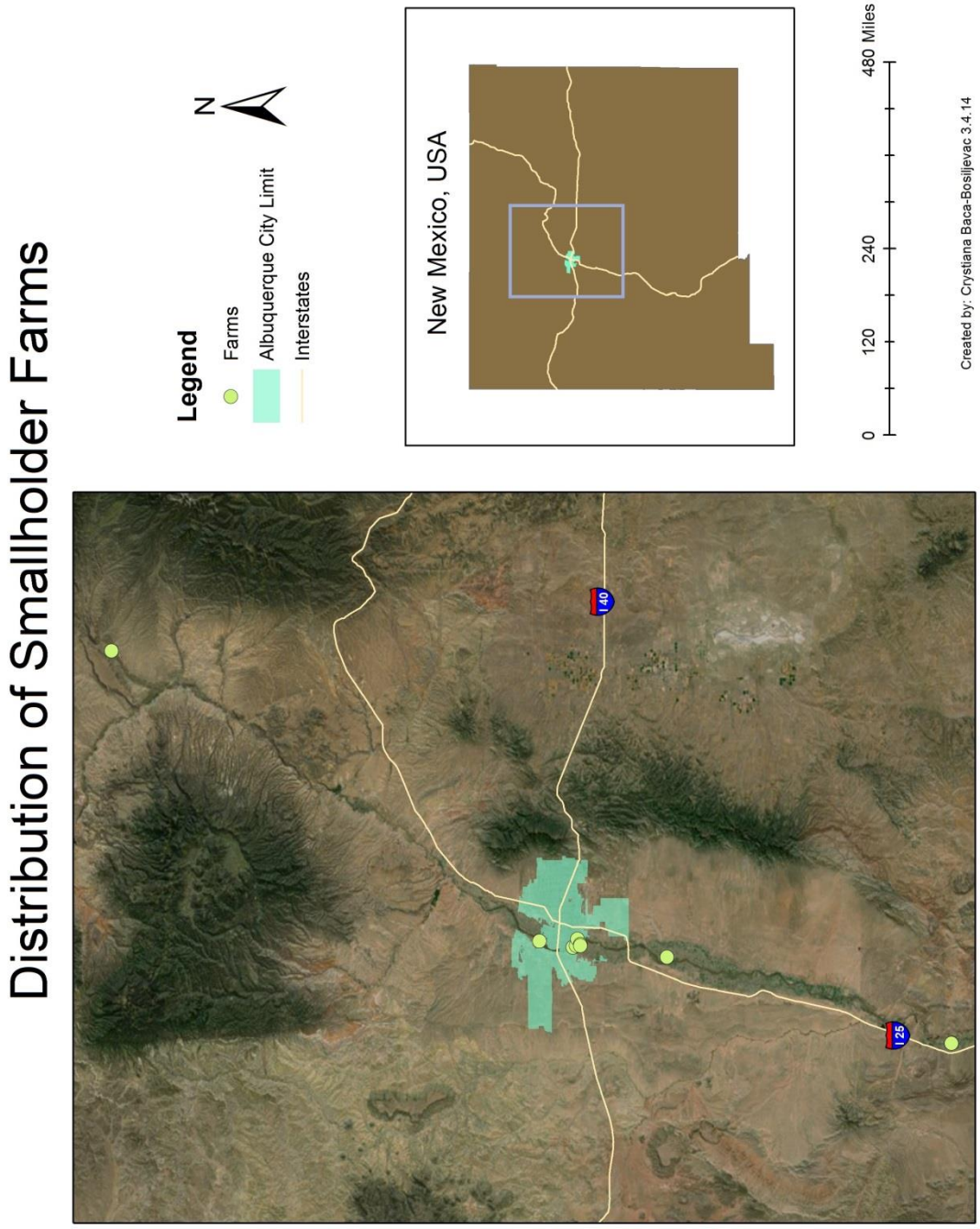

Figure 1: Map of smallholder farms

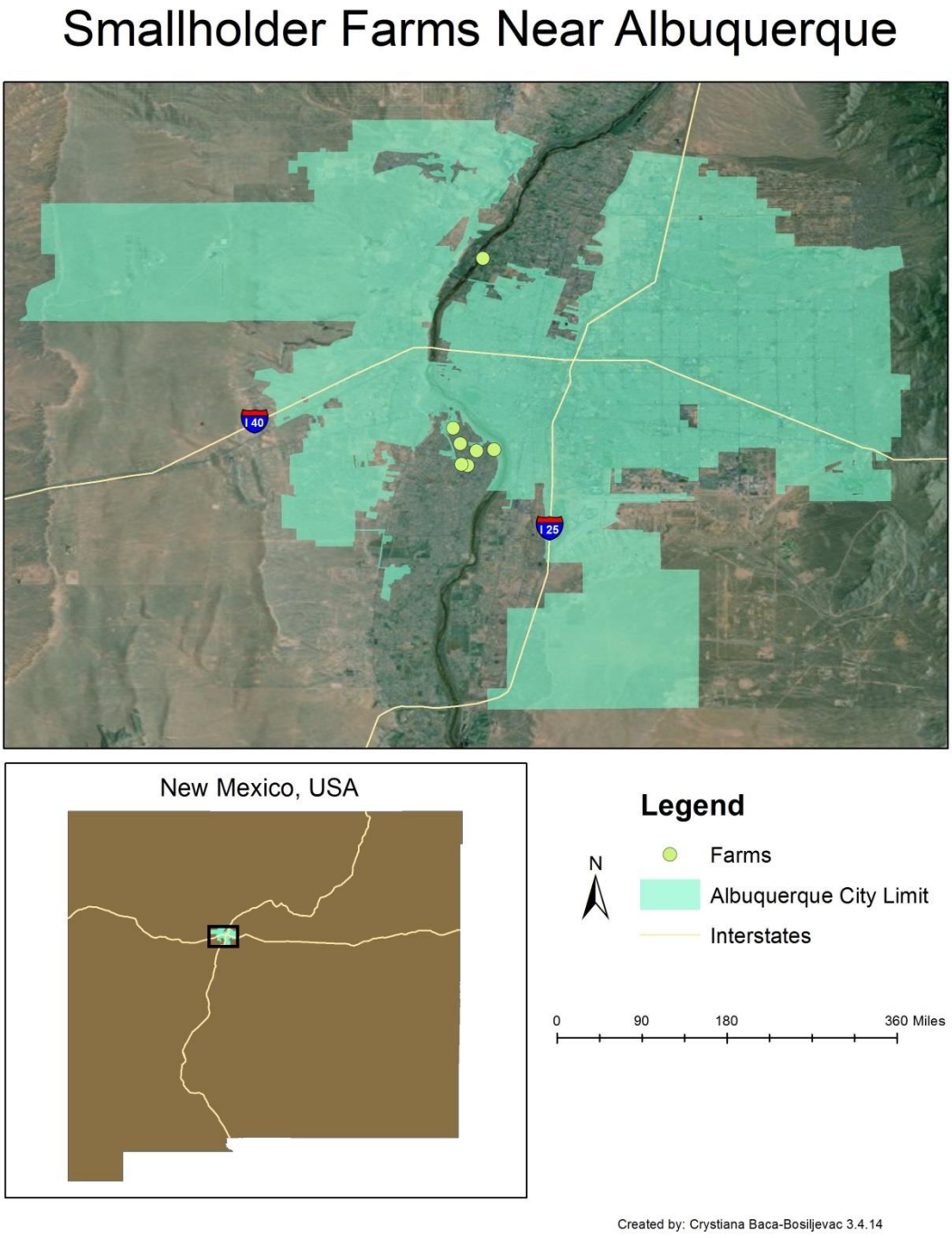

Figure 2: Map of Albuquerque area farms

1.4 Results

The first section addresses limitations experienced by smallholder farmers which is followed by a discussion of successes mentioned by farmers. The third section approaches the role of learning and knowledge for smallholder farmers. With the general context of smallholder farms in place, the final section will discuss farmers' decisions for their future farming plans.

1.4.A Limitations and challenges of smallholder farming

Income

When individuals were asked about the limitations or challenges they experienced, fourteen responses emerged. One of the most discussed challenges was income. While a few individuals mentioned the difficulty of learning to budget for the year, the majority of comments reflected the concern of not being able to make a living wage. As such, it was not uncommon to hear that a second job was necessary in order to make a living. Additionally, it is important to think about the role that subsidies may play in this context. One individual explained:

> I think it's hard to farm because you don't make any money at it. It's not a living wage…If I could get a fair wage for the work I do here that would be amazing….You know, most of the folks that farm, and have been able to do it for so long, are lucky enough to have some kind of subsidy. They're lucky enough to have some kind of salary that pays them that really isn't connected to the success of the farm….a grant that pays them, or some sort of outside support. Maybe it's family land that they don't have to pay a mortgage payment on. There's some kind of subsidy there.

As the above quote illustrates, subsidies, at least in the context of this paper, can be thought of any outside support which defrays the full cost of farming. However, even

with the presence of subsidies, be they grants or access to land, many farmers still struggle to earn a living wage.

Time

Discussions of time centered around two ideas. First, individuals shared their general feelings of not having enough time to do everything they wanted. For instance, starting a CSA or attending additional markets was appealing to several farmers, but they simply did not have the time to organize, prepare, and attend. The second issue raised came from those farmers who were also parents. They discussed the difficulty of balancing family life with the needs of the farm. One couple described their concerns in the following dialogue:

> Woman: ...We have a kid now and I need to have energy for her and I need to be able to give her attention. It's a really exhausting job physically and emotionally and I feel I need to hold some of myself back for that.
>
> Man: It's definitely true that we find ourselves striving for things to have a little bit more of a yearlong quality to them, as opposed to a summer peak. I think we both can see how we could be wonderful parents from like October to April and $#!*heads from April to like September.
>
> Woman: Where'd my parents go? I guess they're in the basil somewhere. I haven't seen them in a couple weeks. I've been eating tomatoes...(Laughs).

Although the dialogue above is humorous at times, it conveys the serious questions farmers face as they balance farm demands with family life.

Communication

Communication, another challenge mentioned frequently, referred to both on farm and off farm experiences. On farm experiences generally expressed the difficulty of co-workers effectively communicating after long, arduous hours of work. Off farm

experiences typically included farmers' interactions with customers at markets but sometimes included farmers' experience with the community at large. For example, one farmer, who did not have organic certification, noted that it was sometimes difficult to fully communicate with customers about their farming practices. With regards to on farm experiences, one farmer said:

> Communication between people working on the farm is always a big challenge. It's very easy to get frustrated, to come to a situation, to feel that someone did something wrong and because of it you have to work so much harder, because of a mistake or laziness that occurred. Being able to communicate that but also being respectful, and then also reminding ourselves, what is our goal.

Pests

Pests, in this context, does not simply mean insects but refers to plants and animals as well that impede peak production of the agricultural product. Plants which were considered pests were usually undesired volunteers growing with crops but sometimes nearby trees were talked about as pests as well. This was because their roots were competing with crops for water and nutrients. Although nearly everyone mentioned having to deal with pests of some sort, they were rarely talked about as being major problems. Instead, pests were a normal, if not expected, challenge for farmers. In regards to insects, some farmers had noticed how weather patterns, such as warm winters, had led to greater occurrences than in previous years. However, farmers seemed to find their existing insect management plans, such as crop rotation, planting intervals, and row covers, effective even with these shifts in insect populations. Trees proved to be one pest which did illicit more critical comments from farmers, such as in the following statement:

> The trees are just insane. I mean the Alanthis and the [Siberian] Elm are insidious and cause huge problems that you can only do so much about unless we took the time to like cut them all down or poison them or something. So the trees are a huge problem. You think it doesn't make that much of a difference but it's insane how much tree roots, networks of tree roots, will just suck life out of the soil and away from the plants.

Animals as pests were mentioned less frequently than plants and insects, and were much more site specific than the other two. For instance, one farmer dealt with feral cats entering his cold frame while another struggled with Sandhill cranes pulling up planted shallots.

Figure 3: Drip irrigation is the most common irrigation method used by farmers.

Water

Issues surrounding water generally centered around concerns of living in a desert and long term availability. Only one farm relied exclusively on irrigation water from the

acequia. The remaining farms, though some had access to the acequia, utilized drip irrigation fed with well water. Water scarcity was discussed as a future uncertainty which would influence habitation of the area in addition to affecting the feasibility of farming. The following quotes describe these concerns:

> There are very few limiting factors if you are genuinely interested in [farming], except for the issue of water in the desert and the possibility that it's kind of stupid to grow food in the desert at a certain point.
>
> …Santa Fe, Albuquerque, even Los Lunas, Belen, Socorro, all of these communities are growing and they need more and more water. That water has to come from somewhere and, a lot of times, if it comes from the rio, from the river, your agriculture loses out…There's only so much water in that river.

Figure 4: Acequia access allows some farmers to flood irrigate.

Community support

Two specific issues were raised with regard to community support. The first issue was that community support is lacking and needs to be developed, perhaps though education. When considering the entire population of Albuquerque and New Mexico, farmers asserted that most are not involved in supporting smallholder and/or local agriculture. However, in addition to simply not being aware of opportunities to engage with smallholder farmers, some farmers mentioned that this general lack of support may also be linked to economic constraints for individuals in the community. The second issue raised was that, even where community support does exists, it is naive and, as such, does not provide aid to farmers in a way that is truly meaningful/needed. For instance, just because people shop at the growers' markets, does not mean they understand the policies or water issues with which farmers are struggling. As such, their desire to purchase food, and support farmers, only reaches the surface of the problems at hand. Even when people venture to a farm to help out with weeding or harvesting, their assistance can fall short. One farmer described this type of situation in the following way:

> Farms end up being...it's kind of a nebulous concept of home for lots of people, so people feel a warmth to farms, but they don't really always know what it means, but they feel like they want to go down to a farm but can't figure out why...There's a residual nostalgia that we had to decide we were no longer willing to enable.

Although the above quote mentions a distancing from the community, perhaps the quality of interactions might also be improved with education.

Loss or abandonment of agricultural land

When talking about loss or abandonment of agricultural land, farmers were not talking about current struggles to keep their own land. Instead, they were speaking to more general shifts in land use. For instance, not only has there been a shift, in some areas, of agricultural land to residential or commercial use, but land once farmed may simply be neglected or turned into lawns. The following quotes illustrate these concerns:

> Urban encroachment has always worried me and been limiting. I live a mile south of the county line and I've watched many pieces in my just half mile radius go from agriculture to nothing or to being residential or wanted to be developed by, in terms of high density housing or commercial. That's limiting to me in the sense that I don't want to be in an island and I want to be in a community that values agriculture.

> ..There is lots of land in New Mexico, just walk around the South Valley. We're driving around the South Valley and you see all those properties with humongous pieces of land and they [the owners] just want to see their grass looking pretty.

> There's a lot of land that's being unutilized in small towns...Right next to us there's five acres and the people have moved to Anderson, Nevada. The parents have died and the kids, they have it but, it's abandoned five acres of land and good land...

Although these changes may not directly affect them immediately, if at all, they pose a threat to future farmers, food security of the area, and overall community engagement and support of agriculture.

