Local Agriculture in the Upper Midwest: Amidst Tariff Wars, Migration Restrictions, Climate Change and Evolving Gender Dynamics

A Collaborative Research Exploration between Common Harvest CSA Farm (Osceola, WI)
&
The Students in Geography 232: People, Agriculture and Environment
Macalester College

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Prologue and Acknowledgements

The following report represents the collective efforts of 20 students co-investigating a series of critical questions related to local agriculture in Northwestern Wisconsin and Central Minnesota. During the September-October 2018 period, students in Geography 232 (People Agriculture and the Environment) engaged in a collaborative research exploration with Common Harvest CSA farm in Osceola, WI. Following on five previous years of collaboration, the course instructor and the co-owners of the farm developed a set of research questions that were of mutual interest. The questions identified were as follows:

1) How are contemporary tariff wars impacting farmers in the upper Midwest (and how might we think about this in the context of the policy history of free trade vs protection for agricultural producers in the US)?
2) How do rural labor dynamics (including the current immigration restrictions) impact different types of farmers in the upper Midwest?
3) How can upper Midwest farmers adapt to a changing climate and what new research do we need in order to facilitate this adaptation?
4) Despite a history of male dominance, there is some evidence suggesting that more and more women are becoming principal farm operators in the US. What factors might be driving the change and what are the implications of such a shift?

The class was divided into four research groups of four to six students. In order to prepare for their exploration of these questions, all students in the class read background materials on the region, soil ecology, farming, and the CSA concept. Common Harvest CSA co-owner Dan Guenther visited the class on September 13 to guest lecture about soil ecology, farming practices and the CSA movement. The class spent a full day visiting Common Harvest CSA farm, as well as a nearby conventional corn and soybean farm, on Saturday, September 15, during which time they received a tour of the area and then moved to the two farms to learn about farming practices and the business side of agriculture. The four groups then spent the following two weeks collecting and analyzing data for their respective research questions. The students working in each of the research groups penned a report addressing a segment of their questions. These reports are included as sub-chapters, following each research question, in this document. While the quality of the individual reports may vary, together they represent a rich set of insights that were co-produced with the owners of the farm, as well as the various individuals who were interviewed for this project.

None of this would have been possible without the time, energy and intellectual input of the co-owners of Common Harvest CSA farm, Dan Guenther and Margaret Pennings. We are also grateful to the Civic Engagement Center of Macalester College, and especially Paul Schadewald, for providing financial and logistic support for this exercise. Last but not least, thanks to TAs Betsy Schein and Eliza Pessereau how supported the class in their exploration of these topics.

Bill Moseley, Professor of Geography, Macalester College

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*Not all student authors chose to publish their findings in this report. Furthermore, some opted to share their findings anonymously as indicated here.

Chapter 1:
How are contemporary tariff wars impacting farmers in the upper Midwest (and how might we think about this in the context of the policy history of free trade vs protection for agricultural producers in the US)?

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Hannah Whipple
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Tariffs, Subsidies, and Farmers in the Upper Midwest

Introduction

Since the beginning of 2018, it seems that we have been constantly bombarded with headlines bringing ominous news of the ever-escalating trade war between China and the United States. It is one thing to hear that China has imposed a 25% tariff on multiple commodity imports from the United States, but sometimes it can be difficult to understand who will be affected by these policies, the scale of damage that will result from these policies, and why the decisions of the Chinese government have evolved to be so crucial in the lives of Americans.

To break down the large idea of the trade war between the United States and China, I will begin by discussing the different scales of agriculture within the United States. Once I have established the contrast between small, local farming and commercial agriculture in the United States, I will discuss the ways agricultural subsidies have led to the creation of industrial agriculture. The mechanization and commercialization of agriculture allows it to function on a global scale. This paper seeks to answer the question: How has the federal farm subsidy program amplified the affects that the contemporary tariffs have on farmers in the Midwest? In order to address this, I analyze the United States agricultural system as well as its place in the global context. Subsidies have encouraged famers to focus on the consolidation and intensification of farming of a few select crops, which may be a clue into the increased reliance on the exports of soybeans, corn, and wheat.

Methodology

The discourse within this paper draws heavily upon observations during the People, Agriculture, and the Environment class field trip to the Carlson and Common Harvest Farms in September 2018. Both farms are located in Western Wisconsin—within ten miles of each other—but operate in completely different worlds. The Carlson Farm is a conventional, 2600-acre farm operated by the Carlson family. On all 2600 acres, the Carlson's produce corn, soybeans, and winter rye. In contrast, Common Harvest Farm is 40-acre vegetable farm with 10 acres in production at any given time. The owners of Common Harvest Farm, Dan Guenther and Margaret Pennings, ground their business practices within community supported agriculture (CSA).

To supplement my personal observations, I have also conducted research within the current literature to understand the complex agricultural subsidies within the United States. Typically, every five years, a new Farm Bill is enacted by the United States Congress. Members of Congress are currently deliberating over a 2019 Farm Bill. For the purposes of this paper, I will be using the subsidy programs within the 2014 Farm Bill. Additionally, I have included several newspaper articles pertaining to the information on the current trade war with China.

Discussion and analysis

Farm Visit

As we drove through farm country in Western Wisconsin in mid-September, most of the fields looked similar. There were acres upon acres of cornfields and soybeans. Long gone are the days of farms growing a multitude of crops to create the symbiotic relationship of polyculture and intercropping (Whipple, 2018). Not only does the landscape look homogenous, but the ownership of the land has changed dramatically. We would pass by a quintessential farm home,

complete with a barn, a gravel driveway, and acreage, only to soon learn that the acreage surrounding the house is no longer owned or operated by the family that inhabits the land. It has been sold or rented to another farmer that is working to expand their vast acreage in order to compete in the global food system (Guenther, 2018).

Farmer Dan talked extensively about the consolidation of farms in order to make ends meet; farmers are faced with the decision of getting big or getting out (Guenther, 2018). The Carlsons' described their farm as being a modest 2600 acres, something that by the standards of large-scale farming is apparently quite small (Carlson, 2018). Not surprisingly, the conventional, Carlson Farm grows three crops: corn, soybeans, and winter rye. The Carlsons were getting bigger in order to stay in the game. Farmer Dan talked about the difficulties facing family farms. They are stuck in this middle ground of being too big to have a niche market (like the CSA market that Dan and Margaret have captured) and being too small to compete within our globalized food network (Guenther, 2018). What options does the average Midwest farmer have?

The scale of a farm's production matters. The system of Dan and Margaret's community supported agriculture model depends on the scale being small and local. The operative word being community. Ideally, people participating in CSAs know the farmer that grows their food and visit the farm from which their food comes from. Due to operating on a local scale, community supported agriculture is not threated or disturbed by the imposition of tariffs on U.S. agricultural products.

On the other hand, conventional farms, such as the Carlsons', are operating on a grand scale—a global scale. Operating at such a grandiose scale will make the 2600-acre Carlson farm vulnerable to political tensions between nations. Although Common Harvest Farm and the

Carlson farm are less than 5 miles apart, the area that impacts their ability to survive could not be further apart.

Subsidies

After establishing that conventional farms are subject to the detrimental effects of tariffs, it is important to understand why they are vulnerable to political actions between countries. The process of consolidating family farms into 2600+-acre farms did not happen by accident, it was ushered in with the agricultural subsidy program. Agricultural subsidies are payments or other forms of support provided to certain farmers and agribusinesses by the United States federal government (White, 2018). Farm subsidies were originally created to provide economic stability to farmers in the midst of the Great Depression to ensure the U.S. domestic food supply (White, 2018). Yet, agricultural subsidies have evolved to only benefit growers of specific crops and certain types of farmers. Additionally, farm subsidies have promoted consolidation within the agricultural industry.

Currently, the United State government pays $25 billion annually to farmers and owners of farmland (White, 2018). It is important to understand that farmers are not just being handed astronomical amounts of money. There are sixty different direct and indirect agricultural subsidy programs (Edwards, 2018). For the purposes of this paper, I would like to discuss the three most influential farm subsidy programs pertaining to the 2014 Farm Bill: Crop Insurance, Agricultural Risk Coverage (ARC), and Price Loss Coverage (PLC).

The Crop Insurance Program was created in 1938, but did not become widespread until the passage of the Federal Crop Insurance Act of 1980 (*History of the Crop Insurance Program).* The program subsidizes the insurance premiums of farmers and the administrative costs of the sixteen private insurance companies currently offering the crop insurance policies (Edwards, 2018). As

with all of the agricultural subsidy programs, only certain crops are eligible for the crop insurance program. Over one hundred crops are eligible for crop subsidization. Yet, the main recipients of these policies are corn, cotton, soy, and wheat (Edwards, 2018). It is important to understand that "…unlike other farm programs, there are no income limits on insurance", so anyone growing the eligible crops can receive subsidies. In fact, there are about 20 farm businesses that receive more than $1 million a year from the Crop Insurance Program (Edwards, 2018). Furthermore, a study conducted by the Environmental Working Group (EWG), found that from 1995 to 2014, fifty people on the Forbes 400 list of the wealthiest Americans received farm subsidies (Edwards, 2018). Again, the farm subsidies the wealthy are eligible to receive are through the Crop Insurance Program because it is the most significant program without income restrictions.

Unlike the Crop Insurance Program, both the Agricultural Risk Coverage (ARC), and Price Loss Coverage (PLC) programs were both created with the enactment of the 2014 Farm Bill. The more common ARC program functions at the county level. The ARC program pays farmers subsidies if their counties average revenue per acre falls below the county's revenue guarantee (Edwards, 2018). The county's revenue guarantee is usually calculated by taking average county crop yields over the past five years. Importantly, ARC county programs only work when the entire county of farmers grows a particular crop elects to participate in the program (Coppess and Paulson, 2014). Schaffer and Ray emphasize that the ARC was developed under the assumption that prices of crops would remain above the cost of production, with occasional years below the reference point (2018). If average crop prices are not above the cost of production, then the ARC program will not be able to aid farmers because the reference point is determined by the average yield of the past five years. The Price Loss Coverage Program (PLC) subsidizes farmers based on

the national average price of crops in comparison the specific crop reference price set by Congress (Edwards, 2018).

As we are beginning to contextualize these different agricultural subsidy programs it is important to understand that only certain crops are eligible. White exclaims, "small commodity farmers qualify for a mere pittance, while producers of meat, fruits, and vegetables are almost completely left out of the subsidy game" (White, 2018). Farms like the Carlson Farm benefit from subsidy programs, but CSA farms, such as Common Harvest, do not.

Small producers are virtually ineligible for agricultural subsidies for two reasons. First, the federal farm subsidy program creates an incentive for farmers to grow certain crops. The Congressional Budget Office estimates that between 2017 and 2027, more that 70 percent of the largest subsidy programs (Crop Insurance Program, ARC, PLC) will be directed towards producers of three crops: corn, soybeans, and wheat (Bekkerman, Belasco & Smith, 2018). Next, subsidies are concentrated among the producers at the largest scale. “Farms in the top 10 percent of the crop sales distribution received approximately sixty-eight percent of all crop insurance premium subsidies in 2014” and the top two percent of farmers receive subsidies more than four times higher than the average per-acre subsidy (Bekkerman, Belasco & Smith, 2018).

In order to qualify for agricultural subsidies, farmers must meet to the Actively Engaged in Agriculture Requirement (Schnepf, 2016, p. 1). To meet the Actively Engaged in Agriculture Requirement, a single producer must have a significant amount of labor and capital invested into the farm. Furthermore, they must incur an amount of risk that reflects their labor and capital investment in the farming operation (Schnepf, 2016, p. 7). If there is a second producer, meaning that two people share an equal amount of labor, capital, and risk in the farming operation, then

they must meet one of two requirements. First, the farm must meet a certain amount of complexity that is simply not feasible for any farmers that are not participating in industrial agriculture. The other requirement that reflects the eligibility of two farm producers for federal subsidies is determined by the size of the farming operation. The farm must be classified as a large operation defined as "an operation with crops on more than 2,500 acres (planted or prevented from being planted due to weather)" (Schnepf, 2016, p. 12). Once again, this requirement excludes small scale farmers. This illustrates not only the advantage of commercial agriculture, but also the push to consolidate agricultural enterprises.

Tariffs

The agricultural consolidation promoted by the federal farm subsidy program has led the United States to become the number one agricultural exporter of corn and soybeans (Mellnik and Uhrmacher, 2018). China is the is the world's biggest importer of soybeans. Furthermore, China is the United States largest buyer of soy, accounting for the importation of a third of the United States' production of soybeans (China Targets U.S. Farm Imports). Therefore, when a twenty five percent tariff is levied on agricultural imports from the United States, it has a drastic effect on the farmers in the United States (Schaffer and Ray, 2018).

While we were visiting the Carlson Farm, Scott Carlson expressed the immediate effects of the tariffs. He explained that after farmers harvest their crop of soybeans, they store them in grain silos until the company that is buying their crop requires their soybeans. The company can and will call whenever. The farmer's income is entirely dependent on when their crop is called up (Carlson, 2018). They are not paid for their harvest until this happens. With the tariffs that have been placed on U.S. agriculture exports by China, the companies are no longer requiring the soybean crop that the farmers have stored. Mr. Carlson explained that a vast majority of North

and South Dakota soybean farmers have stored nearly one hundred percent of their crop (Carlson, 2018). This means that they have not been paid for their entire season of work. This immediate effect is detrimental to farmers because their source of income is nonexistent.

Conclusion

When we are evaluating the ways in which farmers in the upper Midwest are being affected by the contemporary tariffs, understanding the scale in which this reality is operating becomes important. Small-scale farmers in the United States are not subject to the agricultural tariffs because they serve a domestic market. Ultimately, large-scale farmers are being affected by the Chinese tariffs placed on United States agricultural products because the majority of conventional farmers within the United States grow a select few crops. The overproduction of these few crops—chiefly soy, corn, and wheat—has subjected farmers to be at the mercy of global political tensions. The concentration and consolidation of farming in the United States is a direct result of the federal farm program. As Moseley explains, there is nothing inherently wrong with subsides. However, "they become a problem when they leave farmers with little choice but to focus on a few crops" (Moseley, 2012). Homogeneity is not always the answer. Bigger is not always better. In light of the recent tariffs, it is important for policy to reevaluate the agricultural reliance on the global system. The Farm Bill is an incredibly complex piece of legislation. Making significant changes to the deeply entrenched agricultural system in this country will take years to address. Yet, in a perfect world, Congress would make subsidies more accessible to crops outside of the big three (corn, soy, and wheat) the upcoming 2019 Farm Bill. This type of policy change would help to create a more robust agricultural system to support farmers on a local and national scale.

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10.9.18

Export Politics: The Implications of Trade Wars for Midwest Farmers

Introduction

This research paper seeks to analyze and examine the impacts of tariff wars on farmers in the upper Midwest of the United States. More specifically, I will be focusing this analysis on the impacts of the current trade wars between the US and China and the ways that these policies have affected conventional and non-conventional agricultural producers differently. The following exploration of this topic through field work, opinion pieces, and organizational research will provide the opportunity for readers to observe the distinctions between these production models on both localized and international scales.The correlations that exist between commodity production, corporate and government interest, and international trade will be made evident throughout this report. Further, contrasts between conventional and non-conventional production and their relationships to global markets will illuminate the roles that these different production models play in contemporary geopolitics.

Research Methods

The information presented in this paper is compiled from a variety of resources, ranging from field inquiries, lectures, research into current opinion pieces on the issue, as well as public statements made by organized groups like the American Farm Bureau Federation. Field research took place in Osceola, Wisconsin as part of a field trip with Professor William Moseley's

"People, Agriculture and the Environment" class. The trip was co-led by Dan Guenthner, a Community Shared Agriculture (CSA) farmer who lives in Osceola. Information about the area, the farmers who live there, and the changes occuring in the region (as a result of farm consolidation, climate change, etc.) was provided by Dan. While in Osceola the class visited Carlson Farm, a conventional agriculture business owned and operated by Scott Carlson. Scott, with additional contributions from his father, lectured students about the farm, its operation, budgeting, etc. while students voiced questions and comments. Additionally, Dan facilitated the conversation, asking policy and location-specific questions. Following this students visited Common Harvest Farm, Dan's CSA farm where we learned about the non-conventional practices employed by Dan and his wife, Margaret. Students toured the farm, showed various equipment and farming methods, while Dan and Margaret lectured.

Findings

For findings, we will begin with information gathered from field work. While touring Osceola, Dan mentioned that the federal government is offering loans with 1.5% interest to farmers in order to fund the construction of large storage structures. Such structures are needed because of the low commodity crop prices that the tariff wars have brought on, as farmers want to (and need to) store their crops until prices rise. Scott Carlson explained to the class that the short-term consequences of these price changes were mild as, at least in his case, prices for crops were pre-contracted. He mentioned that contractors who facilitate the movement of crops from farms to ports (and from there, markets) can afford to wait for prices to return to normal. Conversely, many farmers who do not have pre-contracted prices cannot afford to wait and must

take out loans to cover costs until prices again rise. Further, he included that some states such as North and South Dakota may not have the infrastructure necessary for such storage facilities and will necessarily have to suffer a loss on recent crops. Nevertheless Scott maintained an optimistic attitude, saying that the demand for commodity crops like soybeans is high and that it will only be a matter of time before prices recover.

An article published by Wisconsin Public Radio (WPR) titled, "Trump Administration's Trade Policy Could be a Factor in Wisconsin's US Senate Race" found that many farmers were feeling uncertainty about the tariffs, contrasting Scott Carlson's take on the issue. Dairy farmer Bob Pronschinske was quoted as saying that "the big question is if it's going to work" (Wisconsin Public Radio, 2018). Additionally, the beef farmer and director of dairy policy analysis at the University of Wisconsin - Madison Mark Stephenson says that trade deals such as NAFTA have increased US exports but, as a result, the agricultural economy is heavily dependent on these exports to maintain profitability. He shared a similar sentiment to Pronschinske in his interview, stating, "They say that if we're patient, it will all iron out. The only problem is, how long can we be patient and at what point patience runs out."

The political ramifications for these uncertainties is reflected in one of the opinion pieces referenced, titled, "Farmers' Anger at Trump Tariffs Puts Republican Candidates in a Bind". Many politicians, the authors claimed, are torn between loyalty to the President and fighting policies which are hurting their citizens (Stolberg and Swanson, 2018). Further, some politicians, such as former Democratic senator of North Dakota, Kent Conrad, recommend employing government agencies, such as the Commodity Credit Corporation, to mitigate the effects of the

tariffs. Among these consequences, the article cuted that that the stocks of various agricultural corporations dropped in response to the tariff announcements.

