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Hard Row to Hoe: Perspectives on Sustainable Agricultural Policy in Illinois

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Abstract

The dramatic transformation of agriculture during the 20th and early 21st centuries has resulted in perceived competition regarding the future of agriculture between conventional and sustainable views. In reality, many farmers engage in both types of agriculture. Through an investigation of farmer perceptions of agricultural practices and policy, this study seeks to understand the state of sustainable agriculture in Illinois. In this study, I strive to answer two questions. What motivates Illinois farmers to engage in sustainable agricultural practices, and what barriers exist to implementing said practices? Secondly, how can the Illinois government support farmers' use of sustainable agricultural practices? By researching these questions, I seek to inform future sustainable agricultural policy in Illinois.

Through the analysis of eleven interviews with Illinois farmers and agricultural experts, I find a wide range of motivations and constraints to implementing or expanding the use of sustainable practices. Considering these factors, I suggest the following policies to facilitate the transition and expansion of sustainable agriculture in Illinois: (1) direct extension service research toward local research on sustainable practices, (2) expand and simplify governmental outreach regarding sustainable agricultural programs, (3) revise crop insurance “good farming practices” to include sustainable methods, and (4) stabilize the agricultural labor force with increased pathways to residency and citizenship for undocumented farmworkers.

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Introduction

In the 12,000 years since the development of agriculture by humans, no century produced a transformation of agricultural practices equal to that of the 20th century. From 1900 to 2000, the US agricultural industry transformed completely, evolving from primarily small-scale, isolated family farms to industrial factory farms that compete in a global marketplace (USDA, 2017). Today, American agriculture faces existential threats from climate change, increasingly extreme weather, and encroaching urban development (Blank, 2002). Meanwhile, dramatic advances in technological innovations in agriculture and the means to distribute them widely to farmers offer hope for the future of agriculture.

Though considered a niche field by some, agricultural policy changes have the potential for significant environmental impacts due to the scope of farmland in America. In Illinois specifically, farmers and ranchers make up just 1.8% of the working population, yet they control just under three-quarters of the state's land, as shown in Figure 1 (USDA, 2017). While it is difficult to mandate what farmers do on their private land, there is considerable room for policy "nudges" to encourage farmers to make more environmentally conscious choices (Loewenstein & Chater, 2017). Because farmers control 27 million acres of Illinois land (USDA, 2017), the impacts of agricultural policies can have far-reaching effects. They thus must be carefully considered to maximize positive benefits and minimize adverse outcomes.

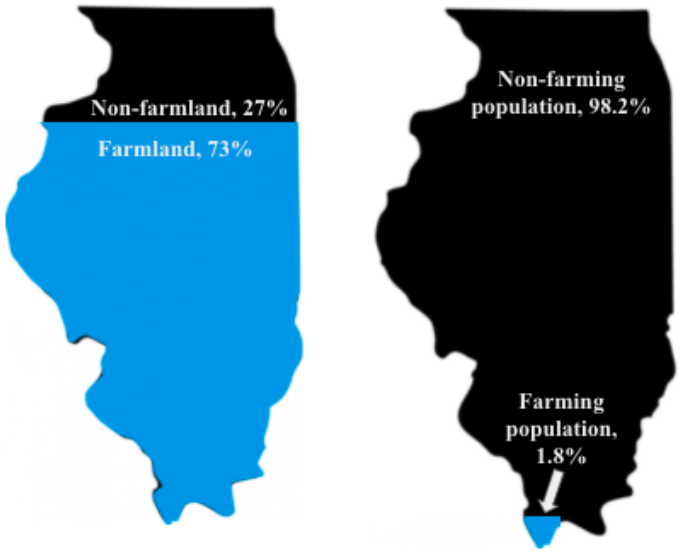

Figure I. Population and Land Use in Illinois (own image).

In this study, I seek to answer two questions. What motivates Illinois farmers to engage in sustainable agricultural practices, and what barriers exist to implementing said practices? Secondly, how can the Illinois government support farmers' use of sustainable agricultural practices? By researching these questions, I seek to inform future sustainable agricultural policy in Illinois.

To this end, I conducted eleven semi-structured phone interviews with a mix of Illinois farmers and agricultural policy experts. The six farmers I spoke with ranged from fully sustainable-certified to conventional commercial farmers, most falling somewhere in the middle. The five policy experts were personally involved in implementing Illinois sustainability laws. Based on these interviews, I developed the following findings.

Interview participants cited a wide range of motivations and constraints to implementing or expanding the use of sustainable practices. Participants' primary motivations included improved soil health, climate change resilience and mitigation, and ethical considerations.

Understanding these factors can help policymakers and other stakeholders better incentivize sustainable methods based on what is most likely to motivate farmers to introduce or expand their use of sustainable practices. Additionally, I sorted concerns listed by participants into three main categories: Financial barriers of scale, lack of information, and concerns regarding risk and research. Addressing these concerns is critical to expanding the use of sustainable agriculture in Illinois. Based on these findings, I recommend sustainable extension research, expanded program outreach, crop insurance requirements, and stabilizing farm labor to inform future sustainable agriculture legislation.

Background

It is essential to acknowledge that no one person "invented" sustainable agriculture. Instead, it is a series of practices, many of which belong to indigenous people who receive no compensation for their use. For instance, the Iroquois and other indigenous cultures in the US Northeast practiced companion planting, in which two or more crops are grown in the same field. This practice has widely recognized pest control benefits, yet current literature rarely cites its indigenous roots (Brush & Stabinsky, 1996). When applicable, future research should recognize these origins and consider that agriculture is not an isolated science or profession but is highly impacted by broader social and cultural factors.

The origins of the study of sustainable agriculture, in the Western sense, began approximately with King in 1911 and his observation of traditional agricultural techniques in Asia. He is also widely considered the father of soil physics, which studies the interactions of soil components and is a central topic in sustainable agriculture (Baver, 1948). King's research inspired Howard (1943), who was the first to introduce the term "organic farming." Based on his

observational studies in India, Howard focused on soil health as the building block of food production. From the beginnings of the Western study of sustainable agriculture, soil health has emerged as a core focus of research and innovation.

Following these discoveries, Rodale (1947) and Balfour (1948) popularized Howard's ideas by putting sustainable agricultural practices to use in the US and England, respectively. Both capitalized on nitrogen shortages, a conventional fertilizer, during World War II to promote alternative forms of soil enrichment, particularly composting (Gill, 2010). Through the middle of the 20th century, scientific developments alerted the scientific community to the ecological damage of some widespread agricultural practices. However, conventional agriculture remained the norm as many believed conventional agriculture was the only way to produce sufficient crop yields to feed the growing world population.

This perception began to change in 1962, when biologist Rachel Carson published *Silent Spring*, bringing the effects of pesticides to national attention and resulting in national and international legislation. Carson's work received immense backlash from the agricultural industry, especially DuPont, a prominent manufacturer of the highly toxic pesticide DDT (Lear, 1997). However, *Silent Spring* also ignited a national conversation about the effects of pesticides and pressured government regulators to look more carefully at conventional agricultural practices. By the 1980s, organic agriculture was becoming mainstream. The federal government in the United States has legally supported organic agriculture since the Federal Organic Foods Production Act of 1990, which established uniform national standards for the production of organic products. In 2002, the USDA introduced its "certified organic" label, enabling consumers to distinguish between conventional and organic products. Since 2008, all federal farm bills have included funding for sustainable agriculture research.

Federal funding for sustainable agricultural research is notable as the style of agriculture promoted by state and federal governments can have broad influence due to agricultural policy's outsized impact on land management practices. While there are as many farming styles as there are farmers, for simplicity's sake, I have classified farming practices as either "conventional" or "sustainable" for the duration of this paper.

Conventional agriculture includes "the use of synthetic chemical fertilizers, pesticides, herbicides… genetically modified organisms, concentrated animal feeding operations, heavy irrigation, intensive tillage, or concentrated monoculture production." (Watkins, 2009). This style of agriculture uses modern technology to produce large quantities of food without particular regard to environmental or long-term impacts.