1.4.B Successes and rewards of smallholder farming

New and diverse crops

The most frequent topic which arose when farmers were asked about things that were successful or worked well was the diversity of things they grew and the opportunity to try new things. A major reason crop diversity is important is because it helps farmers

buffer themselves against uncertainty. By planting a diverse group of crops farmers can more easily deal with changes in weather, water, pests, and even growing season. The following quote expresses these sentiments:

> ...When we plan our tomatoes in particular we say, okay, what's fun? What do we love to eat? What makes a lot of money? What if it's really hot and dry, what does well then? What if it's a cool spring and a really early frost, what likes cool weather? What if it's really wet, what can handle splitting?...Not all of the tomato varieties that we plant do well every year because we can't predict what the weather is going to be like but we've got the plants in the ground just in case...

Figure 5: A rainbow of pepper varieties.

Furthermore, many of the farmers felt they had the opportunity to try new crops without threatening their businesses as a whole. Additionally, although decision making on the part of farmers certainly plays a key role in their willingness and ability to plant an assortment of crops, the physical space of the farm can also facilitate such choices. For instance, one of the farms visited had two fields: one with a few long rows, and the other with many short rows. The meaningfulness of this is expressed by the following:

> I have one field that's these very long beds that are things that either sit in the ground for a long time or are like this greater part of the bank account of this financial decision. Then this little field where there's thirty beds but they're only like fifty feet and so they're made to be able to change. It's designed that way. I designed it that way. So it's not a big deal if something doesn't do well to harvest it all. You could harvest it, till it, plant it all in a single afternoon because it's only like fifty feet.

Relationships with the community

Although community support is a challenge many farmers talked about, there are pockets of people that farmers found supportive and nourishing. These vibrant relationships fit into two main categories: other farmers and local chefs. In regards to the latter, Albuquerque has seen an increase in the number of restaurants sourcing produce locally. Such locally focused restaurants tend to be fine-dining establishments. Although cost may limit who patronizes these establishments, chefs have more flexibility in their menus. Because of this flexibility, chefs can create seasonal dishes to utilize available produce. Furthermore, trusting relationships may result in farmers' willingness to grow particular crops requested by chefs because they are, essentially, guaranteed a market. For instance, one farmer said:

> It's cool to work with chefs and have them sort of meet you there. You can kind of experiment together and sort of trust each other based on this decision of what you're growing.

In regards to relationships with other farmers, sharing of knowledge seemed to be the strongest connection though sharing of resources, such as farm equipment, also took place. Farmers felt comfortable asking someone else in the community for advice on particular crops or providing suggestions for designing a better market stand. One farmer expressed this in the following way:

> ...The biggest thing is support, to realize we're a group...we want to grow together. I don't mean grow food but improve all of our systems collectively...You know, if I see someone with a display that could use a table cloth I would suggest it. Or say they had a salad mix that was really gritty...and they said it keeps longer, and that's a pretty good reason, but me as a customer, I want to just reach in the bag and eat it. I don't want to rinse it...I think that's important, to be able to criticize for the better of everyone.

While many of the individuals interviewed made similar comments about their experiences as a community, I also observed these relationships in action. For instance, during one farm visit a farmer I was working with, who was unsure of how large bunches of kale should be for market, sent a text to another more seasoned farmer for advice. During another occasion, while visiting the Downtown Growers' Market, I witnessed one farmer telling another that their basil had developed downy mildew and to be cautious of purchasing seed from a particular supplier.

Connection to place and self-sufficiency

Many of the farmers talked about the importance of getting to know their land and connecting to place. While this sometimes could be understood simply as a learning

process, getting to know what grows well at their sites or what improvements their land needs, this understanding of the intrinsic workings of their space often translated into something more. Devoting time and energy to their land yielded inspiration as they witnessed their space transform. For some, who were quite new to farming, this transformation reflected ideas of their own potential. They experience a dialogue with the land. As one farmer said:

> I think that the energy that we've put into this land, we've been molding it you know, and just think if we were here and it still looked the same. I always reflect this as my life. So as this place is evolving into something beyond what I can explain, then I am doing something in my life. I reflect this place in my life.

The relationships that people developed with their land were further enforced by their ability to feed themselves and their families. While only one farm was able to completely meet the needs of the farmer and their family (they had set this intention) others still felt comfortable knowing that they were providing the bulk of their consumed food. As one farmer succinctly stated, "Farming is one of the only jobs where, if you don't make a dollar that day, you can still eat."

1.4.C Learning and Knowledge

Throughout the interviews, references to learning occurred often. In general, people often talked about their personal learning experiences. Such learning opportunities were often the result of time and practice. As mentioned briefly above, as farmers spent more time on their land they began to learn what crops and varieties work well in their space. Additionally, many farmers learned other, seemingly non-farm related tasks, like

mechanics. Acquisition of such knowledge allowed people to do maintenance work on tractors and rototillers, thus often saving them time and money. However, in addition to these personal, experiential learning opportunities, there were several other resources farmers looked to to garner additional knowledge. By far, the most common resource utilized was other farmers in the community. This does not come as much of a surprise given the importance and success of community relationships mentioned above. Emerging programs, such as a local chapter of the Young Farmers Coalition, may facilitate further support amongst local farmers. Another key resource mentioned was universities. Farmers mentioned several agriculture and community development programs associated with higher education facilities in New Mexico. Sometimes farmers utilized these programs simply for questions about crops or pest management. In other circumstances, such programs played a significant role in the development and continuation of farms. Connections with out of state schools were also important to some farmers seeking information on innovative practices not yet common in New Mexico. Another source of information for most farmers is the internet. Books have not been disregarded and many of the farmers mentioned their use of several farming classics. However, dissemination of information via the internet is certainly changing things. Not only can information be looked up quickly, but farmers talked about the role of online videos as useful tutorials. Information from universities and state extension offices can also be accessed easily online as well. Additionally, as more individuals have access to and acquire smart phones and intelligent devices, information can be accessed even while in the field. As one farmer said:

> Having an i-phone in the field is very useful I think. For texting restaurants and looking up why the cucumbers are dying, or not dying, just going slow.

Figure 6: Smart phones, such as iPhones, provide internet access while in the field.

1.4.D Farming in the future

As is evident from the information above, farmers often had much to share when asked questions about their farms. Interestingly, when asked about their plans for the future, the

responses were quite brief and delivered, almost every time, in matter-of-fact fashion. Of the twelve individuals interviewed, all but one said they planned to continue farming, with the remaining farmer stating that the future is unknown and s/he couldn't be certain s/he would be doing the same thing ten years from now. When individuals were asked to explain why they planned to continue farming, a moderate list of reasons was given. Overwhelmingly, however, the responses invoked two core concepts: self-sufficiency and connection to place. While both of these have been discussed above, it is worthwhile to re-examine them here in relationship to decisions about the future, which elicited more detailed responses. The following quotes illustrate the deep connections people have to the land:

> I love the lifestyle. I love being able to decide what I am going to do with a set of tasks that need to get done, and having my dogs around and eating the food. Like going out and eating a couple pounds of tomatoes because I want to or all the grapes because they're delicious. Getting rained on, seeing the rainbows, sitting on the porch watching the hail come down. I like the way it feels. I like feeling connected to how the season is going...
>
> The truth is, there's no way it's going to get cold and I'm going to hear the cranes and like, sit in an office. There's no way that's ever going to work if I'm not out in the field, making sure my field is ready for garlic...
>
> The plants, I'd have to say, is the main reason. The relationship with the plants. Every year they impress me. They have new teachings every year and I feel like if I wasn't growing one year I would be missing out on all that wonderful stuff. I don't want to miss out on that.
>
> Now, when I'm in the soil, working in the soil, using shovels or whatever, and I'm thinking...I'm prepared to pass away going back to the earth. That would be the best way to pass away...I mean I love music, but to tell you the truth, now that I'm farming music has a different flavor. I believe every single artist in the world who could learn something about farming, if they practice it while doing their arts, will see the benefits. That beautiful influence of touching the soil and then putting it into practice...

Perhaps even more interesting than the reasons farmers shared for why they plan on continuing farming were their responses when asked what might change their minds. Only four responses emerged from asking farmers why they would not farm anymore. The most common reply was that *how* they farmed, or grew food might change but that they would always be growing food in some capacity. The following quote succinctly describes these feelings:

> Things that would change my mind about farming? I'd say no, because the way my mind is made up about it, it needs to happen. I think the methods can definitely change but to decide not to grow food? You know, when I think about farming I don't necessarily think that is has to be huge or linear or anything like that. I lump it all into the same, gardening and farming is all the same for me. Growing food basically.

Although such statements were most common, farmers did mention water scarcity, being physically unable, and loss of land as reasons they may be unable to continue farming. Of these three, water scarcity and physical inability were most discussed. Farmers were astutely aware of the labor challenges farming places on the body. While hard work was sometimes talked about as a way to stay healthy, changes associated with aging cannot be escaped forever. One farmer joked:

> It's definitely a labor that's hard on the body. I will admit I'm not in the best physical shape but I'm willing to sweat and I'm willing to hurt but at some point there will be a threshold where I probably can't continue. Hopefully by then I have fifteen kids and six hundred grandkids.

1.5 Discussion

Returning to resilience, the first section of the discussion will describe the basic resilience concepts used in this research and apply these concepts to smallholder farms.

As part of this, interesting findings from the research are discussed. Following this, the applicability of resilience is evaluated and some limitations in resilience theory are discussed. Finally, potential remedies to these shortcomings are addressed.

1.5.A Applying resilience concepts to smallholder farms

Resilience

As noted earlier, resilience is the capacity of a system to deal with disturbance in such a way as to maintain the same basic functions and identity of the system (Walker and Salt 2012). This research has been approached from a general resilience perspective. The "system" addressed is the community of smallholder farms. Although it is possible to look at each farm individually, there is an exchange of resources and information which links the farms together. This research has explored the experiences individuals of these farms have and how these experiences influence their decisions to keep farming, linking the data gathered with key resilience concepts.

Disturbance and adaptive capacity

Understanding resilience requires identification of disturbances to the system as well as how the system responds to such shocks. In the context of smallholder farms, disturbances can be easily identified through the list of limitations farmers provided. As such, everything from limited income to pest problems provide challenges which farmers must navigate. Adaptive capacity is the ability of the system to deal with the disturbances it faces (Walker and Salt 2012). For instance, the use of greenhouses not only extends the growing season, but also provides some protection from wind and hail. In doing so, farmers with greenhouses may be better able to deal with fluctuations in the weather

more easily. Adaptive capacity depends on several factors including diversity, redundancy, learning, and self-organization (Gupta et al 2010).

Diversity and redundancy

In resilience theory, diversity is discussed in two main ways: functional and response. Functional diversity refers to the variation of functions in a system (Walker and Salt 2012). Although the crops grown may all be thought of, broadly, as food, different plants serve different functions both ecologically and economically. For instance, nearly all the farmers practice crop rotation as a tool for managing soil health. Taking an economic perspective, shallots and flowers have different monetary values and can be grown to meet different economic needs.

Response diversity refers to the different response types within a particular functional group (Walker and Salt 2012). For example, amongst smallholder farmers' general strategies for marketing there are multiple marketing options such as CSAs, restaurant sales, and participation at growers' markets. Furthermore, since "resilience is enhanced by increased response diversity within a functional group", redundancy is often a component of building adaptive capacity (Walker and Salt 2012, 214). By utilizing more than one marketing strategy, for instance, farmers might be able to mitigate poor sales in one venue with consistent sales in another. Another example of redundancy

Figure 7: Creating habitat for beneficial insects and predators adds response diversity to pest management plans.

is the conscious integration of beneficial insects and predators as part of a pest management plan.

Learning and self-organization

Learning is another integral component of building the adaptive capacity of a system (Gupta et al 2010). In their discussion on social learning, Pahl-Wostl and Hare (2004, 194) describe community learning in the following way:

> Individuals engage in actions and interactions that have to be embedded in culture and history. Such interactions are influenced by and may change social structure and, at the same time, the individual gains

> experience situated in a context. Such learning processes confirm and shape the identity of the individual in its social surroundings. They confirm and change social practice and the associated interpretation of the environment.

In the case of smallholder farmers, it is clear that learning is not only a personal experience but a community action as well. The ability of the community to remember past experiences and anticipate future trends or shocks can help farmers mitigate the effects of disturbances. New farmers may lack such extensive knowledge when they first begin, but being able to share information with other farmers can better equip them to deal with such challenges.

Sharing of knowledge amongst farmers illustrates another resilience concept: self-organization. Self-organization refers to the "internal, interactive processes that determine the dynamics of a system, independently of any external influences" (Walker and Salt 2012). In other words, self-organization acknowledges the interconnection, dependency, and exchange between various parts of the system. While knowledge seems to be the overarching web that connects farmers to one another, communication, in general, facilitates the organizational capacity of the system. Tangible resources, such a tractor implements, walk-in coolers, and seeds, are also shared between farms. This resource exchange not only helps farmers manage costs but is key in developing and maintaining the identity of this system.

Thresholds and transformability

Up to this point only adaptive capacity has been discussed as a response to disturbances. However, there are times when the disturbance proves too much for the

system to handle which results in a shift to a new regime/state with an entirely new identity (Walker and Salt 2012). This shift is known as transformation with the breakpoint between these regimes described as the threshold (Walker and Meyers 2004, Walker et al. 2004). Said differently, thresholds refer to the maximum disturbance a system can withstand before transforming into a different system state. In the case of smallholder farms, thresholds can be identified as those disturbances which would cause farmers to stop farming. Based on farmers responses to what might change their minds about continuing to farm, three thresholds have been identified: physical inability, lack of water, and loss of land. A more thoughtful discussion of these will be given below.

Although transformation often occurs unwillingly, it is also possible for transformation be guided (Walker and Salt 2012). With this in mind, it is important to recall that nearly all the farmers interviewed said that *how* they grew food might change and that they were open to such changes. This willingness to change not only plays a role in the current adaptive capacity of the system but also equips farmers with tools for transformation. While this research focused on decisions to farm or not, transformation does not *have* to mean people are no longer farming. Other changes could occur to change the fundamental identity of the system.

Interesting findings: limitations, game-changers, and the role of social factors

The stories, ideas, and emotions shared during the interviews and farm visits, paint a picture of entrepreneurial individuals with a love of food and the land. In some ways, their experiences are not so different from other small business owners. They struggle to earn a living wage, must acquire the necessary resources for their job, while

also balancing time between work and family. However, for the farmer, their office is the field which provides a slew of other challenges perhaps not as common to the world of indoor activities: pest management, soil infertility, and changes in the weather. These are the types of uncertainties for which resilience theory is designed to anticipate and understand (Walker and Salt 2012). What is interesting, though, is that the three most common limitations mentioned (income, time, and communication) are not the same three factors which would change farmers' minds about farming (water scarcity, physical inability, and loss of land). In resilience terms, this means that the major disturbances/perturbations farmers identified were not the variables they identified as possibly triggering transformation, i.e., a shifting away from farming. Both water and loss of agricultural land were mentioned as limitations, but physical inability was not talked about until farmers considered the future. Perhaps, the distinction between limitations and game changers has something to do with the certainty of the latter as well as decisions to continue farming. Lack of water, loss of land, and loss of physical ability are all distinct and defined experiences which would inhibit people from farming. On the other hand and as will be addressed shortly, issues related to time, communication, and income are more ambiguous and perceptions of the quality and quantity of each can easily change--, i.e., characterized by more radical uncertainty. Such ambiguity and ability to change might explain why these oft mentioned limitations were not listed as reasons to quit farming. Furthermore, one of the main reasons people gave for choosing to continue farming was self-sufficiency. As such, if people are able to grow a substantial amount of the food they need, the necessity of a substantial income may lessen. This is

not to say that money is not an issue for farmers, who still have to buy seeds and tools and make mortgage payments. The intention, rather, is to illustrate how self-sufficiency lessens the demands on farmers' income which may account for why income was not considered as a reason not to farm. Additionally, even though the farmers interviewed may be pressed financially, perhaps they have not yet experienced a substantial monetary shock to make them seriously consider income as a threshold. As such, it would be interesting to compare the thresholds identified by smallholder farmers in this research with those thresholds identified by people who are no longer farming.