While informative and enriching in myriad ways, the visit to Common Harvest Farm was not particularly bountiful in its contributions to this topic of inquiry. However, when doing further research on their website, I did find aspects of the CSA system that are of particular interest and which will be applicable later on in this paper. Various quotes from their website were relevant to this topic, such as that as the concept of CSA farming developed "people saw the need to *share in the risks of the farm*, to form a relationship that in return would enable them to share in the bounty and sustainability of the farm" (Common Harvest Farm, emphasis mine). Additionally, the fact that shareholders pays for their portion of the far creates "economic stability for our farm community."

Research into organized groups and their voice in this debate yielded significant results and offered a key perspective on the issue. In their statement to the Senate Committee on Agriculture, The American Farm Bureau Federation advocated for the continuation of trade deals such as NAFTA and the TPP and encouraged "trade officials to engage in discussions with our trade partners to resolve trade concerns before resorting to tariffs" (The American Farm Bureau Federation, 2018). Their statement included a variety of statistical information and policy recommendations on the issue. For example, they cite that over 25 percent of US agricultural production goes to international markets, hence their belief that the expansion of international trade "is crucial to the well-being of America's farmers and ranchers". The group also lays out the timeline of events which led to their statement. In a series of back-and-forth threats originating from Trump's announcement to put a 25% tariff on steel and a 10% tariff on

aluminum, China ultimately came to impose a 25% tariff on US agricultural products including "soybeans, sorghum, cotton, corn, wheat, beef, pork" and more. As a result, current analysis predicts a $7 billion drop in US agricultural exports to china in the 2019 fiscal year. Responses to such prospects included a drop in futures of soybeans, corn, and wheat. The organization estimated that a reduction in soybean price based on this data would result in a $15,800-$26,200 income drop for farmers harvesting 1,000 acres of land and $11,000-$18,300 for corn farmers on the same acreage.

Finally, the data assembled by the Organic Trade Association in their report on US Organic trade data from 2011-2016 provided great insight on the import and export economies of organic agricultural products in the United States. Most striking was the disparity between the amount of organic agricultural products the US exports and the amount that it imports. In 2016, $547.7 million of organic agricultural products were exported while $1,714.7 million were imported (Organic Trade Association, 2017, pages 9 and 29). Additional relevant information was that the main importers of these products were Canada and Mexico, while the main exporters to the US were primarily from countries of North and South America.

Analysis and Discussion

Information gathered from Carlson Farm and lectures by Dan Guenthner reveal that commonalities of consolidation and mechanization characterize the conventional farming industry. Scott Carlson, when showing the class the equipment he uses, explained that new machinery has to be purchased every 5-7 years so that resale value remains high. It is in the farmers' interest to purchase the newest and most expensive machinery because doing so brings

with it the potential for increasing yields and thus increasing profits. In order to fix these machines, Scott says, speciality technicians must be called in as the computerization of these machines has made the information regarding their operation proprietary. This, like many other inputs on a conventional farm, brings with it great costs. As a result, farmers accomodate for these expenses, ramping up production and increasing inputs to do so. We thus see the perpetuation of a production loop in which the conventional farmer is always needing to catch-up in some way.

Various sources proposed subsidies for farmers as a solution that would mitigate the impacts of these tariffs. As we saw before, Kent Conrad recommended having the Commodity Credit Corporation purchase soybeans "to buoy farmers' revenues" (Stolberg and Swanson, 2018) and the government is offering subsidized loans to farmers for storage structures. Both solutions propose a government bailout to ease the pressure of decreased exports and lower prices. That said, neither approach goes on to address the root of the problem -- namely, that production costs are just too high and sale prices are just too low. Scott Carlson alluded to something similar as he said that contractors have the ability to wait for prices to rise again while farmers do not. Information gathered from opinion pieces and interviews made evident that all farmers feel uneasy about the tariff wars. Some trust in the end result, others do not, yet they all must wait in anticipation to see if their incomes drop -- hopefully not to the extent that the American Farm Bureau Federation estimates.

The same, it seems, does not hold true when we look to non-conventional agriculture. The CSA system, with the support of shareholders, allows Dan and Margaret to operate their farm with a sense of economic security. Indeed, this is a preventative measure built into the

system to begin with, contrasting how the government is attempting to help conventional producers through offering subsidies after economic instability has hit. Additionally, if we look to the findings of the Organic Trade Association, we see that international trade is largely restricted to North and South American, and thus is not directly tied to the markets affected by the current trade wars. From this we may derive that the producers of organic goods will not suffer the same losses that conventional producers will inevitably face in this scenario. Independent from the interests of policy makers and funded by members who invest and subscribe to the organic ideology, non-conventional producers are not caught up in the web of political conflict that conventional producers are.

Conclusion

Such evidence makes clear that conventional agricultural practices and the production of commodity crops like soybeans, corn, and wheat fail to create stable economies and operate in the best interest of the market's producers. The research made clear that US farmers are in an increasingly unstable position. Commodity prices have sunk lower and lower with increased mechanization and the resulting increase in yields and as trade wars continue farmers must make risky financial decisions. Continuing to sell these commodity goods in the global market while backed by government subsidies makes the United States a fierce competitor in the production of these products, however such practices are not in the interest of the farmers themselves and rather serve as tools to be employed by political actors. Nevertheless, Scott Carlson and the American Farm Bureau Federation maintain hopes for the future, with the latter encouraging the expansion of international market as a means of increasing profits. What this reveals to me is an

ideology maintained and enforced by government, corporate, and market interests. The economic security of Common Harvest farm and other organic producers at this time are evidence of just this. Their economies are well structured and supported while those of conventional producers are subject to the whims of political leadership. We may look into the demographics these non-conventional markets, relating the presumed economic security of these demographics to the persistence of the markets in times of economic conflict in further inquiry. However, for the time being, it is imperative that we begin to steer our agricultural producers away from international commodity markets and towards ones which value the farmer, his or her well-being, and the goods he or she produces.

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People, Agriculture and Environment

Tariff Wars in the Upper Midwest

Across the Midwest it's clear: soybean farmers are upset and uncertain with the fate of their farms and businesses. Soybean Tariffs placed by China have resulted in the price per bushel falling from $10.50 a bushel to $8. In other words, for every $1 below average price per bushel the soybean industry loses $4 billion dollars or 10% of total revenue (Jones, 2018). In soybean producing states such as North Dakota and Iowa, the short terms effects of the tariffs have put strain on everyone from farmers to downstream business such as local banks and silo manufacturers (Kitroeff & Casselman, B. 2018). Therefore, how are reactionary tariffs affecting voting decisions in two close election, Iowa's 1st congressional district and North Dakota's class 1 US senate seat, for the upcoming 2018 midterm elections? Secondly, how does this tariff fall in line with previous tariffs that have affected the upper midwest?

This research was gathered from academic journals, newspaper articles, polls and online transcriptions of interviews taken from radio shows. To understand the history of tariffs I used Ghoshal, A. (1981) paper *The Effect of the Embargo on Grain Exports to the Soviet Union on the Exchange Rate* as well as Morris, F. NPR interview "Farmers Swept Up In Trade Wars Remember '80s Grain Embargo." To understand the opinions of farmers and manufacturers alike, I collected quotes from the New York Times, Washington Post, Time Magazine, and Business Insider, among many others. To understand how the candidates are polling I used fivethirtyeight polls to understand how the candidates message are being received. I acknowledge that polls do not 100% accurately predict candidates but based off of a certain

sample size polls can tell us the majority's opinion without having an election.The goal of analyzing these interviews is to understand the implications of Trump's tariffs in a larger political context-- election of Kavanaugh and Trumpism. Secondly, how does this fall into the policy history of free trade vs protection for agricultural producers in the period leading up to the 2018 midterm election.

I. Pre-Soybean Tariff ~ US Grain Embargo against Soviet Union 1980

From the year 1971 to the year 1978, trade between the U.S. and the Soviet Union increased from 220 million to 2.8 billion dollars (Ghoshal, 1981). Of the 2.8 billion dollars around 75% of the exports were grain products including corn and soybean (Ghoshal, 1981). During the late 70s the U.S. was importing precious metals such as gold and platinum from the Soviet Union, creating a strong trade balance in the hands of the United States. After the Soviet Union invaded Afghanistan, Jimmy Carter retaliated by placing an embargo against all grains flowing into the Soviet Union. This meant that 17 million tons of grain or 2.6 billion dollars of grain was restricted to the Soviet Union. Once Carter implemented the embargo, prices began to tumble and farmers across the midwest began to witness the fallout.

In August of 2018, NPR hosted three former Kansas farmers, Paul Penner, Marshall Ulrich, and Duane Hund, all of whom voted for Carter in 1976 but later voted for Reagan in 1980. According to Hund, " it sent a clear signal to the world that we can't depend on the United States to be a reliable trading partner." (Morris, 2018) As a result grain from Argentina and Brazil, and later Canada and Australia began flowing into the Soviet Union Ghoshal, 1981). In the fall of 1980, Missouri's 8th and 10th congressional district switched from Democrat to

Republican (Raasch, 2018). This particular area is home to a number of grain farmers where agriculture plays a critical role in the local economy. Similarly, farming states such as Wisconsin and Ohio both switched from Democrat to Republican. At the same time you can not place all the blame on the embargo. During the late 70s the United States was in a recession, there was the Iran hostage crisis, as well as the grain embargo of 1980 (Morris, 2018). While it's not possible to tell how each voter voted, it's hard to deny the effect the grain embargo had on midwest farmers.

II. History of the 2018~ Trump's Three Justifications

On June 28th, 2016 then nominee Trump stopped at Alumisource in Monessen, PA, detailing his plan to "rewrite global trade wars (Staff, 2016)." Of his seven points, his final point:

> *"if China does not stop its illegal activities[unfair subsidy behavior, currency manipulation, etc], including its theft of American trade secrets, I will use every lawful — this is very easy. This is so easy. I love saying this. I will use every lawful presidential power to remedy trade disputes, including the application of tariff consistent with Section 201 and 301 of the Trade Act of 1974, and Section 232 of the Trade Expansion Act of 1962."*
> -- Donald Trump, June 28, 2016 (Staff, 2016)

It's important to highlight that section 301 of the Trade act of 1974 prevents "unfair trade practices and theft of intellectual property (Staff, 2016)." This would allow a president to "impose fines or other penalties on a trading partners if it is deemed to be unfairly harming U.S. business interests (Staff, 2016)." In this case, Trump has three main contentions for implementing a trade war on China. 1.) Solar panel and washing machines imports injure U.S. business 2.) Imported Steel and Aluminum are a national security threat 3.) Unfair trade practices for technology and intellectual property. Between January 23rd 2018 and September 24th 2018, the United States began implementing Tariffs in those three areas. In response, China reacted by placing a 25% Tariffs on U.S. transportation and agriculture -- mainly soybeans.

III. Midterm 2018: Iowa & North Dakota

During the past 5 months, the New York Times has put out a number articles documenting the effects of President Trump's Tariffs on farmers in the Upper Midwest. One of these articles, "Trump Has No Idea What His Tariffs Have Unleashed for Farmers," was written by KNIA and KRLS New Director Robert Leonard from Iowa. Leonard points out that the reason young people are not interested in farming " isn't because young people in rural America don't want to farm; it's because, if it isn't already the family business, the costs are much too high to allow many of them to get into it (Leonard, 2018)." This comes at a time when the average age of farmer is 58 years old and seems to be only increasing as time goes on (Leonard 2018). For the second part of the article, Leonard argues that as farms get larger, farm loans are less likely to be local. Further, a big operation with farms in dozens of counties or perhaps across state lines will unlikely use local banks for credit. Therefore, the tariff's have created a scenario where small scale farmers are becoming less likely to take out loans. If profits are not enough to pay off loans, Leonard believes farmers will be less likely to take out loans for farming equipment. This may eventually lead to the end of local banks in rural regions (Leonard, 2018).

Leonard's opinion piece was thought provoking and represents the unsureness and uncertainty looming overhead citizens of Iowa. The concern for ordinary Iowans alike whether they be part of the ¼ of Iowans who pursue agriculture or not, are now realizing how precious but also how fragile this system is to reactionary tariff's (Martin, 2018). Already we're started to see the rapid evolution of the situation. In July, Chinese buyers started canceling hundreds of thousands of tons of soybean orders since April (Martin, 2018). Additionally, soybean prices fell

close to a 10-year low in July (Jones, 2018). Soybean producers in Iowa stand to lose $624 million from the trade war, according to Chad Hart, an economist at Iowa State University (Jones, 2018). Farmers from Iowa to North Dakota have been quick to recognize how strikingly similar the embargo of 1980 is to the soybean tariffs. Of the many close elections that will be happening this midterm season, two election stand out more than others -- Iowa's 1st congressional district and North Dakota's class 1 senate seat.

In Iowa's first congressional district, Republican Rod Blum has been struggling to maintain consistency in his message. In June of 2018, Mr. Blum along with 221 members of state and local chambers signed a letter of support for a bill to approve or reject any new tariffs the president imposes based on national security concerns (Baker, 2018). Only a month later during President Trump's visit to Iowa did Mr. Blum praise the president for "having political courage to renegotiate these trade deals (Baker, 2018)." Democratic challenger Abby Finkenauer has repeatedly denounced Mr. Blum saying in an interview, "We deserve a lot better than a congressman who sits there and thanks somebody for throwing livelihoods in flux (Martin, 2018)." According to fivethirtyeight's collection of polls from September 19th, Ms. Finkenauer lead by a margin of 14.2% over Mr. Blum (Silver, 2018). While fivethirtyeight gives her a 97% chance of winning, how should Mr. Blum or other Republicans try to appeal to their base? Should they come out in full support of the president or try to appeal as a Republican alternative by separating themselves from policies such as the Tariff, that have been hurting their base? That's why it's important to examine a democrat incumbent facing Republican opposition in majority Republican state (Martin, 2018) (Silver, 2018).

North Dakota's Democratic incumbent Senator Heitkamp faces many challenges ahead for reelection. Heitkamp won her seat by fewer than 3,000 votes in 2012 and faces Republican Kevin Cramer as her challenger. (Martin, 2018) "Clearly he sees his role is to be a vote for President Trump in the United States Senate," she said. "And I believe my role is to be a vote for North Dakota in the United States Senate (Baker, 2018)." Cramer on the other hand says, "People in North Dakota prefer humility to hyperbole, and that kind of hyperbole I don't think sells very well politically," he said. "But it's certainly not good for our farmers or good for our economy." (Martin, 2018) However, Mr. Cramer let his frustration slip with the president's actions on a local talk radio program,"He tends to have rather emotional responses," he said of Mr. Trump (Martin, 2018). However, in battleground towns like Casselton, such talk is not taken lightly. In terms of polls, fivethirtyeight has called the race a toss up with neither candidate polling no more than 2-4% (Silver, 2018). Nancy Johnson, who leads the North Dakota Soybean Growers Association, said her farmers "are rightly concerned, because we're being used as a weapon." (Swanson, 2018)

It's also important to note how North Dakotans have been reacting in the larger political climate that exists in the midwest. For example, Heitkamp was prepared to vote "yes" on the election of Brett Kavanaugh to the supreme court but voted no after the testimony of Dr. Christine Blasey Ford (Bash, 2018). In response, challenger Kevin Cramer said, "that women in his family, including his mother, cannot understand this movement toward victimization. They are pioneers of the prairie (Bash, 2018)." Heitkamp responded by revealing that her own mother was victim of sexual assault, and to "suggest she's not strong because she's a victim was like a trigger for me [...] this was a life-changing experience for her and she made us stronger because

of it (Bash, 2018).” While Heitkamp has received praise for her response, back in North Dakota where Trump won 63% of the vote the praise is not so loud (Bash, 2018).

In terms of free trade vs. protection policies, farmers do not react well to “being used as a weapon (Martin, 2018).” For example, the free trade the existed between United States and Soviet Union prior the embargo created a trade balance that strongly benefited the United States in the form of $2.8 billion. After the embargo, the Soviet Union was able to find alternatives while farmers paid the price with their livelihoods. Today, farmers echo the same concerns especially considering the upcoming midterm elections. And while the U.S. is not facing a hostage crisis, a recession nor is this a presidential election year, examining policies of free trade has become rooted in a culture of partisan politics. That is, partisanship is dividing rural and urban Americans to the point where partisan loyalty has been this important since the Civil War. Trump’s 2016 speech rallied the support of thousands of steel workers and perhaps gave him an advantage in states such as Michigan and Pennsylvania. However, states such as Iowa and North Dakota are taking much of the hit of reactionary Tariffs. But are farmers willing to sacrifice their own farms, for the benefit of a trade war?

In the end it boils down to party loyalty and the message of each of the candidates. Where Mr. Blum has lacked a clear footing, Finkenauer has stuck with her pro labor message by denouncing Blum’s convoluted message. In this case, I would argue voters would vote for a candidate such as Finkenauer as she has a clear message opposing the Tariff. On the other side, Heitkamp has struggled to maintain support by trying to appeal to the Democrat voice that elected her while also trying to appeal to the Trump vote that she needs to win the race. Like Blum, her lack of a clear message makes me believe that voters might weigh party loyalty in the

hopes of “waiting out the storm (Martin, 2018).” Still it remains uncertain how either candidate will perform but one thing's for certain -- the Tariffs are not going away soon.

IV: Conclusion & Limitations:

This paper analyzed the effects of the reactionary tariffs in Iowa and North Dakota. The scope of this analysis could have been broadened to include the Wisconsin governor race, or Minnesota's 1st congressional district. Due to the length of the paper I choose to focus on these two elections based off how close the elections were predicted to be as well as the vast amount of soybeans that are produced in each district. In addition, the current literature lacks a comparative analysis of both the current Tariff war and the embargo as well as comparing the similarities and differences between the two election year’s. Finally in terms of policy, I believe it is imperative that Trumps works with other countries in creating a multilateral agreement instead of attacking them e.g., the E.U. While it’s completely practicable for president Trump to end the deal, if Trump and his base strongly believe that industries such as the automotive, steel and solar industries are being affected, they need to consult with other countries instead of criticizing them.

In summation, there are striking parallels of the current trade war with the 1980 embargo. Soybean farmers are facing the possibility of losing their businesses that may ultimately affect downstream industries such as banks and manufacturers. Unlike 1980, the increasing rural to urban divide has resulted in increasing partisanship which has created a scenario for farmers where they have to weight the effects of party loyalty over the current effects of the tariff.

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Consequences and Precursors to Trump Administration Tariff War

Introduction

The goal of this paper is to identify the impact of President Trump's tariff war on farmers, specifically those in the Midwest. This paper specifically differentiates the Trump administration's general tariff policy from that of the Obama and Bush administrations, and acknowledges how the tariffs have impacted economies nationally and globally in order to identify the potential effectiveness of said tariffs. President Trump's tariff war could potentially impact nations worldwide, and its global implications make this topic relevant to all. Based on evidence from similar tariffs in recent American administrations, what might Trump's tariffs result in long-term?