Meanwhile, the USDA legal definition of sustainable agriculture takes a long-term focus on the intersection of "human food needs… environmental quality… natural biological cycles… and the economic vitality of farm operation" (USDA, 2021). In simpler terms, sustainable agriculture seeks to balance economic and environmental effects for a style of agriculture that benefits both humans and the surrounding environment. In the US, most sustainable agriculture operations are small-scale and family-run. Unfortunately, there is no exact data for sustainable agriculture's market share due to the lack of a widespread sustainable certification. However, conventional agriculture remains the norm.

Realistically, conventional agriculture is unlikely to become obsolete anytime soon. However, targeted policies incentivizing sustainable practices could play a prominent role in combating climate change, an existential threat to many farmers. Recent research indicates that implementing sustainable agricultural practices could draw down more than 100% of global CO2 emissions (Moyer, Smith, Rui, & Hayden, 2020). Climate change mitigation benefits society by

limiting the catastrophic effects of uninhibited climate change. Additionally, previous research has established that sustainable agricultural practices can benefit farmers directly by encouraging soil health and increasing yields and profitability (Rhodes, 2017; LaCanne & Lundgren, 2018; Francis, 2009).

Soil health, yields, and profitability are of local importance to Illinois farmers and policymakers. Illinois is known for some of the most fertile soil globally, created by tens of thousands of years of glacial activity (Frye, Willman, & Black, 2015). Due to the millennia required to generate just an inch of topsoil, topsoil is considered a non-renewable resource (McDonald, 2019). Unfortunately, conventional farming practices are not conducive to soil health, leading to concerns about the future of food production if significant changes are not made (Conti, 2015). Conventional farming practices such as monocropping quickly deplete the soil, requiring substantial inputs of synthetic fertilizers to maintain yields. Additionally, drought and floods exacerbated by climate change increasingly threaten Illinois' temperate climate (Cai, Wang, & Laurent, 2009). In 2019, extreme flooding in Illinois delayed the planting of spring crops and caused the US Department of Agriculture to declare an agricultural disaster. Extreme weather events are expected to become more frequent and severe if climate change continues unabated (Goldblum, 2013).

With these pressing issues at hand, Governor Jim Edgar (R) introduced the "Conservation 2000" plan in his 1994-95 budget proposal. Once passed in the 1995 legislative session, the six-year, $100 million program encompassed a range of conservation projects under the joint purview of the Illinois Department of Natural Resources and the Illinois Department of Agriculture. The Illinois Department of Agriculture was responsible for the sustainable agriculture elements of the program, a responsibility which was delegated through the creation of

the Illinois Sustainable Agriculture Committee. The Illinois Sustainable Agriculture Committee was responsible for distributing the R.J. Vollmer Sustainable Ag Farmer Award to recognize farmers making notable contributions to sustainable agriculture in Illinois. The committee last presented the award in 2018. It is unclear why the award has been suspended.

Of more significance to this study, the Illinois Sustainable Agriculture Committee managed the Illinois Sustainable Agriculture Grant Program, established in 1996 through the Conservation 2000 funds. According to the Illinois Sustainable Agriculture Committee, "grants are competitive and may be used to fund on-farm research and demonstrations, outreach and education programs, and studies of integrated farming systems" (Illinois Department of Agriculture, 2000). Individuals were eligible for grants of up to $10,000, while governmental units, non-profit groups, institutions, and organizations qualified for awards of up to $20,000. While the number of grants available varied by year, it peaked at $750,000 available in 2000 (Paragraph Staff, 2000). Although the Illinois legislature has repeatedly renewed the Conservation 2000 program under the revised name Partners for Conservation, the Illinois Sustainable Agriculture Grant Program has not received funding since 2016 (Gregory, 2022).

In this study, I seek to take a contemporary look at the state of sustainable agriculture in Illinois. What motivates Illinois farmers to engage in sustainable agricultural practices, and what barriers exist to farmers implementing said practices? Secondly, how can the Illinois government support farmers' use of sustainable agricultural practices? By researching these questions, I seek to inform future sustainable agricultural policy in Illinois.

Despite potential sources of sampling bias (discussed in greater detail in the "Methods" section), the interview sample of this study accurately mirrors Illinois farmer demographics, with the exception of geographic distribution. This study adds to the current literature by developing a

thorough understanding of the grassroots beliefs of farmers, which is essential to expanding the use of sustainable agricultural practices in Illinois and nationwide. Unfortunately, this study faced limitations due to the small sample size and concentration on one program in one state. This limits the generalizability of these results but will hopefully inspire further research on the subject.

Literature Review

Theoretical Framework

Globally, there has been a massive transformation in agricultural technology during the last two centuries, with agricultural technology broadly encompassing knowledge, tools, chemicals, and biological organisms. Developments in transportation, communication, storage, and information processing, while not strictly agricultural, have been equally influential in changing the field. For instance, the introduction of refrigerated transportation systems in the 1940s dramatically expanded American access to fresh fruits and vegetables at all times of the year. Similarly, the advent of the internet has allowed farmers across the country to access information quickly and broadly.

Perhaps the most significant change has been restructuring food systems from hyperlocal subsistence family farming with minimal commercial contact to a globalized, industrial, and highly complex economic system. Grigg (2019) pays special attention to such transformations in Europe and North America, while Laborde, Lallemant, McDougal, Smaller, & Traore (2017) focus on similar topics in Asia and Africa. Both note that these transformations have prevented starvation and malnutrition for millions of people while simultaneously introducing new

challenges. While there is little dispute on the radical shifts of the past few centuries, the future of agriculture is less established. Lang and Heasman (2004) created an essential framework for perspectives on the future of agriculture, which I use to ground my study in theory. This section focuses on the conflict between two main perspectives on the future of agriculture - the productionist and the ecologically integrated paradigms.

The Productionist Paradigm

Beginning in Mexico in the 1940s, the Green Revolution prioritized "scientific" advancements from Europe and the United States in the place of traditional practices. Characterized by using pesticides, synthetic fertilizers, selective breeding, and reliance on irrigation, the Green Revolution would quickly become a global inspiration for governments in developing countries. Its pioneers, E. C. Stakman, Richard Bradfield, and Paul Mangelsdorf, believed this "modern" agriculture style was the quickest way to feed a rapidly growing global population. (Stakman, Bradfield, & Mengelsdorf, 1967). Green Revolution practices spread worldwide, as rapidly expanding countries including India, China and Brazil struggled to keep millions of people out of starvation.

When techniques such as selective breeding and pesticide use reached their natural limits, scientists in the 1970s developed genetically modified organisms (GMOs) to continue increasing yield. GMOs allow scientists to introduce gene pairings that could not be accomplished through selective breeding, such as introducing fish anti-freeze genes to strawberries to increase crop heartiness again unexpected frosts (Roorda, 2016). GMOs are also commonly used to combat pesticide-resistant pests, as seeds are genetically modified to survive against increasingly intense pesticides (López et al., 2012). Altieri (2004) and Conway (2012) offer a cautiously optimistic view of GMOs and their ability to feed the world. Alternatively, some raise concerns over human

health impacts, GMOs as invasive species, and the fact that GMOs primarily benefit corporate farms (de Vendomôis et al. 2010; Séralini, Mesnage, Defarge, & Spiroux de Vendômois, 2014, von der Lippe and Kowarik 2007; Burgeff, Huerta, Aceveda, & Sarukhán, 2014, Azadi et. al, 2015).

Similar concerns have been raised regarding other tenants of the productionist model, including pesticides, monocropping, irrigation, and synthetic fertilizers. (Rain et al., 2021; Richardson, Fitsanakis, Westerink, & Kanthasamy, 2019; Davydov, Sokolov, Hogland, Glinushkin, & Markaryan, 2018, Li et al., 2018; Sharma et al., 2017; Yigezu et al., 2019, Grafton et al., 2018, Velasco-Muñoz, Aznar-Sánchez, Batlles-de la Fuente, & Fidelibus, 2019, Davis et al., 2015; Crews & Peoples, 2004; Nkoa, 2013). These concerns range from impacts on human health to ecological ripple effects. In this context, the productionist paradigm best represents the theoretical basis of conventional agricultural practices, in which the aim is to feed as many people as efficiently as possible.