Another interesting finding is the trend in responses regarding limitations, successes, and reasons to continue farming or not. For both limitations and reasons not to farm, people generally listed social-ecological factors or factors relating to access to resources (see Appendix B for lists of codes). For both successes and reasons to farm, though, people generally listed purely social factors, especially factors pertaining to relationships. This finding suggests that while farmers face very real social-ecological and resource related challenges, relationships play a key role in mitigating such challenges. In doing so, the results highlight the complex connection between social and ecological forces. Furthermore, although ecological challenges certainly exist for farmers, discussions of smallholder farms would be remiss in approach if careful attention is not given to the role of social networks in mitigating such disturbances. Resilience theory, although it acknowledges the importance of social-ecological interactions, may fall short in this regard.

1.5.B Limitations of resilience

While resilience may be a useful tool for understanding the overarching context of smallholder farms and farmers' decision making process, there are some limitations in its approach. First, basic resilience concepts glance over the agency farmers have and their experiences with and expression of power. Secondly, looking at reasons people continue to farm, there is one key idea which has not been addressed at all: connection to place. These two limitations are now addressed in turn below.

Power and agency

As noted earlier in this paper, agency asserts that individuals and communities are conscious decision makers while power implies the ability to actually be able to act on those decisions (Davidson 2010, Cote and Nightingale 2012). Furthermore, power is not only influenced by formal regulations or institutions but is experienced in social interactions everyday (Cote and Nightingale 2012). Up to this point, the only decision making discussed has been farmers' decisions to continue farming. However, everyday tasks provide countless opportunities for farmers to make decisions such as which crops to plant, which projects to attend to, how to set up their market stand, or who they would like to sell their food to. The ability to make and act on such decisions should not be taken lightly as each of these experiences sheds light onto the dynamic relationships influencing such decisions. While many of the farms are owned by the farmers who manage them, several others are not. In such instances, choices of what to grow and how are influenced by expectations of the actual land owners or even agreements amongst a collaborative. For instance, one farm maintains organic certification as part of an agreement between themselves and the landholder. Although they would farm without

pesticides and herbicides regardless, organic certification might not be sought if not for the agreement made with the landowner to procure and maintain such a label. Additionally, although relationships among farmers were described as typically amiable, interactions among farmers are also expressions of power. A farmer seeking advice on weights of bundles and prices for markets, as described earlier, is acknowledging the expertise and, in a sense, authority of someone else. Authority, or power, is not static however, and the role between student and teacher shifts, often facilitating learning in this context. This relationship is captured well in the following quote from one farmer:

> I'm happy to teach other people to the point that they get as good as me and if they surpass me then I'm going to try and be better than them, again, and that's awesome.

Furthermore, individual farmers express their thoughts on the "right" way things should be done, which is clearly evident from earlier quotes describing the need for tablecloths at market, or thorough washing of salad greens. Less subdued expressions of power and agency can be seen in farmers' blatant discussions of self-sufficiency. There's an expression of power at play when farmers are able to provide for themselves without reliance on outside sources. Additionally, the act of growing their own food may sometimes be an overt critique of the larger conventional food system and governance structure. One farmer said:

> Here comes the political side of me and my, my lack of faith in the larger institutions. I do believe there will reach a point where one of the biggest threats is those who can take care of themselves and there may be some government, corporate, basically some type of institutional crackdown...

While it might be possible to discuss some of these issues through concepts of learning or self-organization, the above examples of power and agency at work are not adequately addressed by basic resilience concepts. In both cases, the nuances of these relationships are not teased out using these basic concepts. Instead, it feels as though such experiences are taken for granted because they make up mundane, everyday encounters, which is unfortunate since they have much to offer.

Connection to place

Before addressing resilience theory's ability to understand connection to place, it is first essential to define what is meant by the term in this context. When describing their connection, individuals expressed intimate relationships to the land(scape) which reach beyond usefulness or even duties emanating from a land ethic. Although the farmers interviewed rely upon the land to grow the food they sell and consume themselves, the connection experienced is not based upon this production. The idea that human experience to the land can develop out of something more than the utility of the landscape is certainly not new. Aldo Leopold, author of *A Sand County Almanac* and prominent proponent of a land ethic, said the following:

> ...A land ethic changes the role of *Homo sapiens* from conqueror of the land-community to plain member and citizen of it. It implies perfect respect for his fellow members, and also respect for the community as such (1966, 240).

Although an "ecological conscience" (Leopold 1966, 258) may be integral to creating a sense of stewardship towards the land, it also does not capture the connection to place expressed by farmers. This is not to say that the individuals interviewed do not experience

a sense of responsibility towards the land they farm. On the contrary, decisions to farm organically and encourage beneficial insects and predators on the land speak to the care farmers have for their properties. This being said, the connection to place they expressed is more than an ethical obligation. Instead, it is something even more basic. The connection to place experience by farmers is based upon a fundamental appreciation of the land(scape) and a recognition of their role in this larger system. Land(scape) or place can be thought of as "a setting…of profound meaning and connection to an individual by virtue of personal, direct experiences"(Lockwood 1999, 368). A large part of the appeal of farming, then, is to be in a position where this greater connection is continually reinforced through experience.

Employing the resilience concepts used above, there does not seem to currently be a way to adequately address the connection to place experienced by farmers. There is certainly an element of learning or knowledge at play in farmers' understanding of the larger context in which they live. Yet, to describe connection to place in such a way would miss much of the *feeling* experienced. In her own work on local food and the importance of cultivating sense of place, DeLind (2006, 135) says, "...the body–place connection conveys a sense of the permeability of bodies and, by extension, of living systems." The difficulty, however, is finding the vocabulary for expressing this connection since, "Place remains part of, is comfortable within, the realm of the nonrational. Not only is it lived and therefore alive (and continually being renewed), it is best understood from the inside out, and not from the outside in" (DeLind 2006, 129).

Resilience theory currently lacks the ability to fully understand connection to place. By just utilizing basic resilience concepts, it seems possible to miss the nuances of social-ecological systems such as power, agency, and connection to place. This is because the original definitions of these concepts do not explicitly mention the role of institutions, economic forces, or community and individual agency. Be this as it may, it is interesting that critics, who have been adamant about the lack of attention to power and agency, also failed to discuss the absence of connection to place (Adger 2000, Harrison 2003, Hornborg 2009, Cote and Nightingale 2012, Chandler 2012, Davidson 2010, Davidson 2013).

1.5.C Addressing resilience's limitations

The findings above highlight some of the limitations of resilience theory. The questions that logically follow center on (1) whether, given the permeable and experiential nature of connection to place, how feasible would it be for resilience theory to develop the capacity to address it and (2) how might power and agency be addressed more directly. There are resources such as the Resilience Alliance Workbook (2007) and the adaptive capacity wheel developed by Gupta and colleagues (2010) which provide examples of how such social issues might be understood using resilience. The Resilience Alliance Workbook (2007), for instance, is a guidebook put together by leading resilience scholars to assist in the application of resilience theory to real world situations; it provides step-by-step instructions for conducting a resilience assessment. The workbook provides questions about people and governance meant to help identify the actors in a system as well as the policy and institutional context in which they are situated

(Resilience Alliance 2007). A closer look at how the Resilience Alliance workbook *does* address social concepts reveals that limitations remain. The assessment is divided into four main parts: understanding the system, assessing the system, implications for management interventions, and synthesis of resilience understanding (Resilience Alliance 2007). As noted above, when defining the system, there are questions on people and governance (Resilience Alliance 2007). Such questions include:

- Where does the real power lie?
- Who has the power to influence the system, directly through changing policies, or indirectly through voting, lobbying, advertising, or funding those with direct power?
- What other informal institutions are important in regard to resource use (e.g., lobby groups, informal associations or groups)?
- How flexible or variable are they?
- How effective are social networks and what role are they playing (or could they play) in learning and changes in resource use and management? (Resilience Alliance 2007, 8)

These questions offer some opportunities for resilience to incorporate discussions of power. However, many of these questions are focused on the larger institutional and policy driven power relationships and do not inquire into the everyday social experiences of power. Furthermore, the workbook does not provide a clear working definition of power.

Moving further along into the workbook, in assessing the system, there are a set of questions related to social capacity including the following:

- What social networks are in operation and are they dynamic, or restrictive?
- Is there evidence of: self-organization and action, communication infrastructure and networks, lobby groups?
- What is the status of community organization (e.g., local stewards)?

- What is happening to trust in the system – within social groups, and between social groups?
- How strong is learning in the system and how does it occur? Is it an ongoing process?
- What particular aspects of the social system are critical in determining social capacity in this system? (Resilience Alliance 2007, 11-12)

These questions illustrate, what seems to be, an honest attempt by resilience proponents to address some of the nuances of the social realm. Additional questions relating to connection to place would enhance these efforts. Such questions could be as simple as:

- What relationships do people have with place/land(scape)?
- How do people *feel* about the place/land(scape)?
- Are there community relationships with and/or beliefs about the landscape that foster adaptive capacity?

Additionally, as was the case with smallholder farmers, expressions of connection to place may even emerge from more general questions regarding the system and people's interaction with it.

Meaningfully addressing connection to place, power, and agency, requires more than just asking questions. Just as the effectiveness of policy depends on its enforceability, meaningfully addressing social elements of systems depends upon how such concepts are actually understood, valued, and utilized. Resilience critics have devoted much attention to issues regarding power and agency, though discussions of remedies are not as prolific. Davidson (2010) provides some of the most specific courses of action, highlighting three particular areas of future research: individual and collective agency, critical thresholds, and multiscalar feedback mechanisms. The paper will now

shift attention to connection to place which has been absent from discussions by both critics and resilience proponents.

Part of the problem of meaningfully addressing connection to place lies in the common use of the terms "capital" and "services" in resilience (Millennium Ecosystem Assessment 2005, Resilience Alliance 2007). While it is possible to talk about capital in relation to natural, built, human, social, and financial resources, the end result is the same: elements of a system are understood based on their *usefulness* or *value.* The need to understand the importance of something based on its usefulness does not jive with experiences of connection to place. As noted, connection to place does not necessitate stewardship or action. Instead, the acknowledgement of the relationship which takes place is valuable simply because it is experienced. The issue at hand is not experienced by resilience alone, however. DeLind (2007, 126) shares similar sentiments in relation to her work on local food:

> What are needed are ways of thinking and feeling about local food that cannot be easily appropriated and/or disappeared by the reductionist rationality of the marketplace and that can balance and reframe an economic orientation with more ecological and cultural understandings of people in place.

If resilience wishes to grapple with such issues, an honest look at its epistemological stance may be in order. In other words, understanding resilience's history is important to understanding its current perspective and limitations (Hornborg 2009, Walker and Cooper 2011). This is not to say that resilience *must* change in order to be relevant. As hopefully has been illustrated, resilience can be effectively used to help us understand aspects of the smallholder farm experience. The point, then, is to ask resilience scholars to acknowledge

the scope of resilience as well as their own implementation of it. Room does exist, at some level, to incorporate connection to place. However, it may be necessary to draw on other perspectives and insight as well. While the intentions of resilience proponents have certainly been ambitious and seem to have grown out of a genuine desire to radically shift how we view the world, it is important to remember that resilience cannot be a theory about everything. Nor does it have to be! As Folke (2006, 260) says:

> The resilience approach provides *one* among several arenas (e.g. vulnerability research, ecological economics, sustainability science) for generating integrative science and interdisciplinary collaboration on issues of fundamental importance for governing and managing a transition toward more sustainable development paths, one of the greatest challenges facing humanity. [Emphasis added]

Even without a synthesis of these concepts into the theory, it is important to highlight the potential for collaborations. Numerous researchers in other fields are addressing sense of place and connection (Jackson 1994, Basso 1996, Lockwood 1996, Nabhan 2002, DeLind 2006). As such, pursuing more interdisciplinary connections could yield fruitful relationships for resilience, bringing knowledge of mind, body, and place together. "My mouth, my tongue, and my heart remind me of what my mind too often forgets: I love the flavor of where I live, and all the plants and creatures I live with" (Nabhan 2002, 304).

1.6 Conclusion

Understanding Albuquerque smallholder farmers' decisions to continue farming requires attention to the broader, community level context in which these farms operate. Although ecological, economic, and resource related factors pose challenges for farmers and their long term farming goals, the social fabric of the community creates

opportunities to navigate such perils. Furthermore, this community is grounded by a sense of connection to place and self-sufficiency. Resilience theory, as presented here, can be utilized to understand the basic context of smallholder farms. However, resilience theory provides only a limited understanding of the complex social dynamics of smallholders farms. In particular, basic resilience concepts do not fully address issues of power and agency experienced by farmers, and completely lack the capacity to discuss connection to place. However, careful consideration of such limitations and collaboration with social scientists may provide clarity and insight for how to bring more complexity to the application of resilience theory as a way of understanding the social quandaries of social-ecological systems.

i) Given knowledge of farm size and income in Albuquerque, this research relied on an economic definition from Small Farm Today magazine and the 2007 Agricultural Census' to develop a new definition which seems better suited for smallholder farms in Albuquerque (Small Farm Today 2012)
ii) In Albuquerque, most land in agricultural production is located on the edges of the city. Using city limits alone would prohibit the inclusion of numerous farms, including those in the East Mountains and Albuquerque's South Valley, which is a major agricultural area. Additionally, a radial boundary might also exclude important agricultural areas and could reinforce a food-miles concept, which is not the intention of this research.

Chapter 2

Introduction

Though the alternative food movement continues to gain ground and participants, several authors caution making broad sweeping environmental, social, or economic assumptions about the emerging alternatives (Born and Purcell 2006, Allen 2010, DeLind 2011). While a critical assessment of alternative food models is certainly warranted, we are faced with the task of developing a way to assess their success. Yet, is it possible to evaluate these alternatives in the same capitalist context as the dominant conventional agriculture system? It is out of this dilemma that the current research emerges.

In this research, I explore factors of success and longevity for smallholder farms in Albuquerque. Through the use of interviews and farm visits, I seek to answer the following question: how do scholarly-defined elements of "resilience" compare to the primary factors identified by Albuquerque's smallholder farmers which influence their decisions to continue farming? In doing so, I hope to highlight farmers as a necessary resource for assessing the success of farms and provide greater insight into the usefulness of resilience as a tool for evaluating agricultural systems.

