

Securitized scarcity or insecure abundance? A case study on the strengths and weaknesses of agroecology in southeast Michigan

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## Abstract

There is growing consensus that agroecology is needed to improve the sustainability, equity, economic viability, and climate resilience of farming. Agroecology is burgeoning in scientific literature and has been practiced by peasants to resist corporate and state oppression for over a century, but case studies of agroecological transformation in the U.S. remain sparse and public funding remains limited. In the heart of the Midwest, this case study provides a narrative of alternative agriculture, illustrating the strengths and weaknesses of agroecology in a landscape and country dominated by agribusiness interests. I interviewed female and Black, Indigenous, and Latina/o farm support actors and small-scale farmers of livestock, cut flowers, diversified vegetables, and agroforestry. From these interviews, I assessed which elements of the FAOs 10 principles of agroecology are being supported and practiced in southeast Michigan. All farmers are increasing diversity, resilience, efficiency, and synergies across their farm on their own. This is aided by co-production of knowledge and investments in the solidarity economy. All principles need to be strengthened, but recycling, responsible governance, and culture and food traditions were the least prevalent agroecological principles among these farmers, with the lattermost principle being limited by the diversity of interviewees. Farmers were not invested in internalizing recycling processes, most notably for seeds and compost, and bottom-up responsible governance was deemed aspirational, not practical. Recommendations include securing the knowledge that is being robustly produced and ensuring agroecology is operationalized through active, reciprocal partnerships between farmers, universities, and farm support actors. Other recommendations include developing a set of local policies, propelled forward by policy councils already established, that address equitable access to land and markets for Black, Indigenous, and Latina/o farmers and development of mid-sized markets. Lastly, recycling of inputs and independence from agribusiness should be strengthened through seed commoning.

Keywords: agroecology, peasantry, farmers, agribusiness, equity

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<u>Table of contents</u>	
<b>ABSTRACT</b>	<b>2</b>
<b>ACKNOWLEDGEMENTS</b>	<b>3</b>
<b>LIST OF FIGURES</b>	<b>6</b>
<b>LIST OF TABLES</b>	<b>7</b>
<b>INTRODUCTION</b>	<b>8</b>
AGROECOLOGY	8
THE NEW PEASANTRY	11
FOOD SOVEREIGNTY	12
LIMITATIONS	12
RESEARCH FOCUS AND RATIONALE	13
<b>MATERIALS AND METHODS</b>	<b>20</b>
STUDY SITE AND DESIGN	20
PARTICIPANTS	20
RESEARCH INSTRUMENTS	22
PROCEDURE	23
DATA ANALYSIS	23
<b>RESULTS</b>	<b>23</b>
SUMMARY OF INTERVIEWEE CHARACTERISTICS	23
PEASANT VALUES	25
DIVERSITY	27
RECYCLING	29
ECONOMIC RESILIENCE	31
ECOLOGICAL RESILIENCE	34
EFFICIENCY	35
SYNERGY	37
CO-PRODUCTION AND SHARING OF KNOWLEDGE	38
CULTURE AND FOOD TRADITIONS	40
HUMAN AND SOCIAL VALUE	41
SOLIDARITY ECONOMY	43
RESPONSIBLE GOVERNANCE	45
<i>Vision for policies and future of farming</i>	45
<i>Education</i>	46
<i>Cooperative Governance</i>	47
<b>DISCUSSION</b>	<b>48</b>
CO-PRODUCTION AND SHARING OF KNOWLEDGE	49
RESPONSIBLE GOVERNANCE	51
<i>Local Policy Supports</i>	51
<i>Cooperatives</i>	52
RECYCLING	53
<b>CONCLUSIONS</b>	<b>54</b>
<b>LIMITATIONS AND FUTURE DIRECTIONS</b>	<b>54</b>
<b>DISCLOSURE STATEMENT</b>	<b>54</b>
<b>APPENDICES</b>	<b>55</b>
APPENDIX A: AGROECOLOGY PRINCIPLES (AP), THE CORRESPONDING INTERVIEW QUESTIONS AND FARM PRACTICE INDICES ASSESSED.	55
APPENDIX B: POST-INTERVIEW SURVEY	59



## List of figures

Fig. 1. United Nations Food and Agriculture Organization's agroecological principles

Fig. 2. Agroecology principles practiced

Fig. 3. Farms distributed across the agroecological-peasant matrix

Fig. 4. Types of markets and competitive measures

## List of tables

Table 1. Agroecological principle as defined by the FAO, Chayanovian balances, and the corresponding outcomes for society if they were implemented.

Table 2. Select descriptive characteristics of the farmers interviewed and their farms.

Table 3. Types of support provided by farm support actors

Table 4. Ten peasant values measured as present (0.1) or absent (0) for each farm (F1 – F11; mean=0.5, s.d.=0.10; variation outside of s.d. bolded).

Tables 5 – 15. Indicators for each agroecological principle (diversity, recycling, economic resilience, ecological resilience, efficiency, synergy, culture and food traditions, coproduction and sharing of knowledge, human and social value, solidarity economy, and responsible governance) measured as present or absent for each farm



## Introduction

Farming is no longer about food. Food is presented as scarce by US agricultural corporatocracy<sup>1</sup> so that processed foods, animal feed, and biofuels, not real food, will continue to be overproduced using inordinate amounts of expensive agrochemicals (Kumbamu, 2020; Montenegro de Wit, 2020; Tschardt et al., 2012). This type of production leads to profits for agribusiness<sup>2</sup> (Harker et al., 2017; Sheingate et al., 2017), debt for farmers stuck on the seed-pesticide-fertilizer treadmill<sup>3</sup> (Graddy-Lovelace & Diamond, 2017), and many negative externalities that are not accounted for by agribusiness, namely, environmental injustice for communities of color (Alonso-Fradejas, 2021; Minkoff-Zern, 2019; D. Taylor, 2014) and environmental degradation (Tschardt et al., 2012). It also distracts from the fact that the world produces 1.5 times as much food needed to feed everyone and a productivist<sup>4</sup> approach to farming will not address the root causes of why 1.9 billion people are food insecure—poverty (Hake et al., 2020; Holt-Giménez et al., 2012; Roser & Ritchie, 2019; Tschardt et al., 2012). The COVID-19 pandemic has worsened food insecurity and awakened the public conscience on access to real food and the value of their local producers that were able to provide them food when grocery stores ran out (Kuehn, 2020; Westervelt, 2020). During this time of increased public awareness around the inequities in our food system and a growing call from academics to address these inequities, there is momentum to invest in an alternative agricultural system (Béné, 2020; Loker & Francis, 2020; Montenegro de Wit, 2020). The most promising idea for a transformed, food sovereign future is through the use of agroecology practiced using values of the new peasantry, an expanding class of farmers in rural areas who are defined by their struggle for autonomy in all aspects of their production (Altieri & Nicholls, 2020; Clapp & Moseley, 2020; Ploeg, 2018; Putnam et al., 2014; Rosset et al., 2011). As the old adage by Mahatma Gandhi goes, “*You must be the change you want to see in the world.*” This study takes an inward look at how alternative agricultural movements are being, practiced, supported and inhibited in a US context.

## *Agroecology*

Agroecology is a science, practice, and political movement that has been a term increasingly used in the last couple of decades (FAO, 2018; Mason et al., 2020). This lattermost part of agroecology sets it apart from organic, regenerative, and other forms of sustainable agriculture and is at the root of its success in creating transformative food systems (C. R. Anderson et al., 2020; Rosset et al., 2011). Agroecology requires farmers to work from a collective mindset, utilizing practices based out of indigenous knowledge and creativity to design efficient and resilient farmscapes that function as ecosystems without the use of agribusiness products (Altieri & Nicholls, 2020; Méndez et al., 2013a; Wezel et al., 2020). Specifically, natural pest control, agroforestry, silvopasture, and no-till farming (Holt-Giménez, 2002). These practices and the native populations that have cultivated them have been persecuted and systematically left out of

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<sup>1</sup> Corporatocracy refers to the overwhelming influence of corporations on the US government policies, here it notably refers to influence on the Farm Bill, and where public funding is distributed.

<sup>2</sup> Technocratic, corporate agricultural entities and a term that gained traction in the 1950s after WWII (Hamilton 2014)

<sup>3</sup> The seed-pesticide-fertilizer treadmill is the never ending cycle of needing to purchase seeds that require the application of certain pesticides, fertilizers, and increased mechanization of the farm away from skill-oriented technologies.

<sup>4</sup> The belief that more production is inherently good and leads to progress and prosperity

farming policy. Thus, agroecology can only be fully realized through a new social contract between Black, Indigenous, Latina/o and other marginalized farmers and their diverse customers, land back movements, and racial justice (Graddy-Lovelace, 2021). For the sake of this analysis though, the United Nations Food and Agriculture Organization (FAO) framework will be used to assess what agroecological elements are strongest and which have room for growth. The FAO's principles include: diversity, recycling, resilience, efficiency, synergy, co-production and sharing of knowledge, culture and food traditions, human and social value, solidarity economy, and responsible governance (Table 1; Figure 1; FAO, 2018). This framework will be utilized to assess which elements of the FAO's 10 principles of agroecology are being practiced and supported among small scale alternative minority farmers and farm support actors in southeast Michigan. Farm support actors are those that farmers interact with directly for resources (e.g., market access, food distribution, education, and technical assistance). They were interviewed in addition to farmers that are implementing agroecology in the field to assess what barriers remain for scaling up agroecology. This study also attempts to make space for marginalized voices in our agricultural system.

The focus of most agroecology literature to date is on the ecological components. However, all principles are interdependent and necessary for agroecology to flourish (Figure 1), so there is a growing understanding among some scholars that the sociopolitical elements need to be better integrated into studies (Barrios et al., 2020; Tittonell, 2020). The ecological benefits of agroecology include increased biodiversity that leads to increased productivity, efficiency, resilience against pests and climate change, and internalization of ecosystem services (i.e., recycling and not purchasing inputs from outside markets; Holt-Giménez, 2002; Holt-Giménez et al., 2012). The crop diversity promoted by agroecology can also provide farmers nutritional diversity and diversified income streams from value added products and increased seasonality (Bezner Kerr et al., 2021; Leakey, 2014). Furthermore, agroecology promotes farmers developing greater social value including equality, self-worth, and pride in their work (Kerr et al., 2019). Lastly, agroecology can provide a communal governance structure by which to operate and collaborate with their peers (Dale, 2020; Gliessman, 2018). Due to these characteristics, agroecology has been seen to increase food security and sovereignty (Altieri & Nicholls, 2020; Mason et al., 2020; Putnam et al., 2014; Tittonell, 2020). These studies have also naturally focused on systems in low-income countries where diversified production is necessary for small-scale producers' survival and where industrialized agriculture does not have as strong of a foothold.

### Box. 1. Definitions

Agroecology – Agroecology is a science, practice, and politics that is most often practiced by peasants. Through grassroots coalitions, farmers are able to co-create knowledge with scientists and prioritize their relationship with the ecology of their land and their production.

Peasant farming – Used here in reference to the new peasantry and is not limited to those that only subsist off of what they produce, but refers to small-scale family farms that eat a lot of what they produce (i.e., nutritious whole foods that are not processed) and adopt other peasant values (Table 1).

Entrepreneurial farming – Dependent upon technological innovations and simplification of farm processes through the use of external resources such as pesticides and synthetic fertilizers. They are more oriented towards the market, using wage labor and specializing in certain crops and products.

Capitalist farming – Also referred to as industrialized or conventional agriculture. Capitalist farming oriented towards the market and are a part of a network of farms all owned by one entity. The crops and/or livestock produced are highly specialized and genetically homogenous and end up going towards processed foods, animal feed, and biofuels (Tschardt et al. 2012)

Food Sovereignty – Food sovereignty is the right to all aspects of one's food from production to processing to consumption.

Small scale – Small scale is defined differently in each country, but farms producing on <2 hectares make up 12% of all agricultural land. The size of farms is generally increasing in high income countries and decreasing in low income countries (Lowder et al., 2016). For this study small-scale is defined as less than or equal to 40 acres in production (Guzman et al., 2019).

Family farm – Owned and operated primarily by family, but may hire some additional help. Family farms make up 75% all agricultural land (Lowder et al., 2016).

Agroecology is indeed being practiced in the US, but case studies are less robust. Producers of strawberries in California have incorporated some elements of agroecology through the use of brassica trap crops and insectary plants in between rows (Gliessman, 2018). In the Midwest, farmers transitioning to agroecological practices have strong community ties and coproduction of knowledge as well as place-based scientific approaches to managing soil nutrients and utilizing weeds (Blesh & Wolf, 2014). The People's Agroecology Process has been a source of convergence for multiple groups (La Via Campesina, Climate Justice Alliance, U.S. Food Sovereignty Alliance) working towards agroecology in US, Canada, and Puerto Rico, facilitating collaboration and learning since 2015 (The People's Agroecology Process, 2020).

The agroecological movement shares many commonalities with food justice and urban agricultural movements that emerge out of urban residents' opposition to food apartheid in the US. Urban agriculture is used as a means for self-determination and improved health for the

community and the environment (Halvey et al., 2020; D. E. Taylor, 2018; White, 2011). Consequently, agroecology fits naturally into urban spaces that are conducive to the sociopolitical principles (human and social value, solidarity economy, culture and food traditions, and responsible governance) that may make agroecology less palatable for rural farmers (Siegner et al., 2020). Urban agriculture has grown over 30% over the last 30 years in the US, with Detroit, Michigan arising time and time again in the literature (Altieri et al., 2017; Colasanti et al., 2012; White, 2011). This coincides with the calls from agroecological scholars for increased attention on urban food systems in the wake of the pandemic that has increased food insecurity and as the urban population grows (Altieri & Nicholls, 2018, 2020; Hake et al., 2020; Kuehn, 2020; Loker & Francis, 2020; Montenegro de Wit, 2020). However, urban agriculture can also be a space of privilege, exclusion, gentrification, and harmful agricultural practices (Bowness & Wittman, 2020; McClintock, 2018). Urban agroecology lends itself to improving upon these less savory elements since it does not allow for industrial, agrochemical and mechanically intensive practices and is grounded in equity and social value (Altieri et al., 2017). Thus, in addition to support of rural agroecological transition in the US, farmers adjacent and within cities are a critical part of an agroecological food system.

### *The new peasantry*

Contributing to the development of agroecology, is a growing class of rural family farmers considered *the new peasantry* in places such as the Netherlands, Peru, and China (Ploeg, 2018). The term peasant has its origins in Russian family farming used for subsistence production and today, peasants create economies of non-commodified products such as labor and land to maximize autonomy and decrease drudgery, or menial labor, within the larger capitalist economy (Ploeg, 2018). In the 1920s Alexander Chayanov theorized that by using family labor, peasants increased productivity of the land to the degree that is required to feed all family members and beyond this point of subsistence, labor expenditure results in drudgery (McCune et al., 2019). Peasant farming is characterized by low-input, small-scale, subsistence production by family labor in an effort to secure the right to food (Ploeg, 2013; Trauger, 2014). Peasant farming has also been seen to lead to greater yield/acre than entrepreneurial farming (Box 1; Ploeg 2013; Rosset et al. 2011). As the new peasantry grows, their work can support an agroecological transition if united with the efforts of agroecologists and agroecologists, in turn, center peasant livelihoods in their science.

The new peasantry today is guided by certain values set forth by Van der Ploeg (2018) and rearticulated by scholars such as McCune et al (2019). As peasants are a rural class of farmers, these values have been rearticulated here to be conceptually linked to agroecological principles utilized by scientists and farmers that are more entrepreneurial and urban. This is done to illustrate the similarities between the movements and how they could work together to ultimately transform US agriculture (Table 1).

These values are born out of theoretical balances that each family farm must negotiate daily. There are two main Chayanovian balances identified by Van der Ploeg (2013): the labor-consumer balance and the utility-drudgery balance. The labor-consumer balance is the amount of labor expended by a family vs. the amount of food that must be produced to meet the family's dietary needs. The utility-drudgery balance is the exercise of family labor that is useful vs. the overexertion of labor past the point of utility (Ploeg, 2013). In order to maintain these balances,

peasants make large investments in the value of their land for their family and community, which will continue to steward the land in perpetuity. This element of intergenerational knowledge and capital transfer (patrimony) is essential to peasant farming. In order to ensure this way of life can be sustained for generations, peasants design their farms to be locally adapted and diverse. Diversity is important as the farm provides the family's food as well as resilience against climate change and other uncontrollable variables. Reliance on markets for inputs is seen as one of these uncontrollable variables and is also very expensive (e.g., pesticides, synthetic fertilizers, specialized equipment that requires repairs and fuel). Consequently, peasants reduce the inputs needed on their farm and use skill-oriented technologies that they can continue to adapt. Since they have so intimately designed their farm, they are constantly adapting and co-producing with nature. They may also have a diversified income stream, working off-farm jobs or finding ways to add-value to their land in other ways (e.g., agritourism). They are focused on quality production for their family and community and this community also serves as a resource for knowledge, tools, and other inputs (Ploeg, 2018).

### *Food sovereignty*

Peasants utilizing agroecology, and racially marginalized groups in the US have a long history of initiating food sovereignty movements (Altieri & Nicholls, 2020; Putnam et al., 2014; Rosset et al., 2011). As a concept, food sovereignty arose out of the work of La Via Campesina, a network of farmers, landless peasants, scholar-activists and nonprofits, that sought to broaden the definition of food security (Patel, 2009). As Patel (2009) asserts "As far as the terms of food security go, it is entirely possible for people to be food secure in prison or under a dictatorship". Thus, food sovereignty, requires a fundamental shift in the "business-as-usual" approach to addressing hunger and a re-centering of the equity and wellbeing of producers, producing real food (M. D. Anderson et al., 2021; Mooney et al., 2021). In the US, the US Food Sovereignty Alliance emerged to coalesce disparate food justice movements (Brent et al., 2015).