The Ecologically Integrated Paradigm

In contrast to the productionist's “full steam ahead” approach, the ecologically integrated paradigm, also known as post-productivism (Robinson, 2008), prioritizes ecological impacts and sustainable development over the sheer quantity of yields. In three fundamental texts to the sustainable agriculture perspective, Altieri (1995), Gliessman (2007), and Vandermeer (2011) contrast conventional agriculture practices with a vision of future agriculture that is based upon crop diversity, conservation, and local markets and with less reliance on financial capital. Wahlqvist, McKay, Chang, & Chiu (2012) claim that the globe cannot obtain food security without action at the local level. This fits nicely into the ecological theory of agriculture paradigm, which maintains that agriculture is firmly rooted at the community level.

Similarly, McIntyre, Herren, Wakhungu, & Watson (2009) argue that the productionist prioritization of total yield fails to address communities' social and environmental needs. Contrastingly, the ecologically integrated paradigm considers it appropriate to sacrifice total yield if other elements of community well-being are being negatively impacted. Early work from Fox & Brown (1998) chronicles attempts to shift the World Bank from a productionist to an ecological perspective, considering environmental and population concerns when funding large-scale projects. World Bank loans are a principal source of capital for farmers across the world, and thus the projects they choose to invest in can have a global impact. The ecologically integrated paradigm is the theoretical framework behind the sustainable farming practices researched in this study.

Farmer Choice Framework

While the literature on agricultural development theory is well established, as is literature on the differences between conventional and sustainable agriculture, there is less focus at the individual farmer level on how and why food producers choose their production method. Some literature exists at the theoretical level, with Keeley, Wolz, & Adams (2019) exploring how cooperation between stakeholders can bolster support for agroforestry. Other studies, such as Mattia, Lovell, & Davis (2016) and Glover, Ahmed, & Glover (2013), seek to identify socio-economic and demographic characteristics related to the likelihood of farmers implementing sustainable agricultural practices. However, they do not focus on the policy implications or how governmental actors could influence such factors. Stanek & Lovell (2020) and Valdivia & Gold (2012) identified a lack of knowledge and expertise as critical barriers to the implementation of agroforestry among Illinois and Canadian farmers. These are

individual-level barriers that I explore further in the “Findings and Analysis” section of this study.

Unlike previous studies, which situate themselves within either the productionist or the ecologically integrated paradigm, my approach seeks to understand how farmers sort into paradigms and what may influence them to change directions. The literature is well established regarding sustainable agriculture's practices, efficacy, and challenges. However, there is less focus on implementing such practices and governmental influence. This study adds to the current literature by informing how governmental actors can influence the implementation of sustainable agricultural practices in the US. Additionally, previous literature has been either primarily quantitative or theoretical. However, in the practical application of policy research, the qualitative opinions of farmers are critical to this discussion. This study hopes to analyze and amplify these qualitative opinions to inform future policy.

Previous Research

Several experiments on sustainable farming production are notable for their long duration or structure. Since 1873, Rothamsted Research, an English non-profit, has conducted some of the world’s longest-running experiments in agriculture, with a particular focus on the efficacy of sustainable practices. They provide valuable insight into the long-term effects of sustainable practices on soil health and crop production, and several of their experiments have collected over 170 years of data. Similarly, the University of Illinois has farmed the experimental Morrow plots since 1904, focusing on maximizing the positive effects of crop rotation. Their results routinely prove that crop rotation can more than double the yield of a plot (Delate, Cambarella, Chase, &

Turnbull, 2015). However, both the Rothamsted and Morrow plots are limited in their application because they are observational with no control group.

An experimental counterpart to these plots is the Farming Systems Trial from the Rodale Institute, a 40-year side-by-side study between conventional and organic systems. The Rodale Institute is considered a leading source of sustainable agricultural practices, and its research suggests that organic methods can match or surpass the yields produced by conventional farms (LaSalle & Hepperly, 2006; Pimentel & Burgess, 2014). However, the Rodale Institute is an organization dedicated to the promotion of organic and sustainable farming. Thus, one should not rely solely on their results for proof of efficacy as they may be biased in favor of positive outcomes from sustainable practices.

In combination with observational and controlled experiments, natural experiments can provide insight into the unanticipated effects of real-world policy implementation. A real-life experiment in sustainable agricultural practices occurred in the 1990s. After the fall of the Soviet Union, the cost of oil and agricultural chemicals skyrocketed. The Cuban government was highly dependent on the USSR for imports and declared a national move away from fossil fuels to manage the shortage. During this time, Cuba developed the first federal program in organic agriculture, greatly expanding organic practices nationally by promoting fossil fuel reduction, pest management systems, and urban agriculture. However, the availability of new fuel sources resulted in a return to conventional agriculture, and today Cuba remains highly reliant on conventional practices (Altieri & Funes-Monzote, 2012; Avery, 2009; Funes, García, Bourque, Pérez, & Rosset, 2002).

Conventional approaches, including monocropping and heavy pesticide use, tend to be destructive to the soil microbiome. Once considered a lifeless medium, soil health is now

recognized as one of the leading factors in crop yield and quality (Wall, 2012; Foley et al., 2005) and teaming with microorganisms essential to agricultural production (Cheeke, Coleman, & Wall, 2013; Paul, 2015). With research now recognizing the importance of soil quality, numerous studies and articles are producing alternative strategies for soil management, emphasizing minimizing the use of chemical pesticides and synthetic fertilizers (Diemont et al., 2006; Hamilton, Doll, & Robertson, 2015; Sullivan, 2014). These substances damage the soil microbiome by killing organisms known to contribute to soil health. They also skew soil's natural balance, requiring constant synthetic inputs to maintain crop production. Unhealthy soil can exacerbate other farming challenges, including drought.

Due to the increasing threat of drought as climate change intensifies, emerging literature seeks to advise farmers on making their land more resilient to drought, often through sustainable agricultural practices such as agroforestry, cover crops, and increased biodiversity (Rapidel, DeClerk, Le Coq, & Beer, 2011; Mishra, Bruno, & Zilberman, 2021). Similarly, recent periods of drought in the West and Midwest have encouraged researchers to take a second look at conventional water use on farms. Drummond (2007); Harrington, Harrington, and Kettle (2007); and Kuwayama, Thompson, Bernknopf, Zaitchik, & Vail (2017) investigate the impacts of drought on crop yields, farmer income, and crop variety selection, with varying effects. In this case, practices are highly place-based and not applicable to other regions. For example, agroforestry that uses tree species to manage drought conditions in a Canadian study must be tweaked and re-researched to manage droughts in the American Southwest.

In addition to water, farmers must carefully manage pest populations for a well-functioning operation. Pest management is one of the central topics of contention between conventional and sustainable agriculture. *The Death of Ramón González: The Modern*

Agricultural Dilemma is a classic text critical of the Green Revolution, conventional agriculture, and the heavy ecological and social impact of indiscriminate pesticide usage (Wright, 2005). While many pesticides are certified as safe for human exposure, many farmworkers encounter dosages of pesticides far above approved levels. Well-established literature has verified the harmful effects of pesticides on human health, including increased instances of diabetes, cancer, and reproductive, neurological, and respiratory disorders (Rani et al., 2021; Richardson, Fitsanakis, Westerink, & Kanthasamy, 2019; Bradman et al., 2009; Ahmed, Abushouk, Gabr, Negida, & Abdel-Daim, 2017; Alavanja & Bonner, 2012). While US regulation of pesticides lags behind other agricultural nations (Donley, 2019), promoting alternative pest management practices is increasing. New integrated pest management techniques such as crop rotation, planting and harvesting timing, plant spacing, and companion planting are demonstrably cost-effective. Still, there is limited research on their efficacy in the real world (Hagstrum & Flinn, 1996; Smith, 2020; Altieri & Nicholls, 2004). Primary barriers to farmers adopting integrated pest management are subjective norms and a lack of technical knowledge, which fails to promote sustainable practices (Baker, Green, & Loker, 2020; Allahyari, Damalas, & Ebadattalab, 2017, Despotović, Rodić, & Caracciolo, 2019). The general perception of sustainable agriculture in farming circles is that environmental health requires economic sacrifices.