2.1 Case study background

2.1.A Trends in U.S. agriculture

The dominant food model in America relies ever increasingly on global networks and technological advances to effectively produce, process, and distribute large quantities of food to consumers. Lower transportation costs and improved infrastructure after World War II were part of what made it possible for regional and global crop specialization to

occur (Martinez et al 2010). As a result of these growing food networks, dependency on local food systems declined (Martinez et al 2010). In addition, an emphasis on increased production resulted in industrialization of the food system, which is exemplified by the rise of factory farms (Lapping 2004). In tandem with industrialization, Lapping (2004) notes that our current food model is also experiencing unparalleled consolidation.

While the dominant food system is touted as an exemplary method of increasing food production, there are many who feel that this success comes at the expense of the environment, social justice, and personal health. Perhaps because of these concerns, more people are beginning to engage in discourse about food in America. Allen (2008, 157) argues that, "Never before has there been so much popular interest in food in America-food as culture, food as economics, food as politics." However, even with this active dialog on food taking place, there are some who continue to feel disconnected from their food and the global system which provides it to them. Although more than ten years have passed since Kloppenburg, Hendrickson, and Stevenson (1996, 34) shared the following sentiments, they are still pertinent today: "What is eaten by the great majority of North Americans comes from a global everywhere, yet from nowhere that they know in particular". Others have shared these thoughts and a push towards alternative food models has occurred as a result. Hassanein (2003, 80) describes these alternative food movement advocates as "...sustainable agriculturalists, local food advocates, environmentalists, food security activists, and others" who are all engaged in the process of eliciting change in the current food system.

Agricultural alternatives, such as the local food movement, seek to reestablish connections between people and place (Kloppenburg, Hendrickson, and Stevenson 1996). These alternatives often involve direct-marketing models such as farmers' markets, CSAs (community supported agriculture), and farm-to-school programs. Such spaces are believed to facilitate equitable interactions and venerate various forms of knowledge (Kloppenburg 1991). The number of farmers' markets in the United States experienced exceptional growth from 340 in 1970 to over 3,000 markets in 2000 (Lapping 2004). Growth of farm-to-school programs has also occurred. By 2009, around 2,050 such programs existed in the United States, which was nearly double from the year 2005 (Martinez et al 2010). Similar trends can be seen in Albuquerque. Several local restaurants boast their use of local ingredients, there are six different farmers' markets within the city along with numerous CSA opportunities, and local food festivals are a regular affair.

2.1.B Agriculture in New Mexico

Agriculture in New Mexico has a longstanding history. Evidence of plant cultivation by indigenous peoples can be traced back to ancestral groups such as the Anasazi and Hohokam (Gregonis and Reinhard 1979). The Hohokam, in particular, also developed an elaborate system of irrigation ditches to support their farming practices (Wood 2008). Later on, Spanish expansion into New Mexico brought with it the acequia system, which consists of extensive irrigation canals and a community based method for water management (Rodriguez 2006, Wood 2008). Many acequias are still in use today and much of the land in and around Albuquerque is still irrigated this way. However,

water scarcity in New Mexico, and the Southwest more generally, has resulted in extensive and intensive feuds over water (Wood 2008).

Despite the water constraints of the area, over forty-three million acres of New Mexico land are in some type farm production (NASS 2011). The scale of farming operations varies greatly and the state produces commodity crops, such as hay and alfalfa for export, as well as food crops for local communities and niche markets. About eighty percent of the farms in the state are less than ten acres. In addition, farms of this size have experienced the most growth out of all other farm size categories based on the 2007 Census of Agriculture (NASS 2009). There were just over 3,500 farms under ten acres in 2002 and by 2007 that number had increased to nearly 6,500 (NASS 2009). Thus, small farms seem to have an increasing prominence and role in New Mexico.

Chapter 3

Literature Review

In order to evaluate the success of smallholder farms it is critical to understand the various social, ecological, and environmental perspectives that have already been utilized toward such an end. The Holling School of resilience theory, which often takes a social-ecological approach, may also shed light on economic factors which can influence the resilience of agricultural systems (Holling 1973). However, in understanding the potential usefulness of resilience theory, is also essential to address issues raised by resilience critics. Additionally, other literatures, such as that of the local food movement, may provide us with a better understanding of the social forces influencing the longevity of smallholder farms. It is also valuable to acknowledge critiques of this movement which may help us understand the limitations of drawing upon the local food movement as a guide for evaluating success. Furthermore, though resilience and local food literatures both address economics in their own way, emerging literature on the agricultural economics of local food offers another unique perspective to help widen our overall understanding. As such, an exploration of each of these three literatures follows.

3.1 Resilience Theory

The concept of resilience is utilized by many fields, including mental health/psychology and defense/security (Walker and Salt 2012). In this paper, focus is given to resilience as it has developed out of the field of ecology and the work of C.S. “Buzz” Holling (Holling 1973) . From this context resilience emerged as a tool for better

understanding the capacity of ecosystems to cope with changes and maintain basic functions (Folke 2006, Folke et al. 2010).

Resilience, in this paper, refers to "the capacity of a system to absorb disturbance and reorganize so as to retain the same function, structure, and feedbacks – to have the same identity" (Walker and Salt 2012, 3). It is vital to point out that resilience is neither good nor bad (Walker and Salt 2012). Resilience theory is merely a lens through which the world can be viewed. As such, assumptions about the desired state of a system can vary drastically depending on who is viewing the system. Furthermore, there are two main ways in which we can talk about resilience: general resilience and specified resilience (Walker et al. 2004, Walker and Salt 2012) Specified resilience describes the resilience of a specified part of the system to particular shock (Walker and Salt 2012). In other words, specified resilience is the resilience *of* what *to* what. General resilience, on the other hand, is the capacity of the system as a whole to deal with a variety of disturbances. Instead of planning for one particular threat, general resilience may be enhanced by elements such as diversity, redundancy, and tight feedback loops which foster learning (Walker and Salt 2012). Building specified resilience may hinder general resilience, since focus on a particular disturbance can limit attention to other potential threats (Walker and Salt 2012). Utilizing resilience to understand agricultural systems, this research in concerned with the general resilience of Albuquerque's smallholder famers.

Adaptive capacity is the ability of a system to mitigate disturbance (Berkes and Folke 1998). As noted above, diversity, redundancy, and learning are essential to

enhancing a systems adaptive capacity. However, sometimes shocks prove too substantial for a system to manage. When a system is no longer able to deal with the changes experienced it may shift into an entirely different state (Folke et al. 2010). Resilience moves beyond concepts of sustainability, which are static and limiting, to acknowledge the dynamic character of ecosystems (Davidson 2010). From this basic ecological foundation resilience theory has expanded to address social-ecological systems (Adger 2000, Folke 2006, Davidson 2010, Folke et al. 2010). While social-ecological systems research has many sub areas including agroecology, it has more recently informed the growing community resilience literature (Varghese et al 2006, Bacon et al. 2012, Kremen, Iles & Bacon 2012, Kremen & Miles 2012, Rosset & Martinez-Torres 2012, Sayre & Huntsinger 2012, Ross & Berkes 2013, Davidson 2013, Berkes & Ross 2013). Simultaneously, questions regarding the role of power and agency have become more prominent (Varghese et al. 2006, Davidson 2010, Lof 2010, Berkes, Doubleday & Cumming 2012, Coulthard 2012, Cote & Nightingale 2012, Ross & Berkes 2013, Davidson 2013, Berkes & Ross 2013). However, even with such discussions occurring, resilience scholars have not yet defined what these terms mean to them and how they wish to use them.

Social-ecological systems research emerged in response to the fact that many of the changes or pressures on ecosystems were caused by humans (Folke 2006). Research topics from a social-ecological perspective are incredibly diverse and include topics such assessments of urban resilience, urban design, crisis facing fisheries, farmers' markets as learning spaces, agroecosystem resilience, and the role of climate change on global

resilience (Ernston et al. 2010, Milestad et al. 2010, Folke et al. 2010, Ahern 2011, Coulthard 2012, Cabell & Oelofse 2012). Also within this literature we find theoretical expansion as proponents of resilience clarify and develop key concepts, such as adaptability and transformation, and assess the limitations and challenges to applying ecological theory to social systems (Adger 2000, Davidson 2010, Lof 2010, Folke et al 2010, Cote & Nightingale 2012).

While resilience has certainly proved a useful tool in many circumstances, is has not gone without critique. One of the most common critiques that emerges is that resilience research often fails to adequately acknowledge the political context of and power structures at work in the systems they are studying (Hornborg 2009, Cote and Nightingale 2012, Chandler, 2012, Davidson 2013, Brown 2013). Hornborg (2009, 252), for instance, blatantly states that researchers and agencies who have employed resilience "...seem oblivious to the several strong research traditions in the social sciences that have persuasively shown that social-ecological systems are historically and currently characterized by structural problems of power, conflicts of interest, and unequal distribution." As a result of this lack of attention to the politics of problems, it is then possible to make normative assumptions about desired states or conditions of systems (Nadasdy 2007, Hornborg 2009, Cote and Nightingale 2012, Welsh 2012, Reid 2012). Furthermore, such normalizing behavior, along with constant expectations to cope and adapt to shocks, creates situations which offer little room to criticize the status quo (Nadasdy 2007, Walker and Cooper 2011, Welsh 2012, Reid 2012). These concerns are

exemplified in an oft repeated quote from Hornborg (2009, 252) in which he asserts that, "...the rallying-cry of the early 21st century is not 'revolution'...but 'resilience'".

Another area of critique deals with individual and community agency. Though agency is certainly connected to discussions of power and politics, there are elements of agency which extend beyond such conversations and warrant a discussion of their own. As the majority of critics have noted, extending ecological principles to social systems is quite problematic because doing so often ignores unique characteristics of individuals and or collective actions (Adger 2000, Harrison 2003, Ernston et al 2010, Davidson 2010, Brown 2011, Cote and Nightingale 2012). More specifically, it is humans' capacity to imagine and anticipate the future which allows us to develop innovative solutions to problems faces (Harrison 2003, Davidson 2010, Ernston et al2010). Furthermore, agency is enacted at multiple scales, from the individual to larger community, and resilience must address this complexity of agency as well (Ernston et al 2010, Davidson 2010, Davidson 2013). In short, as Davidson (2010, 1145), says "...human agency is the most contentious wrinkle in the application of an ecological framework to social systems."

Lastly, the idea of resilient subjects arises consistently in critics' discussions of resilience and development, disaster management, and governance (Zebrowski 2009. O'Malley 2010, Welsh 2012, Chandler 2012, Reid 2012). Additionally, several of the critics making claims about resilient subjects utilize Foucault in their assessments of resilience (Zebrowski 2009, Walker and Cooper 2010, Reid 2012). Resilient subjects refers to the shift in governance strategies from top-down control to expectations of individual robustness and adaptability. Reid (2012, 74) demonstrates the problem with

such a shift when he says, “In this sense the resilient subject is a subject which must permanently struggle to accommodate itself to the world”. Additionally, the critics claim that neoliberal ideologies become normalized in these new governance contexts (Zebrowski 2009, Welsh 2012, Reid 2012). What Walker and Cooper (2010) find particularly interesting is the obvious contradiction between resilience's origins and current uses. Specifically, they note the evolution of resilience as a tool for critique “...against the destructive consequences of orthodox resource economics...” to its current neoliberal enabling position (Walker and Cooper 2010, 157).

It is interesting to note that only a handful of the critics mentioned, such as Hornborg (2009), Zebrowski (2009), Chandler (2012), and Reid (2012), seem to believe that resilience may be too damaged, if you will, to still be useful. The remaining critics, on the other hand, may hold differing opinions as to the applicability of resilience, and yet still seem to agree that resilience has been and may continue to be a useful tool for understanding our complex world (Adger 2000, Harrison 2003, Nadasdy 2007, Ernston 2010, Davidson 2010, O'Malley 2010, Walker and Cooper 2010, Cote and Nightingale 2012, Welsh 2013). The future usefulness of resilience in all such cases, though, certainly rests on the ability of resilience scholars to successfully address the problems raised.

Resilience proponents have just begun to address some of these critiques. In an attempt to better understand power and agency the subfield of community resilience has arisen. Berkes and Ross (2013) assert that community resilience has emerged from the synthesis of two strands of literature: social-ecological systems and health and psychology. The former is especially informative for emphasizing the role of scale. In

particular, the concept of panarchy asserts that resilience's concepts "...apply to all levels, from individual to earth system" (Folke 2006, Berkes & Ross 2013, 9). This not only validates the importance of conducting research at the community level but encourages research to assess the relationships between scales. The health and psychology literature, on the other hand, encourages us to acknowledge the strengths of individuals and communities instead of dwelling on challenges and limitations. As such, we can become more aware of the role of agency (Berkes & Ross 2013). However, community resilience is just blossoming and has not yet been able to fully develop or address issues of agency. In addition, Berkes and Ross (2013, 17) point out that, "One relative silence in the community resilience literature is the relevance of power relationships" (Coulthard 2012, Davidson 2013).

Additionally, clear, consistent working definitions of power and agency are lacking from resilience literature. In this paper, the two terms will be used in the following way: agency asserts that individuals and communities are conscious decision makers while power implies the ability to actually be able to act on those decisions (Davidson 2010, Cote and Nightingale 2012). Furthermore, power is not only influenced by formal regulations or institutions but is experienced in social interactions everyday (Cote and Nightingale 2012).

The changes occurring in the realm of resilience theory offer numerous opportunities for future research. Not only is there space and a need for theoretical insight but more applied research is also warranted. In particular, research on agency and power will help fill in the social theory gaps. My own research on small farms and farmers

brings to light power relations at play for these people which, in turn, influences individual, farm, and community level agency.

3.2 Local Food

Literature on local food is prolific and has been approached by numerous fields such as anthropology, sociology, ecology, agroecology, environmental studies, urban design, community and regional planning, and geography, to name a few (Kloppenburg 1996, Hinrichs 2000, Hassanein 2003, Born & Purcell 2006, Allen 2008, Morgan 2010, Hayden & Buck 2012, DeLind 2011). As public interest and participation in local food has risen, scholars have attempted to understand what drives the local food movement and the opportunities and pitfalls it faces. My focus on the goals, values, and critiques of local food has brought to light scholarly interest in scale, social justice and equity, and consumer and producers' values and beliefs (Hinrichs 2003, Born & Purcell 2006, Allen 2008, Allen 2010, Pilgeram 2011, Megicks 2012, Mount 2012, Valiente-Neighbors 2012).

Studying local food is a particularly complicated because there is no singular concept or definition of local (Selfa & Qazi 2005, Ostrom 2006). In addition, scholars have been quick to point out that scale is a socially constructed concept and we should not assume there to be anything inherent about any scale (Hinrichs et al. 1998, Hinrichs 2000, Hinrichs 2003, Born & Purcell 2006). Works by Hinrichs (2000, 2003), especially, and Born and Purcell (2006) have been particularly influential in local food literature and are cited frequently (Lapping 2004, Selfa & Qazi 2005, Born & Purcell 2006, Ostrom 2006. Asebo 2007, Thilmany, Bond & Bond 2008, Cross et al. 2009, Allen 2010, Pilgeram 2011, Mount 2012, Hayden & Buck 2012). The problems of equating scale

with particular outcomes have been generally accepted and many authors advocate for multi-scalar approaches to achieve desired goals such as sustainability and social justice (Hinrichs et al. 1998, Hinrichs 2000, Hinrichs 2003, Born & Purcell 2006, Allen & Wilson 2008, Allen 2008, Allen 2010, Morgan 2010).