### *Limitations*

Agroecology, peasant values, and food sovereignty are intertwined and mutually reinforcing, but face a variety of barriers to implementation in the US that all stem out of their complexities. First, those adopting agroecology in the US and Canada are often younger urban or suburban citizens driven to farm for the societal benefits and are not continuing an intergenerational operation (Laforge & Levkoe, 2018). For these aspiring farmers, agroecology is knowledge and labor-intensive instead of capital and mechanically intensive like the dominant industrial model, posing a barrier to entry in addition to the initial capital investment in land and infrastructure. This lack of intergenerational knowledge transfer and inherent complexity, make organizing around agroecology difficult. Besides entering farmers facing a steep learning curve, farmers transitioning to agroecology are faced with unclear metrics and ways to assess the impact of the transition to their overall resilience and productivity.

Secondly, unlike the well-funded, reductionist agricultural approaches of US agricultural corporatocracy, agroecology defies simplification and is underfunded. Agroecology is a term that continues to be defined by its farmer, researcher, and political proponents, refusing narrow definition and embracing transdisciplinary and contextually specific implementation (Mason et al., 2020; Méndez et al., 2013a). The current agricultural system does not incentivize agroecological production, with minimal public funding that then leads to less adoption, creating

a negative feedback loop (Miles et al., 2017). The continual consolidation of farming operations into fewer hands of white wealthy farmers and lobbying power of agribusiness maintains this ‘business as usual’ approach (Horst & Marion, 2019; Lowder et al., 2016; Sheingate et al., 2017). This remains true even in the European Union where Sustainable Development Goals are linked to all the principles (Altieri & Nicholls, 2020). Only 3% of funds from agencies like the Food and Agricultural Organization (FAO) and other international bodies are going towards projects incorporating agroecology (Moeller, 2020). In contrast, reductionist agribusiness approaches are maintained through monopolization of the funding, policy support, and knowledge creation around agriculture in the US. Agribusinesses donate to universities, research institutes and think tanks so their productivist ideas continue to be funded and implemented by farmers (Kumbamu, 2020; Levidow et al., 2014; Mortensen & Smith, 2020; Pimbert, 2017). Lastly, as case studies from Nicaragua to India have illustrated, state-run agroecological programs can lead to a watering down of the political movement and social organizing elements that have made it flourish in places like Cuba (C. R. Anderson et al., 2020; Rosset et al., 2011).

This complexity and invisibility also makes agroecology a target for cooptation as has happened with regenerative agriculture, a traditional practice of Black farmers in the US (Mason et al., 2020; Montenegro de Wit, 2020; Newton et al., 2020; Wozniaka, 2021). Cooptation can take many forms, but ultimately leads to a watered-down version of the transformative potential of agroecology. This can happen with state and international NGO intervention in programs (M. D. Anderson et al., 2021; Kumbamu, 2020). For example, the UN is bending to interests of the USDA, WWF, and others that are selecting agroecological principles that allow them to maintain business as usual while claiming progressive agroecological approaches (Held, 2021). Largely, this leads to adoption of some ecological elements, but leaves out the sociopolitical elements (Méndez et al., 2013). In practice, this can look like direct to consumer markets such as community supported agriculture (CSA) shares that are only accessible by middle-class white consumers, investment in high-tech, gene-revolution solutions, and increased price premiums for organically certified food (Alkon & McCullen, 2011; Hamilton, 2014; Kumbamu, 2020; Mutersbaugh, 2002). Scholars have been warning of this cooptation for years (Levidow et al., 2014) and there is a growing call for transdisciplinary collaborations that blend scholarship, activism, practice, and politics to ensure agroecology’s transformability (C. R. Anderson et al., 2020; Méndez et al., 2013b; Montenegro de Wit et al., 2021).

### *Research focus and rationale*

All of these limitations point to the need for a unified counter narrative and more case studies that illustrate not only what agroecology is being practiced, but how it is being inhibited in order to scale it up. Set in southeast Michigan, this case study provides evidence for this counter narrative through interviews with farmers and farm support actors. Casting farmer knowledge and needs in the limelight is necessary within academia to bridge the gap between science and practice and contest what is considered valuable knowledge by academia (Pimbert, 2017). This is done through interview questions and a coding system tailored to the United Nations Food and Agricultural Organization’s (FAOs) ten agroecological principles that are widely accepted to provide a common language and transferability of findings. This will increase the visibility of viable agroecological farming practices and illuminate the potential of scaling up agroecology in similar regions where the urban rural divide is less distinct. Since southeast Michigan has large pockets of urban farming in Detroit and Ann Arbor and many rural farmers sell in these urban

centers, no urban-rural divide is considered and the rurality of the farmers is not considered or measured. Despite urban and rural farmers dealing with different issues on their farm, they share similar values and the convergence of these different groups of farmers and their respective social movements is considered inevitable in this study.

There is a robust basis of agricultural knowledge in Michigan that illustrates the potential for both urban and rural agroecology to flourish. Specifically, this study takes place in southeast Michigan where the Anishinaabe, Fox, Peoria, and Wyandot people have long practiced and continue to cultivate this land. Since indigenous knowledge is central to agroecology, the ideas presented in this study would not be possible without the ongoing contribution of Native communities to the body of knowledge and specific ecology of this region (Suárez-Torres et al., 2017). Also contributing to the body of knowledge in the region are large, influential universities: The University of Michigan and Michigan State University (MSU). Influential to the ideas cultivated in these universities are their donors. For example, it is noteworthy that as of 2017, the University of Michigan has received \$30 million from Dow Chemical (now Corteva Agriscience), with the majority of Dow Sustainability Fellows being students from the School for Environment and Sustainability (*Dow Sustainability Fellows Program at U-M Extended through 2020*, 2017). Other influential initiatives include the Sustainable Food Systems Initiative (SFSI) which works with 70+ affiliates across the university to promote research for a healthier, economically viable, just, and sustainable food system. One way they do this is by hosting a course open to all students and the broader Ann Arbor community each year featuring radical food justice speakers. MSU was the first land-grant university in the nation and as such it has deep ties to the USDA and more conventional agriculture. However, MSU has many programs that center sustainable agriculture including an organic farmer training and the establishment of the Detroit Partnership for Food Learning and Innovation (DPFLI), a 0.3-acre urban agroecological research farm. This study considers this context in assessing where farmers get their knowledge and how these universities can influence the trajectory of agroecology.

This study focuses on southeast Michigan, but key differences within this region between Ann Arbor and Detroit should be noted for context. The population in Washtenaw county, containing Ann Arbor and the University of Michigan, is whiter and wealthier than the population of Wayne county which contains Detroit (*U.S. Census Bureau QuickFacts*, 2019). In Washtenaw county you can access hyper local produce 7 days a week from one of the 10+ farmers markets and farm stops (i.e., Argus Farm Stop, Agricole, and Acorn Market) (Washtenaw County Health Department, 2020). The Washtenaw County Food Policy Council, Food Gatherers, Michigan Food and Farming Systems (MIFFS) that previously operated a farm incubator, Tillian, all shape the foodie culture in this county. Detroit is a city that has undergone severe disinvestment and has become a national model for urban agriculture through the use of vacant lands (Colasanti et al., 2012; *U.S. Census Bureau QuickFacts*, 2019). As a result of deindustrialization, Detroit has high level of inequality in terms of employment, food access, housing, and city services (White, 2011). Landgrabs of vacant land by wealthy Whites in Detroit (i.e., Hantz Farm) are being opposed by community led organizations, namely Detroit Black Community Food Security Network (DBCFSN) (Smith, 2020; White, 2018). DBCFSN was instrumental in creating the Detroit Food Policy Council, facilitating education, activism, and self-determination for Black Detroiters to oppose oppressive forces: capitalism, white supremacy, and patriarchy. The American Indian Health and Family Services (AIHFS) provides Native families seeds and

farming education in Detroit, sometimes partnering with Keep Growing Detroit (KGD) which provides support for nearly 1,941 community and home gardens throughout Detroit as of 2020. KGD, DBCFSN and Oakland Avenue Farm came together to create the Black Farmer Land Fund in 2020 as well, raising \$67,000 to support the purchase of land by 30 farmers (*Keep Growing Detroit Annual Report*, 2020). Local organizations farmers can go to for education and resources include the Center for Regional Food systems out of MSU, Michigan Farmers Market Association (MIFMA), Michigan Organic Food and Farming Alliance (MOFFA), Michigan Young Farmer Coalition, and Southeast Michigan Producers Association (Currier & Robinson, 2018; D. E. Taylor, 2018). Given the prevalence of these different organizations to support farmers, *I predict bottom-up responsible governance will be robust. However, federal support will not be as prevalent among these small-scale farmers because government support is still preferential to large-scale undiversified systems. Furthermore, coproduction of knowledge will be strong given the prevalence of local organizations and proximity and quantity of small-scale farms in southeast Michigan.*

This strong farming community is aided by the vast diversity of products grown in Michigan and the strong “know your farmer” culture. The state produces 120 specialty crops including blueberries, apples, asparagus, cucumbers, and tomatoes. Additionally, Michigan derives a substantial portion of their GDP from field crops (e.g., corn for grain, soybeans, wheat, alfalfa, sugar beets) (Knudson, 2018). This allows for year-round production and income for farmers as well as consistent farmers markets for consumers. The strong relationship between farmers and producers in these urban markets can be seen in that Michigan had the second highest direct farm sales to consumers in the nation with \$135 million in sales directly to consumers in 2015 (USDA, 2016). Eighty percent of these sales occurred within 100 miles of the farms. Farmers utilized farm stores on their farms, farmers markets, roadside stands, CSAs, and online markets for these sales. These direct to consumer sales are concentrated in urban areas (USDA, 2016). Given this agricultural community and diversity, *I predict farmers will have plentiful diversity and solidarity economy given the localization of sales. The elevated levels of diversity will then lead to greater economic and ecological resilience.*

In addition to there being great potential for agroecology, Michigan needs agroecology to be scaled up to combat food insecurity and other worrying trends. Michigan follows many agricultural trends as the rest of the nation with consolidation of farms (9 percent decrease in number of farms and 8 percent increase in average farm size), decreased economic viability with net farm income dropping 26 percent (increasingly coming from government payments) between 2012 and 2017 (USDA, 2017). Michigan has higher food insecurity (14 percent) than the rest of the nation (11.5 percent) and severe inequity comparable to the rest of the nation, with less than 2 percent Black, Latina/o, Indigenous, mixed race farmers (Hake et al., 2020; USDA, 2017). The number of female farmers is growing alongside the rest of the nation though, with 35 percent of farmers identifying as female in Michigan (USDA, 2017). Given the disparities that exist in the demographic breakdown of farmers, *I predict that farmers will experience depreciated human and social value and that culture and food traditions will not be prioritized to succeed in the capitalist market.*

The goals of this research were to first assess which elements of the FAOs 10 principles of agroecology are being practiced and supported in southeast Michigan. These will be related back



to peasant values (Table 1) to assess if these farmers can be classified as peasants. Second, it was my goal to assess what barriers remain for scaling up agroecology. Identifying these vulnerabilities should allow farmers and farm support actors to address them, decreasing vulnerability to cooptation. Lastly, this study aims to represent marginalized and critical voices in the agroecological transition. This latter most goal was pursued since the current agricultural system has been upheld by white men and transformation requires utilizing marginalized perspectives (Horst & Marion, 2019). This follows extensive work by others highlighting the sustainable production systems of BIPOC farmers and the resounding call for greater support for BIPOC farmers throughout the US and in Southeast Michigan (Carr et al., 2020; Horst & Marion, 2019; Minkoff-Zern, 2019; D. E. Taylor, 2018). I did this by only interviewing women, and Black, Indigenous, or Latina/o individuals.

Table 1. Agroecological principles as defined by the FAO, peasant values, and the corresponding outcomes for society if they were implemented. Adapted from McCune et al. (2019), Van der Ploeg (2018), and FAO (2018).

Agroecological principle	Peasant values	Outcome when implemented
Diversity: diversification is key to agroecological transitions to ensure food security and nutrition while conserving, protecting and enhancing natural resources	Temporality and Spatiality: Long-term investment in land with stable production each year, based on relationship of peasant with the specifications of their land	<ul style="list-style-type: none"> <li>● Nutritional diversity for subsistence</li> <li>● Resistance to disease, pests, climate</li> <li>● Reduced costs from maximizing ecological functions</li> <li>● Improved soil quality</li> <li>● Multiple revenue streams</li> <li>● Agricultural transformation that preserves nature</li> </ul>
Recycling: more recycling means agricultural production with lower economic and environmental costs	Autonomy from market: Investing in labor and skill-oriented technologies that do not need to be purchased from outside markets; working with limited, locally sourced resources	<ul style="list-style-type: none"> <li>● Reduced costs for inputs and autonomy from input markets</li> <li>● Improved environmental impact through reduced runoff and healed metabolic rift</li> </ul>
Resilience: enhanced resilience of people, communities and ecosystems is key to sustainable food and agricultural systems	Adding value: Using present circumstances creatively to add value to their operation; this can look like income derived from other uses of land, pluriactivity, value added products, or a new crop	<ul style="list-style-type: none"> <li>● Long-term sustainability and slow growth of individual businesses</li> <li>● Longevity of farms beyond a farmer's lifetime</li> <li>● Easier succession planning as alternative farming becomes viable livelihood</li> <li>● Ability to afford/provide food for family</li> <li>● Ability to provide food for community</li> </ul>
Efficiency: innovative agroecological practices produce more using less external resource	Family labor: Food produced is primarily for the family, produced using family labor and this labor is what invested in to improve efficiency and decrease drudgery	<ul style="list-style-type: none"> <li>● Reducing dependence on external markets and sources for inputs which reduces costs and increases farmer autonomy</li> <li>● Improved health of farmers</li> </ul>
Synergy: building synergies enhances key functions across food systems, supporting production and multiple ecosystem services	Adaptability, Craftsmanship, and Coproduction with nature: Place-based farming practices ensure farmers are observing, experimenting, and adapting constantly to produce with nature; they	<ul style="list-style-type: none"> <li>● Optimal use of resources and highly functional on-farm ecosystem</li> <li>● Preservation of associated biodiversity</li> <li>● Biodiverse landscape supported by surrounding relationships</li> </ul>

	take great pride in their final product, ensuring high quality	
Co-production and sharing of knowledge: agricultural innovations respond better to local challenges when they are co-created through participatory processes	Coproduction with peers: Sourcing and creating knowledge from and with peers and community members as well as sharing tools and resources	<ul style="list-style-type: none"> <li>• Easier entry for beginning farmers and succession of farm</li> <li>• Base of alternative agricultural knowledge</li> </ul>
Culture & Food Traditions: by supporting healthy, diversified and culturally appropriate diets, agroecology contributes to food security and nutrition while maintaining the health of ecosystems	Generational knowledge: Culture and food traditions are maintained through intergenerational farming practices and since family subsistence is prioritized, what grown is dependent upon cultural preferences of the farmer	<ul style="list-style-type: none"> <li>• Deeper connections to land and preservation of cultural heritage and knowledge associated with local landscapes and heritage seeds</li> </ul>
Human and social values: protecting and improving rural livelihoods, equity and social well-being is essential for sustainable food and agricultural systems	Community: Peasants derive support for not just resources, but knowledge and social benefits including from their community	<ul style="list-style-type: none"> <li>• Empowered, autonomous, happy farmers are able to help community overcome hunger and poverty and support alternative agriculture for future generations</li> </ul>
Solidarity Economy: reconnecting producers and consumers and provides innovative solutions for living within our planetary boundaries while ensuring the social foundation for inclusive and sustainable development	Relationships with consumers: interactions with consumers are secondary to farmer subsistence and autonomy from market demands	<ul style="list-style-type: none"> <li>• Adaptive, vibrant local economy that can help community members out of poverty and food insecurity</li> <li>• Easier entry for beginning farmers and succession of farm</li> </ul>
Responsible Governance: sustainable food and	Autonomy from the state and private interests: Control over all aspects of the	<ul style="list-style-type: none"> <li>• Policies and support that enable alternative agricultural transformation</li> </ul>

<p>agriculture requires responsible and effective governance mechanisms at different scales – from local to national to global</p>	<p>farm wherein no loans or outside parties are needed to govern the space</p>	<ul style="list-style-type: none"> <li>• Decreased labor and input costs for entire community involved that then enables alternative agricultural transformation</li> </ul>
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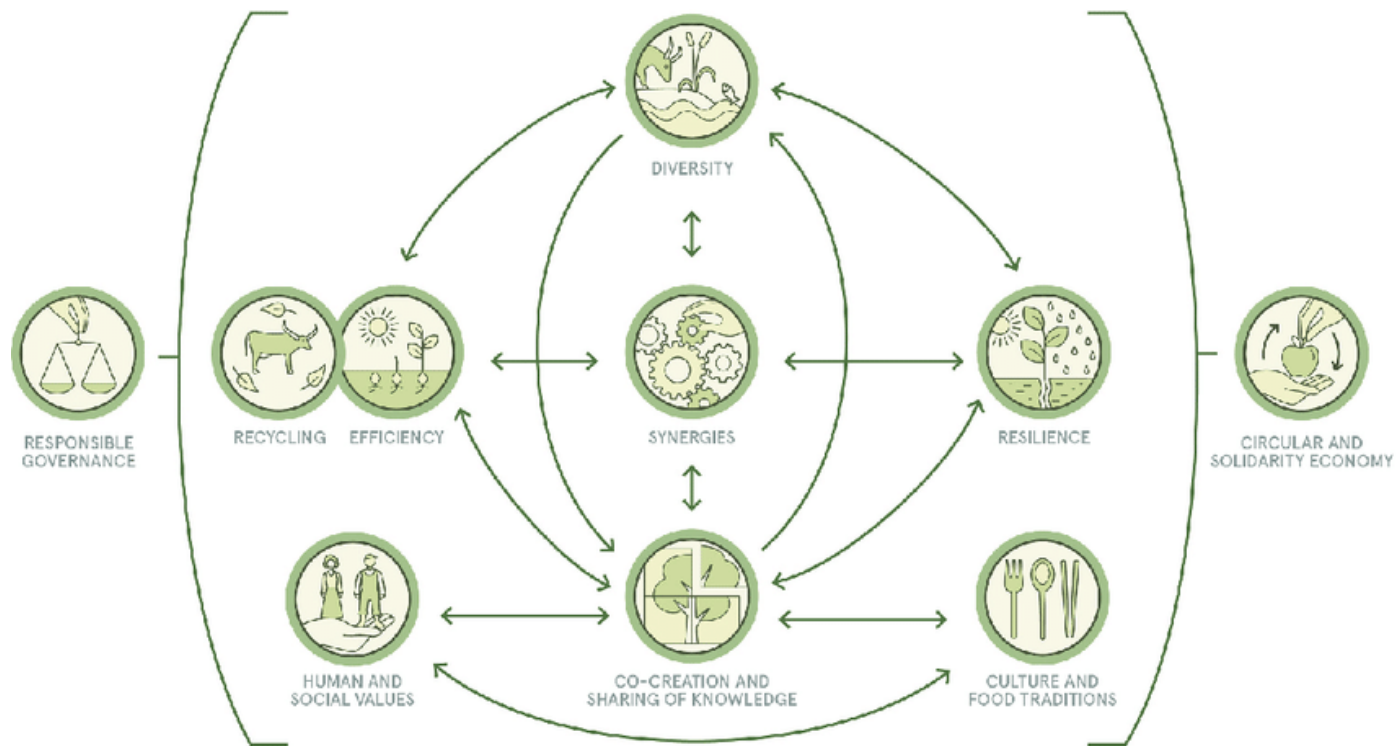


Figure 1. FAO's agroecological principles (FAO, 2018).