Methods

The primary methods of finding information for this paper were the Macalester College library database search engines, which can be customized to find scholarly articles based on subject. As Trump's tariffs meet at the intersection of economics and political science, journalists in both subjects contributed sources for this paper. As a key aspect of this paper is the varying impact of Trump's tariffs depending on people's location and occupation, using a variety of sources that reflect said diversity of impact are important. That is why a wide range of kinds of sources, including excerpts from national news reports, interviews with those in several types

of fields, and even President Trump's Twitter, were relevant to this research. While the last source might seem unconventional, Donald Trump's usage of Twitter to reflect his feelings on his tariff war is key in order to identify the differences between his feelings on current events as the leader of America and the opinions of economists and businesspeople globally.

Tariff Overview

American Secretary of State Mike Pompeo believes that America is "going to get an outcome [from Trump's tariffs] which forces China to behave in a way that, if [they] want to be a power, a global power-- transparency, rule of law, [they] don't steal intellectual property" (Jiang 2018). Pompeo affirms the belief of the Trump administration that China purposefully steals American companies' information, specifically online (Swanson, Rappeport, and Tankersley 2018). This conclusion is one of the main reasons the Trump administration has placed tariffs on Chinese products (Swanson, et al 2018). Another contributing factor to these tariffs is China's "Made in China 2025" plan, an initiative to use technology in order to have higher efficiency production of higher-quality products made from Chinese materials (Kennedy 2018). This plan was based on similar European manufacturing policies, particularly Germany's "Industry 4.0" plan (Kennedy 2018). The "2025" element of the title originates from the plan's goal to ensure 70% of base materials used in Chinese factories are made in China by the year 2025 (Kennedy 2018). As the plan was created by the Chinese Ministry of Industry and Information Technology and contributors to the China Academy of Engineering, most of these key changes that will be made to Chinese manufacturing are technological (Kennedy 2018). Because Trump's administration believes China is stealing American technology (and using hacking in order to do so), China's goal to use more technology to reach more economic success

undoubtedly affirms Trump's tariff decisions, which currently limit access to American technology.

Although Steven Mnuchin claimed that the goal of Trump's first major round of tariffs, on steel production, was "not to single out China or treat them differently" and instead to ensure the United States has "necessary tools to protect U.S. investments" (Swanson, et al 2018), Donald Trump and other members of his administration have said otherwise about the purpose of the trade war. President Trump Tweeted, "We are beating [China] on Trade, open markets, and the farmers will make a fortune when this is over!" (realdonaldtrump 2018), implying that the goal of this war was in fact to reduce China's business abilities . Mike Pompeo, in reference to America's position in Trump's trade war, claimed "we are going to win it" (Jiang 2018). This indicates that Pompeo believes this was intentionally a trade war, instead of an attempt at an agreement between the Chinese and American governments.

Precedence

While previous administrations did not refer to their economic policies in the manner Trump does, there is precedent for Trump's general economic decisions regarding tariffs. The Obama administration placed tariffs on tires made in China, in order to produce and sell more tires made in the US (Appelbaum 2018). Chinese tire factories were essentially unaffected, as the organizations simply built factories outside of China, where they would not be charged the tariffs (Appelbaum 2018). Although the general Obama tire tariffs saved up to 1,200 American jobs, the policy cost $1.1 billion, which is significantly more than the economic value of those manufacturing jobs (Appelbaum 2018). Regardless of the issues with the previously mentioned tire tariffs, the Obama administration later placed tariffs on Chinese solar panels (Garcia and

Smith 2018). These tariffs were also ineffective, as Chinese companies assembled solar panels in countries like Malaysia and South Korea, as they wouldn't have to pay tariffs overseas (Garcia and Smith 2018). The precedent for American tariff policies applies to Republican administrations as well, as the George W. Bush administration adopted steel tariffs in 2002 (Appelbaum 2018). This policy concluded with benefits to steel manufacturers, but problems for any companies that used steel as a material (Appelbaum 2018). An economist from Dartmouth College, Douglas Irwin, explained that the tariff was only successful if the Bush administration's sole goal was aiding the steel industry, noting that the tariffs caused a significant amount of issues for uninvolved Americans (Appelbaum 2018). If the Trump administration's tariffs are intended to emulate Obama or other predecessor's policies, as Vanek Smith indicated, long-term results would likely be similar to that of those previous policies.

Impacts of Current Tariffs

Similarly to factories that used steel in the early 2000s, U.S. manufacturing companies are dealing with issues as a result of tariffs in other industries. Currently, those issues are retaliatory tariffs. It is anticipated that prices will increase on items like lamps, vacuums, shampoo, soap, baseball gloves, hammers, and door locks, among many other items (Malito 2018). As Joe Furlanem, the vice president of international merchandising at Ace Hardware noted, his company has "never experienced any efforts by the Chinese government to unfairly facilitate in systematic investment in, or acquisition of, [their] company or [the company's] assets in an effort to steal [the company's] technology" (Malito 2018), as their products are generally not technological. This further indicates that companies like Ace Hardware are

uninvolved with the tariffs (and will not benefit from them), but are retaliated against simply for being American companies.

U.S. agricultural companies are also particularly impacted by these retaliatory tariffs. In a letter to Robert Lighthizer, the United States Trade Representative, Dale Moore, the vice president of public affairs from the American Farm Bureau Federation, noted that China typically imports 16% of American agricultural exports, purchasing $19.6 billion worth of agricultural products in 2017 (Moore 2018). Because of Trump's trade war, China placed a 25% retaliatory tariff on American pork, and a 15% tariff on tree nuts (almonds, walnuts, and pecans), fruit (apples, cherries, grapes, oranges, lemons), wine, ginseng, and more, for a total of $2 billion in American products (Moore 2018). Because of the trade war, China will likely move from the second most importer of U.S. agricultural goods in the past fiscal year to being the fifth most importer in the 2018 fiscal year (Moore 2018). As China imports such a high percentage of American agricultural items, losing profits on these goods will be extremely impactful economically.

As a result of these negative effects on American agricultural exports, the Trump administration allocated up to $12 million in government aid for farmers. (Daniels 2018) The original distribution of aid was divided into $4.7 billion directly to farmers, and up to $1.2 million for the government to buy American agricultural products (Daniels 2018). Additionally, the government reserved up to $200 million to facilitate new markets for American agricultural products (Daniels 2018). However, as Senator Heidi Heitkamp noted, this amount of funding might not be sufficient to account for the immense economic losses to farmers due to Trump's

tariffs (Salama and Bunge 2018). Therefore, the United States will lose money both in terms of financial bailouts and in agricultural losses, without properly financially aiding farmers.

Nevertheless, Donald Trump believes that his tariffs are successful, Tweeting "People are excited about the USA again! We are getting Bigger and Richer and Stronger. WAY MORE TO GO!" (realdonaldtrump 2018), on September 26. Chinese government representatives indicate otherwise. As evidenced by China's deputy trade negotiator asking "How could you negotiate with someone when he puts a knife in your neck?", in reference to Trump, it is clear these tariffs have not made China interested in negotiating with the United States (Jiang 2018). The Chinese government issued a document in response to the tariff war, and explained that it is "entirely up to the US side" to act more respectfully toward the Chinese government before China will participate in negotiations (Jiang 2018). The trade representative also noted that "containing China or fighting a trade war-neither is in line with the direction of peace and development for mankind… Someone has to pay the price for a trade war. Who? It will be the ordinary people" (Jiang 2018). Although said document indicates that there will be a negative impact of the trade war on the Chinese economy, it also references the impact of the trade war on global economies (Jiang 2018). Based on this evidence, it is fair to assume Trump's trade war will not be successful, and will instead cause economic problems for America and the world. One reason why Trump's tariff war won't be successful is because of the way the Trump administration is mishandling this and not leaving room for China to negotiate, although in a sense it was likely to fail because of American tariff precedence.

Policy Recommendations

In order to truly solve intellectual property issues and end the tariff war, the Trump administration needs to rectify the problems it has created with China. Additionally, members of the Trump administration asserted that the original purpose of the tariff was to ensure the Chinese government listened to and acknowledged the American government's complaints (Swanson, et al 2018). One method of discourse the Trump administration should consider in achieving that goal is courteous dialogue, as the Chinese government has indicated its belief that the Trump administration's tariffs and attitude are disrespectful (Jiang 2018). In these discussions, both China and the Trump administration need to agree to end their practice of tariffs with each other, knowing that future tariff expansion cannot occur between these two countries due to its current effects. Once the countries have solved communication issues, negotiations about intellectual property can resume through conversations and proposals between the two countries, instead of current, unsuccessful tariffs and retaliations.

Conclusions

Because of the unsuccessful impacts of tariffs in both the Bush and Obama administrations, as well as current major issues with retaliatory tariffs, the Trump administration should anticipate its current tariff policy will be futile. These tariffs have been problematic for American entrepreneurs, especially farmers, and it is believed that there will also be negative impacts to American consumers. Although President Trump and his administration claim they believe the tariffs are effective, there are clearly major flaws, as the administration has had to allocate emergency funds to solve problems stemming from the tariffs. Therefore, Trump must rescind these tariffs and focus on his initial intention, effective discourse with the Chinese government, benefiting America and China.

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Chapter 2:
How do rural labor dynamics (including the current immigration restrictions) impact different types of farmers in the upper Midwest?

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Coexistence and Conflict: Interactions Between Locals and Immigrants in Upper Midwestern Rural Farming Communities

Introduction

Long-standing agricultural areas of the Midwest increasingly see persistent labor shortages as the phenomenon of out-migration to urban areas occurs. This trend of depopulation creates growing demand for outside labor. Already, the majority of agricultural laborers are born outside of the United States and that percentage is consistently increasing (Martin & Taylor, 2013). As a result of these changing demographic trends, immigrants are settling into areas that were once majority white and American. Certain communities look markedly different from the way they have looked traditionally and historically. Rural farming areas throughout the region of the upper Midwest have seen pronounced growth in immigrant populations. Beginning in the 1990s, the established trend of immigrants migrating to urban centers and major metropolitan locations commenced to change, with increasing numbers of new immigrants moving instead to rural areas of the country (Valdivia & Flores, 2012).

This paper attempts to investigate how rural agricultural areas of the upper Midwest are changing socially and structurally as immigrants establish themselves in communities that are traditionally conceptualized as heterogeneous, white, and American. The following essay will address the ways in which area locals and incoming immigrants both coexist and clash as immigration occurs in these rural Midwestern farming communities. This essay argues that

farmers' needs for labor and the labor shortage combined with immigrant workers' needs for employment creates a symbiotic relationship that can allow for positive cultural exchange and migrant integration into community structures. Conversely, this paper addresses the ways in which migrants are often exploited by and alienated from rural communities, due to both personal choice and exclusionary attitudes of native community members.

Methodology

The research presented in this paper is compiled from various academic studies and articles. Much of the scholarship examined in the researching of this paper consists of ethnographic interviews with migrant workers, farmers, and professionals in the social service sector who assist migrant populations. The scholarship also includes journal articles on migrant labor dynamics from a range of perspectives including anthropological, political, and psychological. The majority of the research analyzed in this essay focuses on the experiences of Latino immigrants, mainly because close to half of all immigrants to the United States are Hispanic/Latino in origin (Grieco, 2007). Furthermore, the Latino population in the Midwest grew by approximately 36.5% between 2000 and 2008, cementing this demographic as crucial in the examination and broader study of recent Midwestern immigration trends (Martinez, 2010).

Additionally, the research done in this essay is supported with field work personally conducted by a course research group on both a traditional grain farm and a CSA farm in Osceola, Wisconsin. The research group was presented with the opportunity to interview farmer Dan Guenthner in regards to migrant labor dynamics on both his farm and the greater surrounding area and state. Dan delineated his personal experience advocating for the rights of migrant laborers in his community, and the situational conditions under which local immigrants

work and live. The majority of analysis and conclusions presented in this paper are based largely on previous scholarship conducted on migrant labor dynamics, with minimal reference to and background information drawn from the farm interview.

Coexistence and Cultural Integration of Farmers and Migrant Laborers

Over the latter half of the twentieth century, the population of rural farming communities nationwide was hit by an epidemic of depopulation, a phenomenon which continues to occur today. There are a couple of main causes for this depopulation. For one, the average family size dramatically decreased during the late 1900s (Valdivia & Flores, 2012). For another, increasing numbers of those living in rural areas are moving to metropolitan and urban locations. Many of the individuals who participate in out-migration are young. Consequently, the graying of America (the phenomenon of the American population aging more rapidly than it is growing) that is duly occurring across the nation is felt much more immediately and extremely in rural areas (Martin & Taylor, 2013).

Immigrants to the rural Midwest therefore play a crucial role in filling vacant jobs and bolstering and stimulating local economies. Farmers' needs for labor and immigrant laborers' needs for employment combine, producing a symbiotic relationship between the two groups. In instances where both immigrants and farmers recognize their own dependence on the other, positive coexistence and interpersonal relationships can easily be formed within agricultural communities (Flores, Mendoza, Ojeda, He, Meza, Medina, . . . & Jordan, 2011). Immigrants often bring with them much of their own agricultural knowledge and practices. When farmers take the opportunity to learn from the immigrant laborers in their employment, positive cultural exchange can occur. A study of Mexican growers in Michigan finds that "ethnic groups often

introduce new crop varieties that are native to their country of origin" and consequently "help to open new niche markets and new business opportunities" (Martinez, 2011, p. 258). The growing of these types of cultural crops is mutually beneficial for both farmer and laborer, while also posing advantages for the community as a whole. Farmers are able to profit off of the sale of foreign and often uncommon crops which can be sold for high prices given their rarity. Immigrants can use the growing of these crops as a way to remain connected to their culture. The crops act as a means of cultural connection within the community, providing opportunities for community members to try the foods native to their immigrant neighbors (Martinez, 2011). In general, the presence of immigrants in rural communities that were traditionally quite insular encourages learning on all sides.

Immigrant populations possess a huge amount of potential to contribute to rural communities both economically and socially in a number of ways. However, successful integration of new immigrants into these communities is not a given and often depends on a variety of factors. Immigrants who possess certain specific resources are far more likely to be able to immerse themselves in their communities than those who lack said resources. According to a study examining the experiences of immigrant Latina mothers in rural communities, familial connections within the community, English proficiency, level of education, and possession of income savings were the biggest protective factors for immigrants (Raffaelli, Tran, Wiley, Galarza-Heras, & Lazarevic, 2012). Farmer Dan Guenthner corroborates this finding, suggesting that many of the immigrants who move to rural Wisconsin do so in groups. These "clans" (as Guenthner describes them) are often familial and are a means of both protection and support for immigrant workers (Guenthner, 2018).

Alienation, Exclusion, and Exploitation

Although immigration should be seen as a necessary solution to the depopulation and out-migration of rural farming areas, immigrants are not always readily incorporated into the communities within which they settle. Often, immigrants are met with resistance, alienation, and discrimination by members of said communities. Not just social but also structural barriers face immigrants. Rural communities are generally harder for new immigrants to move into, given that certain useful structures present in urban areas are absent in rural ones. Many rural communities "lack public transportation, affordable housing, Spanish-speaking professionals, and an ethnic enclave" that would otherwise advance immigrants' efforts to adapt and integrate into those communities (Raffaelli, Tran, Wiley, Galarza-Heras, & Lazarevic, 2012, p. 560). At times, these factors and others can even unite to put individuals in physical danger, such as when English language barriers, lack of funds and insurance, and the absence of public transportation prevent immigrants from accessing healthcare (Raffaelli, Tran, Wiley, Galarza-Heras, & Lazarevic, 2012).

Unwelcoming communities can have concrete negative impacts on immigrants' livelihoods, beyond just social isolation. Raffaelli et al.'s study found that Latina immigrant mothers who described unfavorable social climates in their communities also described their family as experiencing lower levels of general wellbeing (a measure that includes happiness as well as food and economic security). When community members are expressly less friendly and welcoming towards immigrant populations, the immigrants have less access and are less inclined to access public services within the community. Their health, education, and connections to communal institutions (such as schools) consequently suffer (Raffaelli, Tran, Wiley, Galarza-Heras, & Lazarevic, 2012).

During a field visit to an organic CSA farm, farmer Dan Guenthner provided accounts of common practices of wage theft and other abuses of immigrant labor. Guenthner described how local companies purposefully hire immigrant laborers who they know are in desperate need of work and are therefore more easily manipulated and exploited. Companies overcharge for room and board, although their immigrant employees are often housed in tiny shacks, with many individuals crammed into close quarters. Companies commonly deny workers their wages for weeks at a time, promising to return profits sooner than they actually do. Guenthner described how a local dairy would hire laborers without informing them in advance that they would only be payed for a full pay period of work. Laborers in effect were not payed at all for the first duration of time that they worked if they started midweek. Many of the immigrant laborers employed on farms are undocumented and therefore unable to assert their rights or protest this unfair treatment (Guenthner, 2018).

Conclusion

Immigrant (particularly Latino immigrant) population growth in rural farming areas of the Midwest is helping to ease the burden of a decades-long trend of out-migration typical of rural locations nationwide. Increased immigration to rural farming areas is partially responsible for invigorating local economies and stabilizing population trends. Despite the service that immigrants are doing to rural, agriculturally dependent communities, they often face alienation and discrimination from members of said communities. Many immigrant laborers are underpaid, working long hours and living in squalid conditions (especially when said conditions are provided by their company employers).

In order to better protect immigrants in rural farming communities in the upper Midwest, a number of policies and social programs must be implemented. Mandatory diversity training should be required in all places of employment and schools in order to better enable inhabitants to understand and welcome new immigrants. Workshops and programs that focus on instructing immigrants about their legal working rights and modes of advocacy are recommended to prevent workplace discrimination and exploitation. To facilitate incorporation into communities of residence and to further protect workers' rights, a greater number of English learning programs that are directed at non-English speaking families should be created. In one study of Latino immigrants in Midwestern rural communities, the vast majority of individuals reported actively wanting to engage in English learning programs. The same study found that, perhaps unsurprisingly, immigrants' English speaking proficiency correlated with workplace and academic success, as well as greater job satisfaction and higher earnings (Valdivia & Flores, 2012). The implementation of a sheer larger number of social programs is crucial, especially as many individuals are currently underserved in communities not accustomed to providing for immigrant populations. Given all that immigrant laborers and their families bring to rural communities, the least that these communities can do is attempt to improve immigrant wellbeing and facilitate integration into American society.

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10/8/18

GEOG 232

Prof. Moseley

The Impacts of Current Immigration Policy on Small Vegetable Farmers

Introduction:

The Trump administration's recent policies target illegal immigration are a mainstay in the news cycle. Much of the attention is focused on the large scale optics related to immigration. Images and thinkpieces abound, from the 1,500 children separated from their families to massive ICE raids. However, the undercovered impact of immigration policy on the farming industry is one of the most important facets of U.S. immigration. Dudly (2018) finds that over 50% of undocumented immigrants in the United States work in the agricultural sector. While the most simplistic claim that immigration crackdowns will negatively affect all forms of U.S. agriculture points to the truth, it is important to acknowledge that different sectors, differentiated by output or wealth, will experience the labor shortages differently. Based on my analysis of the effects of current immigration policy on small vegetable farmers in the Upper Midwest, I find that these farms will be among the most impacted by immigration shortages.