As mentioned above, there are many ideas of what local food is and does for communities and individuals. Several studies have sought to capture and understand the diversity of thoughts on local among producers and consumers (Selfa-Qazi 2005, Ostrom 2006, Asebo 2007, Thilmany, Bond & Bond 2008, Bean & Sharp 2011, Megicks 2012). For instance, although concepts of local may reflect spatial or political boundaries they also may be influenced by personal values (Selfa-Qazi 2005, Ostrom 2006, Bean & Sharp 2011, Megicks 2012). Related to this, although seemingly contradictory to the local movement, *how* food is produced may be more important to consumers and producers than *where* food is produced (Asebo 2007). While many of these studies have looked at consumers and producers generally, recent scholarship has begun to look at translocal/immigrant populations in particular (Valiente-Neighbors 2012). These populations have different concepts of local for themselves, which include the countries they emigrated from, and for others, such as Americans in general (Valiente-Neighbors 2012). Explorations such as this have the potential help us acknowledge the diversity of opinions and preferences within communities.

Another major theme throughout the local food literature addresses social justice and equity issues. While many proponents of local food have hoped or claimed that social justice can be realized by adopting a localized food system, scholarship warns us that this

is not necessarily the case (Hinrichs et al 1998, Hinrichs 2003, Allen 2008, Cross et al. 2009, Morgan 2010, Allen 2010, DeLind 2011). As DeLind (2011, 277) notes, "...all locavores are not created equal." Allen (2010, 301) elaborates on this issue by arguing that, "Working toward social equity in local food systems requires questioning an assumption of shared interests among all members of the community when there are often different material interests and power allocations". The task then, seems to be for researchers to continue to problematize and question the role of power and equity so that meaningful change can be realized.

The themes in the local food literature presented here, although they have been identified separately, are inextricably intertwined. It is clear that more research on power and social justice within food systems is warranted, especially research that helps us understand the relationship between equity and power at different scales. In addition, while several authors have addressed the inequality experienced by consumers, research on similar issues among producers is lacking. Questions of empowerment and equality of farmers and farmworkers are valuable and my own research can help us begin to fill in this gap by inquiring about the economic and social impacts faced by these individuals

3.3 Agricultural Economics

The literature on agricultural economics is immense and encompasses everything from assessments of consumer behavior to comparing profitability of different agricultural cropping techniques. Some of the latter initially found their way into my research because they discussed agricultural cropping techniques suited to a specific locality (Lu, Watkins & Teasdale 1999). However, the majority of the literature pertaining

to agricultural economics of local food deals with marketing strategies, consumer behavior and values, and government policy (Guptill & Wilkins 2002, Starr et al. 2003, Darby et al. 2008, Thilmany, Bond & Bond 2008, Hardesty 2008, Tropp 2008, Brown & Miller 2008, Hand & Martinez 2010, Onken & Bernard 2010, Onozaka & McFadden 2011, Mount 2012)

The literature concerning marketing of local food is by far the most robust of those mentioned above. Some of these pieces address specific marketing outlets for farmers such as grocery stores, restaurants, institutions, and CSAs and farmers' markets (Guptill & Watkins 2002, Starr et al. 2003, Hardesty 2008, Brown & Miller 2008). It is interesting to note several of these works have found farmers to feel unsatisfied with the amount they earn for their produce (Starr et al. 2003, Hardesty 2008, Tropp 2008, Brown & Miller 2008). In addition, the idea of direct marketing is often used to describe these relationships (Guptill & Wilkins 2002, Starr et al. 2003, Tropp 2008). While this term is common in the general discussion of local food, in the agricultural economics literature it refers broadly to the sale of food from the farmer to any consumer, be it individuals, groceries, restaurant, or institutions. This deviates from the more common usage which generally only refers to the relationships between farmers and individual consumers. Other works related to marketing take a slightly broader perspective and address questions regarding the effectiveness of state marketing programs and the competition between local labeling and other sustainable labeling (Onken & Bernard 2010, Onozaka & McFadden 2011).

Another group of research, although closely tied to marketing, has begun to look at values and behaviors surrounding local food. Broadly speaking, these articles seek to understand the concept of local and how it affects consumer behavior (Darby et al. 2008, Thilmany, Bond & Bond 2008, Connell, Smithers & Joseph 2008, Seyfang 2008, Dentoni et al. 2009, Toler et al. 2009, Hand & Martinez 2010, Mount 2012). What has begun to emerge is an understanding of local food as a complex concept that is influenced by more than just "self-interested" behavior (Darby et al. 2008, Thilmany, Bond & Bond 2008 Toler et al. 2009). In addition, these values may have a direct relationship on the success of growth, or scaling up, of local food operations (Mount 2012).

A third trend within the literature regards government policy and action. These works discuss the role of recent food policy and initiatives, such as the 2008 Farm Bill and the Know Your Farmer, Know Your Food initiative (Gleissman 2010, Hardesty 2010). Some go further to encourage additional policy changes such as restricting the exportation of goods out of local communities to strengthen local economies(Thompson & Hodges 2011). While much of this literature is simply descriptive, Gleissman (2010) does argue that farmworkers are rarely addressed or invited into these government policy conversations.

The agricultural economics literature has done a good job of addressing the growing role of local food and direct markets in the United States, especially since this booming sector has received little attention from government agencies (Tropp 2008). However, little exists on the viability of the farming operations that supply the local food market. Some studies have looked at the national increase in sales and have asserted that

local foods are a growing market (Brown & Miller 2008). What we are lacking is a closer analysis of farms at a regional, community, and individual level. In addition, research on the role of subsidies on small farms, both by governmental and non-governmental parties, is missing. While research on subsidies outside my scope of local food does exist, it pertains almost exclusively to large scale agriculture or rural development with recent ventures into payments for ecosystem services (Burmeister 2008, Daniel and Kilkenny 2009, Ma et al. 2012). As alternative, small scale food models continue to gain popularity, research regarding the economic inputs of such models is essential to evaluating future success. My own research addresses this gap while also further expanding the literature on values and behavior.

Chapter 4

Methodology

4.1 Research Question

My research addresses the following question: how do scholarly defined elements of "resilience" compare to the primary factors identified by Albuquerque's smallholder farmers which influence their decisions to continue farming?

In this research, I define smallholder farms as those operating on less than ten acres and whose gross farm income is $50,000 or less. There is no singular definition of smallholder farms which has complicated my own process of defining these terms. While the World Bank describes smallholder farms as those occupying two hectares of land or less, this definition is derived from generalizations of farm size in developing countries (Nagayets 2005, Devendra 1993). Smallholder farms in the United States might not match the two hectare size constraints but still experience "limited resource endowments relative to other farmers in the sector" (Dixon, Tanyeri-Abur, and Wattenbach 2004). Given my limited knowledge of farm size and income in Albuquerque, I rely on an economic definition from Small Farm Today magazine and the 2007 Agricultural Census' to develop my own definition which I believe is a more useful way of identifying smallholder farms in Albuquerque (Small Farm Today 2012).

I define Albuquerque farms as those engaged in at least one form of direct marketing (CSAs, farmers' markets, farm-to-school programs, etc.) within the Albuquerque city limits. For Albuquerque, most land in agricultural production is located on the edges of the city. Using city limits alone would prohibit the inclusion of numerous

farms, including those in the East Mountains and Albuquerque's South Valley, which is a major agricultural area. Additionally, a radial boundary might also exclude important agricultural areas and could reinforce a food-miles concept, which is not my purpose. Instead, I am drawing upon a foodshed perspective (Kloppenburg, Hendrickson, and Stevenson 1996). Just as a watershed is made up of tributaries feeding into a larger river, foodshed describes the flow of food resources into a place, such as a city. Without predefined boundaries, like a three-hundred mile radius, it is possible to observe existing flows of goods. By utilizing engagement in direct marketing within the city limits, my research incorporates farms which are functionally tied to the space.

4.2 Data

To answer my research question, I acquired personal accounts of farmers regarding their decisions to continue farming and the primary factors influencing these decisions. Additionally, I collected basic background information about each farm which includes farm name, location, and size of farm along with brief descriptions of what is grown and raised there. This background information also includes marketing strategies (CSA, farmers' markets, restaurants, etc.), farming methods (organic, biodynamic, etc.), community involvement (education, participation), and affiliated groups when it is available. The purpose of this background information was to provide a general context of each farm to aide in understanding the personal accounts mentioned above. In addition to utilizing interviews to acquire this data, I employed observation methods in the form of farm visits, which often involved helping out with farm activities such as harvesting and pulling weeds (Zahle 2012). The research design utilized similar recruitment and data

collection as Pilgeram's (2011) work on Pacific Northwest farmers engaged in sustainable farming.

4.2.A Identifying and contacting farms

In order to conduct interviews and farm visits, it was first necessary to identify potential farms to participate in my research. I began this process by contacting the market managers of four Albuquerque growers' markets. For this initial contact, I emailed the market managers a brief description of my research and asked if they would be able to give me the names of farms that participated at their markets (Savin-Badin and Major 2013). Of the four market managers that I contacted, only the manager for the Downtown Market replied. I was informed that information regarding participating vendors was confidential. However, I was told I could prepare an informative email and have it sent out to vendors by the market manager on my behalf (see recruiting material in Appendix A). Two farms replied to my email.

In order to connect with additional farms, I visited the Albuquerque Downtown Growers' Market, Albuquerque Northeast Farmers' and Artisans' Market, and the Nob Hill Growers' Market. I attended the Albuquerque Northeast Farmers' and Artisans' Market and Nob Hill Growers' Market twice during the month of July. I attended the Albuquerque Downtown Growers' Market eight times during July and August. The Albuquerque Downtown Growers' Market is the largest of the markets in town and had the highest number of participating farms which is why I made the most visits there. During these market visits I made notes of the participating farm vendors and, when possible, talked to farmers about my research. The process of connecting with farmers at

the markets proved particularly difficult for two main reasons. First, and quite obvious, farmers are working at the markets selling their goods and do not have much free time. Second, summer crops peak in July and August which means that farmers are bringing more food to market and dealing with more customers. As a result, farmers have even less free time to talk. I talked briefly with eight farms during these market visits and collected contact information to set up interviews and farm visits.

It was also my intent to talk with people who were no longer farming. To identify former farmers I relied on snowball sampling methods (Pilgeram 2011). During the interviews I asked farmers if they knew of additional farms or people who were no longer farming that I could contact. This process helped me identify three individuals who were no longer farming, only two of which I was able to acquire contact information for. I contacted these two individuals by email and only received a reply from one in which they declined to participate in my research.

4.2.B Interviews and farm visits

I conducted interviews with twelve individuals from ten different. Interviews occurred at a variety of locations (farm, market, library) based on the preference of each farmer. The interviews were semi-structured (see list of questions in Appendix A) and ranged in length from twenty-five minutes to over an hour, though the majority of the interviews were close to forty-five minutes in length (Pilgeram 2011, Savin-Bain and Major 2013).

Questions inquired into the general background and current state of each farm and future plans of farmers. Additionally, some questions were designed to address specific

resilience concepts. For instance, asking farmers what limitations they experience was aimed at providing insight into the disturbances faced by the system. Adaptive capacity was addressed by asking about successes and how farmers responded to change. Learning and knowledge were addressed by asking farmers how they found answers to questions they had about farming. A full list of questions can be found in Appendix A.

Eight of the interviews were recorded and transcribed. The other two interviews took place 1) during the farm visit while harvesting and 2) during the market while the farmer continued to work their booth. Both circumstances did not lend themselves well to the use of the recorder. As such, thorough field notes were recorded immediately after the interviews and were used to write more extensive reflections once I had access to my computer.

All the interviews began by asking individuals to tell me a bit about their farm, to give me the context of who they are and what they do. This not only provided me with useful background information, but it also allowed both myself and the interviewees to settle into the moment. The information they provided set the stage and guided my questions. The goal, of course, was to ask the same general set of questions to all participants, but sometimes the questions were self-generated. For instance, what might start as a reply to my desire for an introduction to the farm would form into a lengthy narrative of their entire farm experience, limitations, challenges, and successes all emerging without direction. While this free form approach complicated the task of coding, it also allowed for more imitate conversations which is reflected in the findings.

I conducted farm visits with seven of the ten farms. I did not conduct farm visits with three of the participating farms because they were 1) too far away to easily coordinate a visit, 2) the farmer was too busy with non-farm work to coordinate a visit, or 3) the non-farmer family member who owned the land did not want visitors. Farm visits ranged from two to six hours in length. During these visits I helped with various farm tasks including weeding, harvesting, and preparing food for market or CSA boxes. Field notes were recorded in a journal after these visits. A secondary research journal was maintained for the dual purpose of recording my experiences during the research process and keeping track of codes used in analysis.

4.2.C Analysis – coding and tables

Once the interviews were completed and transcribed, I began the process of coding. Lists of codes were recorded in a research journal and then input into tables using Microsoft Excel. Additionally, written codes were assigned colors which were used to highlight corresponding sections of the transcripts. Coding occurred in two stages: primary and secondary coding. The primary or "open" coding stage was meant to conceptualize general trends in the data (Savin-Badin and Major 2013, 422). Eight primary codes emerged from this process: diversity of markets, diversity of plants/animals, limitations/challenges, successes/works well, subsidies, resilience, learning/knowledge, and reasons to farm or not. Following the identification of these primary codes, I began the secondary, or "axial", coding process (Savin-Badin and Major 2013, 423). Secondary coding involved breaking down primary codes into more specific secondary codes (Savin-Badin 2013). For example, the primary code

“Limitations/Challenges” was broken down into fourteen secondary codes. During the secondary coding process, I counted the number of times each topic/theme arose during each of the interviews and recorded these numbers in Microsoft Excel tables. Once in these tables, individual occurrences were added together to give me total count for all the interviews. Using these counts, the secondary codes were then ranked from largest to smallest. The purpose of the tables and rankings were not to quantify qualitative data, but to assist me in identifying which topics/themes were talked about most.

While six of the ten farms are located in Albuquerque's South Valley area, participating farms are situated as far north as Velarde, New Mexico and as far south as Lemitar, New Mexico (see Figures 1 and 2 for maps of farms). The farms average 2.2 acres in size. All of the farms sell at least one Albuquerque Growers’ Market. Nine of the farms sell to restaurants. Three farms sell food to Albuquerque Public Schools and only two operate a CSA (Community Supported Agriculture). Six of the farms raise animals in additional to their fruit and vegetable crops. Only two of the supporting farms have one or more greenhouses/cold frames.

Of the twelve individuals interviewed, only three identified as having a family history of farming. Experience farming ranged from three to fifty years. When put into groups, six individuals have been farming 1-10 years, three individuals have been farming 11-20 years, and three individuals have been farming 21+ years. Seven of the individuals who participated are male and five are female. Separated by age, three individuals are 20-30 years old, four are 31-40, three are 41-50, and two are 60+. Out of the twelve, four identify as Hispanic with the remaining eight identifying as white.

Chapter 5

Results

The first section addresses limitations experienced by smallholder farmers which is followed by a discussion of successes mentioned by farmers. The third section approaches the role of learning and knowledge for smallholder farmers. With the general context of smallholder farms in place, the final section will discuss farmers' decisions for their future farming plans.