## Materials and Methods

### *Study Site and Design*

This study took place in southeast Michigan where 4.7 million Michiganders reside. The soil is highly variable ranging from clay to loam, with urban soils suffering from heavy metal contamination, compaction, and construction materials (Howard & Olszewska, 2011). Climate in southeast Michigan is humid and the average annual temperature ranges from 45 – 50 degrees Fahrenheit, influenced by the lake effect. There are 30 - 35 inches of rainfall every year in southeast Michigan (Andresen et al., 2018).

### *Participants*

Farmers were initially identified through a broadly distributed Google survey, that was distributed through MSU Extension and food systems professors at University of Michigan. The survey explained eligibility criteria, reciprocal research process, and the research background. The questions in the survey requested contact information, gender, age, racial and ethnic identity, location of farm, acreage, crops produced/animals raised, presence of honeybees, and how they would describe their practices as ‘regenerative’, ‘organic’, ‘agroecological’, ‘culturally-traditional’, and/or ‘semi-conventional’. All questions were write-in or had a write-in option. Out of 17 responses, 10 of my final interviewees were identified. One additional farmer was identified through snow-ball sampling. Many farmers initially interested in the study were too busy to engage in the interview process. Farms were distributed less than 100 miles from Detroit city center, selling primarily in Wayne and Washtenaw counties where the largest cities are Ann Arbor, Ypsilanti and Detroit. Though eleven farms were chosen for interviews, two farms (Table 2, F2 and F10) had two owners that were interviewed, all other farms had one farmer interviewee, with 13 farming individuals interviewed. Farmers are referred to by their ID listed in Table 2. The farmers in this study are not evenly distributed across the counties.

Table 2. Select descriptive characteristics of the farmers and their farms. Counties served are where farmers sell their products. Farms F2 and F10 had two owners interviewed for their farm. Product categories include cut flowers (CF), diversified vegetables (DV), agroforestry (A), honeybees (H), and livestock (L).

<i>ID</i>	<i>Race</i>	<i>Gender</i>	<i>Age Range</i>	<i>Years in Farming</i>	<i>Product categories</i>	<i>County Served</i>	<i>Tillable Acres</i>
<i>F1</i>	White	Female	25 – 40	7	CF, DV, L	Jackson and Washtenaw	7
<i>F2</i>	White White	Female Female	25 – 40 25 – 40	11 7	CF, DV, L	Washtenaw	40
<i>F3</i>	White	Female	41 - 60	3	CF, DV, A	Washtenaw	2
<i>F4</i>	White	Female	41 - 60	5	CF, DV, A, H, L	St. Clair and Wayne	20
<i>F5</i>	White	Female	25 – 40	4	CF, DV	Washtenaw	1

<i>F6</i>	White	Female	25 – 40	9	CV, DV, L	Washtenaw	12
<i>F7</i>	White	Female	41 - 60	11	CF, DV, L	Jackson and Washtenaw	7
<i>F8</i>	Latinx/white	Female	25 – 40	3	A, L	Wayne	10
<i>F9</i>	Black	Male	25 – 40	8	DV	Wayne	0.5
<i>F10</i>	Mixed White	Male Female	25 – 40 25 – 40	5 5	DV	Wayne	2
<i>F11</i>	White	Female	25 – 40	7	DV	Washtenaw	0.25

The nine farmer support actors interviewed were identified by farmers through the interview process. Farm support actors included an online sales platform designer and individuals from Michigan Food and Farming Systems (MIFFS), Detroit Partnership for Food Learning and Innovation (DPFLI), Argus Farm Stop, The Ann Arbor People's Food Co-op, Chelsea Farmers Market, Taste the Local Difference (TLD), Food Gatherers, American Indian Health and Family Services (AIHFS), and Indigenous Seed Keepers Network (Figure 2). One farm support actor was a former employee of the AIHFS and now works at the Indigenous Seed Keepers Network, speaking to the work of both organizations in southeast Michigan. AIHFS is referred to for the insight this representative provided on food sovereignty in southeast Michigan. All farm support actors worked in southeast Michigan.

Table 3. Types of support provided to farmers, not consumers, as represented by the farm support actors in this study.

<i>Type of Support</i>	<i>Farm Support Actor</i>
<i>Direct Market &amp; Marketing (A)</i>	The Ann Arbor Peoples Food Coop
	Chelsea Farmers Market
	Food Gatherers
	Online sales platform designer
<i>Technical and Educational (B)</i>	Detroit Partnership for Food Learning and Innovation (DPFLI)
	Michigan Food and Farming System (MIFFS)
	American Indian Health and Family Services (AIHFS) and Indigenous Seed Keepers Network
<i>A &amp; B</i>	Argus Farm Stop
	Taste the Local Difference (TLD)

In preparation for these interviews, I looked through all available online materials for their farms and organizations including news articles, websites, and social media. Interviews were asked for their informed consent to participate in the study via a signed consent form sent via email, which was designated as exempt by the University of Michigan Institutional Review Board.

Prior to interviews, I visited farms to ensure they were eligible and to gain contextual insight into their businesses. For two farms where prior visits were not possible (F2 and F11), photographs

and information from their website was used to corroborate eligibility. Farmers were eligible if they:

- Practiced at a small-scale, measured as less than or equal to 40 acres under production (Guzman et al., 2019).
- Produced a minimum of 10 genetically distinct breeds of animals and/or crops grown
- Produced sustainably, defined by the farmers themselves as organic, permaculture, agroecological, or regenerative
- Identified as women and/or Black, Indigenous, or Latina/o

Farm support actors were eligible if they 1) came up as important for growth of small-scale agriculture in southeast Michigan in interviews with farmers and 2) identified as women and/or Black, Indigenous, or Latina/o.

### *Research Instruments*

Interview guides were different for farmers and farmer support actors. Using the Food and Agriculture Organization's principles (Table 1), I created semi-structured interview questions based on each agroecological principle for farmers and farm support actors (Appendix A). The explicit terminology (e.g., 'agroecology', 'ecological resilience', solidarity economy) were not used, but the conceptual grounding of each of these terms was operationalized to ensure understanding across all participants.

For farmers, I started out by asking questions about their background and identity to understand their motivations and what life experiences led them to small-scale, sustainable agriculture, which is important for context. Then I moved onto asking questions about agroecological principles in layman's terms. See Appendix A to see how each of these questions relates to the FAO principles. I let the interviews flow naturally, so no interview was exactly alike in terms of the order of the questions. I asked about how their own physical and mental health is impacted by the type of labor required for farming and any sources of discrimination they may have faced. Then I asked them about their operation: why they planted what they did, tradeoffs they experienced in deciding what to grow, how they managed pests, nutrients, and climate, other uses of their land including food and sources of income, and how they would like to change their practices in the future. I moved on to asking them about where they acquired and shared their knowledge. Then, I inquired about how they found and acquired the land they operate on and ideas for the future of their farm. Lastly, I asked them about big picture issues for farming and how their farm is connected to these larger issues including equity, sustainability, resilience to COVID, and health.

The line of inquiry for farm support actors followed a similar trend by first questioning them about their background, how and why they got to their current position, and rationale for choosing this position. I also asked about how their own physical and mental health is impacted by the type of work they are doing. Then, I inquired about how they directly and indirectly support farmers and why their role is needed in growing small-scale, sustainable farming. This was followed by questions about the impacts of COVID, the future of their business, and their aspirations for helping farmers into the future. Finally, I asked them about their ideas for policy and other systemic changes to support small-scale, sustainable agriculture in southeast Michigan.

To quantify the responses, I separated each principle into several indicators of weighted point values (i.e., 0.20 if there were five indicators, or 0.25 if there were four indicators), that added to 1 when combined. If all indicators were being practiced by the interviewee, the score for the principle was 1. Some principles had more than five indicators and were grouped into sub-principles. Resilience had two sub principles (i.e., ecological resilience and economic resilience). These sub-principle scores were averaged for each principle so each principle still had a score between 0 – 1 for each interviewee. Ten Chayanovian balances that overlapped with agroecological principles were extracted and given point values of 0.1 (Table 4). Thus, if a farm fully embraced values of the peasantry, these indicators added to 1. The ability for farm support actors to continue supporting farmers depends upon farm support actor's personal health and wellbeing in their professions. Thus, food support actors' personal responses as well as their support of farmers in regards to their social value, responsible governance, resilience, efficiency, and autonomy were assessed when appropriate.

### *Procedure*

Using an inductive research approach, 20 semi-structured, 1.5 – 2-hour long interviews were conducted with 11 farmers and 9 farmers support actors. All interviews were conducted from October 2020 to January 2021 over Zoom using auto-transcription and recordings. After all interviews were conducted, a follow-up survey assessing methodology and a few additional questions was sent to participants on wellbeing and income (Appendix B).

### *Data Analysis*

From the qualitative interviews, more than 50 indicators of agroecological practices being implemented were assessed for each farm. Chayanovian balances were extracted and placed along the y-axis, to emphasize the elements that are important to the new peasantry (Table 1). These metrics are helpful for seeing general trends, but codes were qualitatively analyzed as well for more robust analysis and confirmation of this quantitative assessment. Resilience was divided into ecological and economic resilience. These indicators were not directly transferable to farm support actors as farm support actors are not implementing agroecology. Thus, only qualitative data was analyzed from interviews with farm support actors to understand how agroecological principles were supported.

After all interviews were conducted, I created sub-codes according to interview questions, grouping them under top-level codes that followed the ten agroecological principles in NVivo 12 data analysis software (QSR International Pty Ltd, 2018). I then edited Zoom transcriptions, removing filler, and repeat words, while conducting my first round of coding in this software that expanded beyond initial codes. Then I went through all codes aggregated under each principle, consolidating and ensuring consistent coding analysis across all interviewees. Interviewees were selected for their demographic diversity, and therefore demographic diversity was not considered an indicator in this study. This analysis only examined the practices and decisions of the farmers interviewed, not others who might use other parts of their land.

## Results

### *Summary of interviewee characteristics*

Eighty-six percent of interviewees were women and 32 percent identified as Black, Indigenous, or mixed race. The average age of farmers was 39 years old, with six years of farming their



current piece of land. A majority of farms have livestock (55%; n=6), cut flowers (64%; n=7), and value-added products (82%; n=9). Farms that had livestock had small animals (e.g., rabbits, chickens; n=5), and/or large animals (e.g., cows, goats, pigs; n=4). Farms cultivated an average of 3 acres, had an average of 11 acres in pasture, and had access to 0.25 – 40 acres of tillable land in total. Total property size is larger, ranging from 0.25- 100 acres, when forest, prairie, and other preserved habitat is accounted for. All farms practiced organically or beyond organic, but only three had certification (Organic, Naturally grown, or Michigan Agriculture Environmental Assurance Program). All farmers were growing diverse vegetables, but one farmer used those vegetables primarily to feed their livestock. Only one farmer is utilizing their backyard and will be looking to change land, all other farmers will be staying in their current location for the foreseeable future.

Seven farmers interviewed (64%), shared decision-making responsibilities with their partners. Four farmers work alone on the farm, but three of the four rely on financial support from their partners. The only farmer (F9) to work entirely alone expressed desire to hire someone part-time or work with a partner in the future so they could do more strategic work, decreasing drudgery. Besides F2 (a cooperative) and F4, who hires 12 employees at peak season, all farms relied primarily on this spousal and personal labor, with occasional volunteers and one or two temporary, part-time employees to assist in the summer. Due to the large amount of wage labor, F4 was more entrepreneurial than peasant since peasants rely on family labor.

All agroecological principles are practiced to some extent, but as the highest score was 0.91 for co-production and sharing of knowledge and the average of all the principle scores was 0.64, there is significant room for growth. On-farm practices supported high diversity (0.73), synergy (0.69), and efficiency (0.76), which in turn supported moderate ecological (0.53) and economic resilience (0.69). Farmers own social value (0.75) and involvement in the solidarity economy (0.70) were also relatively strong, but depended upon trust and their small peer networks facilitated by institutions and spaces where they learn. Responsible governance had room for growth (0.53), but the least prevalent principles were recycling (0.31) and culture and food traditions (0.43; Figure 2).

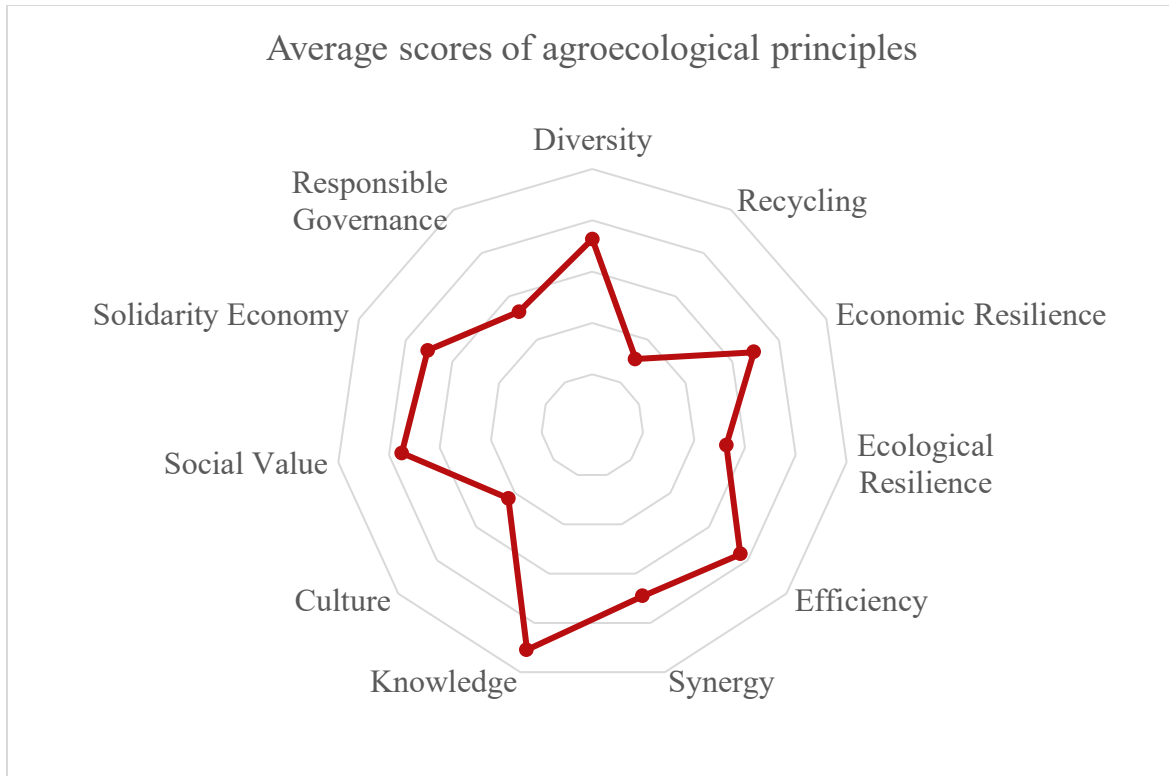


Figure 2. Average of agroecology principles practiced by farmers. For each agroecological principle, each farm (n=11) was given a score from 0 – 1. These were averaged across all farms for one score per principle for farms and farm support actors. Each radial line indicates 0.2 and higher scores indicate more individual metrics were being practiced.

### *Peasant Values*

Three farms were classified as agroecological peasants, scoring above 0.5 for peasant values and agroecology, but all farms were agroecological (Figure 3). Six farms were right on the cusp of being peasants and farms that were agroecological entrepreneurs (n=2) were more profit than productivity oriented, focusing on increasing the scale of their operation, hiring more people or utilizing high tech machines. F11's agroecological practices and peasant values were constrained by the impermanence of their land and inability to invest in it as they would like to long term. The most agroecological peasant farm (F8) was the only farm to do well at recycling (internalizing ecosystem services), had an extremely diversified income, and was investing in agroforestry and heritage breeds. Farms were not peasants because of the sourcing inputs from outside markets, don't have patrimony, rely on hired labor to a minimal extent, and do not focus their production on providing food for their family, but rather prioritize customer needs (Table 4).