One of the primary challenges to sustainable agricultural practices is the concern over a decrease in crop yield and earnings. There is mixed evidence on the veracity of this claim. De Ponti, Rijk, & van Ittersum (2012) indicate that the crop yield gap and subsequent earnings differential between sustainable and conventional agriculture are considerable and too wide to close. Alternatively, a meta-analysis by Ponisio et al. (2015) suggests that the difference in yields

between sustainable and conventional agricultural practices is not as significant as previously thought. Their research indicates that applying multi-cropping and crop rotation to sustainable agriculture systems can reduce, though not close, the yield gap. LaCanne & Lundgren (2018) confirm that lower yields are likely with sustainable agricultural practices but find that an increase in profitability negates this effect.

As sustainable agriculture faces the future, concerns remain about its ability to scale up to feed the world. Several studies have emphasized the importance of scale when assessing agricultural sustainability, including assessments of large-scale organic farms in California (Guthman, 2004) and the potential role of mid-sized family farms (Mount, 2012). These concerns are particularly pressing as global climate change has increased, threatening both conventional and sustainable food production systems (Carter, Cui, Ghanem, & Mérel, 2018). If current climate trends continue, crop yields can be expected to decline up to 50% due to extreme weather (Arora, 2019). Sustainable agricultural practices have been recognized as a strategy for mitigating the effects of climate change by sequestering carbon, increasing soil health and quality, and reducing soil erosion (Malhi, 2021).

The literature regarding the efficacy of sustainable agricultural methods is well established, and the literature concerning the implementation of said methods is emerging. However, the literature is limited regarding policy on sustainable agriculture. DeLonge, Miles, and Carlisle (2016) conducted an in-depth review of the USDA research and extension funding and concluded that despite significant climate threats to agriculture, most funded projects are unrelated to sustainable agriculture. Instead, the principal objective of most projects is to increase total crop yield through conventional methods. The study concludes with a call for more federal funding for sustainable agriculture.

At the federal level, Carlisle et al. (2019) review the current status of policy supports for farmers transitioning to sustainable practices. While there are many small-scale grants and training programs available, the researchers argue that “piecemeal resources” are insufficient. Similarly, they argue that the availability of separate state, local, non-profit, and private resources creates additional challenges for farmers attempting to navigate this system. They highlight resources including California FarmLink, the National Young Farmers Coalition, and the USDA's New Farmers website as valuable tools for navigating the decentralized network of sustainable agricultural resources.

This literature review has compiled the leading research regarding agricultural theory, sustainable practices, and sustainable agriculture funding and establishes the theory of the farmer choice paradigm. In this study, I seek to take a contemporary look at the state of sustainable agriculture in Illinois. This study will contribute to the literature by identifying what motivates Illinois farmers to engage in sustainable agricultural practices, as well as what barriers exist to farmer implementation of said practices. This will contribute to the current gap in the literature regarding influences on farmer decision-making. Additionally, I seek to identify how the Illinois government can support farmers' use of sustainable agricultural practices, which can add to the currently limited sustainable agricultural policy literature.

Methods

Data Collection

Throughout this study, I conducted eleven semi-structured interviews with Illinois farmers and agricultural experts[1]. The semi-structured format of my interviews increased the participants' willingness to engage, with the flexibility to chat informally and shift the conversation to the topics about which they felt most strongly. However, keeping a uniform list of questions provided structure to the interviews and later helped with data analysis. All farmer participants were asked questions from the same interview protocol (see Appendix A). Questions for agricultural expert participants varied between interviews, as they were primarily for clarification and background purposes. Interviews were conducted via telephone and were approximately 30 minutes in length.

Subject selection was initially via convenience sampling. I began collecting contacts from vendor lists from Chicago farmer's markets, featured farm tours on the EnjoyIllinois website, and Illinois Farm Families, a website dedicated to sharing the perspectives of Illinois' farming families. Once I began conducting interviews, I used snowball sampling to contact other farmers who the interviewees recommended. I contacted potential interviewees via email, phone call, or text message.

	Number	**Percent**
Total contact attempts	107	
Response	21	19.6%

[1] While I have classified interview participants as "Farmer" or "Agricultural Expert", all of the agricultural expert participants had professional experience as farmers.

Completed interviews	11	10.3%
Farmers	6	54.5%
Agricultural Experts	5	45.5%

While I sought to avoid subject selection and sampling bias, these subject selection and sampling procedures introduced several limitations. My initial farmer contacts, drawn from Chicago-based organizations, resulted in a geographic skew towards northeast Illinois. While this matches the overall population distribution of Illinois, this does not match the state's farmer population distribution. The geographic distribution of the expert interviewees is more evenly distributed.

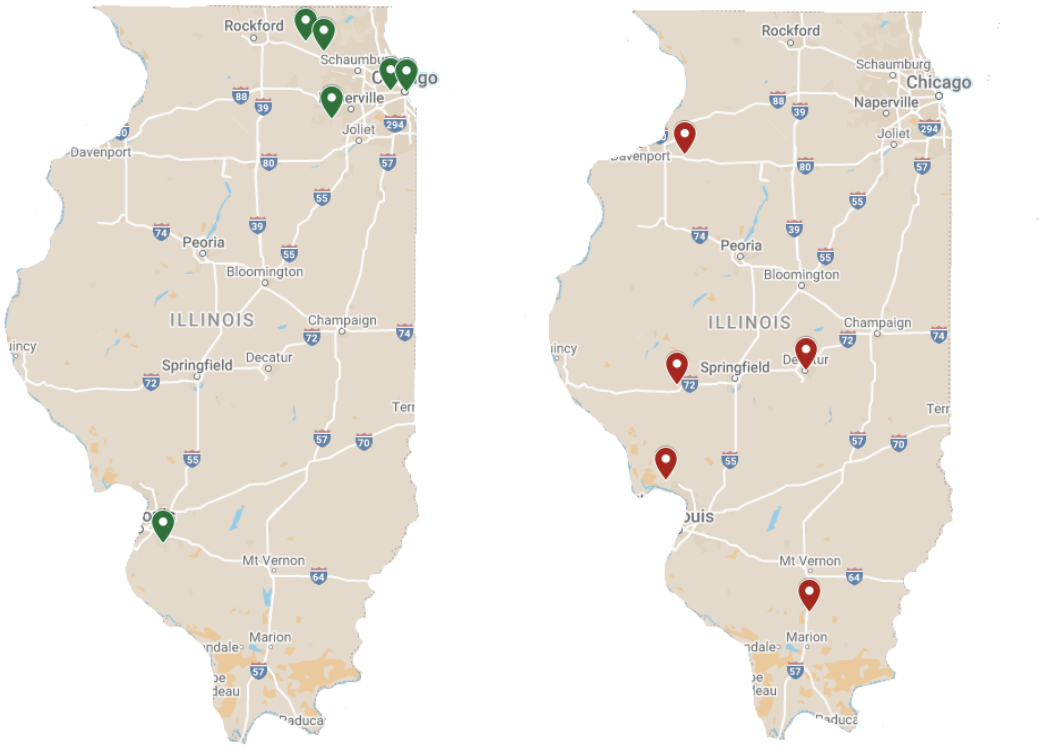

Figure 2. Geographic distribution of interview subjects. Active farmers are marked in dark green. Agricultural experts are marked in red (own image).

Additionally, I contacted many interviewees from the vendor lists of farmer's markets, which are more likely to be small-scale, family-run, and employ sustainable practices. I reached out to potential interview participants via the contact information available on their website. I excluded farms without an up-to-date website, which potentially biased the sample toward farms that are more consumer-facing or with greater online fluency. Once contacted by me, it was up to potential interviewees to respond and schedule an interview. Relying on potential interviewees to return my contact introduced a selection bias into my sampling procedure, as it is possible that farmers who already used sustainable practices were more willing to reach out to schedule an interview.

Despite these potential sources of bias, the interview sample of this study mirrors Illinois farmer demographics fairly effectively. In Illinois, the average farmer is male, over the age of 55, and owns a farm of 375 acres (USDA 2017). This matches the demographic of my sample, as illustrated below.