5.1 Limitations and challenges of smallholder farming

Income

When individuals were asked about the limitations or challenges they experienced, fourteen responses emerged. One of the most discussed challenges was income. While a few individuals mentioned the difficulty of learning to budget for the year, the majority of comments reflected the concern of not being able to make a living wage. As such, it was not uncommon to hear that a second job was necessary in order to make a living. Additionally, it is important to think about the role that subsidies may play in this context. One individual explained:

> I think it's hard to farm because you don't make any money at it. It's not a living wage…If I could get a fair wage for the work I do here that would be amazing….You know, most of the folks that farm, and have been able to do it for so long, are lucky enough to have some kind of subsidy. They're lucky enough to have some kind of salary that pays them that really isn't connected to the success of the farm….a grant that pays them, or some sort of outside support. Maybe it's family land that they don't have to pay a mortgage payment on. There's some kind of subsidy there.

As the above quote illustrates, subsidies, at least in the context of this paper, can be thought of any outside support which defrays the full cost of farming. However, even with the presence of subsidies, be they grants or access to land, many farmers still struggle to earn a living wage.

Time

Discussions of time centered around two ideas. First, individuals shared their general feelings of not having enough time to do everything they wanted. For instance, starting a CSA or attending additional markets was appealing to several farmers, but they simply did not have the time to organize, prepare, and attend. The second issue raised came from those farmers who were also parents. They discussed the difficulty of balancing family life with the needs of the farm. One couple described their concerns in the following dialogue:

> Woman: ...We have a kid now and I need to have energy for her and I need to be able to give her attention. It's a really exhausting job physically and emotionally and I feel I need to hold some of myself back for that.
>
> Man: It's definitely true that we find ourselves striving for things to have a little bit more of a yearlong quality to them, as opposed to a summer peak. I think we both can see how we could be wonderful parents from like October to April and $#!*heads from April to like September.
>
> Woman: Where'd my parents go? I guess they're in the basil somewhere. I haven't seen them in a couple weeks. I've been eating tomatoes...(Laughs).

Although the dialogue above is humorous at times, it conveys the serious questions farmers face as they balance farm demands with family life.

Communication

Communication, another challenge mentioned frequently, referred to both on farm and off farm experiences. On farm experiences generally expressed the difficulty of co-workers effectively communicating after long, arduous hours of work. Off farm experiences typically included farmers' interactions with customers at markets but sometimes included farmers' experience with the community at large. For example, one farmer, who did not have organic certification, noted that it was sometimes difficult to fully communicate with customers about their farming practices. With regards to on farm experiences, one farmer said:

> Communication between people working on the farm is always a big challenge. It's very easy to get frustrated, to come to a situation, to feel that someone did something wrong and because of it you have to work so much harder, because of a mistake or laziness that occurred. Being able to communicate that but also being respectful, and then also reminding ourselves, what is our goal.

Pests

Pests, in this context does not simply mean insects but refers to plants and animals as well that impede peak production of the agricultural product. Plants which were considered pests were usually undesired volunteers growing with crops but sometimes nearby trees were talked about as pests as well. This was because their roots were competing with crops for water and nutrients. Although nearly everyone mentioned having to deal with pests of some sort, they were rarely talked about as being major problems. Instead, pests were a normal, if not expected, challenge for farmers. In regards to insects, some farmers had noticed how weather patterns, such as warm winters, had led to greater occurrences than in previous years. However, farmers seemed to find their

existing insect management plans, such as crop rotation, planting intervals, and row covers, effective even with these shifts in insect populations. Trees proved to be one pest which did illicit more critical comments from farmers, such as in the following statement:

> The trees are just insane. I mean the Alanthis and the [Siberian] Elm are insidious and cause huge problems that you can only do so much about unless we took the time to like cut them all down or poison them or something. So the trees are a huge problem. You think it doesn't make that much of a difference but it's insane how much tree roots, networks of tree roots, will just suck life out of the soil and away from the plants.

Animals as pests were mentioned less frequently than plants and insects, and were much more site specific than the other two. For instance, one farmer dealt with feral cats entering his cold frame while another struggled with Sandhill cranes pulling up planted shallots.

Water

Issues surrounding water generally centered around concerns of living in a desert and long term availability. Only one farm relied exclusively on irrigation water from the acequia. The remaining farms, though some had access to the acequia, utilized drip irrigation fed with well water. Water scarcity was discussed as a future uncertainty which would influence habitation of the area in addition to affecting the feasibility of farming. The following quotes describe these concerns:

> There are very few limiting factors if you are genuinely interested in [farming], except for the issue of water in the desert and the possibility that it's kind of stupid to grow food in the desert at a certain point.

> …Santa Fe, Albuquerque, even Los Lunas, Belen, Socorro, all of these communities are growing and they need more and more water. That water has to come from somewhere and, a lot of times, if it comes from the rio,

> from the river, your agriculture loses out…There's only so much water in that river.

Community support

Two specific issues were raised with regard to community support. The first issue was that community support is lacking and needs to be developed, perhaps though education. When considering the entire population of Albuquerque and New Mexico, farmers asserted that most are not involved in supporting smallholder and/or local agriculture. However, in addition to simply not being aware of opportunities to engage with smallholder farmers, some farmers mentioned that this general lack of support may also be linked to economic constraints for individuals in the community. The second issue raised was that, even where community support does exists, it is naive and, as such, does not provide aid to farmers in a way that is truly meaningful/needed. For instance, just because people shop at the growers' markets, does not mean they understand the policies or water issues with which farmers are struggling. As such, their desire to purchase food, and support farmers, only reaches the surface of the problems at hand. Even when people venture to a farm to help out with weeding or harvesting, their assistance can fall short. One farmer described this type of situation in the following way:

> Farms end up being...it's kind of a nebulous concept of home for lots of people, so people feel a warmth to farms, but they don't really always know what it means, but they feel like they want to go down to a farm but can't figure out why...There's a residual nostalgia that we had to decide we were no longer willing to enable.

Although the above quote mentions a distancing from the community, perhaps the quality of interactions might also be improved with education.

Loss or abandonment of agricultural land

When talking about loss or abandonment of agricultural land, farmers were not talking about current struggles to keep their own land. Instead, they were speaking to more general shifts in land use. For instance, not only has there been a shift, in some areas, of agricultural land to residential or commercial use, but land once farmed may simply be neglected or turned into lawns. The following quotes illustrate these concerns.

> Urban encroachment has always worried me and been limiting. I live a mile south of the county line and I've watched many pieces in my just half mile radius go from agriculture to nothing or to being residential or wanted to be developed by, in terms of high density housing or commercial. That's limiting to me in the sense that I don't want to be in an island and I want to be in a community that values agriculture.

> ..There is lots of land in New Mexico, just walk around the South Valley. We're driving around the South Valley and you see all those properties with humongous pieces of land and they [the owners] just want to see their grass looking pretty.

> There's a lot of land that's being unutilized in small towns...Right next to us there's five acres and the people have moved to Anderson, Nevada. The parents have died and the kids, they have it but, it's abandoned five acres of land and good land...

Although these changes may not directly affect them immediately, if at all, they pose a threat to future farmers, food security of the area, and overall community engagement and support of agriculture.

5.2 Successes and rewards of smallholder farming

New and diverse crops

The most frequent topic which arose when farmers were asked about things that were successful or worked well was the diversity of things they grew and the opportunity

to try new things. A major reason crop diversity is important is because it helps farmers buffer themselves against uncertainty. By planting a diverse group of crops farmers can more easily deal with changes in weather, water, pests, and even growing season. The following quote expresses these sentiments:

> ...When we plan our tomatoes in particular we say, okay, what's fun? What do we love to eat? What makes a lot of money? What if it's really hot and dry, what does well then? What if it's a cool spring and a really early frost, what likes cool weather? What if it's really wet, what can handle splitting?...Not all of the tomato varieties that we plant do well every year because we can't predict what the weather is going to be like but we've got the plants in the ground just in case...

Furthermore, many of the farmers felt they had the opportunity to try new crops without threatening their businesses as a whole. Additionally, although decision making on the part of farmers certainly plays a key role in their willingness and ability to plant an assortment of crops, the physical space of the farm can also facilitate such choices. For instance, one of the farms visited had two fields: one with a few long rows, and the other with many short rows. The meaningfulness of this is expressed by the following:

> I have one field that's these very long beds that are things that either sit in the ground for a long time or are like this greater part of the bank account of this financial decision. Then this little field where there's thirty beds but they're only like fifty feet and so they're made to be able to change. It's designed that way. I designed it that way. So it's not a big deal if something doesn't do well to harvest it all. You could harvest it, till it, plant it all in a single afternoon because it's only like fifty feet.

Relationships with the community

Although community support is a challenge many farmers talked about, there are pockets of people that farmers found supportive and nourishing. These vibrant relationships fit into two main categories: other farmers and local chefs. In regards to the

latter, Albuquerque has seen an increase in the number of restaurants sourcing produce locally. Such locally focused restaurants tend to be fine-dining establishments. Although cost may limit who patronizes these establishments, chefs have more flexibility in their menus. Because of this flexibility, chefs can create seasonal dishes to utilize available produce. Furthermore, trusting relationships may result in farmers' willingness to grow particular crops requested by chefs because they are, essentially, guaranteed a market. For instance, one farmer said:

> It's cool to work with chefs and have them sort of meet you there. You can kind of experiment together and sort of trust each other based on this decision of what you're growing.

In regards to relationships with other farmers, sharing of knowledge seemed to be the strongest connection though sharing of resources, such as farm equipment, also took place. Farmers felt comfortable asking someone else in the community for advice on particular crops or providing suggestions for designing a better market stand. One farmer expressed this in the following way:

> ...The biggest thing is support, to realize we're a group...we want to grow together. I don't mean grow food but improve all of our systems collectively...You know, if I see someone with a display that could use a table cloth I would suggest it. Or say they had a salad mix that was really gritty...and they said it keeps longer, and that's a pretty good reason, but me as a customer, I want to just reach in the bag and eat it. I don't want to rinse it...I think that's important, to be able to criticize for the better of everyone.

While many of the individuals interviewed made similar comments about their experiences as a community, I also observed these relationships in action. For instance, during one farm visit a farmer I was working with, who was unsure of how large bunches

of kale should be for market sent a text to another more seasoned farmer for advice. During another occasion, while visiting the Downtown Growers' Market, I witnessed one farmer telling another that their basil had developed downy mildew and to be cautious of purchasing seed from a particular supplier.

Connection to place and self-sufficiency

Many of the farmers talked about the importance of getting to know their land and connecting to place. While this sometimes could be understood simply as a learning process, getting to know what grows well at their sites or what improvements their land needs, this understanding of the intrinsic workings of their space often translated into something more. Devoting time and energy to their land yielded inspiration as they witnessed their space transform. For some, who were quite new to farming, this transformation reflected ideas of their own potential. They experience a dialogue with the land. As one farmer said:

> I think that the energy that we've put into this land, we've been molding it you know, and just think if we were here and it still looked the same. I always reflect this as my life. So as this place is evolving into something beyond what I can explain, then I am doing something in my life. I reflect this place in my life.

The relationships that people developed with their land were further enforced by their ability to feed themselves and their families. While only one farm was able to completely meet the needs of the farmer and their family (they had set this intention) others still felt comfortable knowing that they were providing the bulk of their consumed

food. As one farmer succinctly stated, “Farming is one of the only jobs where, if you don’t make a dollar that day, you can still eat.”

5.3 Learning and Knowledge

Throughout the interviews, references to learning occurred often. In general, people often talked about their personal learning experiences. Such learning opportunities were often the result of time and practice. As mentioned briefly above, as farmers spent more time on their land they began to learn what crops and varieties work well in their space. Additionally, many farmers learned other, seemingly non-farm related tasks, like mechanics. Acquisition of such knowledge allowed people to do maintenance work on tractors and rototillers, thus often saving them time and money. However, in addition to these personal, experiential learning opportunities, there were several other resources farmers looked to to garner additional knowledge. By far, the most common resource utilized was other farmers in the community. This does not come as much of a surprise given the importance and success of community relationships mentioned above. Emerging programs, such as a local chapter of the Young Farmers Coalition, may facilitate further support amongst local farmers. Another key resource mentioned was universities. Farmers mentioned several agriculture and community development programs associated with higher education facilities in New Mexico. Sometimes farmers utilized these programs simply for questions about crops or pest management. In other circumstances, such programs played a significant role in the development and continuation of farms. Connections with out of state schools were also important to some farmers seeking information on innovative practices not yet common in New Mexico.

Another source of information for most farmers is the internet. Books have not been disregarded and many of the farmers mentioned their use of several farming classics. However, dissemination of information via the internet is certainly changing things. Not only can information be looked up quickly, but farmers talked about the role of online videos as useful tutorials. Information from universities and state extension offices can also be accessed easily online as well. Additionally, as more individuals have access to and acquire smart phones and intelligent devices, information can be accessed even while in the field. As one farmer said:

> Having an i-phone in the field is very useful I think. For texting restaurants and looking up why the cucumbers are dying, or not dying, just going slow.

5.4 Farming in the future

As is evident from the information above, farmers often had much to share when asked questions about their farms. Interestingly, when asked about their plans for the future, the responses were quite brief and delivered, almost every time, in matter-of-fact fashion. Of the twelve individuals interviewed, all but one said they planned to continue farming, with the remaining farmer stating that the future is unknown and s/he couldn't be certain s/he would be doing the same thing ten years from now. When individuals were asked to explain why they planned to continue farming, a moderate list of reasons was given. Overwhelmingly, however, the responses invoked two core concepts: self-sufficiency and connection to place. While both of these have been discussed above, it is worthwhile to re-examine them here in relationship to decisions about the future, which

elicited more detailed responses. The following quotes illustrate the deep connections people have to the land:

> I love the lifestyle. I love being able to decide what I am going to do with a set of tasks that need to get done, and having my dogs around and eating the food. Like going out and eating a couple pounds of tomatoes because I want to or all the grapes because they're delicious. Getting rained on, seeing the rainbows, sitting on the porch watching the hail come down. I like the way it feels. I like feeling connected to how the season is going...
>
> The truth is, there's no way it's going to get cold and I'm going to hear the cranes and like, sit in an office. There's no way that's ever going to work if I'm not out in the field, making sure my field is ready for garlic...
>
> The plants, I'd have to say, is the main reason. The relationship with the plants. Every year they impress me. They have new teachings every year and I feel like if I wasn't growing one year I would be missing out on all that wonderful stuff. I don't want to miss out on that.
>
> Now, when I'm in the soil, working in the soil, using shovels or whatever, and I'm thinking...I'm prepared to pass away going back to the earth. That would be the best way to pass away...I mean I love music, but to tell you the truth, now that I'm farming music has a different flavor. I believe every single artist in the world who could learn something about farming, if they practice it while doing their arts, will see the benefits. That beautiful influence of touching the soil and then putting it into practice...

Perhaps even more interesting than the reasons farmers shared for why they plan on continuing farming were their responses when asked what might change their minds. Only four responses emerged from asking farmers why they would not farm anymore. The most common reply was that *how* they farmed, or grew food might change but that they would always be growing food in some capacity. The following quote succinctly describes these feelings:

> Things that would change my mind about farming? I'd say no, because the way my mind is made up about it, it needs to happen. I think the methods can definitely change but to decide not to grow food? You know, when I think about farming I don't necessarily think that is has to be huge or linear or anything like that. I lump it all into the same, gardening and farming is all the same for me. Growing food basically.