Methodology:

Because I am interested in focusing on small vegetable farmers in the Upper Midwest, it will be useful for me to contextualize what makes small scale vegetable farming different than other forms of agriculture and also larger scale vegetable farming. Then, I will analyze the ways in which current immigration enforcement has impacted several small vegetable farmers in the

area. Then, I will conclude by discussing ways in which these experiences are, or are not, unique to small vegetable farmers and suggest ways that current immigration policy should take into account heterogeneous forms of agriculture. While there are multiple forms of small vegetable farming in the United States, I will focus on organic CSAs as my point of analysis. Because of my experience working on a CSA and the opportunity to interview another similar farmer, I will primarily be drawing on interviews to compose my analysis. Additionally, I will use up-to-date news articles that discuss the current state of agriculture under the Trump administration in order to contextualize my arguments.

Findings, Analysis, Discussion:

The Differences Between CSA's and Other Forms of Agriculture: Output, Scale, and Flexibility

Beginning with type of output, I will categorize different forms of agriculture in the United States, all while considering the ways in which this might affect the demand for immigrant labor. Broadly speaking, most agriculture in the United States falls under one of the following categories: dairy, meat, grains, fruit, and vegetables. Dairy farming is perhaps the most labor intensive form of agriculture in the United States, and therefore it has the highest reliance on immigrant labor. Hall and Vetterkind (2017) state that over half of dairy labor comes from immigrant labor and nearly 80% of milk comes from farms employing immigrants. Dudley (2018) observes that, because of the demanding physical requirements and social stigma around the 'dirty industry,' most non-immigrants in the United States are unwilling to work on dairy farms. She goes on to share that a reduction of 50% of foreign labor in the dairy industry would translate to 3,500 dairy farm closings and a 30% increase in the price of milk. Additionally, the historic trend of dairy consolidation means that fewer and fewer dairy farms are small

family-owned. Fewer families translates to less available labor, so the increasing demand of immigrant labor is unlikely to diminish any time soon.

While meat production used to be an auxiliary to many other agricultural enterprises, the increase in industrialized animal husbandry has meant that meat production is similar in many ways to dairy production. Although many cattle are still raised on ranches, they are not fattened and slaughtered in the same ways. Now, feedlots are the intermediary step before cattle are slaughtered and processed. Despite cattle production retaining some of its connection to ranching, most other meats, such as poultry and pork, are nearly fully industrialized at this point. Because of the similarities to dairy farming, it is no surprise that Dudley (2018) also finds that meat production has been hit by reductions in immigration.

In contrast to most other forms of agriculture, grain farming dynamics mean it is less susceptible to changes in immigration realities. While the mechanization of dairy production has not translated into a lessened need for labor, grain production has increasingly relied on mechanization to cut labor inputs. Tellingly, the only agricultural industry that Dudley (2018) does not mention in her article about the detrimental effects of reducing immigrant labor is grain production. The consolidation of large scale farms and the advent of labor-saving technology such as Roundup-Ready seeds and inorganic inputs has meant that grain production has increasingly relied on capital rather than labor. In an interview with Scott Carlson, a mid-sized no-till grain farmer, he underscored his farm's lack of outside labor inputs. According to Carlson, only about 100 hours of labor were needed outside his household labor inputs, and all of that labor was from familial connections.

Because of the similarities and frequent overlap, between fruit and vegetable farms, these two forms of agriculture while be discussed together. Although inorganic inputs and mechanization have increased capital use and decreased labor needs for fruit and vegetable farms, the delicate nature of many crops still requires hand picking. Therefore, there is still a reliance on immigrant labor for fruit and vegetable production. Ironically, Samuels (2018) reported that a Trump Winery had requested more foreign workers because of labor shortages in their vineyard. As a result of labor shortages in California, Morris (2017) found that crops were actually rotting in the field because farmers could not hire enough labor to pick everything. In addition to finding other instances of crops rotting in farmers' fields, Dudley (2018) highlights the fact that fruit and vegetable farmers have been hit by labor shortages as a result of increased immigration crackdowns.

While the scale of farm operation affects all forms of agriculture in relation to immigrant labor needs, there are dynamics that are unique to the differences between CSAs and large scale commercial vegetable farming. Although previously alluded to, the scale of farm changes the ways in which farmers can move more towards capital as a substitute for labor. As farms increase in size, they are able to use their increased income to buy large scale capital investments, such as the Carlson's nearly $250,000 dollar planter. These huge up-front costs pay off in lower labor inputs, allowing farmers to move away from reliance on immigrant labor. Despite the fact that both large and small scale vegetable farms require more labor inputs than grain production, there are labor differences within vegetable farming related to size. The first difference is that large scale vegetable farms are able to invest in mechanization to a greater extent than small scale CSAs. Because of their increased liquidity and ability to invest, larger

farms can move further from labor input requirements relative to small farms. Additionally, large corporate vegetable farms are able to go through third party companies that hire labor for them. These companies have enough pull and economic means so that they are able to find, often legal, immigrant labor and supply it to larger farms. On the other hand, small farmers are not well-endowed enough to be able to go through those channels, and instead they must rely on less established networks to hire immigrant labor.

Although small CSAs are at a disadvantage when it comes to hiring immigrant labor relative to larger vegetable farms, they do have greater flexibility given their structure. Because CSA's require buy-ins at the beginning of the season, there is a level of security that CSA farmers have as a result of this insurance. As a result of a guaranteed market, farmers can make crop decisions that take into account multiple factors, such as labor inputs and climate. Therefore, small CSA farmers that are facing labor constraints as a result of more restrictive labor policy can substitute away from labor intensive crops towards other options. Larger vegetable farms are more reliant on producing either one or several crops, so there is less flexibility for crop decisions in this context.

On-Farm Experiences for Midwestern CSA's

Based on interviews with two CSA farmers in the Upper Midwest, many of the effects from reductions in immigrant labor on small scale vegetable farms outweigh the potential gains that having flexible cropping decisions permits them. Both Mike Jacobs at Easy Bean Farm and Dan Guenther at Common Harvest CSA faced negative labor outcomes as a result of stricter immigration policy. For Jacobs, the reduction came in the form of losing contact with two part time workers that he had regularly employed for several years. Hired as a pair, Jacobs would

frequently hire them part time to help with weeding if weed pressure got too high during the season. Because of their speed, Jacobs could always rely on them as a security blanket if conditions started to dip. However, Jacobs lost contact with both of them and strongly suspects they were victims of deportation. At Common Harvest, Dan and Margaret lost one of their most reliable full-time employees the last season. Maria was not allowed reentry into the United States after going back to Mexico for a citizenship test. Most importantly, these experiences underscore the harsh and painful experiences of immigrants living and working in the United States; however, in the context of this paper they also represent significant impacts to both CSAs labor supply. Because organic vegetable farming is very labor intensive, this has placed strain on both farms.

While situations such as this have surely affected large scale vegetable farms across the United States, the size of the farm determines the reaction to the shock. Because large scale farms often hire workers through a third party, they are better equipped to replace lost labor. However, small CSAs typically rely on smaller social networks to do their hiring, and it is often more difficult to find labor, especially agriculturally skilled immigrant labor, through those networks. As a result, farmers had to come up with less-than-optimal ways of fulfilling labor requirements. For example, Jacobs had to rely more on less-productive part time laborers from the surrounding community. Although these workers did represent a large portion of the waged labor on the farm, they were not as productive as full-time employees because of their lack of experience and thorough training. Additionally, Malena Handeen, co-owner of Easy Bean and partner to Jacobs, reported that she was forced to allocate more time to working in the fields than previous years because of the labor shortage. In a normal season, she would split time between

caring for her two children and working in her art studio, but she had to sacrifice time for both of those activities this season.

Although the above experiences on CSAs represent bleak outcomes as a result of stricter immigration policy, a potential ray of hope comes from the unique structure of a CSA. As already mentioned, the fact that CSAs represent a committed client base means that farmers do not have to pick only the highest value vegetables to fill out each share. In the case where some crops require lots of labor hours for a small payoff (CSA shares are based on volume as well), farmers can shift from those crops to less intensive vegetables. Jacobs described an example of this flexibility when he discussed his shift away from pea production, which is extremely labor intensive, to other crops that did not require as much time picking. Shifting crop patterns through community buy-in are able to partially negate the negative impacts of immigration restrictions, and therefore offer hope for small scale agricultural enterprises that are one of many groups to be negatively impacted by the Trump administration's restrictive immigration policy.

Conclusion

Overall, the experiences of small CSA farms in the age of more strict immigration enforcement matches what the literature finds. CSA farms fall under the category of small vegetable farms, and therefore I expect that they will be hit fairly hard by the labor reductions because of both their small scale and agricultural output. On a more positive note, CSAs might fare better than other forms of small vegetable farms because of their structure. As a result of community support and investment, CSA farmers face less risk and are able to diversify and choose crops that respond to a variety of factors, such as immigration conditions. A key policy takeaway from this analysis is that, even in adverse conditions, the structure of a CSA allows to a

more resilient agricultural enterprise. Although CSA's are mostly associated with very small scale endeavors, the notion of community participation and risk management could perhaps be scaled up to a variety of farm models, resulting in a system that is better equipped to respond to the negative agricultural climate fostered by the Trump administration.

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Local Agriculture in Context

October 9, 2018

Rural Labor Dynamics and Immigration Labor Policy: Past and Present

Introduction

Temporary seasonal workers have long existed in the United States and continue today to be a controversial subject when addressing immigration. Traditionally, seasonal immigrants have been employed in response to domestic labor shortages. However, their exact use and the policy surrounding seasonal workers has been in near constant change since the first implementation of a seasonal worker policy by President Abraham Lincoln in 1864 (Briggs, 1986). Today, the Immigration Reform and Control Act (IRCA) of 1986 is the dominant government policy for seasonal workers. IRCA divides temporary workers into two categories: agricultural workers governed by the H-2A program, and non-agricultural workers under the H-2B program. This essay will focus on temporary agricultural workers under the H-2A program. Specifically, I will first look at the historical context under which past policies for temporary workers were formed, and how these have led to the creation of H-2A programming. Then, I will examine the impact of the policies of the administration of President Trump on H-2A programs and workers. My ultimate goal is to address the question: what are the historical trends in temporary worker policy, and how have these led to the current implementation of H-2A programming under the Trump administration?

The importance of this research stems from the impact of temporary worker policy on both seasonal workers and the farmers who hire them. Under varying acts and policies, seasonal workers have historically been granted differing rights, which affect both the livelihood of the

seasonal workers and the farmers who are entrusted in granting those rights. Temporary worker policies are also significant in terms of economics, both in terms of wages for farmworkers and the revenue earned by farmers due to work done by seasonal workers. As Slobodan Djajic (2013), honorary professor of international economics at the Graduate Institute of Geneva once wrote, "What renders these programs economically and politically attractive for policymakers is their capacity to address domestic shortages of labor without making long-term commitments to foreign workers" (p. 739). Temporary worker policy plays an important role in our economy and the continuing debate over immigration legislation, making it a key point for further discussions.

Research Methods

In order to address the question asked above, I split my sub-question into two main parts: historical policies on temporary workers, and the H-2A program today under the Trump administration. In order to address the first part of my sub-question, I compiled information surrounding the history of temporary workers policy using databases such as JSTOR and WorldCat Discovery. From these databases, I reviewed a variety of peer-reviewed studies, scholarly reviews, and excerpts from books that examined temporary workers policy and related issues. In order to address the second part of my sub-question on current findings concerning H-2A programming, I reviewed recent online articles published by a variety of local and national newspapers.

Historical Legislation of Temporary Worker Policy

As mentioned in the introduction section, President Abraham Lincoln created the first official policy regarding temporary workers in 1864 under the Contract Labor Act. A key feature of this act is the idea of contract labor, wherein farmers paid for the transportation of workers in exchange for a pre-agreed wage and established working conditions, with the workers paying the

farmer back for the transportation costs as well as other living expenses (Briggs, 1986). However, this type of labor contract was widely criticized for its procedural nature, and was officially repealed in the Alien Contract Law of 1885 (Briggs, 1986). It should be noted, though, that neither of these acts formally acknowledged the idea of temporary workers. Rather, they were created under the assumption that the majority of workers would officially immigrate to the United States after the termination of their contracts, which many did (Briggs, 1986).

The first official use of a truly "temporary" worker policy appeared in the Immigration Act of 1917. This act was implemented after the United States declared war against Germany in April of 1917, in response to the predicted farm labor shortages that would occur as a result of men leaving farms to join the war effort (Briggs, 1986). As expected, nationwide unemployment dropped from about 4.6% in 1917 to 1.4% in 1918, and in response 76,802 temporary workers from Mexico were hired (Briggs, 1986). It is estimated that over half of these workers stayed in the country after the act was formally terminated in 1921 (Briggs, 1986). Thus, even though the act explicitly limited itself to temporary workers, many workers stayed in the country after the act was officially terminated.

The next important legislation governing temporary workers came with the onset of a new war: World War II. This legislation—the Mexican Labor Program, or the "Bracero Accord"—is perhaps more widely known both for the scale at which it functioned, and the human rights violations suffered by the temporary workers. Created in 1942, the program formally continued until after the end of the war in 1947, although it was revived again in wake of the Korean War in 1953 (Briggs, 1986). It is estimated that at its height just before termination in 1964, approximately 4.5 million Mexicans worked in the United States utilizing the program

(Danger, 2000). After the termination of the Bracero Accord, as with the Immigration act of 1917, many Mexicans continued living in the US as illegal immigrants (Briggs, 1986).

Next, in the wake of the Korean War, the implementation of the Immigration and Nationality Act followed in 1952. In contrast to previous acts, the Immigration and Nationality Act explicitly noted the difference between immigrants and non-immigrants entering the United States (Briggs, 1986). This act established the idea of H-2 workers—non-immigrant, temporary workers in both the agricultural and non-agricultural sector (Danger, 2000). A key part of this act mandated that H-2 workers could only be hired when the employer demonstrated that there were no domestic workers willing to fill the needed positions at the given hourly wage (Danger, 2000). This act, especially with the distinction between immigrant and non-immigrant workers entering the United States, clearly attempted to emphasize the temporary nature of non-immigrants workers and discourage them from staying in the United States after their seasonal work was completed. The Immigration and Nationality Act directly led to the Immigration and Reform Control Act (IRCA) of 1986, with further restrictions on immigration. As mentioned in the introduction, IRCA laid out the distinction between temporary agricultural workers—H-2A workers—and temporary non-agricultural workers—H-2B workers (Danger, 2000).

Issues with Past Legislation

Unfortunately, along with this history of legislation comes a history of foreign worker abuse, undocumented immigration, and misuse of the legislation for the profit of farmers. These themes were especially prevalent in the Bracero Program, but they are themes that continue today. For instance, a study done by Hahamovitch (1999) examined the motivation of farmers for their support of the Bracero Program, and found that farmers were much more motivated by an ability to pay foreign workers lower wages than an actual national labor shortage (Smith-Nonini,

2013). Farmers were able to pay foreign workers less than what they would have had to pay domestic workers due to the large number of interested foreign workers, and the relatively small number of interested domestic workers. For instance, after the end of the Bracero Program, the United Farm Workers union was able to negotiate a 40% wage increase for grape harvesters, a milestone for increasing the wages of such workers (Martin, 1999). Economically, this 40% increase in wage for the workers translated to only a 2% increase in the prices of grapes at the retail level, in part due to farm labor being only a small fraction of farm prices, and in part due to farmers being responsible for only a small fraction of the retail prices (Martin, 1999). Thus, increasing wages for such workers would not be detrimental to consumers. Yet, in other areas of the agricultural sector, these workers are still only paid according to the minimum wage rates set by the federal government.

The Bracero Program, especially, has become known for its widespread abuse of foreign workers. In the book *Latin American Migrations to the U.S. Heartland*, author Sandy Smith-Nonini (2013) notes, "Today the Bracero Program prompts memories of 'Harvest of Shame'…Despite contracts guaranteeing fair wages, decent housing, terms of employment, and even health insurance, these protections were poorly enforced and routinely circumvented by growers" (p.104). These abuses under the Bracero Program—combined with the large amount of seasonal workers who stayed as illegal immigrants—led directly to the stricter programs under the IRCA.

Yet, under the IRCA, the H-2A program has failed to completely solve the problems of past legislation. A study by the Pew Research Center estimated the number of undocumented workers in the United States in 2014 to be about 11.3 million (Devadoss and Luckstead, 2017). Clearly, many undocumented foreign workers still exist in the country today.

Present Legislation under the Trump Administration

In reaction to this large population of undocumented workers, the Trump administration has created even stricter immigration policy. For instance, in Iowa, out of the 2,651 H-2A positions requested in 2018, only 186 job orders were completed (Fish, 2018). Also, a study done by Devadoss and Luckstead (2017) found that temporary workers typically displace undocumented workers, leaving the wages of domestic workers essentially unchanged (Devadoss and Luckstead, 2017). Thus, the Trump Administration's reaction of stricter immigration policy does not help domestic employment, while encouraging undocumented immigration. The policy is exacerbating the problem of undocumented immigrants instead of working towards ways to fix it.

Furthermore, the new stricter policies are hurting domestic farmers who find themselves with a labor shortage in a time of low unemployment. The unemployment rate in central Iowa is about 3%, and many unemployed domestic workers are uninterested in the seasonal nature of the work performed by foreign workers (Keller, 2018). An estimated 20% of fruits and vegetables have gone unharvested in the last decade due to labor shortages (Devadoss and Luckstead, 2017). There is an acute need for farm labor that is being unfulfilled. This plight is even felt by employers that use H-2B workers, whose visas have been cut by the Trump administration. One Midwestern company, Alpine Amusement, recounts how they were denied 44 of their usual requested visas (Clark, 2018). The increased need for laborers present in society today is not reflected in the actions of the Trump administration.

Moreover, many farmers find themselves baffled by the long and tedious process of obtaining H-2A workers, a fact made worse by the Trump administration's stricter view on immigration policy. Under the IRCA, farmers are required to prove that their labor needs will not

be met by domestic workers, necessitating the hiring of temporary foreign workers (Devadoss and Luckstead, 2017). Farmers must prove this necessity, a time-consuming requirement that causes them to have to make employment decision months in advance (Devadoss and Luckstead, 2017). The actual details of the H-2A forms can also be "slow and time-consuming," as noted by one Texan farmer (Fish, 2018). He also notes that many other farmers come to him for help on their H-2A forms, as they fear the stricter immigration policy will cause their much-needed foreign workers to be taken away from them if the forms are found to be completed incorrectly (Fish, 2018). The H-2A programming, as it stands, is highly complex and time-consuming for farmers.