	Population average	**Sample average**
Male	64%	66%
Over 55	62%	66%
Average farm size (acres)	375	361

Data Analysis

Interviews were recorded and transcribed for use in data analysis. Before data analysis, I developed a preliminary codebook (Appendix B) based on issues raised in previous literature and my impressions from interviews. The codebook consisted of variables relating to various themes, including farming history and interests, motivation to use or not use sustainable practices, barriers to engagement with sustainable agriculture, the main challenges faced by their farm, and

the policy suggestions raised by farmers. Aggregating these code occurrences across interviews allowed me to identify general trends as Illinois farmers view the main benefits and limitations of the sustainable agriculture in Illinois. I coded the transcripts from interviews with agricultural experts for policy suggestions and the current state of sustainable agriculture policy.

Qualitative data analysis through coding has several weaknesses. Because participants were aware that their responses would be used in the study, they may have self-monitored their responses. Additionally, there may have been researcher bias while coding, as it was done by hand. Due to its small sample size and geographic boundaries, the generalizability of this study beyond Illinois is limited. However, this study may provide a reference point for future, larger-scale studies on perceptions of sustainable agriculture.

Findings and Analysis

In this study, I sought to investigate farmers' perceptions of sustainable agriculture, particularly their motivations for using sustainable agricultural practices and their barriers to implementing sustainable practices. Throughout this research, I made 107 contact attempts via email, phone call, text, or voicemail with a response rate of 19.6% and an interview completion rate of 10.3%. I conducted interviews with both farmers and non-farming experts. Based on this data, I found that the principal motivations for farmer use of sustainable practices included soil health, climate change, and ethical considerations. Meanwhile, the constraints faced by farmers to introducing or expanding their sustainable practices included financial barriers, a lack of information, and concerns about risk.

Motivations

Interview participants shared a variety of motivations for engaging in sustainable agricultural practices. Some motivations were practical, such as protecting soil health, a farm's most important resource. Lloyd, a lifelong small-scale organic farmer, explained, "You want the soil to be sustainable, so you need rotation, and you want to use practices that allow for building soils, and [there are] so many little things that you can do." Without frequent rotation of crops, the soil becomes nutrient deficient and requires heavy use of chemical fertilizers (Bowles et al., 2020). If farmers don't plant sufficient cover crops to stabilize the soil, they risk losing valuable topsoil to erosion from wind and water (García-González, Hontoria, Gabriel, Alonso-Ayuso, & Quemada, 2018). This combination of decisions devastated many family farms during the Dust Bowl (Hu, Torres-Alavez, & Broeke, 2018). Even farms that did not consider themselves at the forefront of sustainability prioritized practices that promote soil health, such as Chris, the CEO of a large commercial farm. "Something that's of interest to us just in terms of cover cropping and minimal tillage [is] the soil biome. That's an emerging science that we're trying to wrap our heads around." As referenced by Chris, a soil microbiome is a complex system of microorganisms, including bacteria, archaea, fungi, protozoa, and even viruses (Jansson & Hoffmockel, 2019). The quantity and balance of these microorganisms can strongly affect crop production, either negatively or positively.

On a larger scale, multiple participants expressed their concern over how climate change has affected their production, motivating them to reconsider how their practices work to mitigate or contribute to climate change. Climate change can affect farmers in a variety of ways. Drought can kill crops before they are harvested, heavy rainfall can encourage new fungal diseases, and mild frosts no longer kill pests (Arora, 2019*)*. As described by Heidi, a flower producer,, "I

would say climate change would be the biggest pressure. This past season has been the worst that I've ever seen." She elaborated on the changes she sees on her farm due to climate change.

> There's no more spring. It goes directly from winter to summer. There's no more gradual warming. [On] Mother's Day, there was still snow on the ground, and then it went to 90 degrees… We have probably about eight acres of peonies, and it went from in bud to so scorching hot. We probably lost about 75% because it just annihilated the bulk of the peonies… I don't know what the roots are going to be like this coming spring. Did it fry them? Or are they fine? Are they going to recover from this? What kind of winter are we going to have?

In response to this threat, Heidi's farm converted their greenhouse to be run on reclaimed oil and only delivers locally to minimize emissions. While these actions won't directly protect their farm from the effects of climate change, they reduce the farm's carbon footprint and potentially inspire others to do the same

This kind of ethical motivation drove many participants to embrace, or at least explore, sustainable agriculture. Lloyd took pride in considering sustainability as the basis of all their operations. "I was conscious of the environment from the time I was very small… The whole idea was sustainability and to be compatible with the environment as a person can be." For Lloyd, sustainable practices aren't just agricultural techniques but part of the identity of his farm. Meanwhile, Heidi hoped that her work could inspire others to explore sustainability in their own lives.

> I think people don't realize what they're losing when they just demolish a field and put up a subdivision or spray their chemicals. When you come here, you're like, Oh, this is the way it's supposed to be. My bees are flying out of their hives right now- they're hanging

> out. When you spray a field, you don't have those bees buzzing around, pollinating, and doing all their things. It is very important that people go... what are we doing and what do we need to do differently?

For Heidi, part of running a sustainable operation means allowing others to educate themselves on sustainable practices. As I address in the next section, education becomes doubly important as many interviewees viewed a lack of information as a critical barrier to sustainability.

Constraints

Due to a lack of comprehensive certification, there is no clear data on what percentage of food in America could be considered sustainably grown. However, a reasonable point of reference is that the organic share in the US is about only 6% of total food sales (Organic Trade Association, 2019). Many sustainable farmers struggle to break into established markets, and conventional farmers fear switching to sustainable practices could cost them financially. At the end of the day, a farm must be profitable to stay running, and transitioning to sustainable practices can be a risk that some farmers aren't willing to make. Doug, an educator for the Illinois Extension Service, described the financial considerations of this,

> The biggest challenge is that agriculture is extremely competitive. [The biggest challenge is] staying in business. It's a highly capitalized business that works on small margins. And so if [farmers] have a system that they think is working for them, they're very reluctant to change because they have little room for error if things go bad in a big way. Organic farming is picking up… but it isn't, for the most part, large scale. [They change] a field at a time so that if things don't work out it's not going to cause serious financial problems for the farmer and their families.

As indicated by Doug, financial solvency remains a crucial concern for farmers, particularly when it comes to their keystone crops. Farmers are understandably hesitant to experiment with sustainable practices on their major crops because they risk jeopardizing their entire operation if those fail.

Other participants felt that while they could manage a sustainable operation at a small scale, expanding to become a mass production commercial facility would not be possible financially while maintaining their sustainability. Said Fred, another small-scale farmer,

> Most of your commercial farmers who do this for bread and butter have got to make it as profitable as possible. Applying some of these organic things, like, for instance, my corn we have to spray every year with this neem oil. It takes a little bit of time. It's a little more expensive. The big guys, it's easier just to put it all down, whether it's fertilizer, pesticides, or herbicides, [and] use stuff that works with one pass. You don't see guys out there hoeing.

Fred's explanation reveals that while sustainable practices such as the application of neem oil or hoeing are widely available, applying them to large areas of cropland requires a large investment of money and labor without guaranteeing a positive result.

Similarly, labor remains a crucial struggle for many conventional and sustainable farmers. A 2019 study of California farmers found that 58% of the participants were unable to recruit all the workers they needed at some point during the past five years. Additionally, nine out of ten farmers had to raise their wages to recruit enough workers at some point during the past five years (Rutledge & Taylor, 2019). Agriculture is highly labor-intensive and thus very sensitive to shocks in the labor supply (Charlton & Kostandini, 2020). Lloyd explained,

> The biggest problem [when] farming in a sustainable way [is that] it's very labor-intensive. Labor is the number one challenge. The thing is, you can only be as big or as productive as your physical labor. Unless you're going to be a monocrop kind of agricultural venture, and that wouldn't have worked for us.