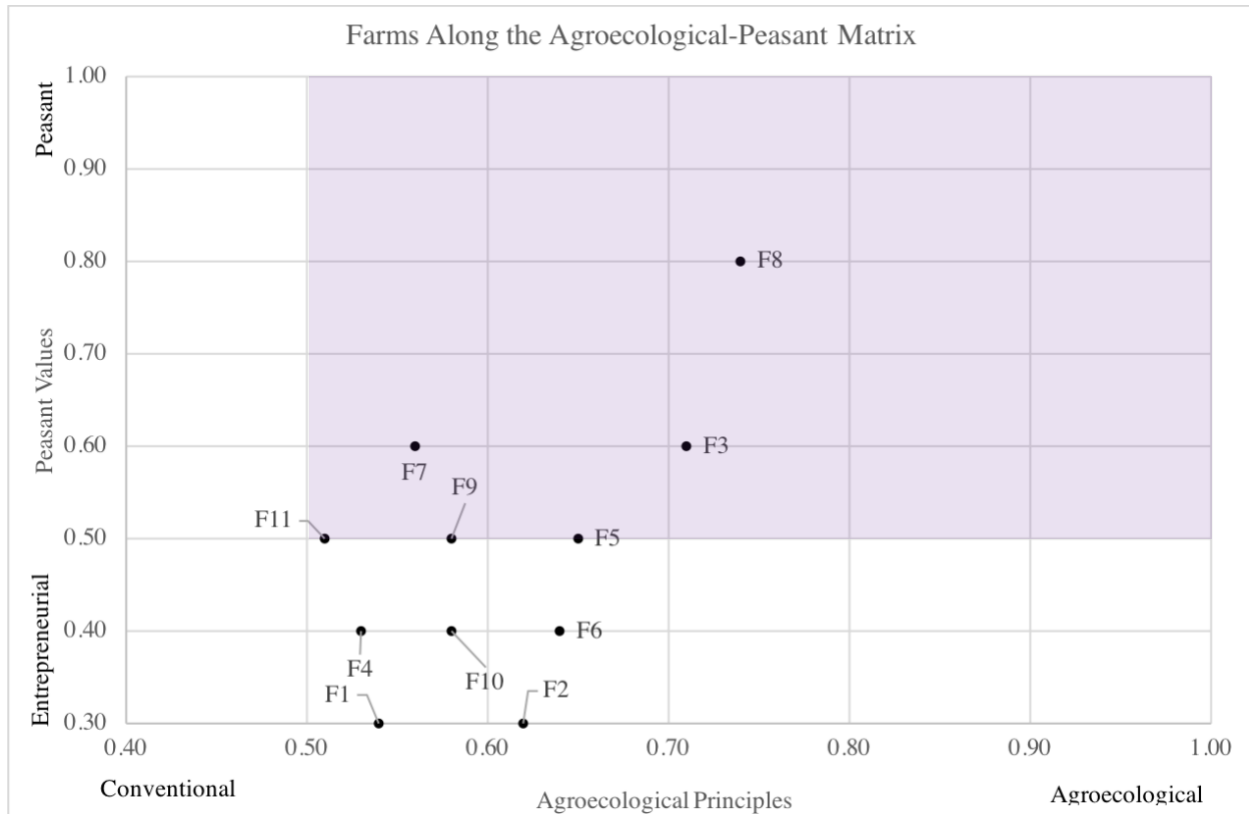


Figure 3. Farms (n=11) were distributed across the agroecological, peasant matrix based on the average of their individual scores for all agroecological principles. The agroecological peasant area is denoted with a purple rectangle. Higher scores indicate more individual metrics were being practiced.

Table 4. Ten peasant values measured as present (0.1) or absent (0) for each farm (F1 – F11; mean=0.5, s.d.=0.10; variation outside of s.d. bolded).

Peasant values	F1	F2	F3	F4	F5	F6	F7	F8	F9	F10	F11
Coproducing with their site; place-based farming	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
Investing in land for perpetuity	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.00
Not sourcing inputs from outside markets	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.00	0.00	0.00
Focusing on skill-oriented technology; not tractors	0.00	0.00	0.10	0.00	0.10	0.00	0.00	0.10	0.10	0.00	0.10
Adding value to their operation through other sources of income on AND off farm	0.00	0.00	0.10	0.10	0.00	0.00	0.10	0.10	0.00	0.00	0.10
Farmers subsist exclusively off of farm and bartering	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.10	0.00	0.00	0.00

Got knowledge from previous generation; have an intergenerational plan	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Exclusively family labor is used	0.10	0.00	0.00	0.00	0.10	0.10	0.10	0.10	0.10	0.10	0.10
Desire for autonomy, experimentation, and cultural heritage comes before mainstream preferences for plant choice	0.00	0.00	0.10	0.00	0.10	0.00	0.00	0.10	0.00	0.00	0.10
Cooperative mechanisms	0.00	0.10	0.10	0.10	0.00	0.10	0.10	0.00	0.10	0.10	0.00
Sum	<b>0.30</b>	<b>0.30</b>	0.60	0.40	0.50	0.40	0.60	<b>0.80</b>	0.50	0.40	0.50

*Diversity*

Planned structural, temporal, spatial and genetic diversity supported by farmers and incentivized by farm support actors.

Table 5. Five diversity indicators measured as present (0.2) or absent (0) for each farm (F1 – F11; mean=0.73, s.d.=0.18; variation outside of s.d. bolded).

Diversity indicators	F1	F2	F3	F4	F5	F6	F7	F8	F9	F10	F11
Have planted agroforestry and perennial shrubs	0.20	0.20	0.20	0.20	0.2	0.20	0.20	0.20	0	0	0
Cut flowers or shrubs	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0	0	0	0
Intercropping and crop rotation	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20
Overall genetic diversity	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20
Heirlooms and heritage breeds are majority of what is grown	0	0	0	0.20	0	0	0	0.20	0	0	0.20
<i>Diversity sum</i>	0.80	0.80	0.80	<b>1.00</b>	0.80	0.80	0.80	0.80	<b>0.40</b>	<b>0.40</b>	0.60

Answers about the process for choosing how to plant (e.g., companion planting, crop rotation, intercropping, agroforestry) indicated all farms are utilizing intercropping, companion planting, and crop rotation. Consistent crop rotation was noted as key for managing soil health, managing pests, and economic viability. Only two farmers used raised beds and all farmers are conscious of tilling and reducing tilling, though only two are currently using no-till practices. Adding to the structural diversity, three farms have agroforestry currently and five farms are introducing perennials and agroforestry elements in their farming for future harvests. As F6 notes: “*The return on the investment is a little slower than annuals, but it's manifold over the years, as these crops mature so that's been a really exciting lesson.*”

Answers about what to plant/raise indicated that farmers have complex planting plans that fluctuate each year. These plans are determined based on what is demanded and grows fast so they can make a profit vs. what they like to grow, maintaining their creativity and autonomy. For example, the choice to plant sweet corn was raised by four farmers as a crop that consumers demand, but it takes up a large amount of space and resources and consumers expect it to be cheap.

Answers about diversity of crops planted indicate all the farms had high planned genetic diversity, with an average of 40 crops, and farms that had cut flowers had more than 200 varieties planted in a given year. These cut flowers add a bulk of this diversity and attract pollinators in turn (F6): *“Especially with the cut flower crops...I cannot get out to the plants early enough to beat the honeybees because they'll be swarming all over the flowers.”* Farmers were actively leaving ‘weeds’ in addition to planting flowers (F4): *“We see monarch butterflies.... They're beautiful. I think it has to do with the fact that each field has like parameters around it and we don't we don't mess with the milkweed in those areas...you know there's weeds...So they're living and populating in there. We see praying mantis. We see crayfish, we see the frogs hundreds and hundreds of frogs in the spring, where we didn't before.”*

Only two farms did not discuss associated biodiversity of their farms and there is a strong desire to understand native bee diversity based on my post-interview survey (78%). Only one farm has a honeybee hive they actively manage and rely on for pollination, but three others have honey bees on their property that are managed by another farmer and one has a hive that naturally appears each year.

Answers about what to plant/raise also indicate that there are three approaches to choosing heirlooms vs. hybrids and no farms utilize GMOs: 1) farms focus on what is popular and reliable, only growing heirlooms that are in high demand (n=5), 2) farms that are concerned about genetic diversity, but still rely primarily on hybrids (n=3), or 3) a majority of what is grown is heritage breeds and heirlooms (n=3). Hybrid varieties are preferred for their reliability and productivity as F6 notes: *“[Heirlooms] don't have the output of hybrids and the disease resistance package that hybrids have so we're really like hybrid devotees”*. These farms grow a handful of heirloom varieties, often tomatoes, because farmers like experimenting with new varieties and their consumers will pay more for it depending on where it is sold (F3): *“I try to do heirloom. I believe in a diversified seed stock in America or around the world.”* In contrast, more rural consumers do not value heirloom varieties (F9): *“Heirlooms don't do well in rural areas...because they look kind of funky.”* Five farms are motivated by what is popular as F1 notes, *“We just try and do stuff that we know it's going to sell so popular items...we don't really get into the specialized varieties.”* Similarly, F10 notes, *“we just want to grow things that are good”* and F9 notes *“Consumers don't care about your wedding practices...They don't care if you're no-till. They don't care if it was heirloom seeds. They care about a high-quality product... So, we have to just cut out things that people don't care about.”* Thus, the planned biodiversity is aided by market demand for valuable flowers, but the diversity score of less than one (0.73) is driven by the lack of demand by consumers for farmers to grow heirlooms or perennial crops as a focus of their farms.

Six farms were more concerned about preserving genetic diversity, noting the ability for heritage livestock and plants to adapt to the environment. As F4 describes *“We try to choose a breed that fits with our environment, but also wants to do their own foraging and that kind of thing. So, you can see them out in the fields picking the seeds off of the weed plants...same thing with the turkeys. We chose heritage breed turkeys and they are totally different from the stuff you get like a [Tractor Supply Company]. They have personality.”* Those that are focused on heritage livestock and plants, F8 and F11, respectively, may lose customers as F8 notes: *“It's not gross gristly weird fat like you get on supermarket bacon. It's melty in your mouth, but you know a lot*

of people are a bit resistant to that.” This is not a concern as they have loyal customer bases though and they would even like to try more breeds/varieties, but are constrained as F11 notes “I love different varieties and...if I had more land, I would probably be growing a lot more varieties.”

Farm support actors were supportive of a diversity of types of product through markets, marketing and education for agroforestry products, heirlooms, and cut flowers, but were unable to support specific on-farm practices directly. Beyond local, what is prioritized is very different between farm support actors. The People's Food Coop has 83% local products and a different pay scale for conventional vs. organic agriculture. Food Gatherers prioritizes hardy vegetables, the American Indian Health and Family Services (AIHFS) prioritizes three sisters planting, and Argus prioritizes low-tech farming, noting that there is “*somewhat of a bias against hydroponic because it's not traditional soil based growing...without so much technology.*” Argus and farmers markets focus on building trust-based relationships with consumers and urging them to seek out relationships with farmers, which can incentivize certain products. Argus notes “*We have a couple farms who do have some crops that they [spray pesticides on]. But we won't take those....it can't be near the stuff that you're selling at Argus, because our customers care about that. And we want to preserve that trust relationship.*” The Chelsea Farmers market urges consumers to ask farmers about their practices and are considering requiring farmers to list their practices: “*We did have a policy at one point, and I might reinstate it that you have to list your practices.*”

### Recycling

The increased internalization of inputs and ecosystem services (i.e., pollination, nutrient cycling, and pest management) on farms.

Table 6. Five recycling indicators measured as present (0.2) or absent (0) for each farm (F1 – F11; mean=0.31, s.d.=0.16; variation outside of s.d. bolded).

Recycling indicators	F1	F2	F3	F4	F5	F6	F7	F8	F9	F10	F11
Does not purchase compost	0	0	0	0	0	0	0	0.2	0	0	0.2
Does not purchase seeds	0	0	0	0	0	0	0	0	0	0	0
Does not purchase chemicals/antibiotics	0	0	0	0	0	0	0	0	0	0	0
Does not purchase pollinators	0.20	0.20	0.20	0	0.20	0.20	0.20	0.20	0.20	0.20	0.20
Highly experimental repurposing of materials	0	0	0.20	0	0.20	0	0	0.20	0.20	0.20	0
<i>Recycling sum</i>	0.20	0.20	0.40	0	0.40	0.20	0.20	0.60	0.40	0.40	0.40

Answers about how farmers manage soil nutrients indicate all waste stays on the farm (i.e., no runoff or outside disposal needed), but farms were highly dependent upon outside sources for inputs on their farm (i.e., compost and other fertilizers, seeds, and pest deterrent materials). Eighty-two percent of farmers sourced additional nutrients from compost companies. The farmers that did not purchase compost were unique in that one has a very small backyard operation that requires a small amount of compost produced by their vermicomposting (F11) and the other farms focus is heritage livestock, supplying more than enough manure (F8). There was

not concern over this increased expenditure on manure, and farmers without animals did not indicate they wanted to add animals to their systems; rather many farmers found innovative ways to use other resources both on farm (F5): *“It's still a dream to like be able to have a closed loop here of supply, I think it's a lofty dream, given our scale and that we can't really have large animals here...So, trying to get creative... Like using the leaves that fall from our trees using various plants here for compost teas, things like that. So, I try to use that as a jumping off point. Yeah. How can we use what's available to us?”* and off farm (F4): *“Every week we pick up,, up to 4000 pounds of pulp.... We feed it to the animals first and then anything that's left goes into compost piles that then...goes right back into the land.”* Trusted farmers or verifiable practices of compost companies were the most abundant sources for additional nutrients.

This investment in soil quality was noted as an important pest management strategy by all farmers for plant health and ability to defend themselves. This exemplifies coproduction with nature, a peasant value. Other non-chemical pest management strategies include removal by hand, cloth tarps, use of other barrier methods including a liquid clay-kale mixture that plants are dipped in, and overplanting (F6): *“I think like if there's any like real big secret to avoiding you know pest issues on our vegetables in our flowers. It's just over planting and expecting loss.”*

Answers about use of agrochemical inputs indicate that farmers are uncomfortable with the continual over use of pesticides and antibiotics as F11 notes: *“I try not to spray anything. I don't even care if it's certified organic.”* and F8 notes: *“I would never give an animal antibiotics, just because I wanted to stimulate growth or because I had them in conditions that made them so vulnerable to disease that you have to use kind of like a preemptive strike of antibiotics.”* Farmers expressed intimate knowledge of the pesticide-treadmill as can be seen in statements by F5: *“But honestly, over the years, [pesticides have] just become less and less effective and the whole game of applying organic pesticide seems like a really vicious cycle.”* However, responses also indicate farmers keep them on hand for minimal use after they have used all other strategies (F9): *First step is through the type of crops we choose. Second is through soil maintenance...So we started out as trying to have the healthiest plants possible. And then after that we do exclusion techniques. Also use some organic sprays.”* Farmers have to reach a certain level of loss and utilize them in the least harmful way as F6 notes: *“I'm going to lose 50% of the crop or more, then I look to BT or Spindle... I only applied to plants where I'm not harvesting fruit”* and F10 notes: *“We try to use those in the evening when pollinators aren't out... And so, we try our best with that and limiting the use and trying to stick on a schedule with it so that we're not playing catch up on things and spraying a lot.”* What is considered ‘minimal’ pesticide spraying varies with one farm noting 10 times a year as minimal and another noting three times a year.

Answers about seed sourcing indicate that farmers are concerned about the seed supply, but do not see seed saving as an economically viable option. Seeds are largely sourced from Johnny’s, High Mowing, and other large organic seed companies and augmented with purchases from local seed companies run by farmers they trust, Ann Arbor Seed Company and Nature and Nurture Seeds. The same farmers who were concerned about preserving genetic diversity (n=6), also noted concern about seed shortages (F7): *“By the end of April there was a huge seed shortage...people had to compromise their choice of varieties...because consumers had bought it up.”* Farmers are increasing their heirloom varieties and seed saving because of this, and one farm support actor, the AIHFS, who said: *“Seed companies were being sold out...at least the*

people with financial resources that can buy seed and so I think something that was really eye opening...there wasn't enough seed for everyone.” Through their current work with the Native American Food Sovereignty Alliance though, seed was distributed during the pandemic to community members (Levy-Uyeda 2020).

### Economic resilience

The ability for farms to remain economically viable in the face of crisis such as the ongoing COVID-19 pandemic.

Table 7. Five economic resilience indicators measured as present (0.2) or absent (0) for each farm (F1 – F11; mean=0.69, s.d.=0.21; variation outside of s.d. bolded).

Economic resilience indicator	F1	F2	F3	F4	F5	F6	F7	F8	F9	F10	F11
Value added product offered	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.00	0.20	0.20
Hoop house and/or other means for extended season	0.20	0.20	0.20	0.20	0.00	0.20	0.00	0.20	0.20	0.20	0.20
pluriactivity	0.00	0.00	0.20	0.20	0.20	0.00	0.20	0.20	0.00	0.00	0.20
other income from land	0.00	0.00	0.20	0.20	0.00	0.00	0.00	0.20	0.00	0.00	0.00
online ordering and/or delivery	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.00
Economic resilience sum	0.60	0.60	<b>1.00</b>	<b>1.00</b>	0.60	0.60	0.60	<b>1.00</b>	<b>0.40</b>	0.60	0.60

Answers about economic viability indicate all farms had very profitable years during COVID, but had increased labor and expenses with online ordering platforms (n=10), delivery (n=4), investing in infrastructure (n=3), and collaboration with other farms to sell products through their farm stand or CSAs (n=6). As Taste the Local Difference (TLD) noted, this year, *“I think the pandemic across the board for, especially in the in the food sector has I don’t want to say forced but it’s inspired a lot more collaboration than historically has happened in the space or sped up the rate of collaboration, which is wonderful and those relationships with all relationships take energy and time.”* Infrastructure investments included refrigeration, processing equipment, and farm stands at their farms. Farms had to pivot to sell directly from their farms with the precariousness of the farmers markets and they also pivoted to CSAs with the loss of some of their wholesale restaurant markets.

Additional labor was required by farmers to pivot to CSAs from restaurant relationships, to be accessible online, and meeting consumer health demands during the pandemic through options like delivery. Argus noted *“I can sense from talking to them that this is not what they want to do...run an online platform.”* Similarly, Michigan Food and Farming System (MIFFS) notes *“A lot of farmers started doing their own deliveries to people...All of those things are really labor intensive for farmers and extremely stressful on top of just trying to keep production going ...So they’re already underwater just trying to farm and then you’ve shifted all their market platforms and have to teach them new technology tools.”* Responses about how farm support actors are able to support farmers’ economic resilience through this indicates all but AIHFS and Food Gatherers, which focus less on farmer profitability and more on community food security, were



able to support farmers in the pandemic. For instance, Detroit Partnership for Food Learning and Innovation (DPFLI) would like to teach canning and preserving workshops to help both farmers and consumers save money, and prevent waste: *“you can also dehydrate, freeze, salt, etc... when you really want to get into like saving money.”* Argus and the People's Food Coop host educational events as well. MIFFS work to *“give farmers a better understanding of how they can diversify farm revenue streams from working land conservation. Pollinators has been a big thing.”* Others like Argus, have increased revenue for farmers *“We've doubled the volume of what we're selling our farmers, we've got farmers that are selling over \$100,000 a year with us.”* Similarly, Chelsea Farmers Market, notes their role in driving profit to farmers *“If you have two vendors that sell eggs and they're right next to each other, someone's not going to make money...So there's a lot of thought put into how to best utilize the space for profitability for the vendors.”* Furthermore, Argus, the online platform designer, Chelsea Farmers Market, People's Food Coop and TLD helped farmers to sell online.