In response to complaints about the complexity of the current system, the Trump administration has announced that they will significantly change the system to be easier on farmers. They announced that they will simplify the system and give farmers added incentives to use the E-verify system, an online system of verifying employment eligibility (Wheat, 2018). Specifically, the statement released by the Trump administration stated,

> The Trump Administration is committed to modernizing the H-2A visa program rules in a way that is responsive to stakeholder concerns and that deepens our confidence in the program as a source of legal and verified labor for agriculture—while also reinforcing the program's strong employment and wage protection for the American workforce (Wheat, 2018, p.1).

It is important to note that, other than the ides of modernizing the H-2A program, no specific changes are mentioned in the release statement.

Conclusion

A government policy for temporary workers has been implemented since the administration of President Lincoln. Emphasized and revived in times of war, these policies have become an essential part of our agricultural sector—even when the country is not at war. Over the decades, and especially after the Bracero Program, these policies have become stricter in reaction to the continued employment of foreign laborers, and the numbers of temporary workers that overstay as undocumented immigrants.

Today, under the Trump administration, policy has become even more strict and complex, ultimately hurting domestic farmers and foreign workers alike. As a potential solution to this, I believe that we should create an immigration policy that is essentially an open door for foreign workers interested in working in the agricultural sector. These immigrants should be given equal rights and pay as any other citizen of the United States. Also any undocumented immigrants currently living in the United States who are working in the agricultural sector should be granted the same working conditions. This would go a long way towards curtailing foreign worker abuse, and help alleviate the current labor shortages. And workers who want to continue to migrate to the United States on a seasonal basis should be encouraged to continue to do so, with significantly less regulation from the United States government.

Given the complexity of this issue in terms of social and economic repercussions, especially at this time of a polarized political sphere, there is currently much debate in the literature as to the best course of action. From economists to political scientists to geographers, there are varying degrees of consensus between those who believe in a more open door policy, those who want even stricter policies, and every position in between. Regardless, it is quite clear to me that now is the time for a major change in temporary worker policy, to the benefit of both workers and farmers alike.

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H-2A Policy and Social Services for Farmworkers in the Midwest

Introduction:

Throughout the upper Midwest in states such as Minnesota, Wisconsin, Iowa, Illinois and Michigan, more than 30 million acres of land are utilized for corn crop production in order to feed both livestock and humans throughout the country. (United States Department of Agriculture, 2018) While corn and soybeans are the two largest crops grown in this region, due to the mechanization of the agricultural industry, these crops do not require much human labor. Most large-scale farms use mechanized planting and harvesting systems and need only a few extra laborers on the farm during specific planting and harvesting seasons. On the Carlson Family Farm, a 2600 acre corn and soybean operation in Osceola, Wisconsin, the three owners and year-round workers only hire about 5 extra laborers who are frequently family members during the harvesting and planting season to help the operation. (Carlson, 2018) During the off-season, full-time employees use planters and tractors to keep the farm running without extra labor support.

The most labor intensive sector of the agricultural industry in the midwest is dairy farming. In 2017, Wisconsin produced 30 billion pounds of diary and Minnesota produced 9.6 billion pounds of dairy. (Statista, 2018) Dairy cows need to be herded inside and outside of barns, fed, milked and taken care of throughout harsh climates in a routine manner, every day of the year. This is work that is undesirable to many, and therefore, the work is often acquired by those in dire need of employment and income. The population that is often employed to do this work are immigrant and migrant workers. However, there are controversial and politicized laws

and regulations regarding the immigration of farmworkers to the United States that restrict the number of visas distributed to migrant agricultural workers, the amount of time immigrants can legally work in the U.S. and the conditions under which they must live. As a result of the fact that these policies are so complex and difficult to navigate, many farmworkers are undocumented immigrants which makes it difficult for them to receive social services and for them to fight for a living wage. This essay will seek to answer these guiding questions; What are the differences in social services for immigrants working on conventional versus organic/CSA small-scale farms in the Upper Midwest? How has the H-2A policy impacted immigrants livelihoods?

Research Methods & Background Information:

This essay will utilize data and facts from sources such as the United States Department of Labor, as well as research from organizations focused on investigating farmworkers livelihoods. There were two interviews conducted for this essay. The first with a owner of a conventional corn and soybean farm and the second with the owner of a small-scale organic CSA farm. The essay seeks to analyze and investigate the realities of farmworkers on a variety of types of farms.

Some background data is provided by the National Center for Farmworker Health which states that, as of 2017, there were 2.5-3 million agricultural workers throughout the U.S. (many undocumented immigrants are left out of this statistic due to fear of deportation). 16% of these workers identified as migrating and 83% identified as seasonal workers. 73% of agricultural workers were foreign born and 68% of all agricultural workers were born in Mexico. (National Center for Farmworker Health, 2018) The average level of completed education for these workers is the equivalent of 8th grade in the U.S. (National Center for Farmworker Health, 2018) Given these facts about migrant agricultural workers in the US, it becomes clear how this

population accounts for some of the most economically disadvantaged people in the U.S. Agricultural workers rarely have access to workers compensation, few can access services such as food stamps or medicaid and their housing is often substandard or non-existent. Despite these realities and the high number of undocumented immigrant workers, there are about 200,000 visas issued to agricultural workers for employment in the U.S. (Nigh, 2017)

These visas are provided by the "H-2A Policy," a federal policy that was put into place in 1986 and first began issuing visas in 1992 to help farm owners meet their labor needs that were not fulfilled by the population of U.S. citizens. (Nigh, 2017) According to the U.S. Department of Labor (2010), the H-2A Policy, "authorizes the lawful admission into the United States of temporary, nonimmigrant workers (H-2A workers) to perform agricultural labor or services of a temporary or seasonal nature." In order for employers to qualify to hire workers through the H-2A policy, they must prove that there aren't enough workers in the United States to do the necessary work in their establishment. The employers must show that they have actively searched for U.S. workers and were not able to find enough. These employers also need to prove that hired H-2A employees will not negatively impact the wages and conditions of employees who are U.S. citizens. (U.S. Department of Labor, 2010) These steps of investigating and navigating the labor market seem quite vague and complex. They are just the beginning of the process to provide migrant workers with H-2A visas.

After employers have proved the necessity of immigrant labor, there are three different bureaucratic steps through two different federal government entities. The first is a labor certification through the U.S. Department of Labor, and the second is the I-129 form through the U.S. Immigration and Citizenship Services Office; a 36 page long form with a $460 fee. After these forms and processes have been completed and workers have received a H-2A visa they are

able to legally work and live in the U.S. for a maximum of 3 years (U.S. Department of Labor, 2010). Family members of H-2A workers can apply for and receive H-4 admission visas however, with these visas, they cannot be legally employed in the US. This regulation ensures that the income of the H-2A worker will be the family's sole income. Not only undocumented migrant farmworkers who are unable to advocate for living wages but also those who are in the U.S. legally through H-2A visas quickly become some of the most economically disadvantaged people in the U.S. because only one family member can economically support the family.

Findings/Analysis:

In theory, the H-2A policy is beneficial to both farmworkers and farm owners alike by creating jobs for immigrants and providing labor to farm owners. However, the realities of H-2A farmworkers' livelihoods are often not as the program advertises. A report by an organization called "Farmworker Justice" focuses on the ways that the H-2A agricultural visa program fails U.S. and foreign workers. The authors write that, "social and geographic isolation, lower than advertised wages, less work than promised, dirty and dilapidated housing, dangerous working conditions, and even forced labor or slavery typify the experience of many guest workers." (Farmworker Justice, p. 11, 2012) The report provides many accounts of farmworkers who have had their rights violated through the H-2A program it describes the ways that employers benefit from the program because they don't have to pay Social Security and unemployment taxes on H-2A workers in the same way that is necessary for U.S. workers.

According to a report titled, "Immigration Facts: Temporary Foreign Workers," published by the "Brookings Institute," a nonprofit public policy organization, only 10% of the total agricultural jobs throughout the U.S. are filled by H-2A workers and between 2010-2011 there were between 345-1,000 H-2A workers in Minnesota. (Wilson, 2013) This is out of a total

of 20,000-35,000 migrant farmworkers that are recruited to work in Minnesota during the annual harvest season. (Contreras, Duran & Gilje, 2001) These statistics show that the complex process of applying for visas and hiring H-2A workers is causing farms to hire undocumented and migrant labor. Moreover, the bureaucracy and complicated steps of the H-2A policy do not allow for enough visas to meet the amount of necessary farm labor.

Brookings Institute report estimated that 55% of farmworkers are working in the U.S. without legal status. (Wilson, 2013) Due to the fact that undocumented workers are in danger of deportation, employers can pay them as little as they want and know that the employees will never be able to advocate for their rights. Undocumented workers are also vulnerable to health hazards in farm and agriculture settings. In fact, between 2008 and 2012 in Iowa alone there were 2,519 cases of work-related pesticide poisonings. Even though these are employees within the U.S. working in vulnerable conditions, due to their status as undocumented, these workers are not eligible for federally subsidized healthcare and social services such as medicaid. (Mills, 2013) On small-scale organic farms, there are fewer health hazards because pesticides are not being sprayed. There are also fewer workers on a smaller farm which can lead more more interpersonal connections between workers and employers and therefore better working conditions.

In a study published in the *Journal of Anthropological Perspectives on Migration and Health,* titled, “Health Care Access Among Hispanic Immigrants,” Perez-Escamilla, Garcia and Song investigate the disproportionate access to health services among immigrant hispanic families. Their study found that, in 2010, hispanic identified people made up 15.5% of the U.S. population. (Perez-Escamilla, Garcia & Song, 2010) Among this population, immigrants and the children of immigrants are at much higher risks of not having access to healthcare due to higher

poverty levels, status. as undocumented, language barriers, discrimination and geographic isolation. The authors write that, “Hispanic children of immigrant farm workers are at risk of the worst health outcomes and are more likely to be uninsured compared to Hispanic children whose caretakers are not involved in agricultural activities.” (Perez-Escamilla, Garcia & Song, 2010, p. 49) This fact shows that minimal access to health care has not only individual but also intergenerational impacts for immigrant agricultural workers.

Discussion:

There are many different non-profit organizations that work to provide migrant workers with services that the federal government fails to offer. These organizations exist on the local and national scale. “Farmworker Justice” which is non-profit based in Washington DC that works on a national scale to “empower migrant and seasonal farmworkers to improve their living and working conditions, immigration status, health, occupational safety and access to justice on a national scale,” (Farmworker Justice, 2018). Throughout the midwest, there are organizations such as, “Centro Campesino” which is a membership-based advocacy group formed by migrant farmworkers in response to problems they face in their working and living conditions. The group works to improve the lives of agricultural workers and the rurally based Latinx community in southern Minnesota. They advocate for storm shelters, hot water in farmworkers camps and updated day care facilities. (Centro Campesino, 2010) While organizations such as this one are crucial to empowering and improving conditions for Latinx farm workers throughout the Midwest, there are also necessary larger structural changes.

In a report published by the University of Minnesota’s Center for Urban and Regional Affairs, titled, “ Migrant Farmworkers in South-Central Minnesota: Farmworker-Led Research and Action for Change,” Contreras, Duran and Gilje outline specific policy changes based in

Minnesota to improve the lives of Minnesota farmworkers. The first change recommended is to "increase availability of livable and affordable housing in rural Minnesota." The second is to "encourage safe jobs that pay a wage on which migrant families can comfortably live," thirdly, "translate agency and service materials into Spanish, and encourage second and third language acquisition for everyone," and lastly, "encourage cross-cultural dialogue and an inclusive approach to community development in Minnesota." (Contreras, Duran & Gilje, 2001) These changes are crucial to the improved health and well-being of immigrants which will in turn improve the agricultural economy .

Dan Guenther, one of the founders of Common Harvest Farm, a 40 acre CSA farm in Osceola, Wisconsin, noted that Americans need to start paying more for the food that we buy. He is certain that smaller-scale organic farms are crucial to the future of sustainable agriculture in the U.S. (Guenther, 2018) However, in order for these farms to be successful, people must start paying more money for the food we consume. If consumers pay more, producers will be able to pay their workers higher wages which will improve the livelihoods of farmworkers. This economic model is assuming that large scale farms will prioritize paying workers more as their income increases, something that is not completely guaranteed. However, it seems that paying more for the food we consume is a tangible step that can be taken to ensure that workers are paid a living wage.

In their report, Perez-Escamilla, Garcia and Song write about changes to the U.S. healthcare systems that can improve farmworkers health and wellbeing. They note that, "worker medical leave labor policies are needed to diminish the fear of losing a job for missing work because of the need to bring a child to receive health care." (p. 52) They also highlight the

importance of access to an English education which breaks language barriers increasing immigrants ability to navigate healthcare systems as well as individuals mental health. Another important policy change could be a simplification of necessary procedures for workers to acquire H-2A visas and a increased number of distributed visas.

Conclusions:

Farmworker justice writes that, “More than 50% of the farmworkers on U.S. farms and ranches lack authorized immigration status. Deporting them all would decimate American agriculture. In fixing our broken immigration system, skilled, law-abiding farmworkers should be given the opportunity to earn legal immigration status and continue their work in agriculture.” (Farmworker Justice, p. 11, 2012) Moreover, on a larger scale the demilitarization of the Mexico-U.S. border and the U.S. Immigration and Customs Enforcement Agency (ICE) would improve the lives of undocumented and refugee populations in the U.S.

While the demilitarization of the border would be an exceptional step towards improving the lives of immigrant populations in the U.S., it is not a process that will happen in the foreseeable future. In the meantime, it is crucial for the H-2A program to expand to meet the needs of more migrant and immigrant workers and the regulations of treatment of employees to be monitored more regularly. All workers in the U.S., especially those doing grueling physical labor, need to be treated equally and provided a living wage within the economic context of where they are employed. While these workers often can’t advocate for themselves it is imperative that documented citizens support organizations and groups who are allied with farmworkers and undocumented populations.

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Evolutionary Changes In Agricultural Technologies:

How Mechanized Tillage Methods Affect Farmers Considering Hiring Traditional Labor

Introduction

Tillage is a crucial portion of the complicated process of farming for it ensures the fundamental conditions for plants to grow by flipping over the crop residues which later turned into additional nutrients in the soil. Due to the reliance on different qualities of the soil and structures of landscapes which determine the final productivity of a field, modern farmers face the challenge of choosing a more efficient method to farm while considering the environmental consequence and risk behind it (Moseley et al, 2014). It is important to examine the historical interaction human beings have with the still-evolving tillage technologies. Mechanized tilling equipments are both creating convenience and trouble for many rural households as there are many social aspects that are associated with them such as finance, policies, and management (Guenthner 2018). Though internationally, there are various levels of technologies adopted for tillage and approaches of agricultural improvements that exist in different countries, the focus of my research will mainly be on the United States. The realistic examples I provide are two farms located in the Midwest. I will first briefly introduce the evolution of tillage methods and demonstrate how and why human labor had been gradually replaced by tools and machines. Then I will specify the differences in hiring labor between organic and conventional farms that select to either deploy conservation or no-till strategies. To conclude, I will provide an analysis

of specific reasons which present-day farmers have in their preferences in using machines or hiring workers.

Research Methods

Visiting both the Carlson Farm and Common Harvest during the field trip allows me to witness some of the realistic similarities and distinctions between organic and conventional styles of farming. I have interviewed Dan Guenthner and Margaret Pennings who are the owners of Common Harvest both in-person and through email. They are very helpful in providing the specificities of the current labor situation in the Midwest area. Also, Scott Carlson who is the present main operator of the Carlson Farm, has offered me compelling information regarding the system which his mechanizing equipments are running under right now. I have also referred to journal articles, press reports, and statistical data that reflect the general trends of how labor dynamics interact with tillage technology in the upper Midwest and on a national level.

Progression of Tillage

The most primitive concept of tilling demonstrates an arduous farming task that requires tremendous amounts of labor. During the early American history, the source of labor was mainly extracted from slavery (Wright, 2003). Agriculture was born with the intention to produce food supplies that are sufficient for the growing population. Therefore, the scale of tilling kept expanding until the present day. The Native Americans were claimed to be the first who built plowing tools. The Incas, for example, made hard wooden sticks to help overturn the soil (Derpsch 2004). The discovery of metal then made wood an outdated material since iron was more durable and efficient to work with. Many farmers also chose to keep animals such as oxen,

horses, donkeys, and mules that were specifically trained for dragging heavier moldboards[1] in order to achieve higher productivity than manpower (Biwet & Muhabaw 2014). "John Deere invented the metal beam walking plows (Figure 1.) in the 1830s" which motivated a chain of agricultural inventions that later replaced human and animal labor (Guenthner & Pennings, 2018). Due to the stimulation of government economic policies, a great portion of farmers transitioned from localized farming to more commercially-oriented markets. Farmers no longer needed to cultivate their lands for the purpose of feeding themselves. They began to look for ways that could enrich their funds by exporting large quantities of agricultural products (Moseley et al, 2014 & Stromberg, 2014). The plowing techniques were also significantly improved. With the discovery of fossil fuels, farmers switched from bulky iron plows to tractors (Figure 2.) attached with blades that rolled into the soil automatically (O'sullivan, 2018). People started to become managers and users of machines. They sat before control panels and performed the same old task with an exceedingly quick speed and high quality. More and more farmers favored a mechanized and systematic management of their agricultural resources, which led to the entry of capitalist elements that later revolutionized the farming industry. In the early twentieth century, the average yield of a farmer could feed nearly ten urban Americans. The work that used to take days (approximately 75-90 hours back in the 1850s) to complete, with the push of industrialization in that era, was reduced to only fifteen to twenty hours at most to generate 100 bushels of corn and wheat (Bellis, 2017). The contemporary rapid urbanization

Figure 1. John Deere's Plow

[1] Also known as plough, moldboard plows have heavier blades that deviate earth to separate sides of the furrows.

resulted in a more scattered rural population. Cities were seen to be filled with prospering opportunities to acquire fortune and status. As the city population accumulated drastically, the burden of ensuring a stable food supply was laid on the farmers (Stromberg, 2011). Inorganic fertilizers, pesticides, herbicides, and many other technological products were introduced into the fields. But soon the usage of machinery was discovered to cause numerous unintended consequences, For instance, the quality of crops ceased to match the former health standards under the heavy spread of chemical substances. And the motorized operations were found to potentially destruct the original structure of the soil, making it more difficult to bear crops in the future (Moseley et al, 2014). So, driven by these realistic challenges, different tactics of farming emerged.

Figure 2. Tractor

Organic vs. Conventional

While the United States led the world in its advanced farming technologies, many environmental and social side effects were actually not well-recognized and controlled by the government. One of the most convincing examples was the Dust Bowl, which took place in the 1930s (McDean 1986). When farmers deployed mechanical equipments to cut down massive areas of forests to free up more space for planting crops, the green barriers provided by nature to defend sandstorms were gone. The Great Plains were greatly affected by the catastrophic dust spread. Thousands of residents suffered from enormous amounts of financial losses. Millions of acres of the major agricultural regions were swept away. Warned by this horrendous calamity,

the authorities decided to advocate for a more harmonious relationship with nature while developing economically at the same time (McDean 1986).