Governmental and private sustainable agriculture grants do not typically include labor costs, which may be needed to transition to sustainable practices or ramp up production. Fred would have liked to see this change, especially concerning work visas for undocumented laborers. He relied heavily on undocumented workers for labor and felt frustrated that the government doesn't offer more paths to citizenship. "The labor issue is a big deal. You know, I think that the absolute factor is labor. If they deported [the undocumented workers], the country would collapse. We would just have no food." Fred is accurate in assessing that the US agricultural economy runs on undocumented labor. It is generally accepted that at least 49% of the American agricultural workforce is undocumented (USDL, 2021), reaching 83% of farmworkers in some counties (Rodriguez et al., 2018). Should all those workers be removed from the market, wages would surge an estimated 42%, putting many farms immediately out of business (Lopez, 2014).

In addition to labor shortages, markets for sustainable farms remain limited. When selling sustainably grown products, participants struggled to break into established markets. Many rely on less traditional outlets such as farmers' markets or community-supported agriculture programs, which are more labor-intensive than selling to a commercial distributor. Community-supported agriculture (CSA) entails a local, small-scale subscription service in which consumers receive regular deliveries of various products from the farm. Fred's farm recently attempted to broaden their market with a CSA, but as a small operation, they didn't have the capital to wait several years to become profitable, said Fred.

> "I had another employee years ago… was going to try to do a CSA out of our business. We let him do it for one year, and it was successful. He had very high-quality produce, but he just couldn't make it work on paper."

Diversification of markets helps some sustainable farms stay afloat, but this requires a heavy investment of time. Heidi's farm concentrates on farmers' markets, but they also sell from the farm, deliver locally, source to independent chefs, and contract with a local grocery store. Managing such a wide variety of consumer bases requires time and organization to maintain, ultimately cutting into profits.

However, some farmers felt their sustainable practices double as a marketing tool. Lloyd was proud of his farm's reputation as a sustainable operation. "It all goes back to how we market. We market to people that want sustainable agriculture from a local farm." Ultimately, Lloyd felt that developing markets for sustainable agriculture is key to bringing in new producers. "There's no need to be a sustainable farmer if there's no market." In recent years, Illinois has made an effort to expand markets for sustainable producers, which Fred appreciated. "I see the state trying to help develop markets. One market I've had there's a lot of SNAP, food stamps… and then you're getting… healthier food into the hands of people who want it." These actions help to normalize sustainable products, which the general public may otherwise view as unaffordable.

Another key barrier to sustainable practices mentioned by farmers was a lack of knowledge about sustainable farming techniques and programs to fund them. While sustainable agriculture is beginning to make inroads in college farming courses, food production programs remain dominated by conventional methods. After decades as a farmer, Doug says that he is "continuing to learn about new approaches to sustainable agriculture [like] nutrient cycling [and]

so many different things. The kind of stuff wasn't taught when I was in college." This starts new farmers off with conventional methods as the default, making the transition that much more difficult.

Agriculture is not just a profession but a lifelong skill. Because experimenting with new techniques can be a financial risk, many farmers aren't satisfied to make a change based solely on what they find on the internet. Speaking to me about grants available for sustainable agriculture, Chris said, "I was Googling around [and] it was hard to get a lot of information." This lack of information was frustrating to Chris, who felt that "we would be interested just from the little bit I read… I think I would be interested to learn more [and] see how we can participate." Making information on sustainable agricultural practices and grants to fund them widely available may be a critical step in transitioning conventional farmers like Chris, especially when their typical sources of information are biased toward conventional techniques. According to Doug,

> Some of the biggest advisors to farmers are their input suppliers. It's awfully hard for input suppliers to say "hey, you shouldn't be doing this." They can say, "oh, you know, you're gonna get an extra two bushels an acre." But seriously, are you gonna make extra money? What are the effects? What's it gonna look like five years from now?

To many Illinois farmers, the delivery and source of information matter just as much as content. Farmers need personalized advice from trustworthy sources, which can include state governmental departments, in order to change techniques.

Several farmers suggested that the Illinois Department of Agriculture promote sustainable practices more heavily during winter grower conferences, where they access the bulk of their information on governmental programs. Explained Fred, "There [are] several organizations- the

Farm Bureau, the conservation specialty growers, and they all know each other [and] work together. They've had conferences, and those are quite good. Really learn a lot about all kinds of things, including the latest in legislation and stuff that affects the farmer." None recalled hearing about sustainable legislation at such conferences, which they felt was a missed opportunity.

Beyond information about governmental and private sustainability programs, the access to knowledge regarding sustainable techniques that a farmer has access to can make or break a sustainable production. Lloyd has been reading about sustainable agricultural practices since the 1950s and relies heavily on research conducted by the Rodale Institute. Seventy years of knowledge on the subject has helped make his farm entirely sustainable, both ecologically and economically. Lloyd was very proud of the fact that he can run a sustainable operation while maintaining financial independence. "We are sustainable in the truest sense… You're probably talking to the first person in your life that makes a living [farming sustainably]. We don't take any subsidies for farming at all." While Lloyd wasn't against subsidy programs, he felt that information on sustainable practices could serve farmers better than subsidies.

Unlike Lloyd, other farmers have had more difficulty accessing the knowledge to implement sustainable practices. Fred felt the Illinois Department of Agriculture could do better by promoting information and expertise on sustainable practices and "making that readily available. Providing information on things like, what's the best way to get rid of certain bugs without using heavy-duty chemicals." On one's own time, trial and error can only get a farmer so far without professional help, explained Frank. "We dabbled with trying to be very low pesticide use. Certain crops don't work well in that respect. Our soils in Northern Illinois are so good that it's very difficult to stay ahead of weeds in organic production." Without access to more

professional sources of information on sustainable weed management, farmers such as Frank are unwilling to swap their pesticide use for other practices.

While one barrier to sustainability is accessing information, another is that no data is available at all in some cases. Agricultural research is a large field, but only a small portion is dedicated to sustainability research. Many farmers expressed hesitancy to engage in research due to the inherent financial risks. Frank shared his experience with sustainable research, which he ultimately decided not to pursue. “There's a horticulture supply company in Illinois, and they got into using biological controls for sweet corn. I talked to them, and they were trying to see if I was interested in doing that, but there's a lot of headaches involved with experimenting because you can't unless you have a way of sectioning off your farm to test it.” In this case, Frank refers to the challenge of preventing a neighbor’s practices from affecting one's own crops. For instance, sprayed pesticides are highly likely to land on fields adjacent to those sprayed, which can contaminate experimental plots. “They’ve definitely got to allow people to experiment and not necessarily succeed. I'm always afraid that if we really stick our neck out on something and we lose, then we’re out.” In order for more farmers to transition to sustainable practices, the financial potential risk must be lowered during their first seasons. Some farmers need more support than others, said Doug.

> There are those that are innovators and they try [new things]. There are those who wait to see if what the innovators do works. And then there are there's that those that they won't change. We have all of those in agriculture, but for the most part, it's the third group. [They have a] system that works for them and they're making money [so] they're just terrified of change.

Successful sustainable agriculture programs serve all three types of farmers, rewarding the most experimental while supporting the more reticent.

The lack of comprehensive research was a concern for Chris, as well. He hesitated to venture into sustainability because,

> Whenever you have anything new in agriculture like that, you've got to tiptoe in it because it's not necessarily stood the test of time and the climate is ever-changing, and it's different every year. You don't always know how [it will] react to the different pieces of Mother Nature.

Although he was intrigued by the Sustainable Agriculture Act, Chris would have liked to see it emphasize the extension service. The USDA began the extension service program in 1914, which requires all land-grant universities and colleges to conduct agricultural research and share the results with local farmers free of charge (UFIA, 2022). Extension service research is a crucial producer of research on sustainable practices, as it is not beholden to corporate interests. Today, more than 100 universities and colleges partner in the extension program (also called cooperative extension), with research bases in all 50 states (Franz & Townson, 2008). Chris described the extension as

> ...a critical program, especially in an industry like ours. It's made up of a lot of small growers that don't have the independent capacity to do fundamental research… on the crops that we grow [or] test which chemicals are the best at controlling diseases or insects, and [then] sharing that information. Extension is a critical component for keeping fruit and vegetable production alive in the state of Illinois.