These farm support actors were economically resilient themselves, but also indicated they were taking on additional work and having to adapt quickly to serve farmers and their community. The People's Food Coop said *“we had a staff of 80 of us were well reduced to about 40 to 60 currently”* resulting in current staff taking on more work. In contrast, Argus maintained staff and pivoted quickly, saying *“There's an advantage that we have a very small management team who makes decisions...And we did all that pretty quickly. But I will tell you, being really small. It means all hands-on deck.”* TLD, MIFFS, and Food Gatherers were all hiring new staff and Chelsea Farmers Market had a stream of steady volunteers for the first time to assist with this additional labor.

Responses about how farmers maintained this economic viability of their farms indicate they use diversified revenue streams (i.e., value added products, pluriactivity, multiple streams of revenue from the land). Value added products included very minimal processing such as packaged salad greens to those that are very labor intensive such as processed spices, pickles, baked goods, teas, and soap. Farms that do not have certified kitchens get around the cottage food law by offering products like pickles to consumers in their CSA boxes. One farmer (F4) expressed a desire to increase value-add to both keep members of her community employed year-round as well as recycle and reduce waste: *“We're also looking at expanding the herb production so that we can keep year-round staff and do dried herbs and teas and those kinds of things that are organic... But I'd really like to try to explore more of the value added from the farm, because there's a lot of production that we do here. And one of the things I try to have is we don't want a lot of waste. So, it's either allocated towards CSA or it needs to be allocated someplace else. So, we're working on how we value add some of it.”*

Responses also indicate farmers focus on high value products such as cut flowers for economic viability as F3 notes: *“I don't grow [salad mix] in summer because it's too kind of time consuming and the flowers, frankly, make more money than vegetables.”* This decreases competition and stress as F6 says they *“focus on cut flower growing because I see that the market is less saturated with supply than the vegetable market in our area and it just felt more comfortable for me to not have to compete so hard.”* They also increased revenue by operating four seasons out of the year selling meat (n=6), using hoop houses (n=8), and diversifying their markets (i.e., farmers markets, restaurants, wholesale; Figure 4). Responses about having other

revenue streams based off of their land indicate farms use their land to tell the story of their farm through opening up the space to the public, increasing sales of food indirectly. Only three farms make money from others using the land for camping or rental for workshops.

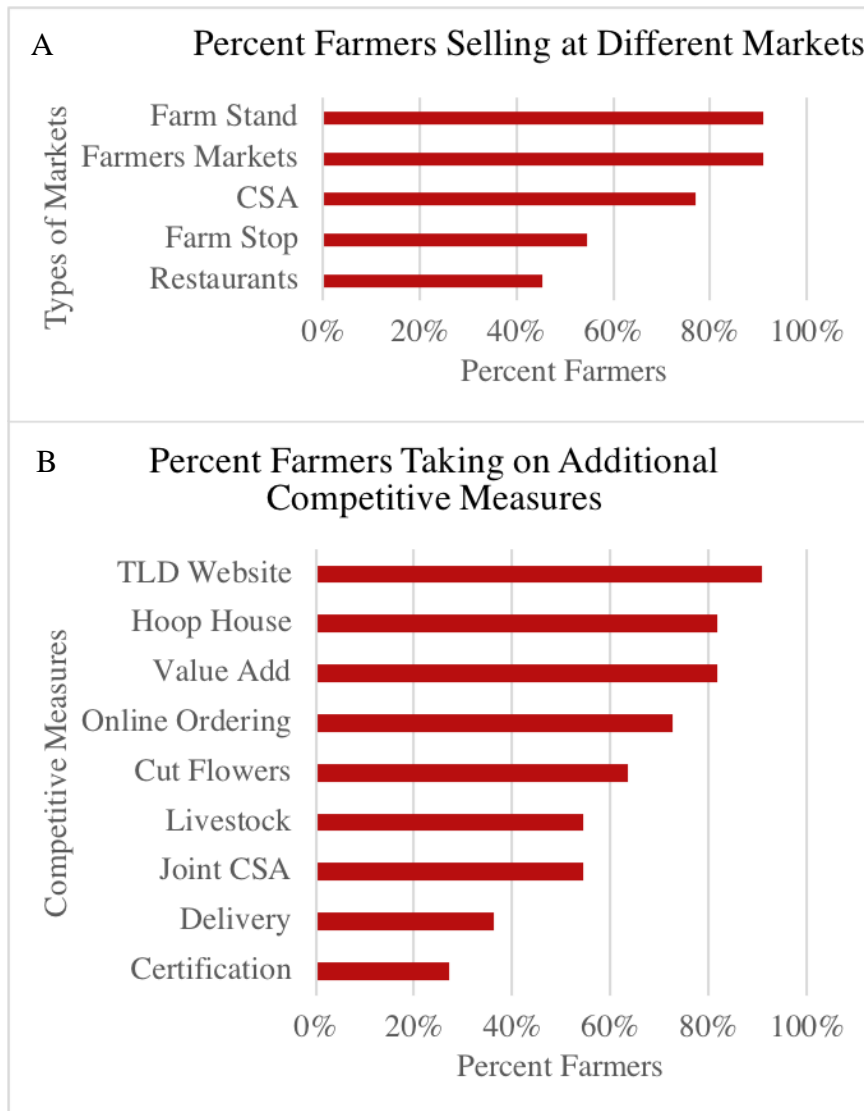


Figure 4. Farm characteristics and practices identified in a pre-interview survey and interviews (n=11). A) Percent farmers selling at each type of market: farm stands on their property, farmers markets, online, restaurants, and wholesale (i.e., St. Joes, Agricole, Argus, Flower Coop, White Lotus). B) Percent farmers taking on additional competitive measures to sell their products by increasing marketing (featured on the Taste the Local Difference--TLD--Website, CSA, Online Ordering, Certification labeling), diversity of offerings (Value-Add, Cut Flowers, Livestock) and collaboration that add to efficiency and diversity of products offered through collaborative CSAs and cooperatives, and extended selling periods with hoop houses.

Responses about other supplemental income that makes their farming lifestyle possible indicates that five farms work side jobs for additional income. Out of the six other farms, four are working full time on the farm for the first time, and two have been working full time on the farm for a few years. F9 is only going to work for a restaurant if needed to preserve their relationship *noting* “*I want to be there for them because they're there for us.*” Additional jobs are not always seen as economically beneficial, and partner support through their labor on the farm and/or another source of income from off the farm, was seen to be important by all farmers. As F9 notes: “*I found personally that the amount of benefit I got from having more money never outweigh the loss of time on the farm. I think if you had a spouse with off farm income that would be fantastic.*” F3 notes the importance of partners support: “*It is a subsistence living at best and the*

*infrastructure that I've put in, you know, I'm going to be paying off for years. So, the good news is, is my husband is a lawyer, he's able to keep us afloat.”*

### *Ecological resilience*

The ability for farms to remain productive in the face of pest pressure, soil, and climate barriers to productivity.

Table 8. Five ecological resilience indicators measured as present (0.2) or absent (0) for each farm (F1 – F11; mean=0.53, s.d.=0.22; variation outside of s.d. bolded).

Ecological resilience indicator	F1	F2	F3	F4	F5	F6	F7	F8	F9	F10	F11
Established agroforestry	0.00	0.00	0.20	0.20	0.00	0.00	0.00	0.20	0.00	0.00	0.00
Mixed animal/crop systems	0.20	0.20	0.00	0.20	0.00	0.20	0.20	0.20	0.00	0.00	0.00
Organic soil management and no till	0.00	0.20	0.00	0.00	0.00	0.00	0.00	0.00	0.20	0.00	0.00
Manages wildlife habitat on their property (forest, prairie, and/or wetland)	0.00	0.20	0.20	0.20	0.20	0.20	0.00	0.20	0.20	0.00	0.00
Adapting what and where crops are grown according to site-specific qualities of the land; overplanting for herbivory	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20
Ecological resilience sum	0.40	<b>0.80</b>	0.60	<b>0.80</b>	0.40	0.60	0.40	<b>0.80</b>	0.60	<b>0.20</b>	<b>0.20</b>

Answers about ecological resilience relative to management of pests indicate that pest problems are abundant, but farmers are constantly adapting and adding to the complexity of their practices. Many of these adaptation measures were outlined for pest management under “recycling”. Pest management for increased ecological resilience include companion planting, overplanting, quick crop turnover, investing in soil health, mowing tightly around fields to prevent insect spillover, and physical barriers including fencing, row cover, and powdered clay. Answers about ecological resilience relative to soil quality indicates farmers have an intimate knowledge of their land as F4 notes their land has *“beautiful sand all the way to clay it within probably 10 feet of each other.”* This farmer has plots set up with crops suited to this natural soil configuration and brings in boron so their beets will grow. Similarly, F6 adapts their planting practices and says: *“I'm sure every site has its own challenges, but we have very...poorly drained clay soil which is probably our primary challenge. And that's come with a lot of errors. You know, we've had a lot of flooded crops in the past. We've certainly learned where we can and cannot plant in the spring. We've also just pushed back spring planting by four to six weeks on almost everything.”*

Answers about their farming practices indicate farmers are consistently learning about their specific piece of land and adjusting where they plant, how they plant, and what they plant in order to retain ecological resilience (i.e., co-producing with nature). As F5 notes, this may result in decreasing the scale of production: *“So, part of what I love about our land is that we're surrounded by conifers, and part of what will be challenging is that we're surrounded by conifers. I feel like I've underestimated the amount of growth that they put on each year, but it's*

*substantial and it will be more shaded out as time goes on...I'm curious to see if it just makes sense to kind of get a little smaller. I'm open to that as opposed to just, you know, like cutting all these trees down."*

Ecological resilience may be hindered if farmers cannot invest in their sites for the long term as F9 notes the transformative relationship developed with the land once they were in a permanent place: *"I realized that I spent all this money trying to fight nature. I never owned land before I'd always just rented land. Now the ability for me to improve the land's biology became a possibility. And I realized I can have a long-term effect on the land here. So, then I started to ditch the property and drain it out. I was doing what would happen naturally already, just doing it faster...when I started putting in ponds, life just blew up on the property. It was insane."*

### *Efficiency*

The ability for the farm to increase productivity without scaling the acreage under production, hiring more people, or purchasing high-tech equipment; effectively, efficiency is a measure of decreased drudgery.

Table 9. Five efficiency indicators measured as present (0.2) or absent (0) for each farm (F1 – F11; mean=0.76, s.d.=0.25; variation outside of s.d. bolded).

Efficiency indicators	F1	F2	F3	F4	F5	F6	F7	F8	F9	F10	F11
increase number of customers while not expanding acreage or employees	0.20	0.00	0.20	0.00	0.20	0.20	0.20	0.20	0.20	0.00	0.20
Small plot intensive production, hand tool scale without big machinery and not attempting to change that	0.00	0.00	0.20	0.00	0.20	0.20	0.00	0.20	0.20	0.00	0.20
Subsistence (50+ from farm)	0.20	0.20	0.20	0.00	0.20	0.20	0.20	0.20	0.20	0.20	0.20
experiences net benefits to mental and physical health from farming	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20
adapting farm to meet health concerns	0.20	0.20	0.20	0.00	0.00	0.20	0.00	0.20	0.20	0.20	0.00
<i>Efficiency sum</i>	0.80	0.60	1.00	<b>0.20</b>	0.80	1.00	0.60	1.00	1.00	0.60	0.80

Answers about whether farmers are interested in scaling up indicate that farmers are working to maximize production on the land they own, but are relying on technology and staff. F2 notes *"I think we're going to probably try and maximize this property as much as we can. So probably adding a few more vegetable fields in the next couple years. And that would probably mean adding additional staff as well."* Farmer's desire moderate increases in technology to increase efficiency, but have not invested in them yet as F8 says *"I spend a lot of time fantasizing about tractors"* and F10 says: *"We need more turnaround space on our farm. So, we are thinking about bringing in some of the beds and creating a little less growing space in order to accommodate that."* Similarly, F1 says *"I think the smart thing to do would be to invest in those tools and that machinery that allows us to keep doing it with two people, but people to do it a lot faster."* And F9 said: *"As I've been making more money, I have been able to do less work because I'm able to invest in better tools, better soil, better infrastructure, that has allowed me to*

work less." Some types of equipment desired by farmers besides tractors includes irrigation, which would reduce the need for overplanting as F7 notes *"Irrigation would be a big thing, because then they instead of having to plant four times as much summer squash, I could plant what is appropriate."* Only one farm, F4, is currently set up for large scale equipment: *"That's been a struggle because we're not huge. We are not soybean/corn size. So, we kind of fall under that radar. But we're not walking behind seeding... we're at the point where we need to be higher volume than that."*

Farmers increase efficiency by cutting out unnecessary tasks like weeding as F11 notes *"I really don't weed anymore.... I got more important things to do"*. Farmers are also increasing efficiency by staying on the "treadmill" of turning beds as well as investing in perennials to decrease this continual replanting that is hard on the body. Similarly, technology and farm design were improved upon to make the farm more ergonomic and require less drudgery (F9): *"...designing the farm... It is only for you...So, the entire farm is built around lean principles, so the property flows in one direction. So, the safest way to move things as easy as possible, which is a long term...physical health decision for more efficient work."*

It is also inefficient to sell all of one's food produced only to go and purchase food from someone else. Answers about efficiency in terms of procuring food for their farm family on-site indicate that all farms except F4 have a majority of their food coming from their farm. However, farmers are not purists about producing their own food and shop at supermarkets for items they do not produce on the farm. Bartering and sharing with other farmers is also a part of their food procurement, but is discussed under "solidarity economy". Farmers and farm support actors alike, note the importance of food produced on the farm when they were going through food insecurity (n=6). As the online platform designer notes: *"Luckily, I worked on a farm and I can get free produce."*

Efficiency is also largely impacted by physical and mental health as F9 notes how their health is directly tied to the land: *"The farm is a living thing and so am I.... We live in cycles together...If my life balance is out of whack, then so is the farm."* All farmers appreciate the physicality of the work, but mental health impacts of farming are more complex. Farmers appreciated the autonomy and working outside, but tired of the isolation and stress from a lack of control over so many variables. Former farmer and TLD representative said *"It's really you put so much of yourself into that business which is wonderful and I love having dirt under my nails all the time. And also, I've never cried so much, just out of just frustration or like you stress because you're not guaranteed a paycheck, like there's so much that you can't control in farming."* F1 says *"I would say it's less stressful in that I only have myself to answer to...but you know, I think it's more stressful in that it puts more stress on my personal relationship with my partner and especially because there's no safety net to fall back on"*. Similarly, F3 says they *"farm by triage...looking for what's going to die next and taking care of that before it dies"*, but F7 notes *"I would say overall my mental health is significantly better now than it ever was...I feel freer. I feel less stress. I feel less pressure... doesn't mean I don't feel stress when it doesn't rain."* There is room for farm support actors to step in and mitigate some of that risk and uncertainty as the Chelsea Farmers Market manager notes: *"I need to be a liaison between the city officials and our farmers or the hospital and our farmers, because everything is out of your control when you're a*

farmer. It's like you're putting all your faith into things that are outside of yourself, for the most part. So, these small things that farmers can control, they like to do.”

Time and resource efficiency are impeded if farmers are not able to live on their land as F10 notes that their prior setup was “*really inefficient to be running between fields that are like 45 minutes apart or something or to get stuff to cooler that's like half an hour.... gas was our biggest expense those first two years.*” Similarly, F9 notes that there was increased efficiency when finally living on the farm: “*I camped on my farm in a tent...I was able to work more efficiently and I got so much more time off.*” This was recognized by TLD, MIFFS, and Argus as a barrier for farmers who do not own their land as TLD notes “*Even if you had access to say a fallow piece of land. If you don't have outbuildings, if you don't have wells, if you don't have electricity it certainly makes things really challenging and difficult and way less efficient, which means way less profitable.*”

### Synergy

The ability to optimize resource use through resource sharing with other farmers and integrating processes across the farm.

Table 10. Five synergy indicators measured as present (0.2) or absent (0) for each farm (F1 – F11; mean=0.69, s.d.=0.14; variation outside of s.d. bolded).