Although such statements were most common, farmers did mention water scarcity, being physically unable, and loss of land as reasons they may be unable to continue farming. Of these three, water scarcity and physical inability were most discussed. Farmers were astutely aware of the labor challenges farming places on the body. While hard work was sometimes talked about as a way to stay healthy, changes associated with aging cannot be escaped forever. One farmer joked:

> It's definitely a labor that's hard on the body. I will admit I'm not in the best physical shape but I'm willing to sweat and I'm willing to hurt but at some point there will be a threshold where I probably can't continue. Hopefully by then I have fifteen kids and six hundred grandkids.

Chapter 6

Discussion

Returning to resilience, the first section of the discussion will describe the basic resilience concepts used in this research and apply these concepts to smallholder farms. As part of this, interesting findings from the research are discussed. Following this, the applicability of resilience is evaluated and some limitations in resilience theory are discussed. Finally, potential remedies to these shortcomings are addressed.

6.1 Applying resilience concepts to smallholder farms

6.1.A Resilience

As noted earlier, resilience is the capacity of a system to deal with disturbance in such a way as to maintain the same basic functions and identity of the system (Walker and Salt 2012). This research has been approached from a general resilience perspective. The "system" addressed is the community of smallholder farms. Although it is possible to look at each farm individually, there is an exchange of resources and information which links the farms together. This research has explored the experiences individuals of these farms have and how these experiences influence their decisions to keep farming, linking the data gathered with key resilience concepts

6.1.B Diversity and Redundancy

In resilience theory, diversity is discussed in two main ways: functional and response. Functional diversity refers to the variation of functions in a system (Walker and Salt 2012). Although the crops grown may all be thought of, broadly, as food, different plants serve different functions both ecologically and economically. For instance, nearly

all the farmers practice crop rotation as a tool for managing soil health. Taking an economic perspective, shallots and flowers have different monetary values and can be grown to meet different economic needs.

Response diversity refers to the different response types within a particular functional group (Walker and Salt 2012). For example, amongst smallholder farmers' general strategies for marketing there are multiple marketing options such as CSAs, restaurant sales, and participation at growers' markets. Furthermore, since "resilience is enhanced by increased response diversity within a functional group", redundancy is often a component of building adaptive capacity (Walker and Salt 2012, 214). By utilizing more than one marketing strategy, for instance, farmers might be able to mitigate poor sales in one venue with consistent sales in another. Another example of redundancy is the conscious integration of beneficial insects and predators as part of a pest management plan.

6.1.C Learning and self-organization

Learning is another integral component of building the adaptive capacity of a system (Gupta et al 2010). In their discussion on social learning, Pahl-Wostl and Hare (2004, 194) describe community learning in the following way:

> Individuals engage in actions and interactions that have to be embedded in culture and history. Such interactions are influenced by and may change social structure and, at the same time, the individual gains experience situated in a context. Such learning processes confirm and shape the identity of the individual in its social surroundings. They confirm and change social practice and the associated interpretation of the environment.

In the case of smallholder farmers, it is clear that learning is not only a personal experience but a community action as well. The ability of the community to remember past experiences and anticipate future trends or shocks can help farmers mitigate the effects of disturbances. New farmers may lack such extensive knowledge when they first being but being able to share information with other farmers can better equip them to deal with such challenges.

Sharing of knowledge amongst farmers illustrates another resilience concept: self-organization. Self-organization refers to the "internal, interactive processes that determine the dynamics of a system, independently of any external influences" (Walker and Salt 2012). In other words, self-organization acknowledges the interconnection, dependency, and exchange between various parts of the system. While knowledge seems to be the overarching web that connects farmers to one another, communication, in general, facilitates the organizational capacity of the system. Tangible resources, such a tractor implements, walk-in coolers, and seeds, are also shared between farms. This resource exchange not only helps farmers manage costs but is key in developing and maintaining the identity of this system.

6.1.D Thresholds and transformability

Up to this point only adaptive capacity has been discussed as a response to disturbances. However, there are times when the disturbance proves too much for the system to handle which results in a shift to a new regime/state with an entirely new identify (Walker and Salt 2012). This shift is known as transformation with the breakpoint between these regimes described as the threshold (Walker and Meyers 2004,

Walker et al. 2004). Said differently, thresholds refer to the maximum disturbance a system can withstand before transforming into a different system state. In the case of smallholder farms, thresholds can be identified as those disturbances which would cause farmers to stop farming. Based on farmers responses to what might change their minds about continuing to farm, three thresholds have been identified: physical inability, lack of water, and loss of land. A more thoughtful discussion of these will be given below.

Although transformation often occurs unwillingly, it is also possible for transformation be guided (Walker and Salt 2012). With this in mind, it is important to recall that nearly all the farmers interviewed said that *how* they grew food might change and that they were open to such changes. This willingness to change not only plays a role in the current adaptive capacity of the system but also equips farmers with tools for transformation. While this research focused on decisions to farm or not, transformation does not *have* to mean people are no longer farming. Other changes could occur to change the fundamental identity of the system.

6.1.E Interesting findings: limitations, game-changers, and the role of social factors

The stories, ideas, and emotions shared during the interviews and farm visits, paint a picture of entrepreneurial individuals with a love of food and the land. In some ways, their experiences are not so different from other small business owners. They struggle to earn a living wage, must acquire the necessary resources for their job, while also balancing time between work and family. However, for the farmer, their office is the field which provides a slew of other challenges perhaps not as common to the world of

indoor activities: pest management, soil infertility, and changes in the weather. These are the types of uncertainties for which resilience theory is designed to anticipate and understand (Walker and Salt 2012). What is interesting, though, is that the three most common limitations mentioned (income, time, and communication) are not the same three factors which would change farmers' minds about farming (water scarcity, physical inability, and loss of land). In resilience terms, this means that the major disturbances/perturbations farmers identified were not the variables they identified as possibly triggering transformation, i.e., a shifting away from farming. Both water and loss of agricultural land were mentioned as limitations, but physical inability was not talked about until farmers considered the future. Perhaps, the distinction between limitations and game changers has something to do with the certainty of the latter as well as decisions to continue farming. Lack of water, loss of land, and loss of physical ability are all distinct and defined experiences which would inhibit people from farming. On the other hand and as will be addressed shortly, issues related to time, communication, and income are more ambiguous and perceptions of the quality and quantity of each can easily change--, i.e., characterized by more radical uncertainty. Such ambiguity and ability to change might explain why these oft mentioned limitations were not listed as reasons to quit farming. Furthermore, one of the main reasons people gave for choosing to continue farming was self-sufficiency. As such, if people are able to grow a substantial amount of the food they need, the necessity of a substantial income may lessen. This is not to say that money is not an issue for farmers, who still have to buy seeds and tools and make mortgage payments. The intention, rather, is to illustrate how self-sufficiency

lessens the demands on farmers' income which may account for why income was not considered as a reason not to farm. Additionally, even though the farmers interviewed may be pressed financially, perhaps they have not yet experienced a substantial monetary shock to make them seriously consider income as a threshold. As such, it would be interesting to compare the thresholds identified by smallholder farmers in this research with those thresholds identified by people who are no longer farming.

Another interesting finding is the trend in responses regarding limitations, successes, and reasons to continue farming or not. For both limitations and reasons not to farm, people generally listed social-ecological factors or factors relating to access to resources (see Appendix B for lists of codes). For both successes and reasons to farm, though, people generally listed purely social factors, especially factors pertaining to relationships. This finding suggests that while farmers face very real social-ecological and resource related challenges, relationships play a key role in mitigating such challenges. In doing so, the results highlight the complex connection between social and ecological forces. Furthermore, although ecological challenges certainly exist for farmers, discussions of smallholder farms would be remiss in approach if careful attention is not given to the role of social networks in mitigating such disturbances. Resilience theory, although it acknowledges the importance of social-ecological interactions, may fall short in this regard.

6.2 Limitations of resilience

While resilience may be a useful tool for understanding the overarching context of smallholder farms and farmers' decision making process, there are some limitations in its

approach. First, basic resilience concepts glance over the agency farmers have and their experiences with and expression of power. Secondly, looking at reasons people continue to farm, there is one key idea which has not been addressed at all: connection to place. These two limitations are now addressed in turn below.

6.2.A Power and agency

As noted earlier in this paper, agency asserts that individuals and communities are conscious decision makers while power implies the ability to actually be able to act on those decisions (Davidson 2010, Cote and Nightingale 2012). Furthermore, power is not only influenced by formal regulations or institutions but is experienced in social interactions everyday (Cote and Nightingale 2012). Up to this point, the only decision making discussed has been farmers' decisions to continue farming. However, everyday tasks provide countless opportunities for farmers to make decisions such as which crops to plant, which projects to attend to, how to set up their market stand, or who they would like to sell their food to. The ability to make and act on such decisions should not be taken lightly as each of these experiences sheds light onto the dynamic relationships influencing such decisions. While many of the farms are owned by the farmers who manage them, several others are not. In such instances, choices of what to grow and how are influenced by expectations of the actual land owners or even agreements amongst a collaborative. For instance, one farm maintains organic certification as part of an agreement between themselves and the landholder. Although they would farm without pesticides and herbicides regardless, organic certification might not be sought if not for the agreement made with the landowner to procure and maintain such a label.

Additionally, although relationships among farmers were described as typically amiable, interactions among farmers are also expressions of power. A farmer seeking advice on weights of bundles and prices for markets, as described earlier, is acknowledging the expertise and, in a sense, authority of someone else. Authority, or power, is not static however, and the role between student and teacher shifts, often facilitating learning in this context. This relationship is captured well in the following quote from one farmer:

> I'm happy to teach other people to the point that they get as good as me and if they surpass me then I'm going to try and be better than them, again, and that's awesome.

Furthermore, individual farmers express their thoughts on the "right" way things should be done, which is clearly evident from earlier quotes describing the need for tablecloths at market, or thorough washing of salad greens. Less subdued expressions of power and agency can be seen in farmers' blatant discussions of self-sufficiency. There's an expression of power at play when farmers are able to provide for themselves without reliance on outside sources. Additionally, the act of growing their own food may sometimes be an overt critique of the larger conventional food system and governance structure. One farmer said:

> Here comes the political side of me and my, my lack of faith in the larger institutions. I do believe there will reach a point where one of the biggest threats is those who can take care of themselves and there may be some government, corporate, basically some type of institutional crackdown...

While it might be possible to discuss some of these issues through concepts of learning or self-organization, the above examples of power and agency at work are not adequately addressed by basic resilience concepts. In both cases, the nuances of these

relationships are not teased out using these basic concepts. Instead, it feels as though such experiences are taken for granted because they make up mundane, everyday encounters, which is unfortunate since they have much to offer.

6.2.B Connection to place

Before addressing resilience theory's ability to understand connection to place, it is first essential to define what is meant by the term in this context. When describing their connection, individuals expressed intimate relationships to the land(scape) which reach beyond usefulness or even duties emanating from a land ethic. Although the farmers interviewed rely upon the land to grow the food they sell and consume themselves, the connection experienced is not based upon this production. The idea that human experience to the land can develop out of something more than the utility of the landscape is certainly not new. Aldo Leopold, author of *A Sand County Almanac* and prominent proponent of a land ethic, said the following:

> ...A land ethic changes the role of *Homo sapiens* from conqueror of the land-community to plain member and citizen of it. It implies perfect respect for his fellow members, and also respect for the community as such (1966, 240).

Although an “ecological conscience” (Leopold 1966, 258) may be integral to creating a sense of stewardship towards the land, it also does not capture the connection to place expressed by farmers. This is not to say that the individuals interviewed do not experience a sense of responsibility towards the land they farm. On the contrary, decisions to farm organically and encourage beneficial insects and predators on the land speak to the care farmers have for their properties. This being said, the connection to place they expressed

is more than an ethical obligation. Instead, it is something even more basic. The connection to place experience by farmers is based upon a fundamental appreciation of the land(scape) and a recognition of their role in this larger system. Land(scape) or place can be thought of as "a setting...of profound meaning and connection to an individual by virtue of personal, direct experiences"(Lockwood 1999, 368). A large part of the appeal of farming, then, is to be in a position where this greater connection is continually reinforced through experience.

Employing the resilience concepts used above, there does not seem to currently be a way to adequately address the connection to place experienced by farmers. There is certainly an element of learning or knowledge at play in farmers' understanding of the larger context in which they live. Yet, to describe connection to place in such a way would miss much of the *feeling* experienced. In her own work on local food and the importance of cultivating sense of place, DeLind (2006, 135) says, "...the body–place connection conveys a sense of the permeability of bodies and, by extension, of living systems." The difficulty, however, is finding the vocabulary for expressing this connection since, "Place remains part of, is comfortable within, the realm of the nonrational. Not only is it lived and therefore alive (and continually being renewed), it is best understood from the inside out, and not from the outside in" (DeLind 2006, 129).

Resilience theory currently lacks the ability to fully understand connection to place. By just utilizing basic resilience concepts, it seemspossible to miss the nuances of social-ecological systems such as power, agency, and connection to place. This is because the original definitions of these concepts do not explicitly mention the role of institutions,

economic forces, or community and individual agency. Be this as it may, it is interesting that critics, who have been adamant about the lack of attention to power and agency, also failed to discuss the absence of connection to place (Adger 2000, Harrison 2003, Hornborg 2009, Cote and Nightingale 2012, Chandler 2012, Davidson 2010, Davidson 2013).

6.3 Addressing resilience's limitations

The findings above highlight some of the limitations of resilience theory. The questions that logically follow center on (1) whether, given the permeable and experiential nature of connection to place, how feasible would it be for resilience theory to develop the capacity to address it and (2) how might power and agency be addressed more directly. There are resources such as the Resilience Alliance Workbook (2007) and the adaptive capacity wheel developed by Gupta and colleagues (2010) which provide examples of how such social issues might be understood using resilience. The Resilience Alliance Workbook (2007), for instance, is a guidebook put together by leading resilience scholars to assist in the application of resilience theory to real world situations; it provides step-by-step instructions for conducting a resilience assessment. The workbook provides questions about people and governance meant to help identify the actors in a system as well as the policy and institutional context in which they are situated (Resilience Alliance 2007). A closer look at how the Resilience Alliance workbook *does* address social concepts reveals that limitations remain. The assessment is divided into four main parts: understanding the system, assessing the system, implications for management interventions, and synthesis of resilience understanding (Resilience Alliance

2007). As noted above, when defining the system, there are questions on people and governance (Resilience Alliance 2007). Such questions include:

- Where does the real power lie?
- Who has the power to influence the system, directly through changing policies, or indirectly through voting, lobbying, advertising, or funding those with direct power?
- What other informal institutions are important in regard to resource use (e.g., lobby groups, informal associations or groups)?
- How flexible or variable are they?
- How effective are social networks and what role are they playing (or could they play) in learning and changes in resource use and management? (Resilience Alliance 2007, 8)

These questions offer some opportunities for resilience to incorporate discussions of power. However, many of these questions are focused on the larger institutional and policy driven power relationships and do not inquire into the everyday social experiences of power. Furthermore, the workbook does not provide a clear working definition of power.