In the early 1970s, organic farms gradually became a familiar concept in America. The definition of being organic in agriculture is that the farm guarantees to not apply any chemical or synthetic products to assist cultivating crops. But this approach often requires more intensive manpower, so the physical and financial resources needed to run an organic farm is much more consumptive than the conventional farms (Schonbeck 2015). As a result, many farms that grow organic crops are generally limiting their business on a small scale. Common Harvest is a particular example that hires more interns or temporary workers than long-time committed labor since their wage levels are significantly different (Guenthner, 2018). For the sake of protecting the soil and sustaining its fertility chronically, conventional tillage methods were criticized for its aggressiveness. A typical tractor engineered by John Deere usually extends the whirling blades into a depth of about two to three inches in the soil (Carlson, 2018). But unfortunately, this part of the soil is actually the layer where the organic matter is stored the most, so the zone tillage practice will destroy the structure of the land every time it is plowed. Consequently, the fertility of the soil will degrade more quickly in and harvest quality will decline every season (Guenthner, 2018).

In order to alleviate the environmental damage caused by mechanized tilling equipments, agronomists began to popularize the concept of no-till farms that was proposed after World War II[2] (Bate 2007). In the late 20th century, there was a significant increase in farms that chose to exercise no-till strategies when planting wheat and soybeans. The no-till strategy basically

[2] The components of the chemical weapons that were used during World War II became the key ingredients in making many of the modern types of pesticides/herbicides such as DDT.

implies not plowing at all so the soil compaction is better preserved. It is a strategy that minimizes the soil's vulnerability to water and wind erosion. However, the unplowed land will cause the surface to be exposed to the atmosphere, leading to a loss of warmth that is embedded by more aggressive tillage. And the growth of weeds can also significantly reduce crop productivity (Plumer, 2013 & Massey, 1997). Many organic no-till farmers choose to cover their crops (Figure 3.) with residues left from the previous year in order to retain the nutritions and provide a protective surface for the growing plants. But this approach usually requires more physical labor which results in larger amounts of financial burdens. Furthermore, hand weeding and green manure often become outmatched by herbicides and chemical fertilizers, so switching to organic styles of farming is still quite a challenging decision as it needs the farmer to make compromises and face the disadvantages (Guenthner, 2018 & Schonbeck, 2015). Also, farms that grow a diverse range of products, regardless of their approaches categorized as organic or conventional, rely on labor intensity differently. Vegetable and orchard-type farms often demand more physical labor than farms that cultivate soybeans and corn due to the fact that green products usually require more hand-picking processes (Barclay, 2015). Whereas the trend of shifting to either partially no-till or organic agriculture appears to be spreading across the United States. American farmers are becoming more environmentally aware because of the more frequent exposure to information about how nature may impact the reality of farming (Plumer, 2013).

Figure 3. Cover Crop

Benefits and Drawbacks

My visit to Common Harvest allowed me to engage in a conversation with Dan Guenthner who reflected on his own childhood experience in the 1970s when he and his siblings were often times hired by the neighboring farms to pick beans and pull weeds. But when commercial herbicides such as Roundup were introduced in the area, there were little opportunities for them to undertake the same jobs as they did in the past because spraying simply seemed much more convenient to most farmers (Guenthner, 2018 & Ronald, 2017). The progression in agricultural technology is happening at an incredible speed right now. Softwares are engineered to seed and harvest crops, GPS systems are designed to track locations of dairy herds, and drones are distributed to monitor the live situation of the farms. Despite having these conveniences, farmers complain about the irrational pricing of these new products. At the Carlson Farms, a single corn planter is estimated to cost around $240,000. The famous McCormick Reaper is generally priced at a range of $3800~$4500 depending on the different selectable models. (Carlson & Guenthner 2018) The maintenance fees are also ridiculously high as these machines do not have a very endurable usage period. Typically, a corn planter needs some extent of repairing every 6 seasons. Moreover, companies like John Deere have a very strict access to their intellectual property to their consumers. So when there are any malfunctioning or operative abnormalities, farmers are forced to hire their technical personnel who are also priced unreasonably to provide services. Some may suggest that farmers can purchase hardware components and try fixing the machines themselves. However, the reality is that these equipments nowadays have become so sophisticatedly designed that a corn planter has an interior that is almost as intricate as an Apple smartphone. (Carlson, Wien & Chamberlain 2018) While machines are criticized for their costs, physical labor does not seem to be a perfect

solution, either. Many farms in the Midwest used to rely on large portions of immigrant labor because of its cheapness. Even though there was a prevailing trend of exploitation towards these immigrant workers, labor was never a severe concern for farmers. But now with President Trump's Zero-Tolerance Policy that is specifically drafted to target undocumented immigrants who are not given legal permission to work in the United States, seeking foreign labor seems to be nearly impossible (Lobeck 2018). Moreover, younger generations today are greatly attracted to urban locations, leaving many of the family farms empty of successors and eventually unattended. According to Guenthner, "more labor means fewer machines, triggering more management, training, and other costs." The indebted situation significantly limits the ability of farmers to either purchase equipments or employ physical workers. (Guenthner 2018).

Conclusion

From the most primitive subsistence agriculture to today's massive production, humans have made incredible progress in fulfilling the promise of feeding the globe. But as technologies emerge, our relationship with nature and our communities has become more subtly complicated. Maximizing productivity and creating high-yield plants are no longer the centered arguments. Instead, scholars are more concerned with building a beneficial network of food production without disturbing the ecological environment. Tillage is one concrete example that has been revolutionized by machines. Apparently, farmers whose management methods are different react distinctively when selecting between machines and humans. But the influence imposed by technology has challenged the traditional concept of farm labor. Now we are at a critical time when there is no absolute statement on whether technology or manpower constitute a better option for modern farmers than the other. Political ecologists are striving to design mitigating

policies that aim to rebuild the rural landscape and create economic incentives that maintain labor diversity. For example, increasing federal subsidies to the poor rural households that cannot afford heavy equipments is going to alleviate their financial burden which subsequently, leads to easier food access. The ideal concept of modern agriculture is based on establishing an effective understanding of our nature's capacity and deploying an appropriate amount of technological intervention that helps both produce food supplies and distribute them to families.

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Chapter 3:
How can upper Midwest farmers adapt to a changing climate and what new research do we need in order to facilitate this adaptation?

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Carbon Sequestration in the Upper Midwest: Techniques for Carbon Farming

Introduction:

The agricultural sector is responsible for a significant portion of anthropogenic carbon emissions. But as environmental activists advocate for cleaner energy and sustainable development, they often overlook solutions on farms. In this paper, I focus on farms in the Upper Midwest of the United States and review beneficial farming techniques that also help to mitigate climate change. In the Midwest, climate change may bring more precipitation and intense storms, requiring plants and soils to be more resilient (Climate Impacts, 2017). To adapt, farmers need more productive soils that are less vulnerable to erosion. This means soils higher in organic matter, 58% of which is carbon (Sayre, 2017). Capturing and storing carbon in agricultural soils has the double benefit of improving soil health and mitigating climate change.

The Intergovernmental Panel on Climate Change recognizes carbon sequestration as a strategy for climate change mitigation: storing carbon in a way that does not allow it to function as a greenhouse gas (Sage Publications, 2008 and Patel, 2018). According to estimates from 2015, soils have the potential to absorb 3 to 8 gigatons of carbon dioxide in the next 20 to 30 years (Kane, 2015). Practices that help sequester carbon into soils used for agriculture are known collectively as carbon farming. These include, but are not limited to, using organic fertilizer, minimizing the compaction zone in a field, cover cropping, no-till farming and agroforestry. Thus, my research question was what are viable methods of carbon farming the the upper Midwest? In this paper, I use ‘viable’ to describe practices that are both economically feasible for and appealing to farmers as well as that have potential to mitigate climate change.

Through reviewing the literature, visiting to two family farms in northern Wisconsin and having discussions with farmers, I have determined cover cropping to be the most viable means of carbon farming with the highest potential in the the upper Midwest. However, no-till farming and minimizing soil compaction are also beneficial.

Research Methods:

This paper draws from lectures and discussion with Dan Guenthner, co-owner and operator of Common Harvest Farm in Osceola, Wisconsin. Guenthner's years of farming experience combined with his soil expertise provide valuable, area-specific knowledge on soil-smart farming. Information from his lecture on soil and tour of Common Harvest Farm serve as the basis for analysing different carbon farming techniques in practice.

Site visits to Common Harvest Farm and the Carlson Family Farm nearby were made in order to study carbon farming techniques and understand their context on a small scale. Common Harvest is a 40 acre organic vegetable, community supported agriculture farm that uses carbon farming techniques including composting/organic fertilizer, compaction zone minimization and cover cropping. The 2600 acre Carlson Farm grows corn, soybeans and rye. A tour of the farm from Scott and Lee Carlson informed the analysis of the benefits and limits of carbon farming practices in the upper Midwest. The Carlson Farm uses carbon farming techniques including no-till agriculture and compaction zone minimization.

To provide context and perspective on carbon farming techniques, I reviewed both scholarly articles and popular press articles. While they present more thorough explanations of carbon farming, not all were specific to the upper Midwest. The combination of scholarship, popular press, information from small-scale farmers and large-scale farmers hopefully permits a study that is both scientifically informed and of practical use.

Findings, Analysis and Discussion:

In this paper, I focus on three carbon farming techniques: no-till farming, cover cropping and minimizing soil compaction. I chose these techniques because they were featured in scholarship, in popular press and used at Common Harvest and/or the Carlson Farm. In this section, I will review each of the three techniques, discuss them in the context of the upper Midwest and finally detail incentives for farmers to adopt carbon farming practices.

No-till Farming:

No till farming keeps organic matter and crop residue on the surface of the soil, storing carbon. Tilling often inverts the soil in order to dry and warm it in preparation for planting. In doing so, organic matter moves too deep into the soil, making it more accessible to microorganisms who transform it into carbon dioxide (Patel, 2018). While no-till farming effectively preserves soil organic matter and benefits soil microorganisms, the technique is limited by climate, weather and soil type. According to Scott Carlson, the Carlson Farm sits near the northern border of where no-till farming is possible. In colder areas with shorter growing seasons, farmers rely on tilling to warm their soils. Additionally, no-till is challenging when farming on wet soils; tilling drys out the soil to prepare it for planting. Scott Carlson stated that no-till farming is “almost impossible” in southern Minnesota where a combination of soil type and precipitation means that the soil does not naturally dry out to permit a high-yielding growing season. Weather also plays a role; on the Carlson Farm, for example, the farmers aim for no-till but a cold or wet spring can force them to till. Guenthner explained that no-till farming poses a challenge for organic farmers. In addition to drying and warming soil, tilling is used to control weeds. On no-till farms, more herbicides are often used as compensation to combat the weeds. While tilling helps Common Harvest remain organic, they do not use the soil-inverting moldboard plow, allowing soil aggregates to largely remain intact (Guenthner, 2018). On both

farms, the farmers seemed very aware of their tilling choices. This is important given that the type of tilling affects the ability of farmland to be a carbon sink; soils can either sequester carbon or contribute to emissions, depending on how they are treated (Sayre, 2017).

Cover Crops:

Cover crops are plants grown for the purpose of soil protection and improvement. They enhance carbon sequestration in two ways. First, planting cover crops increases the quantity of plants in an area. During photosynthesis, plants take carbon dioxide out of the atmosphere and store it. When they die, that carbon goes into the soil. Plant roots also give off carbon, increasing the amount of carbon stored in the soil (Patel, 2018). Second, cover crops keep soils cooler, slowing the metabolic processes of the soil organisms. Because soil organisms break down soil organic carbon, slowing them down allows the carbon to remain stored in the soil for a longer period of time (this is the opposite effect as moldboard plowing, which accelerates soil organism processes). Common Harvest uses three cover crops: radishes, oats and peas. Radishes are particularly beneficial because they fracture the subsoil, leaving space for organic matter when they are harvested. Given that a wide variety of species can function as a cover crop, this technique is less limited by climate than no-till farming.

Minimizing Soil Compaction:

Soil compaction lowers the potential of soil to store carbon. The different sized particles that make up soil allow space in its structure for organic matter. When heavy machines like tractors and plows move across land, they compress the soil, eliminating that space (Guenthner, 2018). This is because organic matter holds together aggregates which break apart under heavy loads (Hoorman, de Moraes Sá, & Reeder, 2009). Therefore, isolating the path of a tractor through a field helps to sequester carbon by maximizing the spaces in a soil's structure in which carbon can be held. Both Common Harvest and the Carlson Farm aim to minimize soil

compaction by driving tractors in the same place every year. Being conscious of where heavy machinery is driven is a simple but significant method of carbon farming because isolating compaction minimizes aggregate destruction.

Upper Midwest Specifics:

As noted, soil type can be a limitation to no-till farming. The sandy, more gravelly soils found on the Carlson Farm in northern Wisconsin and in parts of Michigan are spodosols, a sand-based soil type that drys more quickly and is therefore more conducive to no-till farming (Lucas, Ross, & Swaby, 2014). However, in other areas soils are wetter, precluding the possibility of no-till farming. For example, many soils in Eastern Minnesota, Southern Wisconsin, Michigan, Indiana and Ohio are alfisols in which clay accumulates and holds water (Lucas et al., 2014). Soil type depends on the bedrock material which varies across the Midwest.

The climate of the upper Midwest presents both benefits and challenges to carbon farming. Cold winters help build soil organic matter by slowing the metabolism of microorganisms (Guenthner, 2018). However, the need to warm soil for the growing season prompts tilling. Furthermore, vegetation patterns impact the rate at which carbon can be sequestered. Prairies recycle nutrients more quickly than forests so they store more organic matter (Guenthner 2018). For example, Common Harvest, which used to be a forest, started with soil organic matter levels as low as 1.2%. Prairie landscapes such as those found in western Minnesota, North Dakota and South Dakota could have an easier time sequestering more carbon (Landscape Conservation, 2011).

Farmer Incentives:

In addition to mitigating climate change, carbon farming boosts soil organic matter, creating healthier, more fertile soils. Thus the adoption of carbon farming practices is in the best interest of farmers looking to farm sustainably with increased yields. In general, soils high in

organic matter are more fertile with healthier soil organisms and less vulnerable to drought and erosion (Sayre, 2017). Some of the techniques described above have additional benefits to farmers. Scott Carlson noted that the no-till drill has the advantage of being simpler than a John Deere corn planter which has more electronics, a shorter lifespan and has to be fixed by a John Deere employee (Carlson, 2018). Cover cropping has multiple functions aside from carbon sequestration; cover crops help to prevent soil erosion and some species also fix nitrogen. In fact, the Carlson farm has found a niche market selling rye as a cover crop to other farmers. This suggests farmer demand for cover crops in the upper Midwest.

The Conservation Reserve Program, a part of the U.S. Farm Service Agency, creates financial incentives for carbon farming. Farmers typically enter a 10 to 15 year agreement in which the government pays their rent. In exchange, farmers stop farming on “environmentally sensitive” land and grow species that will help improve the environment (Conservation Reserve Program). One focus of the program is grassland protection which helps to sequester carbon in the same way that cover crops do. Another is preventing erosion. This helps to maximize the amount of soil available to store carbon because erosion affects topsoil where organic matter is stored.

Similar to the Conservation Reserve Program, the Environmental Quality Incentives Program (EQIP) helps farmers adopt conservation practices such as cover cropping. The National Resource Conservation Service works with farmers one-on-one to develop a conservation plan specific to their farm (Environmental Quality). EQIP can cover half the cost of implementing the conservation programs (Patel, 2018). This program is a good example of farmers and non-farmers working together to achieve common goals.

Considering the variety of incentives that exist for farmers to practice carbon farming, it appears a realistic method of both climate change adaptation and mitigation. The many

techniques make it applicable to different farms and regions. Because one third of land on Earth is agricultural, it has the potential to significantly mitigate climate change (Patel, 2018).

Conclusion:

Cover cropping is the most viable method of carbon farming in the upper Midwest because of its many additional benefits and ability to be easily adapted. Its applicability is particularly important in the context of climate change. Although growing conditions will likely change, shifting which species can survive in different areas, farmers can use different species of plants as cover crops.

There are many opportunities for further research around carbon farming. A key question concerns the potential for carbon farming to mitigate climate change within a time frame beneficial to humans. Researchers should work with farmers to determine how much carbon soils currently store and how much more they could store. Extension agencies should support individual farms in analyzing their potential for carbon sequestration by assessing soil type and climate. Given the variety of conditions, this work should be done at a small scale in order to insure the findings are relevant. Again, research should be conducted in tandem with farmers because there is little use investigating carbon farming if it is not going to be done in a way that appeals to farmers.

Lastly, I aim to highlight three pieces of literature relevant to the topic of carbon farming in the upper Midwest. While dated, a 1996 *Landscape and Urban Planning* article on the St. Croix River valley provides important area context. The St. Croix River valley is known as an ecotone, including areas of prairie, oak savanna and forest. Accordingly, different places have different potential for carbon sequestration as I discussed in the *Upper Midwest Specifics* section. The authors also note that logging peaked in 1898 to 1903, likely resulting in lower amounts of sequestered carbon during or right after those years (Andersen, Crow, Lietz, &

Stearns, 1996). Reforestation efforts would also benefit the soils and climate similarly to the practice of cover cropping. I also emphasized the importance of farmer involvement in research, which connects with the small-scale participatory research advocated for by Paul Richards in his article “Indigenous Agricultural Revolution.” Richards implies the question of who the real experts are in farming: outsider scholars or farmers (1985). Programs like EQIP have potential to adopt practices at smaller scales, acknowledging farmer expertise. Farmers likely know their soils better than researchers, so scholars and extension workers should assist them in implementing carbon practice techniques. Even so, some scientists question the capacity of carbon farming. A 2016 study found that previous models overestimate soil’s potential as a carbon sink by 40%. The study concluded that it could take thousands of years for soil to take in enough carbon to benefit humans (He et al., 2016). This supports my point that further research is needed into the speed of carbon sequestration, which I have noted depends on the vegetation. Even if carbon farming can not rapidly mitigate climate change, the techniques still prove worthwhile for their soil health benefits.

Subsidizing carbon farming techniques, particularly cover cropping, would mitigate climate change and help farmers adapt. Programs such as the Conservation Reserve Program should include carbon farming as a focus. It is also worthwhile to invest in further research and innovation. For example, the development of perennial wheat could eliminate tillage (Guenthner, 2018). The federal government should provide more funds for programs such as EQIP so that they can cover more than half the expenses of planning and implementing farm-specific adaptations. Similar programs should also be executed at the state level in order to reach more farms and bring a deeper knowledge of regional needs and limitations. In carbon farming lies a solution to mitigate climate change, produce food to feed a growing population and care for local environments.