Synergy indicators	F1	F2	F3	F4	F5	F6	F7	F8	F9	F10	F11
pollinator habitat	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.00	0.00	0.00
companion planting/physical barriers	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.00	0.20	0.20	0.20
Using waste products and weeds on farm for other things	0.00	0.00	0.20	0.20	0.20	0.00	0.00	0.20	0.00	0.00	0.20
synchronizes work with partner to maximize use of time and skills	0.20	0.20	0.00	0.20	0.00	0.20	0.00	0.00	0.00	0.20	0.20
coordination with other farmers or neighbors for resources, tools	0.20	0.20	0.00	0.00	0.20	0.20	0.20	0.20	0.20	0.20	0.20
<i>Synergy sum</i>	0.80	0.80	0.60	0.80	0.80	0.80	0.60	0.60	<b>0.40</b>	0.60	0.80

The most important resource on a small-scale farm is time and energy. Consequently, answers on how they share labor indicates that farmers value collaboration, but that it is not common practice to collaborate (F7): “*We don't talk about...how much money we make, we don't share information...instead of realizing we're stronger together. We're better together...more powerful when we pool our resources.*” When collaboration does take place, it allows them to maximize time and energy as it allows individuals to play to their personal strengths as F3 describes: “*I have a young couple who are going to be leasing part of the property to grow organic food. Which is really good because that keeps me from expanding more because I'm already maxed out on what I can do. And instead of charging them rent. I'm going to swap them for a CSA box. Yeah, and that will keep me from growing. Some of the things I find hard to grow. There are some brassicas that have a lot of damage from worms and things like that. They have a really good system organically of keeping that under control. So, I won't have to fight with that.*”

At the micro-scale this collaboration is happening between partners operating the farm together. Answers about how they share resources with other farmers across southeast Michigan also indicate all farmers are sharing tools and other resources with one another, helping farmers to set up greenhouses, tool sharing, and selling products through collaborative CSAs. Answers about how farmers are integrating systems across their farms indicate farmers are using things like weeds for floral arrangements (F3): *“I love selling weeds. It's fabulous.”* and animal fodder (F8), *“A lot of the animals will eat these weeds. They don't necessarily love them but especially in the winter when there's just not much greenery around if you have a big dried up pile of ragweed and you dump it in there. They'll love that...you find a way to use that.”* Answers about what crops they choose to grow indicates that farmers are crafting planting plants for myriad benefits including pollination, pest management, diversified revenue, and mental health benefits as F6 describes: *“There's what, there's what sells what's popular, you know, tomatoes and lettuce, there's crops that don't sell as well, but we just love them for their natural pest resistance or just the ease of, you know, they're more competitive with weeds. It's just sort of an easier crop for organic growers like an example of that would be radicchio or fennel, they're definitely like some of the least popular vegetables we grow, but they're just such a fantastic choice for an organic grower.... what we like, what everyone else likes, and then what does well.”* And similarly, as F4 describes: *“We put a quarter acre of sunflowers in and put it for sale at the markets and to, you know, have something pretty on the farm. Those sunflowers attracted all of the cucumber Beetles, and the Japanese beetles. Okay, now we plant the sunflowers in...the edges of the fields to attract them out of the fields. And so, we have sunflower stripes through the farm...We do a lot of the three sisters planting in some of the different areas. So, it's got squash and beans and corn, and then we plant the sunflower... We've seen it actually physically improve the soil when we've done soil testing. But we're also seeing that helps with the pest management to it's so it's kind of interesting to watch them all work together.”*

### *Co-production and Sharing of Knowledge*

The creation of knowledge among farmers and dissemination to farm support actors and their community.

Table 11. Four synergy indicators measured as present (0.25) or absent (0) for each farm (F1 – F11; mean=0.91, s.d.=0.13; variation outside of s.d. bolded).

Co-production indicators	F1	F2	F3	F4	F5	F6	F7	F8	F9	F10	F11
Peers: Internet community, books by farmers, informal conversations with peers, MSU organic training programs, conferences	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
No conventional agriculture influence: seed catalogs, USDA programs	0.25	0.25	0.25	0.00	0.25	0.25	0.00	0.25	0.25	0.25	0.25
active - workshops, social media, YouTube	0.00	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.00
passive - newsletters, website, farmers markets	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
<i>Co-production average</i>	<b>0.75</b>	1.00	1.00	<b>0.75</b>	1.00	1.00	<b>0.75</b>	1.00	1.00	1.00	<b>0.75</b>

Answers about where they sourced their knowledge indicate that the sources of knowledge were somewhat diverse including the MSU organic farming training program, hands-on experiences through friends' farms and internships, community groups on Facebook and simple google searches, and books written by farmers (notably *The Market Gardener* and Eliot Coleman's books). MSU organic farmer training is expensive though, and one farmer even experienced food insecurity during the period when they were enrolled in the program. To a lesser extent conferences like the one hosted by MIFFS, seed catalogs, and federal programs were used as an essential part of gleaning knowledge. Beyond outside sources, all farmers are relying on trial and error, creating their own site-specific knowledge as one farmer notes (F7): *"Yeah, I think people who have the luxury to have grown up in a farming family...really have a magical knowledge set...like I take notice of things like the ginger this year and the turmeric, I put in the center road hoop house, and it did phenomenally, it was by far my best harvest. But was that because it was in the middle where it was warmer? Was it because I put new fans in and there was better circulation? Was it because I put a further gator in and they actually got fertilized every week, rather than, you know, when I got around to it? I don't know. And so, it's trial and error. Trial and error. Trial and error. And I just haven't had enough trials."*

Since knowledge is not being passed down, they are not bound by the farming ideologies and technology invested in by this previous generation and they have more autonomy (F7): *"And I think out of that passion. And that choice comes with a lot of freedom for us to explore other opportunities to explore cooperation and not have to be so protective of, you know, 100 years of whatever our other generations have built up."* However, the lack of intergenerational knowledge also means there is no guarantee this knowledge they have created will be passed on. No farms have a formal succession plan and even those with children were not expecting their children would farm after them. No support actors facilitated transfer of farms between aging out and beginning farmers or provided services that supported farmers' mental and spiritual health, but noted this was a large concern of theirs for the future of farming. Both farms and farm support actors expressed a desire for a formalized network to connect aging out farmers with farmers entering the field.

Answers about the ways in which farmers are sharing knowledge indicated they are actively sharing it through workshops at farm support actors' venues and social media (73%) and passively to their consumers through newsletters to CSA members and conversations at farmers markets (100%). These latter two means of communication are considered passive because they do not require farms to reach outside their current customer base. One farmer is going to create a YouTube channel with her son (F7) and another farmer hopes to one day write a book (F9). In 2020 attendance at farmers markets decreased, but all but one farm had a farm stand directly on their property. This required more active communication with their loyal customers that purchase from them each year or increased social media presence. Knowledge is also shared through their use of labeling at Argus, Agricole, and farmers markets and through services like TLD. Only one farm was not listed on the TLD website, but this farmer has been around for the longest period of time, 11 years, and has an established CSA customer base that either stops by their farm or has their produce delivered.



Most farm support actors are educating consumers about farmers passively. Ninety-one percent source knowledge from farmers for their organizations, and 60% of these farm support actors have previous experience farming themselves. Eighty-two percent actively share information about farmers and their practices and 44% of these farm support actors also have physical labels at their organization or on their website on farmer practices and individual farmers.

### *Culture and Food Traditions*

The production of culturally appropriate foods that support diverse food traditions among their customer base and themselves.

Table 12. Four culture indicators measured as present (0.25) or absent (0) for each farm (F1 – F11; mean=0.43, s.d.=0.16; variation outside of s.d. bolded).

Culture indicators	F1	F2	F3	F4	F5	F6	F7	F8	F9	F10	F11
Second generation - received knowledge or land/resources from family	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Alternative agriculture connection in family	0.00	0.25	0.25	0.00	0.25	0.00	0.00	0.00	0.00	0.00	0.25
Growing foods that connects to their food traditions	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Growing foods to serve diverse cultures	0.00	0.00	0.00	0.25	0.00	0.00	0.00	0.25	0.00	0.25	0.25
<i>Culture sum</i>	<b>0.25</b>	0.50	0.50	0.50	0.50	<b>0.25</b>	<b>0.25</b>	0.50	<b>0.25</b>	0.50	<b>0.75</b>

Answers about culture and food traditions indicate farmers are tuned into “foodie culture” and note differences in the food traditions of city consumers. Answers about farmers' own customs indicate all farmers were motivated by a desire for the lifestyle and sustainability aspects of farming and four farmers started their farms because of a personal or family health issue tied to the environment. No farms had support or knowledge that was passed down to them from family members, but four had family members that had been a part of CSAs, had a home garden, and/or ancestral connection to farming as F11 notes *“But for me it's been really helpful because again you know when I'm in the garden like I think about my grandfather and he had a restaurant”* and F7 notes *“my great, great, great grandfather was actually in farming in Tennessee in the early 1900s.”*

Thirty-six percent of farmers were planting foods for cultures beyond their own as F10 notes they work to provide “culturally black cuisine” for their consumers in Detroit and that *“we got into farming was like to connect people with their food and be closer to the people that we are selling to and we also wanted to be in the city...a cultural hub.”* F8 describes: *“A lot of the cultural traditions I'm introducing are actually probably coming from Central America and being applied here. So, they're not necessarily my traditions, but you know there are things that I have learned and observed in working with farmers and then trying to apply it here.”* Lastly, F11 grows primarily heirloom peppers and tomatoes from her own cultural background, but also *“African style three sisters...I've done okra, crowder's, and watermelon...there's a lot of this knowledge that doesn't come from just this continent, but a lot of indigenous knowledge from all over the world that can be really, really helpful.”*

The AIHFS intentionally works to strengthen cultural connections to food, “we started incorporating different pieces of culture into the cooking classes to where people would get a little info about the seed or the plan that we are featuring at that class a little bit of our language.” Similarly, Detroit Partnership for Food Learning and Innovation (DPFLI) in the heart of predominantly Black communities in Detroit seeks to be “mindful of what is culturally appropriate...I do want to promote and expose people to new things, but I also value kind of a return or a restoration of indigenous ways and practices so that includes reestablishing and cultivating foods that we aren't necessarily familiar with but plants and even I guess animals that are native or historically native to the Midwest in this bio region.” As MIFFS notes, the “Tribal farmers and Black Farmers...always had a very strong connection to each other, largely part of the history of how the state was settled. We're seeing a lot more cultural and knowledge exchange and them finding common ground between their communities and being able to come together and collaborate.” The rest of the farm support actors work to connect consumers to their farmers, but not specific food traditions.

### Human and Social Value

The value ascribed to farmers because of their identity, profession, and personal value cultivated through craftsmanship and autonomy.

Table 13. Four culture indicators measured as present (0.25) or absent (0) for each farm (F1 – F11; mean=0.75, s.d.=0).

Culture indicators	F1	F2	F3	F4	F5	F6	F7	F8	F9	F10	F11
Craftsmanship, very particular about quality of product going out to market	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Does not deal with sexism, racism, or exclusion for their type of farming	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Autonomy to be flexible, adapt, creativity	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Derives great value and pride from the work, way of life, and feeding people	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Values average	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75

Wellbeing was very high, averaging above 0.75 on a scale from 0 – 1, except for a few farmers that experience fluctuations in their emotions due to the lack of control within farming. This lack of control and risk impacts their health and must be constantly kept in balance with the perceived mental, spiritual, and other non-material benefits of farming.

Answers about negative perceptions and discrimination indicated all farmers deal with either sexism or racism, decreasing social value. F2 says she has received comments like “Oh, it's so nice you work on [your husband's] farm... And, you know, he's very supportive. He says, no, I work for her.” F9 gets comments such as “Oh, what are you growing weed?” all the time. This is further illustrated by this statement by F4, “If I went to a John Deere dealership...If I go to any of the normal channels for farming, I find I just send [my husband]. I send him a list of

*questions I send him with what I want to know.... Because they just won't talk to you or they won't call you back.”, and this statement by F7, “when [consumers] have questions about the tractors or equipment they immediately ask if they can talk to my husband, or if my husband is home. Or if he and I are both standing there, they will turn to my husband and talk to him and most the time he just shrugged his shoulders and looks at me and I shake my head and laugh because I chose every single one of our tractors for a reason.*

Answers about negative perceptions also indicate that perceptions their work is unprofessional, or a hobby weighs on them heavily, decreasing social value. As F10 notes *“I think one of the hardest misconceptions about the farming that we do is that people don't think that it is our job”* and F6 notes people *“think I'm just picking flowers all day...we have friends will drop in and middle of a weekday unannounced and just want to chat and hang out. And it's a little insulting to me because I feel like they think that's what we're doing.”* Similarly, F5 says *“by virtue of being female and having a farm that isn't a giant cornfield with a tractor. There's a lot of just confusion around what I'm doing.”* This is directly tied to their small-scale, diversified style of production in rural areas as F11 says *“there's also a lot of stigma around that, you know, if you don't own land, a lot of other growers were like, Oh, you're not a real farm or, you know, you need to go in debt for 40 years...there's sort of stigma around that in the in the more traditional growing spaces. Not at all, of course, in urban agriculture space.”*

Farmers naturally talked about their pride, care, and craftsmanship of their businesses that counters the negative perceptions impacting their value. As F10 describes in their design choices *“we've always believed in putting like a fence around the garden to keep rabbits and groundhogs out, but also to delineate like this is a working space that is cared for.”* Or as F9 says *“It truly is an art form that only comes from user experience...it is just understanding living systems...We, the food movement, have been building...farming as a charity. Which it isn't. It's a craft. And I think we haven't put a lot of...energy into building them as a business first.”* F7 describes the vast number of skills that are needed for a farm *“I put a farmer up against a business person, any day. The things that we have to know like said engineering in dealing with the mechanics of the tractors and whatnot. We are weathermen. We have to run a business. We have to do research. We have to be PR and HR people.”* Furthermore, after the business becomes stable, the experimentation can increase as F6 notes *“The cool thing about farming is it's not just one thing. So like once you have access to the land or own your land you can try a new crop every year, add on some livestock or plant some trees... we are just at this fun place where we can really experiment and try new things and see what fits instead of just being in that like head down, scramble, kind of like just pay the bills and you know keep planting lettuce strategy that I think we were stuck in for many years”*

All farmers utilize creativity and are constantly adapting to different conditions on their farms, experiencing a high sense of purpose. When local regulations and governance restrict this craftsmanship, farmers expressed frustration as F6 notes *“So, for cut flowers there is literally like no organic nursery for cut flower plugs or major roots or shrubs in the country.”* Similarly, F2 (quoted) and F8 would love to do farm processing: *“Well, it's been a dream of ours for a while to do farm processing. The whole taking them to the processor can be really traumatic and had mixed results with the quality of the butchering to like our, our favorite place closed. A few years ago, and we've had a hard time finding a replacement and then.... I think a family that owned it*

retired [processor]. Okay, but they might be a new person taking it over. But there's nowhere to get organic processing either which is also very frustrating. So, we have certified animals within. We don't have certified meat at the end of it. Which is frustrating.”

This craftsmanship is encouraged by farm support actors as Argus notes “Well, we have an application for lettuce potatoes and carrots and now they've planted a whole bunch of other things and they just start bringing in. And we have to figure out how to balance all that because it's creativity and talent that lets them do that. And that means the models working.” The online platform designer recognizes that “Food people are like natural designers, like they design all the time. They workshop ideas all the time from sunset to sundown.”

Answers about farm support actors’ value is impacted by negative perceptions indicating that four actors interact with conventional agriculture to a degree and experience exclusion for their representation of alternative agriculture in these interactions. Only 27% of actors are supporting farmers' human and social value to a significant degree (>0.65), but all expressed a desire to serve more female and BIPOC farmers. Farmers markets had minimal diversity, but about half of their vendors were female. Farm support actor’s own wellbeing is very high, but female actors experienced sexism to varying degrees throughout their careers, though to a lesser degree in their current roles than in past corporate, academic, and professionalized spaces as TLD said: “There's not a lot of discrimination in this space. I've only experienced it, like more sexism, with larger advertising partners that are like male and condescending.” Similarly, the online platform designer said, “It's oppressive stuff that happens in academia, but like on the farm, heck no.”

### *Solidarity Economy*

Supporting and being supported by the community of consumers, peers, and farm support actors in southeast Michigan.

Table 14. Four solidarity indicators measured as present (0.25) or absent (0) for each farm (F1 – F11; mean=0.70, s.d.=0.29; variation outside of s.d. bolded).

Solidarity indicators	F1	F2	F3	F4	F5	F6	F7	F8	F9	F10	F11
Donates food	0.00	0.25	0.00	0.25	0.25	0.25	0.00	0.25	0.00	0.25	0.00
Participates in bartering for food	0.25	0.25	0.25	0.00	0.25	0.25	0.25	0.25	0.25	0.25	0.00
All markets are hyperlocal (>20 miles from farm)	0.25	0.25	0.25	0.00	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Supporting other farmers to get their start (land share, jobs)	0.25	0.25	0.25	0.00	0.00	0.25	0.00	0.25	0.00	0.25	0.00
<i>Solidarity economy sum</i>	0.75	1.00	0.75	<b>0.25</b>	0.75	1.00	0.50	1.00	0.50	1.00	<b>0.25</b>

Answers about how farmers are supporting one another indicates “the farming community is so tight” as F1 says and all farmers are a part of their own small networks supporting one another through bartering, use of land for beehives and farming, and tool sharing. Additionally, 63% of farmers are collaborating with farmers by combining products in CSAs. Answers about how farmers are supporting the larger community indicates that fifty-four percent of farmers donate food to either Food Gatherers, St. Joes, and/or have set up their own CSA donation program. Ten

farmers sell their food hyper-locally (>20 miles from their farm) with 64% selling in Washtenaw and 46% selling in Wayne counties. Only one farmer drives over miles to their market in Wayne County. Only one farmer does not currently have a farm stand and the other ten farms have customers driving to their farms to pick up their produce. Answers about how to ensure equity with who has access to the food small-scale diversified farmers are producing indicates farms desire to keep their prices low for consumers, but were limited by the constraints of their smaller operations and their solutions indicate need for more federal support as is explored in the next section. As F8 says *“I want people in my community to have access to really good healthy sustainably produced food. And so, you know, if I do price it higher, that's going to price somebody out. Um, so, you know, I'm like as a capitalist I'm not very good.”* Similarly, F6 says: *“And I think unfortunately with first generation farms like ourselves. You know, our price point is always going to be a little higher. We're still dealing with that sort of startup cost...and our volume is just smaller so you know when you grow more food and you're mechanized to grow more food your cost can go down. But when you grow less and you're harvesting and washing it by hand your cost is going to be higher. So, I think, you know, it's a good thing. You know, the marketplace has that variety and diversity of food costs, but I think the more that we look to those like big vegetable growers the more we think that we don't want to be that.”*

Answers about how farmers feel about competition indicated that some farmers feel no competition with other farmers (n=8) as F9 says *“But there are so many people and so many eaters and so few farms that if on my street 10 farms opened up, I probably wouldn't even know it.”* A few farmers are feeling competition (n=3) as F10 says *“Like I don't know if we necessarily would want like a bunch more competition right now”* or as F6 says it can feel like a *“rat race sometimes”* and is subsequently deepening their cut flower offerings since the *“cut flower market not saturated”*. F1 says that more sales outlets would need to open up for more small farmers to enter the market. TLD notes that there is a need for more farmers, because responsible governance is lacking: *“I feel like sometimes the reason we need more farmers is because it's not sustainable for people to farm at the small scale...you see these trends 5 to 10 years of people farming at this scale and getting so burnout, because there's no support. And so, I think that that creates a demand for new farmers to come into the space...in my dream world more small-scale farmers would receive financial support so that they're sustainable...The only way I see that actually happening is if there become subsidies available for organic vegetable growers. Or like insurance healthcare needs to become more affordable so that people can spend less dollars on health care and more dollars on food.”*

When farmers do lose customers, they often lose them because they are growing their own food. All farmers who have experienced this are supportive of it as F7 says *‘That's the number one reason why I tend to lose CSA members. They decide they want to grow their own garden. Which is great, I support that.’* Or as F5 says *“I've been encouraged a lot more people are trying to grow their own food this year”* and F3 says *“My goal is to be able to help other people learn how to do it and share what I'm doing, with that as my priority, rather than profits.”*

Answers about solidarity economy indicate that three farm support actors support and promote some federal programs, while all other actors exclusively focus on growing the local economy. No farm support actors are able to support all the farmers that want or need their services due to the costs of their programs, limits to the number of farmers that can be supported, built in

seniority, limited demographic served by the support actor, or physical inaccessibility. Answers about how farm support actors support food access for the broader community indicate all places of sale (Argus, Ann Arbor Peoples Food Coop, online sales platform, and Chelsea Farmers Market) facilitate the use of SNAP benefits and three farm support actors provide food directly to food insecure consumers through donations.