I spoke with Duane, an Illinois extension educator, on the relationship between sustainable agriculture and extension. Currently, Illinois extension has "a team of educators that are called

local foods and small farms educators who work directly with a lot of producers who are working in sustainable issues. They do field research on different types of practices… [and] people [can] go in and ask questions." However, these educators are targeted toward small farms of only 20-200 acres, which reaches only a minority of farms in Illinois. Additionally, these programs are not necessarily well publicized. When I asked local sustainable farming advocate Walt about extension, he said "I'll be honest, I don't use the extension at all. I don't believe in their methodology of farming." He believed that Illinois extension was based completely on conventional methods and thus had completely tuned out of their communication. Moving forward, the extension service program could be a valuable partner in researching and promoting sustainable practices, and some progress has been made. However, further tweaks could improve the efficacy of the program.

Even when farmers transitioned to implement practices developed through extension research programs, Chris was firmly in favor of protecting crop insurance. Crop insurance is a form of insurance purchased by farmers and subsidized by the federal government, which protects farmer revenue in the case of lost harvests due to natural disasters or decreased prices (Glauber, 2004). Said Chris, "The most important thing for us has been crop insurance. That's a very effective program that's in place that's been a huge hedge on risk. Keeping crop insurance funded and alive is critical." While crop insurance doesn't typically differentiate between conventional and sustainable practices, adding incentives for sustainable practices such as lower premiums or enhanced coverage could incentivize farmers to test sustainable practices without increasing their level of risk.

In this study, I sought to investigate: What motivates Illinois farmers to engage in sustainable agricultural practices, and what barriers exist to implementing said practices? Based

on this data, I found that the principal motivations for farmers' use of sustainable practices included soil health, climate change, and ethical considerations. Meanwhile, the constraints faced by farmers in introducing or expanding their sustainable practices included financial barriers, a lack of information, and concerns about risk. The implications of these findings are that policies to incentivize sustainability should be based on alleviating the above barriers, as they are the principal reasons farmers choose not to engage in sustainable agriculture. This answers my second research question: How can the Illinois government support farmers' use of sustainable agricultural practices? In addition to focusing policy on reducing barriers, messaging promoting sustainable practices should focus on the benefits to soil health, the potential mitigation of climate change effects, and emphasizing the ethical responsibility of farmers. According to my findings, these angles are most likely to incentive farmers into action.

Some readers may be hesitant to accept these findings due to the small sample size of this study. It is true that the sample size limits the generalizability of this study, especially outside of Illinois. However, this study is not meant to be the definitive treatise on the opinions of all farmers. Rather, it can serve as a starting point for other research on how farmer perspectives can inform sustainable agricultural policy.

Policy Recommendations

Throughout interviewing, several policy recommendations developed, either as repeated themes to expand upon or explicit suggestions from farmers. The constraints discussed above fell into the buckets of financial, informational, and risk. After considering these themes, I propose sustainable extension research, expanded program outreach, crop insurance requirements, and stabilizing farm labor to boost sustainable agriculture in Illinois.

Sustainable Extension Research

Several participants were hesitant to assume the risk of sustainable practices, especially when they don't know how untested approaches will work in their local environment. Many Illinois farmers rely heavily on the extension service as a crucial provider of local research and information. The extension service operates in all 50 states and territories with federal and state funding for agricultural research and education (Warner and Christenson, 1984). In Illinois, it is operated by the University of Illinois with campuses across the state. Local extension offices advise farmers on applying new research findings to their operations and offer continuing education for farmers on best practices.

Unlike private operations, extension services do not operate for profit and thus can absorb crop loss more easily. They are an excellent candidate for sustainable research because their primary objective is not profit but to improve the lives of farmers. Currently, most extension research focuses on increasing crop yield in the vein of the productionist paradigm. The Illinois extension service does include a "local food and small farms" program that educates farms with roughly 200 acres or below on sustainable methods. While this is a good start, programs need to target larger commercial operations as well in order to make a substantial difference. Industrial level consultants would take the risk off of commercial as well as local farmers in Illinois.

Further facilitating this approach, extension services are a non-political, local, and trusted source of information for nearly all farmers. Farmers as a demographic group have very little access to the internet and thus rely heavily on in-person resources from extension offices (USDA, 2017). While research from academics and advocacy groups can be a helpful resource, advice from an established source such as their local extension office is more likely to encourage farmers to attempt sustainable practices. This is especially true when farmers receive advice

personalized to their regional conditions, which vary dramatically even within Illinois. This approach would require either hiring more extension staff or retraining current staff to be knowledgeable of sustainable practices. Data collection on engagement levels with sustainable workshops and outreach programs can measure implementation success and be used to adjust the program as necessary.

Expanded Program Outreach

A common theme across all participants was a lack of knowledge regarding available sustainable agriculture programs. While no longer operating, none had ever heard of the Sustainable Agriculture Act, which reflects poorly on outreach attempts made by the Illinois Department of Agriculture. Though the Illinois legislature has not funded the program in five years, it remains highlighted on the Illinois Department of Agriculture website, suggesting it is rarely updated. Additionally, there was very little media coverage of the Sustainable Agriculture Act when it was operating. This lackluster effort to promote sustainable resources to farmers may be one reason for the ultimate failure of the program.

Highlighting future programs to the media and trusted sources such as farmers' associations or the aforementioned extension offices could increase engagement. Stakeholders should take care not to rely exclusively on the internet for promotion, as nearly 30% of American farms still lack access to the internet (USDA, 2017). Several farmers referenced grower's conferences as their primary source of information on governmental programs. These conferences occur in the winter months, during farmers' slow season, and represent a trusted source of information. Sending program representatives to such conferences to engage with

farmers and answer questions would allow farmers unconnected to the internet to learn more about the program.

Additionally, the patchwork nature of federal and state incentives hampers farmer engagement with sustainability programs. Private stakeholders, including California FarmLink and the National Young Farmers Coalition, have comprehensive lists of federal, state, and private resources available to farmers. The Illinois Department of Agriculture could compile a list of public and private sustainable resources for farmers and update the website to include that in an easily accessible place. However, as previously established, the internet is not a reliable way to reach all farmers. Thus, a physical compilation of such resources that the department of agriculture could distribute at farmer conferences or extension offices would be a valuable complementary outreach strategy. Analysis of implementation success can be based on website hits as well as non-internet engagements including flyer distribution and one on one conversations. Routine focus groups with local farmers can test if outreach efforts are reaching the desired constituency and what can improve engagement.

Crop Insurance Requirements

Crop insurance reform offers both great promise and significant challenges to incentivizing sustainable agricultural practices. Farmers purchase crop insurance policies heavily subsidized by the federal government and regulated by both state and federal governments. In the case of an unexpected event adversely affecting the crop yield, insurers will pay farmers some of the income they would have received from selling their ruined harvest. Crop insurance helps farmers manage some inherent uncertainty in a profession based on natural resources (Fleckenstein et al, 2020). Crop insurance is one of the USDA's most widespread programs, with

between 84% and 96% of planted acres insured depending on the crop (Shields, 2015). Additionally, crop insurance is most common among large commercial producers, who are the ablest to pay premiums and the least likely to use sustainable practices (Bekkerman, Belasco, and Smith, 2018).

Currently, to receive insurance payouts after a loss, farmers must prove they have followed "Good Farming Practices" (GFP) set by the USDA. If crop failure results from failure to follow these practices, farmers lose some of their insurance payouts (Federal Crop Insurance Act, 2009). There is now considerable conversation among policymakers to include sustainable practices in the list of GFP. For instance, cover cropping reduces soil erosion due to excessive precipitation and increases soil's water-holding capacity in times of drought (DeVicentis et al, 2020). Adding sustainable practices such as cover cropping to GFP would incentivize farmers to explore sustainable methods, especially those least likely to try them independently.

While this policy recommendation is gaining steam among sustainable agriculture advocates, barriers to implementation remain. Crop insurance reform is notoriously difficult. Crop insurance is extremely popular among farmers, and agribusiness lobbies aggressively to prevent changes to the GFP (Smith, 2020). To reduce opposition, the USDA could consider paying a bonus for early adoptions of sustainable GFPs a few years before making them mandatory for insurance payouts. Decreased insurance payouts can quickly pay off this upfront cost through the increased resilience of crops to adverse events.