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Zoé Tkaczyk

Alternative Agriculture Essay

October 9th, 2018

The Dirt on Increasing Soil Temperatures

Introduction:

Many environmentalists argue that we are past the point of no return. Climate change is no longer reversible and as temperatures continue to climb, farmers must adapt to local changes. As global temperatures increase so do local soil temperatures. Farmers in the Upper Midwest have begun to adapt to increased temperatures and their widespread effects. With this in mind, I investigated the questions "How are increasing global temperatures affecting the warming and cooling of soil in the Upper Midwest, specifically what are these effects having on local farmers? and "What is being done to mitigate these variations in local ecology?"

At a first glance, increased soil temperatures seemed beneficial for farmers in the Upper Midwest. Warmer soils lengthen the average growing season and increase the likelihood of seed germination; however, over time it decreases moisture content, increases plant disease, and disturbs nutrient recycling. Farmers must compensate for these increased temperatures with new technology and farming practices as well as mitigate any effects that have already unfolded.

Research Methods:

In order to better understand the causes of higher soil temperatures, I turned to multiple academic papers, lab reports, and case study analyses. Based on these, I was able to hone in on some of the more prominent impacts of increased temperatures: shifts in moisture content, plant disease, and nutrient recycling. With these effects in mind, I looked at the solutions farmers in

the area are using to combat the effects and ultimate cause of this problem. Additionally, my visit to Common Harvest CSA Farm and the Carlson Farm in Wisconsin as well as lecture and interviews with the farmers gave me insight into their personal approaches to these new issues.

Once I understood the cause, effects, and some solutions to this problem I analyzed other preventive methods, connecting this research to its relevance in literature, and finally considering some policy recommendations to combat this problem's causes in the long run and offer some short term mitigation measures.

Moisture Content:

Warmer weather slowly decreases moisture content over time, shifting the habitat for certain microorganisms. Crops previously grown in the region may eventually be too difficult and expensive to grow, but other crops will replace them. As the warmer regions of the globe continue to expand, new species of flora and fauna take root, replacing native species. Similarly, species seeking cooler climates will slowly migrate North. "Plant–soil feedbacks [or PSF] are important interactions that may influence [plant growing ranges] in a changing world. What remains largely unknown is the generality of plant-soil biotic interactions across populations and the potential role of specific soil biota, both of which are key for understanding how PSF might change future communities and ecosystems." Both "field observations and experimental soil treatments," prove that plant–soil biotic interactions influence the migration of plant species (Van Nuland, et al., 2017). Testing temperature, elevation, and plant species, a correlation between air and soil temperature and species of soil microorganisms was discovered, which corresponds to the plant species thriving in each region.

This shift in microorganism habitat and activity is not necessarily good or bad: simply different; however, farmers must be prepared to change or develop methods to counteract it. Dan used radishes as one of his cover crops for winter. Because of their root system, radishes are ideal for maintaining moisture in the soil. As they hold a lot of water in the roots, which have direct contact with the soil, which will freeze when winter comes and keep temperatures lower during the spring. It only delays the thawing of the soil by a few days, but this has positive benefits for local flora. Simply maintaining soil temperature and helping it freeze maintains moisture levels in the long run. They also planted alfalfa as a cover crop. Not only does this decrease moisture loss, it gave them an extra source of income. One of the benefits of using cover crops as a solution is the extra income derived from these crops and return of nutrients to the soil. Farmers can also leave any plant waste from the previous harvest on top of the soil in order to mitigate some soil loss as they wait to plant new crops. By implementing such simple solutions, farmers attack the smaller, local problems and larger regional issues at the same time.

Plant Disease:

As temperature increases, it is easier for disease causing and carrying microorganisms to spread. In the Upper Midwest, there is a fine line between a productive amounts of soil microorganisms and a detrimental amount. More microorganisms increase the likelihood of disease or mold. For example, at the Carlson Farm, they discussed that this past summer was warmer than usual, and they had the highest number of days of consecutive 70℉ weather. While this did allow them to plant more crops, it also resulted in a mold infestation, and I saw several farms in the area with moldy, infested, and sick fields.

Increased soil temperatures transform the local ecosystems, creating what is essentially a new environment. The correlation between higher temperatures and shifts in local ecosystems. These shifts, in turn, allow for new pathogens to be introduced. The catch is that local crops do not have any immunity to these disease, and often times, farmers do not immediately know what is wrong. “Pathogen biology and ecology may be difficult to predict in new environments. Previously available knowledge is key to devise eradication, quarantine, and management strategies, but it must be adapted to novel scenarios in short time frames to be effective (Almeida, 2018).”

As soil continues to stay warmer for longer, farmers must often resort to chemical solutions for plant epidemics. Since they cannot always predict when an outbreak will occur, they have to use last minutes resorts to save their crops. While plant disease will still occur, regardless of soil temperature, increased temperatures directly correlates with higher instances of infection. “A high correlation was found between soil temperatures above 20°C during the first 30 days after planting and disease severity. It is suggested that soil temperature during the early stages of plant development is an important factor in disease development (Pivonnia et al., 2002, 472).” While these experiments were in a controlled lab, the theory of correlation still holds true as more instances of epidemic sweep across the Upper Midwest.

Because of this, farmers must approach this problem at two levels. First they focus on the immediate threat to their crops and do their best to save them, often through chemical means or the use of seeds genetically modified to contain antibiotics or other “medications”. “Important decisions such as the pursuit of eradication efforts and how to implement those efforts must be made quickly, decidedly, and may not be entirely supported by the scientific literature (Almeida,

2018).” Because of this, many farmers must consider how to decrease soil temperatures on their land. When interviewing Dan at Common Harvest Farm, he explained that many of the problems caused by increasing soil temperatures can be fixed or mitigated with the use of cover crops, which is a possible solution I will present multiple times throughout this paper. In one of his fields, Dan used three different cover crops to maintain the soil moisture and temperature throughout the next growing season. While each crop--radishes, peas, and oats--had a specific function, by simply covering the field, the soil’s temperature will stabilize so in the spring when Dan begins another cycle of food production, it will be harder for infection and mold to take hold of his crops. This small and simple solution allows Dan to decrease the temperature and, in turn, microorganism activity, ultimately protecting his crops.

Nutrient Recycling:

Warmer weather lengthens microorganisms’ seasons of activity. Again, this has both positive and negative consequences for farmers. On one hand, it means land can be farmed for longer. On the other, it increase the rate of nutrient recycling throughout the ecosystem. This means that farmers must often apply or reapply more nutrients to the soil as a great deal of the nutrients are lost when the produce is shipped to customers or processing plants. While farmers have always had to deal with nutrient loss and replenishment, they have to start compensating for higher levels of nutrient loss. Dr. Biederbeck and Dr. Campbell (1973) considered this in their experiments regarding soil temperature, humidity and microorganism activities. In their lab, they simulated different soil types with different temperatures and moisture content to try predict microorganism activity levels. While humidity also affected the rate at which nutrients were recycled, they found increasing temperatures correlated with microorganisms’ nutrient recycling

rates. For soils and climates similar to the Upper Midwest, they found that rising temperatures resulted in less nutrients in the soil over time: meaning farmers will have to incrementally apply more and more nutrients to their soil in order to maintain necessary levels.

As increasing microorganism activity requires more nutrients to sustain the land, farmers must find cheaper and more efficient ways to recycle nutrients sustainably. Whether it is through chemical or organic fertilizers, farmers must find ways to compensate for the net loss of nutrients. Many farmers left their corn stalks and husks on the field as a cover crop and nutrient recycling solution. Dan described an almost completely self sustaining farm while on the bus tour of the region. Thy use animal waste from their own cattle to fertilize their crop by mindfully collecting and spreading the manure. Similarly, Dan uses chicken waste to compensate for lost nutrients on his property; however, he still has to supplement that with other organic fertilizers. Farmers in the Upper Midwest must continue to adapt to the longer seasons of microorganism activity and shift in nutrient recycling that ensues.

Summary of Findings:

We must approach this issue in two steps. First, we must combat the effects of warming soil temperatures: increased rates of plant disease, a decrease in moisture content, more erosion, and a disturbance of nutrient recycling. After we lessen the effects of warmer soils, then we can begin to attack the ultimate cause of this issue. Farmers can only do so much to completely decrease the global temperatures and in turn soil temperatures, but they can mitigate its effects.

Cover crops are the simplest and easiest solution. Not only do they mitigate the effects increased temperatures have on microorganisms, they regulate soil temperatures. For farmers in the Upper Midwest, the use of cover crops is not only viable but necessary. Given the wide range

of benefits, including temperature regulation and a new source of revenue, to not use cover crops would be illogical and irresponsible.

Relevance to Literature:

The ultimate cause of these increased temperatures is increasing global temperatures. As the climate change continues to worsen and the world gets hotter and hotter, more than just farmers must manage these problems and attempt to solve them. In order to ultimately end this issue, we must tackle its underlying cause. "Multiple changes in Earth's climate system have been observed over the past decades. Determining how likely each of these changes is to have been caused by human influence is important for decision making with regard to mitigation and adaptation policy (Hannart et al., 2018, 5507)." With this approach in mind, all of the effects described above and solutions offered target the anthropogenic causes of increased soil temperature so we can provide short-term solutions and set a long-term plan into place to mitigate warming soil and global temperatures. In all of the literature used to research this paper, the writers addressed the underlying cause of increased soil temperatures. Some went so far as to argue that focusing our efforts on industrial, manufacturing centers and finding global harmony on issues such as carbon emissions are key to decreasing temperature. Once the globe has stopped warming, we can focus on regulating temperature until it is once again sustainable.

Policy Recommendations:

With this tactic in mind, there are two ways in which policy can be used to mitigate warmer soil temperatures. The US farm bill already has provisions which established the National Cooperative Soil Survey Program. This program mitigates erosion which regulates moisture content to an extent and considers microorganism health; however, we needs plans that

will also hone in on the disturbance of nutrient recycling. By funding research on more sustainable fertilizers, we can reduce the negative impacts of cycle disturbance; however, unless no till agriculture is mandated across the United States, there is little policy that can truly regulate this issue. If we expanded upon pre existing clauses of the Farm Bill, we could very easily begin to improve soil health and hinder the negative impacts of increasing temperatures.

However, just focusing on farmers in the Upper Midwest is not enough to solve this larger issue. As such, the United States should not leave the Paris Climate Agreement and enforce emission policies similar to those in the EU, specifically Germany. Simply exporting dirty industries does not keep the Earth clean. Just because the pollution is not in our "backyard," does not mean it is not occurring, and as local farmers are learning, this sudden rise in emissions and temperatures has global implications. There needs to be global standards for emissions that eventually decrease or at least stabilize at current levels until we find a cleaner source of energy or method of cleaning polluted air.

Conclusion:

Dan stated "that we need biological solutions to biological problems," and this philosophy holds true for increasing soil temperatures. Farmers continue to adapt to increasing temperatures by mitigating its effects or embracing it and farming different crops better suited to this new environment; however, they alone cannot tackle the ultimate cause of these global problems: climate change. It will take a global effort to fix this problem and revert Earth back to a healthy and sustainable state. As humanity tries to create a sustainable model of existence, it is imperative that we try to find "biological solutions to biological problems."

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People, Agriculture, and the Environment

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Agricultural Nitrogen Use and the Environment

The modern revolutions in industry, technology, agriculture, and supply chains have forever altered society and the environment which supports it. Alongside allowing for explosions in population, increasing net global wealth, and connecting the world in new and fascinating ways, we are also faced with new challenges; particularly, in sustaining these revolutionized global systems in the face of climate change. Agricultural production sits at a unique intersection as both victim to the negative climatic effects and active contributor to either their exacerbation or mitigation. Agricultural adaptation has become necessary to farmers' economic survival and to the survival of the global environment and population. For the purposes of this paper, I will limit this deeply complex issue to the place of the Midwest and the climatically significant use of nitrogen in agricultural production. How can Midwest farmers adapt their nitrogen use to a changing climate, and how can this adaptation in turn contribute to a global solution for combating climate change?

Research Methods

To answer this question, I will first explore the duality of the cause-effect chain between agricultural nitrogen and climate change, examine the most common examples of agricultural nitrogen use, and then suggest the most effective paths for intervention. The latter will include regionally specific case examples where they exist, and identify gaps in knowledge which require further research. I rely on recently published scientific studies and reports from the

range of 2009-2017 for the research on nitrogen-climate interactions, and include case studies from the Midwest region.

Findings: Nitrogen, Climate, and the Environment

While most climate policy discussions focus on curbing carbon emissions and their impact on climate change, nitrogen's disproportionately potent impact on the environment is too often left ignored. Like carbon, nitrogen in its many forms creates a positive feedback loop with short-term and long-term environmental implications. The simplest side of this feedback equation is how climate change is increasing nitrogen release into the environment. Even with an assumption of steady business-as-usual nitrogen use, studies show that the increasing global temperatures and heavier rainfall events will lead to increasing nitrogen pollution (Conniff). Water run off from more extreme weather events will sweep increasing amounts of nitrogen into water systems, and worldwide we are already contending with some of the implications of this form of degradation in the form of unprecedented amounts of algae blooms in ecologically vital water sources. Additionally, the increasing amounts of atmospheric nitrogen has widespread effects by increasing soil fertility deposits. Paradoxically, this actually decreases ecological diversity, because increased soil fertility disrupts the ecological balance and allows some plant species to thrive and dominate at the expense of the rest (Ibid.).

On the inverse side of the nitrogen-climate impact equation, the trend of increased nitrogen use will contribute to the problem of global climate change. Human activity has more control over and more severely impacts the global N cycle than the global carbon cycle, and agricultural production plays the largest role in this impact (Suddick). First, nitrogen fertilizer production through the Haber-Bosch process consumes a large quantity of fossil fuel and releases an equal amount of CO2 (Udvardi). However, this is just the start, as the entire chain of

the fertilizer's use continues to directly impact the climate. The agricultural nitrogen cycle involves many forms of nitrogen which each have different, and even diverging, impacts on the environment, complicating predictions but nonetheless making understanding its climatic role all the more critical (Fagodiya).

The first step in the natural cycle is nitrogen fixation, in which plants fix gaseous N2 into NH3. Then, nitrification occurs, turning it into a form which plants can uptake into plant tissues through assimilation. Next, ammonification turns what has by now become organic N back into NH3, or ammonia-- one of the most potent and environmentally degrading forms of nitrogen. The last step in the process is denitrification, in which nitrogen is once again released into the atmosphere as gaseous N2 (Fagodiya). This is not a perfect closed system, and throughout this cycle, NH3 and a form of atmospherically polluting oxidized nitrogen escape into the environment. Oxidized nitrogen in the form of N2O is of particular concern because it has a long atmospheric lifetime of 116 years, and its global warming potential is 310 times that of CO2 (Fagodiya). Another form, nitrous oxide, forms ozone which contributes to warming. This form has more complex implications, however, because it reacts to remove methane from the atmosphere which contributes to cooling. Overall, the many complicated variables of increasing nitrogen inputs into the cycle have a net cooling effect over a twenty year scale, and a net warming effect over one hundred years (Fagodiya). Most agricultural sources of nitrogen cause long-term warming, are increasing in use, and are unregulated (Suddick).

Intervention: Analysis and Discussion

Having established the dual feedback effects of nitrogen on the environment, it follows to examine the modern agricultural uses of nitrogen to ultimately identify the most promising sites for intervention. The aforementioned Haber-Bosch process was a key part of the Green

Revolution and dramatically increased the potential for total agricultural output through manufacturing nitrogen fertilizer. Previous to this revolutionizing process, farms had a greater tendency to be sustainable closed-loop systems; viable farmland was kept naturally fertilized by a mixture of pragmatic nitrogen-fixing crops and animal waste from the farm's livestock, which could be raised using the farm's crops for feed. With synthetic fertilizer, this system became unnecessary and no longer profit-maximizing. Instead, today's farms tend to be either all livestock or all crops, which creates a disjointed system that wastes extra energy inputs to reap capital gains. Additionally, nitrogen fertilizer alone accounts for up to half of the total cost of running the farm (Conniff), but is the single most limiting nutrient controlling agricultural production (Fagodiya). This contributes to the trend of upscaling in farm sizes, as it takes enormous yields to cover the heavy input costs, and larger farms tend toward over-fertilizing because they would rather "waste" extra fertilizer in order to ensure maximum yield. So, the current agricultural system suffers from both ramped-up nitrogen fertilizer use and livestock production.

When it comes to livestock production, there's little to be done from a technical farming standpoint besides downscaling global livestock production. However, a number of tools and techniques can be used to diminish the environmental and climatic impacts of agricultural nitrogen fertilizer use. These include the use of cover crops, no-till farming, and natural sinks to reduce nitrogen runoff into the surrounding environment (Suddick), optimizing the timing and amount of fertilizer used (Ibid.), strategically integrating natural nitrogen fixers, and exploring the potential of GMO nitrogen fixers (Udvardi). Davidson predicts that through applying these current practices alone, farms could reduce nitrogen pollution by 30-50%, and that innovation could increase this reduction to 70-90% (1). The first set of strategies, which target run-off

reduction, are all fairly self-explanatory. Cover crops and no-till farming prevent erosion in the event of rain or extreme weather, which thereby diminishes the potential for excess nitrogen in the soil to leach into the surrounding area. Natural sinks such as "streamside buffer strips (planted with grasses or trees), natural wetlands, and more complex stream habitats...allow current agricultural production practices to continue, but remove reactive nitrogen by plant and microbial uptake and denitrification" (Davidson 9). Such sinks could also provide potential for recapturing lost nitrogen (Robertson).

Fertilization optimization becomes a more laborious and technical process. As previously mentioned, big farms often have an incentive to over-fertilize rather than to risk losing any yields. However, farms could be much more exact and precise with fertilizer application using soil nitrogen tests to predict yield-goal recommendations (Robertson). The second issue to address here is timing; farms are limited by the logistics of labor, weather, and equipment when applying fertilizer. They may spray fertilizer up to 8-9 months in advance of actual crop uptake, which would also require spraying in excess to account for all that will be lost before it is used by the plants (Robertson). Robertson writes that "on-the-go fertilization, whereby variable-rate N applications to a growing crop are made on the basis of real-time spectral reflectance of the crop canopy, offers a promising new technology for matching N inputs even more precisely to need." In other words, advanced computer sensing can predict when and where fertilizer need is greatest. An advanced fertilizer formula and interactive microbial inhibitors can also diminish waste and optimize fertilizer efficiency. The cheapest and most common forms of fertilizer react quickly and easily with soil enzymes to form the nitrogen gas that escapes into the atmosphere and is wasted. Slow-release fertilizers coat the pellets and thus

protect it from as readily reacting before it serves its fertilizing purpose, and adding specialized bacterias to soil can also slow the nitrification process (Ibid.).