*Responsible Governance*

The top down federal support of these farmers and their own bottom up governance mechanisms to remain viable in a sustainable way. Governance was a large theme with lots of data so it is broken into three sub-themes: vision for policies and future of farming, education, and cooperative governance.

Table 15. Four solidarity indicators measured as present (0.25) or absent (0) for each farm (F1 – F11; mean=0.53, s.d.=0.24; variation outside of s.d. bolded).

Solidarity indicators	F1	F2	F3	F4	F5	F6	F7	F8	F9	F10	F11
Does not rent land or plan on acquiring more	0.00	0.20	0.20	0.20	0.20	0.20	0.00	0.20	0.20	0.00	0.00
Is not growing beyond their current capacity	0.20	0.20	0.20	0.00	0.20	0.20	0.20	0.20	0.20	0.20	0.20
Policy advocacy	0.20	0.20	0.00	0.00	0.00	0.20	0.00	0.00	0.20	0.00	0.00
Joint CSA	0.00	0.20	0.20	0.20	0.00	0.20	0.20	0.00	0.20	0.20	0.00
Formal cooperative	0.00	0.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
<i>Governance average</i>	0.40	<b>1.00</b>	0.60	0.40	0.40	<b>0.80</b>	0.40	0.40	<b>0.80</b>	0.40	<b>0.20</b>

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Vision for policies and future of farming

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Answers about visions for their farms indicate no farmers have plans for the future tenure of their land, but do not want it to be developed. Answers about federal support received by farmers indicate that four farmers have received federal loans and all the others have worked out loan contracts with private companies and individuals. Answers about how farm support actors are supporting farmers indicate that Food Gatherers and MIFFS work to get farmers federal support and to “*explain to them how the game works. The USDA is a giant game and it's a rigged game.*” There is a recognition that the USDA is not set up to help small-scale producers of pigs as F8 says “*They're not considered grazing animals. So, like those programs aren't open to me unless I were to like get cows or sheep or goats*” and diverse vegetables as F4 notes “*So I have to tell him how big each of those patches is for each of those types of 200 vegetables. Do you know how much time he wants to spend with me? When he can talk to a corn guy that goes, I got 1500 acres of corn. Done.*” The online sales platform designer desires for their community to not be “*so self-reliant on government entities, because the government, whether it's the state government, the federal government or whether it's the USDA especially the USDA. I mean it's set up for anti-blackness.*” Federal assistance is desired by farmers through subsidy restructuring as F1 lays out: “*We need to feed a lot of people quickly at once. Especially for these larger institutions like schools, hospitals, like these places that are producing at a mass scale. That's not going to change. A million of me is not going to be able to do that. I think what needs to*

*happen is we need to focus more than vegetable production. Maybe convert some of the farms that do the corn and soy into more specialty crops. To do that, you know, you have to have more federal incentive programs people help shoulder the cost burden. I think we need education, sales outlet for it.”*

As F5 put it *“I guess I see it as too variable [federal assistance]. It never promises to be consistent, based on shifting ideologies... who's in power. So, I do feel like there's a lot of strength to be had by doing it ourselves and doing it on a smaller level.”* The rest of these policy recommendations focus on local policies to grow small-scale farming, first and foremost through access to land, infrastructure, and markets. F11 wrote about their own struggle to access land that *“it's really bad if somebody like me that is white presenting that comes from more financial privilege is still having this trouble.”* Local policies of importance to farm support actors and these policy councils include food hubs and local processing, permissive zoning, farm incubators for beginning farmers to learn. Increased autonomy from regulations and policies (i.e., organic certification, agritourism, cottage food law, and zoning) was desired by farmers to decrease financial stress, allowing them to be more creative. Though many farmers have also found ways to circumvent these regulations by piecing together parcels of land, selling cottage foods through their CSAs, and providing information on what their practices entail regardless of certification.

Answers about how farmers advocate for policies indicate that a slight majority (55%) of farmers advocate for policy through involvement of the Greenbelt advisory council, the Washtenaw Food Policy Council, and the Michigan Local Food Council Network. However, farmers are busy and as one farmer, F5, says *“I'm not a policy geek, and it's not where my skills are...”* Answers from farm support actors indicate policy advocacy as a primary function for only three actors, but the other six are plugged into local and/or national food policy issues. TLD notes the need for more mid-sized sales outlets *“So Argus is doing a great job with their model, but I still think that a larger hub that would be more institutionally focused”* and mid-scale farmers *“Particularly in Ann Arbor, it seems like most of the farms are interested in being more direct market, market garden scale... We don't have mid-scale farmers.”* Argus is working to *“help the Washtenaw Meats people try to have a voice and they're a bunch of farmers...It's not their thing...they're too busy. So, we're trying to find a way to impact the policymakers similarly to how the lobbyists do it for the big CAFOs.”* This lattermost issue of local, trustworthy processing facilities and the option of on-farm processing came up with all producers of livestock.

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## Education

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Farmers reiterated the need for education to consumers about the quality, affordability, and seasonality of their products in order to grow local demand. Answers about educating customers on their products indicate farmers aren't set on using terms like “organic” or “heirloom”, but emphasize the quality of their products. As F4 says *“We have a lot of people that just walk by the table because it says organic because they feel like it's going to be too expensive...I don't push the organic as much as I push the we don't use chemicals, we don't use pesticides, and here's the cost compared to what you're paying for a grocery store.”* As F10 says *“You know, like an heirloom tomato from Whole Foods does not taste as good as an heirloom from our farm.”*

Farmers also emphasize the affordability of their products (F6): *“I think people don't realize that you know, if you buy a tomato in Michigan in early September, it's probably way cheaper than a tomato you could walk into the grocery store and buy on that same week.”* Similarly, farm support actors that offer SNAP and Double Up reiterated this need for outreach to food insecure individuals and communicate the accessibility of what they offer as the People’s Food Coop notes *“I think there's still a negative price perception with our business because we're right in Kerry town, that we are super expensive.”*

Consumers are used to being able to purchase things year-round and F10 says *“There needs to be a shift in expectations. People want spinach, but in the middle of the summer. There's that issue about seasonality... a lot of people don't want collard greens until after the first frost, but we haven't had the first frost yet and we had a lot of beautiful collard greens.”* Similarly, Argus notes *“it's not going to kill us to not have tomatoes in November in December and February, but Meijer has a customer base that just expects it... it comes at a high cost, right, the electricity usage and the fossil fuel usage to keep those sites going.”*

Furthermore, farm support actors noted a need for education on what is really “local” as the online platform designer says, *“Local has to become local again and I'm speaking specifically from a black and brown perspective. I mean, other people can join in as well. But we have to build our own systems now. Because what I'm seeing is that if we were relying on other people, the system is not the other system. It wasn't feeding us properly.”* Similarly, Argus says *“But if you're doing fake local it's going to come back to haunt you because you're not going to get the farmers that want to sign up with you. There's one called Misfits Michigan. Well, none of them really from Michigan, but they have really good marketers.”*

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## Cooperative Governance

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Answers about merging businesses into a cooperative indicate there are three perspectives among farmers: 1) cooperative farming is necessary and they have merged businesses already (n=1), 2) they are open to having their land go into cooperative farming after their retirement (n=6), 3) cooperative farming sounds great, but is very complicated (n=4). For this latter group, there is a consensus that (F10): *“running a farm cooperatively sounds really good, but it's also very complicated...”* and a lot of other things have to happen first as F9 notes: *“I think cooperative farming will hopefully one day be a very common thing, but there are so many other issues: land management, access to capital, racism, that are going to have to play a role...so many steps before you can get to that.”*

How they feel about merging businesses is not indicative of what they are presently doing as three of the farmers that feel it is far off are informally collaborating with other farmers at present and two of the farmers that are very vocal about the importance of cooperatives are not presently collaborating with other farms. Answers about how farmers are collaborating indicate that there are degrees of informal cooperation among the farmers, with participation in the Flower grower’s cooperative (n=2), joint CSAs and selling other farmers’ products (n=7), collaborating on growing plants (n=1), and sharing their land or receiving land from another farmer (n=3). Joint CSAs were adopted because certain crops do not grow well in their soil or other farms could provide value-add products. They are doing this with select farmers that they



have built trustworthy relationships with and that share their values as F4 notes *“you have to find the right farms to work with”* or as F5 says of cooperative farming *“that actually terrifies me...Part of why I'm doing it this way is I do love the freedom of it.”* but is looking at sharing workdays with her friend whose *“values are very closely aligned.”* F11, who is not farming cooperatively as of yet, connects the complexity of cooperative farming and hesitation to adopt it: *“In my viewpoint the only way forward is collaborative growing, but of course that's also difficult. You have to make sure that people are really on board with the same vision, same practices.... that's one of the biggest issues with the way the US conceptualizes agriculture...it's a very individual centric, family specific thing. Whereas, historically, all over the world, that's not how agriculture has been. Most agriculture throughout time has been a collective effort, and has been community based. I think if we're serious about revamping the food system, we all need to kind of go more in that direction.”* The one farm cooperative interviewed, F2, identified the benefits of cooperative farming to be sharing each other's debts, not having to stress about finances as much, and *“being part of this collective has allowed me to like accept that I don't have to be good at everything”*.

Answers from farm support actors about cooperative farming indicates that would be the most advantageous to farmers, but are constrained in their support of this type of farming. Since cooperatives are not being adopted by many, farm support actors only theoretically support the formation of cooperatives or at least do not hinder their adoption. In referring to the difficulty of marketing, farming, and running a business, Argus notes *“if you're one farmer and you have to do all that it's really, really hard”*. Similarly, MIFFS notes of farm incubators such as the retired Tillian incubator *“We also are seeing huge trends and producers coming off those incubators of really valuing the environment of cooperative farming.”* The AIHFS has helped translate cooperative farming practices to the home scale *“skills and knowledge-based workshops to teach people not only how to grow the foods... but how-to kind of translate ancestral food processing and preservation methods to like the home scale because usually these traditionally a lot of these things were done in community and large groups because they're very labor intensive and large scale.”* As the Chelsea Farmers Market notes there is bias against farmers who are not doing all the work themselves: *“There was a group of folks in like the Ypsilanti area, I think, that had started initially doing a collaborative farm and there was a little resistance with some of my older vendors on allowing them into our market space...so like if they were actually producing their food, but their co farmer was on a different piece of land and then they were selling it for them. They didn't like that.”*

## Discussion

These results illustrate that new, small-scale, marginalized farmers are dealing with significant barriers to entry, but have been able to prosper regardless. New farmers have to purchase land, invest in infrastructure, and are up against seniority in market spaces. This is made more difficult when they are excluded from government support that prioritizes farmers with extensive capital and large, simple operations and there is a steep learning curve for their knowledge-intensive small-scale, diversified production system. This resulted in all farmers utilizing informal networks to acquire land and build up resources and knowledge. These barriers are further compounded when there is institutional sexism and racism that the farmers must deal with. For those that do succeed, like the farmers interviewed here, there are not many structures in place to ensure their operations remain sustainable. This study highlights a small subset of agroecological

farmers who were able to increase sales and thrive during this pandemic, but their agroecological practices are limited since they have to remain hyper-focused on making their business viable in the current market economy they operate on the margins of.

Even though this was a very small, specified sample, there was deviation between farms across the agroecological-peasant matrix. Given the overlap in the majority of measurements, the degree to which farms were agroecological and had peasant values were tightly correlated. Peasant values were low because of the use of non-skill-oriented technology, relying on outside markets for inputs, not getting knowledge from a previous generation, not having a plan to pass knowledge and their land along to the next generation, and the focus on consumers' needs before their own autonomy, experimentation, and cultural heritage in planting decisions. Thus, profitability took greater precedence to decreasing drudgery.

Though there were a number of agroecological principles that were more prevalent than others, all principles had significant room for growth and were interdependent. Farms are highly diverse, with crop choices and planting practices based off a complex array of benefits including personal, ecological, and consumer needs. This diversity adds to ecological and economic resilience through a variety of products that attract consumers, provide economic security throughout the year, and provide ecosystem services. These planting designs are also chosen for ergonomics and aesthetic qualities, illustrating how autonomy, craftsmanship, and adaptability of operating their farm is a business, but is also a lifestyle that evokes pride. These social value elements helped them overcome negative perceptions of their type of farming and personal identities marginalized by the dominant agricultural system. Some of the other important factors that help them remain viable are their tight-knit communities that provide resources, food for bartering, tools, and coproduction of knowledge. Their production of knowledge is the strongest agroecological element and most valuable asset, but is also highly vulnerable. Recycling is underinvested currently and responsible governance needs to be deepened locally. Thus, agroecology is abundant, but insecure. To increase the security of the investments farmers are currently making, we need to invest in coproduction of knowledge, especially its transfer and promulgation by the universities in the area, grassroots responsible governance, and recycling.

### *Co-Production and sharing of knowledge*

Agroecology and peasant farming are knowledge intensive. The process of coproducing knowledge with their peers and specific conditions of their land is influenced by their creativity and experimentation that is enabled by their small-scale and autonomy. Furthermore, the farmers utilizing these practices tend to be younger which leads to greater adaptability and less ingrained practices passed on from generational operations (Fernandez et al., 2012; Laforge & Levkoe, 2018). This steep learning curve is currently being surmounted by small peer networks and training from an expensive MSU organic training program. Their small informal networks are formed at this MSU training as well as hyperlocal intern programs (e.g., Tantre farm and Tillian farm incubator), and at farmers markets and social gatherings hosted by farms (Farmer Beer nights). This keeps small-scale diversified farmers rather isolated from older conventional farmers as others have found to be true (Currier & Robinson, 2018).

We need to ensure the term agroecology is not co-opted and that we can continue to grow a transferable body of knowledge for beginning small-scale farmers. This can be done through the democratic, grassroots coproduction of agroecological knowledge. The first step to this is increasing education using agroecological principles. Since farmers receive educational support from MSU, Argus, TLD, DPFLI, and the AIHFS, these farm support actors in addition to all the local universities need to teach agroecology. This will help farmers start to operationalize the term and use it when co-producing knowledge with their peers and realize the political potential of working together and preserving knowledge in a more structured way for new farmers (Fernandez et al., 2012). Furthermore, there is potential for consumers to support this co-production since the pandemic has heightened consumer awareness around food production. Given the confluence of research coming out of Wayne State, the University of Michigan and Michigan State University, there is great potential for decreasing this knowledge intensive barrier for beginning farmers.

The University of Michigan has the responsibility and opportunity to be a leader in best on this front which starts with decoupling schools like the School for Environment and Sustainability from agribusiness interests. Beyond this, partnerships with universities outside the elite Ann Arbor bubble and expansion of ongoing sustainable food systems education needs to occur. Given the more conventional agricultural support provided by Michigan State University, University of Michigan could partner with them and compliment their research happening in more rural areas and at the DPFI to bridge the rural and the urban and the Black and the White farming communities from Ann Arbor to Detroit. The DPFLI presents an ideal model for education and research on agroecological farming while providing food for the surrounding community in Detroit while the University of Michigan Campus farm is also making inroads to educate, conduct research, and function as a working farm. These multifunctional spaces should be used to expand agroecology as both a practice and science. Just as farm support actors with previous experience in knowledge felt it helped them better serve their farmers, students have to step outside the classroom to avoid prescribing technocratic solutions that miss the complexity needed for uncorrupted agroecology. The Sustainable Food System Initiatives summer intern program and employment and volunteer opportunities at the campus are hands-on opportunities provided to students, but are limited by funding, transportation, and awareness. These ongoing programs need to be invested in and expanded to reach more students.

Highlighting success stories and conducting research with small-scale agroecological farmers will ensure agroecology is not co-opted by agribusiness. Since farmers do not have succession plans, continuation of the knowledge and complex systems they have invested so much time, energy, and resources into, is not currently guaranteed either. The data revealed that agroecology in southeast Michigan could be bolstered through formal networks to help farmers transfer all of this investment. This investment by the University of Michigan will not likely occur without bottom-up pressure from the farm support actors that contribute significantly to the community and who believe in agroecology. Thus, these small business, c-corps and nonprofits must pressure the larger universities in the region to support these efforts. There needs to be growth of farms support actor positions at the organizations mentioned here and many more to take on more labor of farmers primarily through education (based off knowledge they coproduce with farmers) and marketing.

### *Responsible governance*

With the pandemic, food became a national security concern that perpetuated scarcity narratives, leading to hoarding, mandates for COVID hotspots, slaughterhouses, to remain open, and bailouts to agribusiness (Loker & Francis, 2020). Food industry workers including farmworkers and those in our meat processing industry were treated as collateral, with massive COVID outbreaks, worker deaths, and backlogged processing that resulted in animals lives being wasted and crops being left to spoil in the field (Lussenhop, 2020; Montenegro de Wit, 2020). This has led to a growing concern over how our food system is governed, with a push for grassroots initiatives. Responsible governance must focus on local policy supports and cooperative governance, which is especially true for these small-scale farmers that do not find much support in federal programs.