Additionally, widespread and controlled research on sustainable agricultural practices is still developing. Sustainable practices need to be tested in every American microclimate before the USDA can require them to avoid inadvertently harming crop output. Before implementing

targeted crop insurance requirements, the USDA will need research proving the efficacy of sustainable practices beyond a reasonable doubt before requiring them as part of GFP.

Stabilizing Farm Labor

Sustainable agricultural practices are often more labor-intensive than conventional techniques, as they rely on human labor rather than chemical compounds. Labor-intensive methods can work well at a small scale or when labor is abundant and cheap. This is not currently the case in the US, and several interviewees cited the uncertainty of available farmworkers as a barrier to scaling up their sustainable operations. The labor economy of farms is unique in that it is highly unregulated and runs almost entirely on undocumented labor. A staggering 48% of all farmworkers are undocumented immigrants, and another 21% are non-citizen residents (USDA Economic Research Service, 2018). Undocumented workers live under the constant threat of deportation, which affects them and their families and the farms at which they work. Additionally, undocumented farmworkers lack the protections of formal employment, leaving them much more vulnerable to exploitation.

Stabilizing the agricultural workforce through amnesty programs could alleviate some sustainable farmers' labor fears. A 1986 immigration bill under the Reagan administration granted amnesty to nearly 3 million undocumented farmworkers (Partida, n.d.). Some of those workers are still providing agricultural labor today, including at Lloyd’s farm. Despite several attempts to recreate the success of this program to offer stability to both farms and farmworkers, various political pressures have prevented the repetition of such a program for more than 30 years. The farmworkers granted amnesty in 1986 have primarily retired or left agriculture, with millions of new undocumented and unprotected workers taking their place. In March of 2021, the

House passed the Dream Act of 2021, easing the pathway to citizenship for undocumented farmworkers and streamlining the visa process for agricultural labor. Expanded visa access could protect farm labor from political fluctuations affecting supply, potentially increasing the willingness of farmers to experiment with higher-labor sustainable practices. The success of this policy can be measured by reduced fluctuations in labor supply and wages, as well as farmer surveys of their hiring needs. While Illinois Senator Dick Durbin introduced the Dream Act of 2021 to the Senate in April, as of March 2022, it has yet to come to a vote.

Conclusion

Previous research on sustainable agriculture has focused on economic theories of the efficiency of sustainable practices or on the national and global levels from a policy perspective. However, state-level departments of agriculture wield considerable policy power and can be less politicized than at the national level. Due to the implementation issues of pre-existing sustainable agriculture legislation in Illinois, studying perceptions of sustainable agriculture in Illinois can provide insight into policymakers seeking to implement similar policies elsewhere in the United States.

Through an investigation of farmer perceptions of agricultural practices and policy, this study seeks to understand the state of sustainable agriculture in Illinois. By analyzing nine interviews with Illinois farmers and agricultural experts, I find a wide range of motivations and constraints to implementing or expanding the use of sustainable practices. Considering these factors, I suggest the following policies to facilitate the transition and expansion of sustainable agriculture in Ilinois: (1) direct extension service research toward local research on sustainable practices, (2) expand and simplify governmental outreach regarding sustainable agricultural

programs, (3) revise crop insurance “good farming practices” to include sustainable methods, and (4) stabilize the agricultural labor force with increased pathways to residency and citizenship for undocumented farmworkers.

Due to the enormous scope of farmland in America, both federal and state-level agricultural policy can make a significant influence. Sustainable agriculture, slowly becoming more mainstream in the past several decades, benefits farmers and society by considering the ecological impacts of agricultural methods. However, ground-level implementation of sustainable practices requires the buy-in of farmers. This study adds to the literature by exploring how farmer perceptions of sustainable agricultural practices influence their implementation.

This study faced limitations due to the small sample size and concentration on one program in one state. Both of these limit the generalizability of these results but will hopefully inspire further research on the subject. Sustainable agriculture is a nationwide topic, and future research should consider both federal and state-level programs. If farmers are to be persuaded of the importance and feasibility of transitioning to sustainable methods, considerable more research needs to be done on many agricultural methods, in many regions, and at multiple scales.

Appendices

Appendix A: Interview Protocol (Farmers)

1. How did you become involved in agriculture?
2. Please tell me about your farm.
3. Do you use any sustainable/regenerative/organic practices on your farm? Why or why not?
4. Have you heard of Illinois' Sustainable Agriculture Act? What do you know about it?
5. Have you ever engaged in the program? Applied for funds, gone to an info session, etc?
6. If not, what didn't appeal to you about the program? What changes would make the program a better fit for you?
7. What are the biggest challenges faced by your farm today?
8. How do you feel the government can better support farmers like you?
9. Anyone else?

Appendix B: Codebook

Name	Description	Example quote	Files	References
Background	Interviewee's background as a farmer/ info on their farm		9	11
Family history	Family history in farming industry	"I grew up on the farm, brought up with it all around me and from a very young age had an interest in it. I wanted to come back to the farm [so] I went to the University of Illinois to study agricultural economics."	6	7
Personal interest	Non-familial factors motivating them to pursue farming	"I just decided life is too short. You just have to do what you love and what keeps you sane. So being outside and doing my thing and not being stuck behind a cubicle, is what I absolutely love."	3	4
Motivation	Inspiration for engaging in sustainable agriculture		5	11
Soil health	Protection or improvement of soil health	"The most important asset we have is our land. The more we protect that…"	3	4
Climate change	Mitigation of climate change or extreme weather	"I would say climate change would be the biggest pressure. This past season has been the worst that I've ever seen it"	2	4
Ethical motivation	Personal concerns to "do the right thing"	"Starting from that base of wanting to be organic and sustainable and being conscious of the environment. I was conscious of the environment from the time I was very small."	2	3

Barriers	Constraints faced when implementing sustainable practices		9	50
Certification	Experience with farming certifications (organic, all natural, sustainable, animal welfare, etc)	“We chose not to go the route of being certified organic because it's men in suits, coming to your farm with a clipboard and checking check marks off of a box and then they take a percentage of income. Being a farmer, I don't want to give someone a percentage of what I've [earned]”	4	7
Financial	Concerns on the economic impact of choosing sustainable agriculture	“I had another employee years ago who wanted to do a CSA. It was gonna be conventional, but he was going to try to do a CSA out of our business and we let him do it for one year. And it was successful. He had very high quality produce, but he just couldn't make it work on paper.”	5	11
Scale	Difficulty scaling sustainable practices up to a larger operation	Most of your commercial farmers who do this for bread and butter have got to make it as profitable as possible. Applying some of these organic things, like for instance, my corn we have to spray every year with this neem oil. It takes a little bit of time. It's a little more expensive. The big guys it's easier just to put it all down, whether it's fertilizer, pesticides or herbicides, use, you know, stuff that works with one pass. You don’t see guys out there hoeing.”	5	10
Informational	Information used or needed to implement practices	“Information and expertise [and] making that readily available. Providing information on things like, what's the best way to get rid of certain bugs without using heavy duty chemicals.”	7	16
Labor	Physical workers needed to practice sustainable agriculture	“The labor issue is a big deal… If they eliminated the illegals in the country, if they deported them… the country would collapse. We would just have no food.”	2	6

Solutions	How could the government better support farmers like you?		6	16
Outreach	Views on Illinois Department of Agriculture outreach	“I think we would be interested just from the little bit I read out about it. Yeah, I think I would be interested to learn more about it. See how we can participate.”	4	6
Conferences	Winter grower’s conferences	“There's several organizations, there's the Farm Bureau, there's the conservation specialty growers, and they kind of all know each other work together. And they've had conferences and those are quite good. Really learn a lot about all kinds of things including the latest in legislation and stuff that affects the farmer.”	2	2
Crop insurance	Targeted crop insurance programs	“The most important thing for us has been crop insurance. And that's a very effective program that's in place that's been a huge hedge on risk. So you know that keeping crop insurance funded and alive is critical.”	1	1
Market promotion	Development of markets for sustainably grown products	“There's no need to be a sustainable farmer if there's no market.”	3	4
Worker visas	Amnesty programs to protect undocumented workers	“We have people that go back to 1985. There was an amnesty program from Ronald Reagan. At that point, he legalized about one point something million agricultural workers and I had some of those guys with me”	2	4

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