Moving further along into the workbook, in assessing the system, there are a set of questions related to social capacity including the following:

- What social networks are in operation and are they dynamic, or restrictive?
- Is there evidence of: self-organization and action, communication infrastructure and networks, lobby groups?
- What is the status of community organization (e.g., local stewards)?
- What is happening to trust in the system – within social groups, and between social groups?
- How strong is learning in the system and how does it occur? Is it an ongoing process?
- What particular aspects of the social system are critical in determining social capacity in this system? (Resilience Alliance 2007, 11-12)

These questions illustrate, what seems to be, an honest attempt by resilience proponents to address some of the nuances of the social realm. Additional questions relating to connection to place would enhance these efforts. Such questions could be as simple as:

- What relationships do people have with place/land(scape)?
- How do people *feel* about the place/land(scape)?
- Are there community relationships with and/or beliefs about the landscape that foster adaptive capacity?

Additionally, as was the case with smallholder farmers, expressions of connection to place may even emerge from more general questions regarding the system and people's interaction with it.

Meaningfully addressing connection to place, power, and agency, requires more than just asking questions. Just as the effectiveness of policy depends on its enforceability, meaningfully addressing social elements of systems depends upon how such concepts are actually understood, valued, and utilized. Resilience critics have devoted much attention to such issues regarding power and agency, though discussions of remedies are not as prolific. Davidson (2010) provides some of the most specific courses of action, highlighting three particular areas of future research: individual and collective agency, critical thresholds, and multiscalar feedback mechanisms. The paper will now shift attention to connection to place which has been absent from discussions by both critics and resilience proponents.

Part of the problem of meaningfully addressing connection to place lies in the common use of the terms “capital” and “services” in resilience (Millennium Ecosystem

Assessment 2005, Resilience Alliance 2007). While it is possible to talk about capital in relation to natural, built, human, social, and financial resources, the end result is the same: elements of a system are understood based on their *usefulness* or *value.* The need to understand the importance of something based on its usefulness does not jive with experiences of connection to place. As noted, connection to place does not necessitate stewardship or action. Instead, the acknowledgement of the relationship which takes place is valuable simply because it is experienced. The issue at hand is not experienced by resilience alone, however. DeLind (2007, 126) shares similar sentiments in relation to her work on local food:

> What are needed are ways of thinking and feeling about local food that cannot be easily appropriated and/or disappeared by the reductionist rationality of the marketplace and that can balance and reframe an economic orientation with more ecological and cultural understandings of people in place.

If resilience wishes to grapple with such issues, an honest look at its epistemological stance may be in order. In other words, understanding resilience's history is important to understanding its current perspective and limitations (Hornborg 2009, Walker and Cooper 2011). This is not to say that resilience *must* change in order to be relevant. As hopefully has been illustrated, resilience can be effectively used to help us understand aspects of the smallholder farm experience. The point, then, is to ask resilience scholars to acknowledge the scope of resilience as well as their own implementation of it. Room does exist, at some level, to incorporate connection to place. However, it may be necessary to draw on other perspectives and insight as well. While the intentions of resilience proponents have certainly been ambitious and seem to have grown out of a genuine desire to radically shift

how we view the world, it is important to remember that resilience cannot be a theory about everything. Nor does it have to be! As Folke (2006, 260) says:

> The resilience approach provides *one* among several arenas (e.g. vulnerability research, ecological economics, sustainability science) for generating integrative science and interdisciplinary collaboration on issues of fundamental importance for governing and managing a transition toward more sustainable development paths, one of the greatest challenges facing humanity. [Emphasis added]

Even without a synthesis of these concepts into the theory, it is important to highlight the potential for collaborations. Numerous researchers in other fields are addressing sense of place and connection (Jackson 1994, Basso 1996, Lockwood 1996, Nabhan 2002, DeLind 2006). As such, pursuing more interdisciplinary connections could yield fruitful relationships for resilience, bringing knowledge of mind, body, and place together. "My mouth, my tongue, and my heart remind me of what my mind too often forgets: I love the flavor of where I live, and all the plants and creatures I live with" (Nabhan 2002, 304).

6.4 Conclusion

Understanding Albuquerque smallholder farmers' decisions to continue farming requires attention to the broader, community level context in which these farms operate. Although ecological, economic, and resource related factors pose challenges for farmers and their long term farming goals, the social fabric of the community creates opportunities to navigate such perils. Furthermore, this community is grounded by a sense of connection to place and self-sufficiency. Resilience theory, as presented here, can be utilized to understand the basic context of smallholder farms. However, resilience theory provides only a limited understanding of the complex social dynamics of

smallholders farms. In particular, basic resilience concepts do not fully address issues of power and agency experienced by farmers, and completely lack the capacity to discuss connection to place. However, careful consideration of such limitations and collaboration with social scientists may provide clarity and insight for how to bring more complexity the application of resilience theory as a way of understanding the social aspects of social-ecological systems social quandaries.

6.5 Limitations and Further Research

The main limitation to this research was lack of involvement of people who are no longer farming. Although I had intended to include such individuals in my research, difficulty contacting them or their lack of desire to participate, hindered these plans. In the future, it might be useful to have more time devoted to identifying such individuals.

Another limitation is the scale of this research and the broader implications being made. Although, resilience proved inadequate to address the issues of Albuquerque's smallholder farmers, this is just one case study. To fully understand the limitations of resilience theory, additional case studies should be consulted and/or conducted.

Going through the process of coding provided many insights into the ways in which data collection could be improved. For instance, although I asked specific questions such as "What is challenging?" or "Do you want to continue farming?" and could easily code answers as pertaining to such, there were other parts of the interviews in which the information being shared by participants seemed to be related to such questions as well. However, it was not easy to tell whether this was what was really going

on in the minds of participants or if I, the researcher, was making assumptions. As such, follow up interviews would have been helpful for clearing up such ambiguity and providing more accurate and insightful data. Future research would benefit from incorporating two sets of interviews into the research design.

Appendix A: Recruiting Material, Consent Forms, and Interview Questions

Information to be shared via email/letter:

Hello,

My name is Tiana Baca-Bosiljevac and I am a graduate student at the University of New Mexico.

I am researching factors that influence farmers' decisions to continue farming. My goal is to try and understand what success means for small scale farmers in and around Albuquerque. My research will involve interviews with farmers and visits to the farms they work on. During these farm visits I will volunteer my time to help out on the farm for a day. I will ask your permission to record interviews and take pictures during the farm visits. The audio-recordings are to help me remember and understand what was said in the interviews. If I use audio-recordings, photos, or anything you tell me during the interview or farm visits, you and your farm will remain anonymous. I will keep your information confidential. I will not use farm or people's real names in my research paper. Your participation in this study is completely voluntary and you can withdraw at any time for any reason. If you have any questions you can contact me at the phone number or email address below.

To participate you must meet the following criteria:

- Your farm must be ten acres or less AND
- You must have a gross farm income of $50,000 or less AND
- You must be involved in some type of direct marketing* within the Albuquerque city limits.

*Direct marketing means you do at least ONE of the following:

- Sell at a Farmers' Market
- Sell through a CSA
- Sell directly to schools
- Sell directly to restaurants

If you meet these criteria and would like to participate, please contact:

Crystiana "Tiana" Baca-Bosiljevac
(505) 417-8720 tbaca82@unm.edu

The University of New Mexico
Consent to Participate in Research

Farmers, Resilience, and the Future of Smallholder Farms in Albuquerque

06/20/2013

Introduction

You are being asked to participate in a research project that is being done Crystiana Baca-Bosiljevac from the Department of Geography. This project involves researching factors that influence farmers' decisions to continue farming. The goal of this research is to understand what success means for small scale farmers in and around Albuquerque.

You are being asked to participate in this project because you have self-identified as meeting the following criteria:

- Your farm is ten acres or less AND
- You have a gross farm income of $50,000 or less AND
- You are involved in some type of direct marketing* within the Albuquerque city limits.

*Direct marketing means you do at least ONE of the following:

- Sell at a Farmers' Market
- Sell through a CSA
- Sell directly to schools
- Sell directly to restaurants

What does participation mean?

If you agree to participate, the following will occur:

- An interview will be arranged at your convenience. The interview will take about an hour and will be recorded and transcribed to aid the analysis process later on.

- A farm visit will be arranged at your convenience. During these farm visits I, Crystiana, will volunteer my time to help out on your farm for a day. I will ask permission to take pictures during these farm visits.

Risks and Benefits

Potential risks of this project include emotional discomfort caused by interview questions as well as loss of confidentiality through recognition of video and audio recordings by the community. Although names will be kept confidential, I cannot guarantee confidentiality if voice recordings or photographs are recognizable by the community.

I will not ask specific financial questions about you or your farm. If any interview question makes you feel uncomfortable, for any reason, you can choose to not answer.

There are potentially both direct and indirect benefits to you and your farm. Directly, you will receive my help on your farm for a day. Indirectly, the findings from this project may be useful to government and other programs at the city, state, or even national level who can direct resources and support to Albuquerque farmers. Additionally, the knowledge of farmers will hopefully be better valued outside of farming communities.

Confidentiality and Withdrawal

The names of you and your farm will be kept confidential. Your real name or the name of your farm will NOT be used in the research results. However, as stated above, I cannot guarantee confidentiality if voice recordings and photographs are recognizable to the community. Your participation in this project is completely voluntary and you can withdraw at any time for any reason.

Personal information, including voice recordings and photographs, will be stored for up to one year in a secure and locked location at my home or office at the University of New Mexico. Any information stored on my password protected computers will also be encrypted. After one year, all personal information, including voice recordings and photographs, will be destroyed.

If you have questions or complaints about this project:

If you have any questions, concerns or complaints at any time about the research study, Crystiana will be glad to answer them by phone (505.417.8720) or email (tbaca82@unm.edu).

If you would like to speak with someone other than the researcher, you may call the UNMHSC HRPO at (505) 272-1129.

If you have questions about your rights as a research participant:

If you have questions regarding your rights as a research participant, you may call the UNMHSC HRPO at (505) 272-1129. The HRPO is a group of people from UNM and the community who provide independent oversight

of safety and ethical issues related to research involving human participants. For more information, you may also access the IRB website at http://hsc.unm.edu/som/research/hrrc/irbhome.shtml.

Consent

You are making a decision whether to participate in this research. Your signature below indicates that you read the information provided. By signing this consent form, you are not waiving any of your legal rights as a research participant.

I have had an opportunity to ask questions and all questions have been answered to my satisfaction. By signing this consent form, I agree to participate in this research. A copy of this consent form will be provided to you.

_____	_____	_____
Name of Participant	Signature of Participant	Date

Investigator Signature

I have explained the research to the participant and answered all of his/her questions. I believe that he/she understands the information described in this consent form and freely consents to participate.

_____	_____	_____
Name of Investigator	Signature of Investigator	Date

Consent for Voice Recordings and Photographs

I give the researcher permission to record our interview and take pictures of me and my farm. I understand that the researcher cannot guarantee confidentiality if voice recordings or photographs are recognizable to the community.

_____	_____
Participant Initials	Date

Interview questions* were pulled from the following list:

- How did you get into farming?
- Do you plan on farming next season? Why?
- Do you think you'll keep farming in the future? Why?
- Do you see yourself farming throughout your life? Why?
- Is there anything that might change your mind or influence your decision/s? Why?
- What do you like most/least about farming?
- Do you consider the farm to be successful? Why?
- Do you consider yourself to be successful? Why?
- What limitations do you experience on your farm?
- How do you respond to change?
- Have there been any major changes or shocks to the farm since you've been here?
- How did this farm get started?
- How do you find answers to questions you have about farming?
- Do you consider you farm to be resilient? Why?

***Not all questions were asked.**

Appendix B: Codes for Analysis

Primary Codes	Secondary Codes
Limitations	Income Time Communication Pests (plant/animal/insect) Water Community Support Soil Fertility Uncertainty Loss/Abandonment of Ag Land Tools/Infrastructure Existing Food Policy and Regulations Weather Organic vs Non-Organic GE Crops
Successes	Diversity/New Crops Relationships w/ Community Farm as Business Connection to Place Businesses Collab w/ Farms Opportunities for Growth Learning Self-sufficiency
Learning/Knowledge	Other Farmers in Community Universities Books Farmers Out of State Internet Government programs
Decisions to Farm	Connection to Place Self-Sufficiency

	Educate Others Relationships Health Continual Learning Income/Business Make Own Decisions Addicted
Decisions Not to Farm	 Possibility of Change Water Scarcity Physically Unable Loss of Land
Diversity of Markets	
Diversity of Plants	
Subsidies	

Appendix C: Resilience Concepts

Term	Definition	Source
Adaptive capacity	The capacity to adapt to and shape change. **Adaptability** is the capacity of actors in a system to manage resilience, either by moving the system toward or away from a threshold that would fundamentally alter the properties of the system, or by altering the underlying features of the stability landscape (change the positions of thresholds, and the ease of movement of the system).	Berkes F. and C. Folke, eds. 1998. Linking Social and Ecological Systems: Management Practices and Social Mechanisms for Building Resilience. Cambridge, UK: Cambridge Univ. Press. Walker, B., C. S. Holling, S. R. Carpenter, and A. Kinzig. 2004. Resilience, adaptability and transformability in social–ecological systems. Ecology and Society 9(2): 5. [online] URL: http://www.ecologyandsociety.org/vol9/iss2/art5/
Disturbance	In ecological terms, disturbance is a relatively discrete event in time coming from the outside, that disrupts ecosystems, communities, or populations, changes substrates and resource availability, and creates opportunities for new individuals or colonies to become established.	Smith, R.L. 1990. Ecology and Field Biology (fourth ed.). Harper Collins, New York.
Diversity	The different kinds of components that make up a system. With respect to resilience, there are two types of diversity that are particularly important: functional & response. **Functional** Diversity is the diversity of the range of functional groups that a system depends on. **Response** Diversity is the range of different response types existing within a functional group. Resilience is enhanced by response diversity within a functional group.	Walker, B and D. Salt. 2012. Resilience Practice. Washington, DC: Island Press .
Resilience	Resilience is the capacity of a system to absorb disturbance and reorganize while undergoing change so as to still retain essentially the same function, structure, identity, and feedbacks.	Walker, B., C. S. Holling, S. R. Carpenter, and A. Kinzig. 2004. Resilience, adaptability and transformability in social–ecological systems. Ecology and Society 9(2): 5. [online] URL: http://www.ecologyandsociety.org/vol9/iss2/art5/

Self-Organization	The internal, interactive processes that determine the dynamics of a system, independently of any external influences. A system processing these processes is a self-organizing system.	Walker, B and D. Salt. 2012. Resilience Practice. Washington, DC: Island Press .
Threshold	A breakpoint between two regimes of a system.	Walker, B. and J. A. Meyers. 2004. Thresholds in ecological and social–ecological systems: a developing database. Ecology and Society 9(2): 3. [online http://www.ecologyandsociety.org/vol9/iss2/art3/
Transformability	The capacity to create a fundamentally new system when ecological, economic, or social (including political) conditions make the existing system untenable.	Walker, B., C. S. Holling, S. R. Carpenter, and A. Kinzig. 2004. Resilience, adaptability and transformability in social–ecological systems. Ecology and Society 9(2): 5. [online] URL: http://www.ecologyandsociety.org/vol9/iss2/art5/

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