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### Local Policy Supports

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As called for by the AIHFS representative, policy councils such as Detroit Food Policy Council and the Washtenaw Food Policy Council must be given more ‘teeth’ and agroecology must be operationalized in the policy space. Other studies have also found the ability of agroecology to influence policy to be weak due to its complexity and ongoing development, but that local policy councils can be influential (Fernandez et al., 2012; Putnam et al., 2014). Through city and county policy, the agricultural landscape has to be desegregated, increasing BIPOC farmer access to land and markets. As more farmers gain access to land they run into other issues, notably farmers need more control over their production and help developing mid-sized markets.

Currently, in Ann Arbor, their strong food culture, but not-in-my-backyard (NIMBY) sentiments have limited integration of urban agroecological measures. For instance there is large demand for small meat processing facility in Ann Arbor by farmers, but staunch resistance by residents. As with farmland, there has been a rapid consolidation of meat processing facilities in the US, and these large scale slaughterhouses are both far away and provide lower quality processing (Montenegro de Wit, 2020). Similarly, the Greenbelt program successfully prevents development of green parcels, including farmland in advancing agroecology outside city limits, but predominantly conserves large contiguous parcels *outside* the city, preventing urban agroecology from taking hold in Ann Arbor. I propose that rather than agricultural land be conserved as a part of a larger conservation goal, food sovereignty for urban citizens must be seen as a prerequisite for stewarding lands and conservation in urban areas (Halvey et al., 2020; Loker & Francis, 2020). This builds upon the 2019 strategic planning for the Greenbelt, that the program should help farmers acquire land instead of only supporting land already in farming (Ryan Stanton, 2021; The Conservation Fund, 2019). In addition, this program should preferentially select agroecologically farmed land run by BIPOC farmers, regardless of size of the parcels. Though some Black farmers are selling in Ann Arbor, the inordinate price of land results in Black farmers feeling like they will “never be able to own land in Ann Arbor” as Jesse Raudenbush of Starr Valley Farms says of his current rental situation (VanRenterghem & Collins, 2021).

As farmers hoping to make land access more equitable are already on food policy councils, the city should work directly with these councils to identify farmers and parcels for acquisition and seek advice from the Detroit Food Policy Council and Keep Growing Detroit that have increased green space in Detroit and prioritized a thriving citizenry that will steward their green spaces. In conjunction with the expansion of agricultural research and education sites like DPFLI, the

Campus Farm, and Tillian farm incubator should probe students and residents to reinvasion an urban agroecological landscape that will deter nimbyism. MIFFS should reinvest its resources into this community, serving as facilitator between farmers and city officials as local policy councils become more engaged around urban agroecology.

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## Cooperatives

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Cooperatives have complex organizational structures and different outcomes depending on the purpose of formation. For instance, many conventional farmers form cooperatives for economic benefits, but find the complexity of cooperative discussions stressful (Liang et al., 2021). Cooperatives were most limited by perceptions of cooperative farming requiring labor intensive communication and relics of conventional agricultural wisdom that individualism leads to success. Though partner labor was central to their success, this was limited by farmers' inability to afford hiring wage labor, not evidence of peasant values about participating in the market economy more explicitly through hiring of wage laborers.

There are many informal collaborative efforts in southeast Michigan including Washtenaw Organic Collaborative, Green Things Collective, and collaborative CSAs through St. Joes, Tantre, White Lotus, and Fisheye Farm. All measures for increased *cooperative* governance should be modeled off of the successes of grassroots initiatives in Detroit and continue to localize policy responses. For instance, the Black Farmer Land Fund, started in partnership between Keep Growing Detroit, Oakland Avenue, and Detroit Black Community Food Security Network (DBCFSN) is making significant strides toward food sovereignty. Though Keep Growing Detroit is still reliant primarily on grant funding, 87% still goes directly back into their programming which provides supplies for nearly two thousand gardens and direct support to nearly 30 farmers (*Keep Growing Detroit Annual Report, 2020*). It was the local networks of Food Gatherers, farmers, and direct to consumer services (i.e., Argus, farmers markets, and Indigenous Food Sovereignty Alliance) that facilitated these programs and helped the community through the pandemic, adapting operations and increasing delivery services to immunocompromised and elderly individuals.

Cooperatives could also allow local farmers to combine efforts and provide food to larger institutions since there are not many mid-sized farms in the region at present. The need for mid-sized operations has been noted in Michigan and the 10 Cents a Meal program is one incentivizing mechanism for this market expansion, but could go further to incentivize agroecological production and equity (Abatekassa et al., 2010; Matts et al., 2016). The 10 Cents a Meal program provides matching grants to school districts to purchase local produce, not necessarily sustainably produced. This is utilized by 40+ school districts in southeast Michigan, but it is up to the farmer to develop these relationships, which could be easier with more farmers involved in the operation. The University of Michigan has a large opportunity and responsibility to work on this issue given their resources and economic impact in Ann Arbor. As the largest employer in Washtenaw County, farmers serving this institution would have a significant, stable source of income. There is also demand from socially conscious students and staff at the University that have been deploying studies and pilot project for more local, sustainable food procurement. This could also help to democratize knowledge as well if research was conducted in tandem with farmers supplying the produce.

Lastly, fostering cooperatives could increase equity in the marketplace. For instance, farmers markets should allow reselling of produce and stand collaborations. This would allow farmers who do not currently produce enough to operate a stand throughout the whole day, hopefully leading to smaller, BIPOC farmers to get a foothold in the seniority dominated farmers market spaces. This could lead to less white farmer market spaces (Alkon & McCullen, 2011; Slocum, 2008). Though some products may be inferior, reselling notably impacts the culture of a market and the consumers and farmers served. This is practiced at the Eastern market, serving a much more diverse customer base, as one farmer noted who sells their produce there. From other studies in Michigan and Iowa, it is clear that location of markets can significantly impact farmers' revenue and the economic impact of the market (Morckel, 2018).

### *Recycling*

Farmers were well aware of the pesticide-treadmill and the role of nontoxic organic pesticides in this global pesticide complex (Shattuck, 2021). I see this being a source of positive deviation from other recycling efforts and think farmers are moving away from this input despite its labor intensity as farmers primarily use physical barriers and hand pick off pests. Due to the poor soil quality and years of farming being short-lived so far, farmers are still investing a lot in soil quality and will for the foreseeable future. Farmers purchase a lot of compost from off-farm, but still source it locally. Thus, this is not of great concern in the immediate future, rather, seed sourcing was a concern of many farmers, but remains underinvested in.

Currently, farmers are not saving seeds due the large labor input required, largely relying on hybrids that are not as viable when saved. This mirrors other studies that have found seed saving to be motivated by personal use, not consumer demand and is most limited by the labor involved and slow rate of turnover for seeds to dry out and be harvested (Brouwer et al., 2016). Nature and Nurture and another company used by these farmers, High Mowing Seed, are a part of the Open Source Seed Initiative (OSSI), a commons created by plant breeders, seed companies, and growers that pledge to keep varieties in their commons free from patents and available to the public (Montenegro de Wit, 2019). Farmers are not currently purchasing from these commons itself, most likely due to a lack of trust in the overall quality, familiarity, and convenience.

Four agrochemical corporations (Bayer, Corteva Agriscience, Syngenta and BASF) own a majority of the global proprietary seed market (63 percent) and pesticide market (70 percent), keeping farmers on a seed-pesticide-fertilizer treadmill (Kumbamu, 2020; Montenegro de Wit, 2019). Companies can patent seed varieties, developed over many years by communities (i.e., biopiracy), and then turn around and criminalize these same communities for saving seed or growing varieties with the same genes as their proprietary seeds (Montenegro de Wit, 2019; Shiva, 2016). Thus, it is not just the genetic material that is stolen, but the knowledge and labor of the producer communities. This makes the lack of concern over seed disheartening. Community led commoning contests the tragedy of the commons narrative and biopiracy of agribusiness and should become a larger part of the local food movement in Ann Arbor. I suggest a regional seed commons produced by and for growers in southeast Michigan to ensure it considers the farmers' needs and preferences (Nyantakyi-Frimpong, 2019). Seed saving and the creation of a trusted commons still hinges upon farmers seeing their seed supply as threatened and the urgency to keep genetic material public. Thus, more education on the harms of privatized

genetic material should be provided by farm support actors. Argus is already hosting workshops run by these local seed companies, the Michigan Family Farm Conference could facilitate this as well as programming by DPFLI, the AIHFS. Since what is grown by farmers is negotiated through a back and forth with consumers and farmers, this education should be coupled with increased outreach and awareness around the importance of heirloom varieties, seed saving, and perennial crops to consumers so they will demand it (Brouwer et al., 2016; Morgan & Trubek, 2020).

### Conclusions

Southeast Michigan is a proving ground for what principles of agroecology are able to emerge in our current food system. There is much room for growth, notably through securing coproduction and sharing of knowledge among farmers, institutions, and farm support actors so that knowledge is not lost between generations. Operationalizing agroecology to include all of its sociopolitical as well as ecological elements is necessary to avoid cooptation as well as build deeper alliances between urban and rural farmers as agroecologists and peasants strive to make a living while healing the metabolic rift that currently exists. Other areas that need attention include responsible cooperative governance and internalization of recycling processes. Farmers are not very peasant-like presently given their complicated relationships to outside markets for inputs and labor as well as lack of patrimony. However, their desire to reduce costs, increase efficiency, and work alongside nature as well as openness to collaboration offer hope that they will not become entrepreneurial. Ecological components of agroecology are being practiced by farmers on their own, but the sociopolitical elements of agroecology need to be supported by farm support actors and consumers in order for the movement to. This will allow the southeast region of Michigan to move closer to food sovereignty.

### Limitations and future directions

My results were limited by the sample size and lack of diversity in the interview pool. Thus, these results cannot be ascribed to the rest of small-scale farmers or other farm support actors in southeast Michigan. Rather, findings here provide a foundation for further investigation in the region and small-scale farms in agroecological agricultural communities in the US. Though culture and food traditions were insignificant in this study, this is likely driven by the small, predominantly white sample. As an introspective investigation, this research probes primarily white female farmers as to how they are adopting these practices and thus incomplete. Further studies should look at how Native farmers are scaling out agroecology as well.

### Disclosure statement

No potential conflict of interest was reported by the author.

## Appendices

### *Appendix A: Agroecology principles (AP), the corresponding interview questions and farm practice indices assessed.*

Farm practice indices are evaluated on a 0 – 1 scale in parenthesis following each indicator. Indices are evaluated with each measurement receiving a portion of the total possible.

AP	Questions/Prompts	Farm practice Indices
Diversity	<p>Tell me about your process for choosing how to plant (e.g., companion planting, raised beds, intercropping)</p> <p>Tell me about your process for choosing what to plant/raise</p> <ul style="list-style-type: none"> <li>● How many crops do you grow or breeds do you raise? Why these varieties?</li> <li>● Do you use heirloom seeds? Seed save?</li> </ul>	<p>Spatial, temporal, structural, and genetic diversity (each worth 0.200)</p> <ul style="list-style-type: none"> <li>● Has agroforestry and perennial shrubs</li> <li>● Has flowers growing on property</li> <li>● Practices intercropping and crop rotation</li> <li>● Grows 50+ crop types or 200+ varieties of less crops</li> <li>● Grows predominantly heirlooms and heritage breeds/seeds (not reliant on hybrids)</li> </ul>
Recycling	<p>Where do you source your seeds?</p> <p>What amendments do you use?</p> <p>What have you learned through observation? (e.g., what plants grow well together)</p>	<p>Recycling (each worth 0.200)</p> <ul style="list-style-type: none"> <li>● Doesn't purchase compost</li> <li>● Does not purchase seeds,</li> <li>● Does not purchase synthetic pesticides</li> <li>● Does not purchase pollinators</li> <li>● Creative repurposing of materials</li> </ul>



Resilience	<p>Economic resilience  Do you have value added products?  Does your farm have any other functions besides selling food? Tours, research, training, woofing/tenants? Do they provide revenue directly or indirectly?  Other sources of income?  How has COVID affected your farming as a business?  Ecological resilience (see Diversity)  Tell me about your process for choosing how to manage pests (e.g., Have you or do you use pesticides?)</p>	<p>Economic resilience (each worth 0.200)</p> <ul style="list-style-type: none"> <li>● Offers value-added products and/or cut flowers</li> <li>● Uses hoop house to extend the season</li> <li>● Has multiple jobs (Pluriactivity within entire farming family, not isolated to farmer interviewed)</li> <li>● Has other income from land besides selling produce</li> <li>● Has online ordering and/or delivery</li> </ul> <p>Ecological resilience (each worth 0.20)</p> <ul style="list-style-type: none"> <li>● Has agroforestry</li> <li>● Has mixed animal/crop systems</li> <li>● Practices no-till and organic soil management</li> <li>● Manages wildlife habitat on their property (forest, prairie, and/or wetland)</li> <li>● Adapts what and where crops are grown according to site-specific qualities of the land; overplanting for herbivory</li> </ul>
Efficiency	<p>Work efficiency  Do you feel any competition? Need for more small farmers? Pressure to scale up in intensity or area  Do you want to change your practices in any particular way? If so, why?  How has your labor changed over time?  Subsistence  Is the majority (&gt;50%) of what you consume coming from your own farm? Where is your other food coming from?  Health  Do you feel stressed often?  Do you have physical pain from the work?</p>	<p>Work efficiency (each worth 0.250)</p> <ul style="list-style-type: none"> <li>● Increasing number of customers or amount of production each year while not expanding acreage under production or employees hired</li> <li>● Small plot intensive production, hand tool scale without big machinery and not attempting to change that</li> <li>● Obtains 50+ percent of food from farm</li> <li>● Experience net benefits to mental and physical health from farming</li> <li>● Adapting farm to meet health concerns by investing in perennials and ergonomic technology</li> </ul>

Synergy	<p>See ‘Diversity’ and ‘Coproductioin with Nature’ under ‘Resilience’</p> <p>Have you noticed bees or wildlife on your property? If so, where do they concentrate?</p> <p>What practices do you use to manage ecosystem services?</p> <p>Do you share resources with other farmers?</p> <p>How do you work with your partner and negotiate who does what?</p>	<p>Synergy on and between farms (each worth 0.20)</p> <ul style="list-style-type: none"> <li>● Native pollinator habitat planted and seen on farm</li> <li>● Practices companion planting and physical barriers for pest suppression</li> <li>● Using waste products and weeds on farm for other things</li> <li>● Synchronizes work with partner to maximize use of time and skills</li> <li>● Coordinates with other farmers for resources</li> </ul>
Co-production and sharing of knowledge	<p>What are your sources of information that inform your practices?</p> <p>How do you share your knowledge currently?</p>	<p>Knowledge acquisition and sharing (each worth 0.25)</p> <ul style="list-style-type: none"> <li>● Diversified sources of knowledge from peers’ sources (Internet community, books by farmers, informal conversations with peers)</li> <li>● Not relying on a few sources of knowledge with conventional agriculture influence (MSU training programs, conferences, seed catalogs) in addition to peers</li> <li>● Actively sharing knowledge through workshops, newsletters, farmers markets, social media</li> <li>● Passively sharing knowledge through newsletters and farmers markets</li> </ul>
Culture & Food Traditions	<p>Family Connections</p> <p>Why did you get into farming?</p> <p>What would you say are your primary motivations to farm?</p> <p>Temporal Change</p> <p>Do you feel the type of farming you are doing is an anomaly? Do we need more farmers like yourself or something else?</p> <p>What is your vision for the future of your farm (retirement, next generation, vision for land)?</p> <p>Non-material benefits</p> <p>Are there any cultural ties to what you grow?</p>	<p>Family Connections and non-material benefits (0.25)</p> <ul style="list-style-type: none"> <li>● Continuing alternative agriculture—second generation</li> <li>● Connection to alternative agriculture in family</li> <li>● Growing foods, they feel cultural connection to</li> <li>● Growing foods to serve diverse cultures other than their own</li> </ul>

Human and social values	<p>What have you learned on your own through observation and experimentation?  Were you able to adapt to COVID and how did you do this?  Have you had to overcome any negative perceptions of farming?  Have you ever felt discriminated against?  Creating well-being for self (scale of 0 – 100) based off of post interview survey</p>	<p>Social value (each worth 0.250)</p> <ul style="list-style-type: none"> <li>● Craftsmanship, very particular about quality of product going out to market</li> <li>● Does not deal with sexism, racism, or exclusion for their type of farming</li> <li>● Autonomy to be flexible, adapt, creativity</li> <li>● Derives great value and pride from the work, way of life, and feeding people</li> </ul>
Solidarity Economy	<p>Where do you sell your products?   How do we make local, organic foods affordable for a larger part of the population and the segment that needs health benefits?</p>	<p>Local markets and is connected to community (each worth 0.250)</p> <ul style="list-style-type: none"> <li>● Participates in bartering with community for food</li> <li>● Donates food</li> <li>● All markets are hyperlocal</li> <li>● Supporting other farmers to get their start (land share, jobs)</li> </ul>
Responsible Governance	<p>Financial Stability  Is the land owned? How did you acquire this land?  How did you finance the start of your farm?  Cooperatives  Have you thought about a cooperative style of farming?  Politics and Land Access  Do you consider your work political? Do you have any particular policies you are advocating for?  Do you have geographic challenges where your farm is situated?  Do you have ecological challenges where your farm is situated?</p>	<p>Financial Stability and Political involvement (each worth 0.20)</p> <ul style="list-style-type: none"> <li>● Does not rent land or plan on acquiring more</li> <li>● Is not growing beyond their current capacity</li> <li>● Participating in local policy advocacy</li> <li>● Part of a joint CSA</li> <li>● Part of a formal cooperative</li> </ul>

## *Appendix B: Post-Interview Survey*

- What email would you like me to send the research results to?
- How was your experience participating in this research in terms of how convenient it was to participate, your level of comfort, and how useful you think this experience was to you as a farmer?
- Please provide feedback on how I might improve my methods and the overall research experience for participants
- Are you still interested in me conducting a native bee diversity survey in the spring at your farm?
  - If so, what will be in bloom and when?
- Do you have anything you hope to learn from my analysis of interviews with fellow small-scale farmers? If you have any research questions that would help your work in any way please let me know here.
- What address can I send your gift-card for participation to?
- What is your net income on average (can be an approximation/estimation)?
- How would you rate your overall quality of life (satisfaction, sense of purpose, and emotional state)?

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