Lastly, nitrogen use and its detrimental effects can be mitigated through the seemingly simplest method of all; using less nitrogen fertilizer. Instead, farmers could use either natural or genetically modified nitrogen fixers. By rotating crops which naturally fix nitrogen from the atmosphere, fertilizing the ground for the next rotation which would require a higher nitrogen input, farmers can reduce their need for synthetic nitrogen. In fact, this system predates the invention of synthetic fertilizer and the Green Revolution, though the knowledge of nitrogen fixing plants and their ideal pairings has since advanced and been systematized. Crops like legumes, winter ryegrass, and winter wheat, can all be incorporated into seasonal rotating systems to naturally fertilize the ground for more nitrogen-demanding crops (Robertson). Alternatively, paired crops can be intercropped and grown in alternating rows at the same time for similar benefits, though the modern mechanized harvesting process does not currently offer many adaptations to such a system (Ibid.). The final and as-yet still developing approach to reducing fertilizer use involves genetically modifying crops to improve their nitrogen use efficiency (Udvardi). However, this approach requires greater research over the coming decades, making it unlikely to be a viable or affordable option for most in the foreseeable future.

Any mixture of these options for intervention could theoretically be adopted in the case of Midwest agriculture, but the prohibitive factor for farmers remains economic. Under current U.S. regulations (or rather, lack thereof), taxpayers and those living on nitrogen-polluted land pay for the negative externalities caused by agricultural nitrogen, and most farmers have no economic incentive to switch from using the cheapest and most yield-maximizing modes of production. In a 2010 theoretical study, Matthew Helmers of Iowa State University models a

35% reduction in the case of the Cedar River watershed region from southern Minnesota to Eastern Iowa, which was recommended in 2006 by the Iowa Department of Natural Resources to protect downstream cities water supplies as the most easily measured of many negative polluting effects (196). Helmers determines the most cost-effective strategy, using a mixture of reducing nitrogen fertilizer spray by 20% on continuous corn and corn-soybean rotations, omitting the fall preemptive fertilizer application, implementing wetland sinks and better water drainage management, and planting rye cover crops. Even still, the total anticipated cost to farmers to achieve the reduction over 20 years is $71 million per year (Ibid.).

However, this model has no way to calculate for the total costs shouldered by those who face the impacts of nitrogen pollution. In 2015, the city of Des Moines, Iowa, attempted to account for at least a fraction of this hidden cost by suing the upstream farmers for the cost of removing nitrogen from its drinking water supply. It lost the case in 2017 (Conniff), so the city will have to build a new $80 million nitrate removal facility to increase its capacity to deal with the ongoing problem, on top of the $1 million annually it has previously spent on nitrate removal (Masters). Of course, the city's total costs only represent part of the greater burden that Midwest nitrogen use spreads in terms of global climate impact.

Conclusion

The tools for mitigating climate change and the harmful environmental impacts of nitrogen pollution are largely available today to farmers in the Midwest and elsewhere, but under the current system of agricultural production, there exists no economic incentive to adopt large scale reform. United States agricultural policy prioritizes increased yields at low production cost, with little to no regulation of negative externalities like nitrate-polluted water sources. To effectively promote widespread change and motivate further research into innovative fields like

nitrate-fixing GMOs, the true cost of nitrogen pollution must be properly assessed in order to incentivize a policy and regulatory shift from yield-maximizing to nitrogen-efficient agricultural practice. This will involve more economic research and cost-effective modelling such as the type exemplified by Helmers, though much more focus should turn to identifying the negative externalities shouldered by taxpayers across the country. With the right economic incentives, Midwest farmers can adapt to more sustainable nitrogen practices. With farmers then forming a crucial part of the strategy to mitigate climate change, they will benefit from contributing to the region's own long-term agricultural (and thus, economic) sustainability.

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Soil Carbon Storage:
Tillage and Health Factors as Climate Change Mitigators

Introduction

A report by the UN-sponsored Intergovernmental Panel on Climate Change released findings on October 8, 2018 that climate change is not a distant reality. Real effects will start to be more and more visible and global average temperatures are expected to increase 2.7 degrees by 2040, which is both hotter and more quickly than previously estimated (Davenport 10/7/2018). Effects from a warming atmosphere such as higher temperatures and more extreme weather events are scientifically proven to be caused by human-generated emissions of greenhouse gasses. Carbon dioxide is the most abundant greenhouse gas in our atmosphere, but we may be sitting, quite literally, on a possible way to both mitigate the impacts of climate change, as well as to slow down its progression by sequestering excess atmospheric carbon. The solution? It's in the dirt: agricultural practices which maintain soil health may be a part of the answer.

This paper seeks to answer the larger question of how upper Midwest farmers can adapt to a changing climate and what new research is needed to facilitate this adaptation. My research investigates tillage practices on both a conventional, as well as small, organic farm, in order to analyze the potential sequestration possible within each respective agricultural endeavor. What tilling process is best for carbon sequestration, and do tilling practices which maintain good soil health have any potential to mitigate the effects of climate change? By conducting both a literature review and a field visit to two farms with different agricultural practices and outputs, I

hope to answer these questions and provide a recommendation for tillage practices for Midwestern farmers.

Research Methods

My initial research was conducted in a larger group setting with a class from Macalester College. On September 15, 2018, the other students and I attended a field trip to Osceola, a rural town in western Wisconsin. This area lies in a glaciated zone with silty-loam soils. Farmers here grow mostly corn and soybeans for both ethanol and human consumption.

We first visited the Carlson family farm, a mid-size conventional farm of 2,600 acres, whose main crops are non-GMO soybeans for export to Asia for food production (tofu, soy sauce, etc.), and corn which is sold to a biofuel company which converts the crop into ethanol. Smaller plots of land are also dedicated to growing rye for cover crop seed and for export to Japan, as well as straw, which is sold to local horse and chicken operations in the Midwest. We heard the farmer and his father speak about their experiences and challenges. Following this visit, we spent the afternoon at the Common Harvest Farm, operated by the Guenther family. A family owned and operated farm as well, Common Harvest runs off of a 40-acre plot, and grows a variety of vegetables and fruits, which they sell directly through customers through a Community Supported Agriculture (CSA) system. Crops rotate throughout the growing season and are sometimes germinated indoors in a greenhouse, and moved outside to be planted once sprouted.

Both farmers were extremely warm and welcoming to the group and were open to questions regarding their practices and challenges. Their interviews on the field visit constitute the basis for my research, with additional findings from a literature review of scientific studies on soil and atmospheric change.

Background

Soil organic matter represents the largest global terrestrial carbon pool, acting as a source of CO2, CH4, and other greenhouse gases (Kern and Johnson 1994). Soil composition includes 45% mineral matter, 25% air, 25% water, and only 5% organic matter (Guenther 9/11). This 5% represents the critical proportion of the soil that allows for its water holding capacity, and acts as the microbial center and engine of the soil. Unhealthy soils lack a balanced organic composition, while healthy soil structure includes large pores where oxygen, water, and nutrients are stored. Heavy industrial farming machinery can collapse these delicate pores and compress soil, essentially suffocating the microbes which live in the aerated pores.

More extreme weather events correlated to changing climate can include high rainfall. In unhealthy, erosion prone soils, topsoil can run off farmland, and agricultural inputs such as fertilizers and pesticides find their way into the water table and eventually to larger bodies of water such as rivers and lakes. Soil which is more stable, is less- likely to erode, and can act as a sponge for high rainfall. Increased water retention would also be beneficial during an extreme drought event. Native plants adapted to benefit from and maintain healthy soil structure, but have been replaced with agricultural crops which have less ability to maintain soil structure.

The native plants of this glaciated northern region are prairie plants, which have 12 ft. roots. The active organic matter of their root structure build up organic matter in the soil when they die. There is a high level of soil regeneration in a prairie ecosystem, a process which is disrupted with the introduction of agricultural crops (Guenther 9/11/18).

Mr. Guenther explained his challenges with the soil composition and degradation on his plot of land. Corn, which is incredibly nutrient-demanding, had been continually planted by the previous land owner, without fallow or active soil restoration. When the Gunther's established

the farm, the level of soil organic matter was a measly 1.5%. Nutrients are water soluble, and so after each rain event the soil would become even further depleted. Thus, for Common Harvest, it has been an uphill battle to both turn around, and to maintain the health of their soil.

Soil organisms consume more organic matter and are more active in warm soil. Winter in the Midwest slows the metabolism of the soil, leading to an ever-increasing challenge of a condensed growing season, due to the increasingly unpredictable nature of weather patterns and seasonal change. An additional challenge represented by the changing climate, is that these unpredictable seasons lead to much higher economic risks for farmers, who already often struggle to make a single-income living with this livelihood. The 2017-8 growing season in Minnesota included a long winter with frosts lasting through April, an extremely short spring, and a drought during the summer with record high temperatures (Guenther 9/15/18). This could easily continue, and it is more important than ever to both maintain soil health, as well as use soil as a tool to harness and sequester atmospheric carbon and hopefully slow the rapidly encroaching effects of climate change.

Tillage Practices

Moldboard plowing is a fixture of conventional tillage processes. A sharp nose on the end of the instrument churns the soil and paces organic matter below the surface. This warms soil by darkening the surface layer, which absorbs more sunlight energy. Conventional tillage is differentiated by no-till agriculture where the soil is not disturbed at all, but to plant the seeds. All organic residue is left on the surface of the soil. The soil temperature tends to be colder because plant fodder and decaying organic matter is a lighter color, thus absorbing less heat from sunlight because of lighter material's reflective properties. However, this tillage style is built in

conjunction with pesticide and genetically modified crop reliance. GMO corn and soybeans are strong enough to push through a large amount of surface residue.

In the 1960s, the Carlson farm moved into conservation tillage, transitioning through the following decades from using a chisel plow, to a tandem disk, until eventually reduced till. They practice vertical tillage of the top 2 inches of soil in order to dry out and warm up the surface temperature because of the geographic location is so far north. The refuse from corn, fondly called "corn trash," does not break down easily on the surface and can take a full two years to decompose, and instead requires a slight mixing with top soil in order to break down organic material. Mr. Carlson has added a spike wheel to the planting tractor in order to chop of the top surface of the soil. The farm has struck a balance between adapting to climactic challenges and colder winters, while staying as close to no-till as possible (Carlson 9/15/18).

Down the road, Common Harvest has implemented a similar reduced tillage method. While no-till is impossible for the delicate veggie sprouts because the organic top soil residue is too dense to break through, Mr. Guenther has implemented a technique from the Australian drought of the 90s. Long fingers attached to the trailer delicately fissure the soil and mix organic compounds with the churned earth. While less superficially "chopped" than the Carlson method, this technique introduces organic matter more gently into the soil horizons than a moldboard plow, while trying to stay as shallow as possible while still plowing.

Findings, Analysis and Discussion

West and Marland (2002) specifically define different tillage types based on the percentage of residue cover. Conventional tillage refers to "tillage practices that leave less than 15% residue cover after planting. Reduced tillage represents practices that leave 15–30% residue

cover. Conservation tillage is any practice that leaves greater than 30% residue after planting; this latter category includes no-till" (224). The authors further differentiate tillage practices by pointing out that conventional includes any use of a moldboard plow, while reduced tillage includes practices that do not use a moldboard plow, and no till leaves the soil relatively undisturbed.

Scientific literature has many proponents of the argument in favor of agriculture's high potential as a carbon-sequestration method. Slowing down climactic warming means an immediate limiting of atmospheric CO2 "to a trajectory that avoids a doubling of the preindustrial concentration" (Pacala and Socolow 2004, 968). Pacala and Socolow describe "wedges" of solutions, which while are incomplete on their own, when brought together can create a holistic solution. They argue that the carbon capture potential within agricultural soils management is the second-best solution to reforestation. The initial transition from natural grassland or forest to agricultural purposes causes a net loss of around 50% of sequestered soil carbon because undecomposed organic matter becomes aerated. While the researcher's scale of measurement estimates a net loss of "2 wedges" through transformation of forested land to agricultural uses, a full wedge can be restored if "conservation tillage could be extended to all cropland, accompanied by a verification program that enforces the adoption of soil conservation practices that actually work as advertised" (Pacala and Socolow 2004, 971).

Carbon sequestration in agriculture is very difficult to measure because of the complexity of farming's many inputs. Sequestration of carbon occurs in processes when the input of carbon is less than the output of carbon. For agriculture, the input values may not seem like they concern carbon, but West and Marland (2001) point out that a thorough analysis of agricultural production reveals a carbon-intensive endeavor in many unexpected places. Often, calculated

emissions values were calculated "with existing data on C sequestration rates to determine the potential changes in net flux of C to the atmosphere when changing from conventional tillage to no-till practices (218). However other carbon inputs into agricultural production include fuel and electricity needed to operate machinery and farm buildings, the carbon dioxide emissions from the "production of fertilizers plus the energy required for their transport and application…Carbon emissions from fossil fuels used in the production of fertilizers include emissions from mineral extraction and fertilizer manufacture" as well (West and Marland 2001, 218). Additionally, although no-till may sequester more carbon, it is often associated with the increased usage of pesticides (Ronald 2017). These chemicals are "almost entirely produced from crude petroleum or natural gas products. The total energy input is thus both the material used as feedstock and the direct energy inputs" (West and Marland 2001, 219). Overall, West and Marland (2001) found that despite hidden carbon-emitting inputs into agricultural systems, no till still has higher potential to sequester carbon.

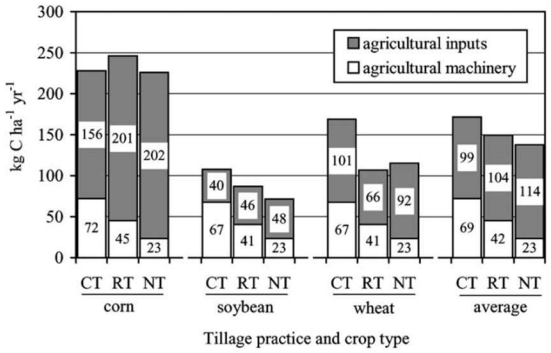

Fig. 1. Total US average carbon dioxide emissions for three crop types using three different tillage practices. CT, RT, and NT are conventional tillage, reduced tillage, and no-till, respectively. The graph is for non-irrigated areas, which comprise 85% (by area) of US corn crops, 95% of soybean crops, and 93% of wheat crops. Carbon dioxide emissions from agricultural inputs (fertilizers, pesticides, seeds, etc.) and machinery are from Tables 7 and 8, respectively.

Fig, 1: Carbon emissions and crop type from West and Marland (2001) p. 228)

In addition to the potential for carbon sequestration, no till is often associated with healthier soil structures, which in turn can mitigate some of the challenges imposed by changing climates. Healthy soil structure is qualified by "include favorable soil texture and structure or tilth, good internal drainage, optimal water, and nutrient retention capacities and soil reaction. Relevant soil processes include good aeration, low susceptibility to erosion, and strong nutrient

cycling. An optimal level of soil organic matter (SOM) content is essential to all key soil properties and processes, which are strong determinants of soil health" (Singh et al. 2017, 3). A healthy, functioning soil system can contribute ecosystem services such as "net primary production, denaturing, and filtering of pollutants to purify water, improving air quality by scrubbing contaminants, enhancing the environment, and moderating climate at local, regional, and global scales" (Singh et al. 2017, 4). No-till agriculture in combination with practices such as maintaining crop cover with nutrient enhancing properties are important because of the residue's role in reducing erosion. Water in healthy soils moves vertically due to the capillarity of soil pores (Guenther 9/11/18). Compaction from heavy machinery and other causes leads to topsoil erosion and horizontal water movement which strips nutrients quickly from soils. The kinetic energy from erosion-causing events such as rain or wind events (which occur with increasing frequency due to climactic changes) disrupt soil aggregates and "exposes the soil organic matter, hitherto encapsulated and protected, to microbial/enzymatic reactions. Thus, breakdown of aggregates increases the rate of SOM decomposition" (Singh et al. 2017, 8). Additionally, erosion changes soil temperature and moisture balances to accentuate emissions. Carbon dioxide, although abundant in the atmosphere, is not as potent as other greenhouse gasses, notably nitrous oxide (N2O) and methane (NH4), both of which are emitted by large scale agriculture. Marland et al. (2003) studied conventional vs. no-till practices and found that there were consistently higher N2O emissions from ploughed vs. no-till farming sites. Nitrous oxide is one of the gaseous off puts of an increased aerobic turnover caused by tilling and described by Singh et al. (2017). Because the rate of organic matter decomposition is linked to soil temperature and moisture, warming global temperatures may pose a risk to decreasing the global pool of soil organic content.

Not all literature reviewing soil health and tillage practices' correlation to climate change are fully optimistic. Powlson et al. (2014) argues that claims that no-till agriculture mitigates climate change through carbon sequestration ignores "a large body of experimental evidence showing that the quantity of additional organic carbon in soil under no-till is relatively small and in large part apparent increases result from an altered depth distribution. The authors point out that "the larger concentration near the surface in no-till is generally beneficial for soil properties that often, though not always, translate into improved crop growth. In many regions where no-till is practiced it is common for soil to be cultivated conventionally every few years for a range of agronomic reasons, so any soil carbon benefit is then lost. [Thus], no-till is beneficial for soil quality and adaptation of agriculture to climate change, but its role in mitigation is widely overstated" (Powlson et al. 2014, 678). This limited potential for carbon sequestration in agricultural soils is further exacerbated with the likely situation that "organic C in soil will be subject to more rapid decomposition at elevated temperatures resulting from climate change" (Powlson et al. 2014, 678). Other authors have argued that no-till adaptation on a global and universal scale would represent a long-term and easily implemented solution for changing climate. Powlson argues that in order "to qualify as climate change mitigation long term (more than 100 years) or permanent removal of CO2 from the atmosphere is necessary. The extra carbon under no-till is predominantly in labile forms that would certainly be decomposed if no-till practices ceased and a farmer reverted to conventional tillage" (Powlson et al. 2014, 679). Kern and Johnson (1994) agree that while there is potential to sequester more carbon through conversion to conservation tillage practices, it is not a singular solution and will require a combination of other strategies of carbon sequestration and fossil fuel emission reduction.

Conclusion

Good soil health can both reduce CO2 and sequester carbon. To restore and maintain soil health, I would recommend the strategy of converting agriculturally marginal soils to a restorative land use, and to adopt no till, or minimal tillage practices on healthy agricultural soils. Examples of restorative land uses include "establishing a perennial vegetative cover through afforestation, conversion of cropland to pastures with low stocking rate and controlled grazing, and reclamation and rehabilitation of degraded and desertified soils/ecosystems" (Singh et al. 2017, 15). In Minnesota and Wisconsin, marginal land has been converted to cropland because of government incentives and economic risk mitigation for farmers through subsidies outlined in the Farm Bill of 2001 (Guenther 9/11/18). If possible, farmers in the Midwest should till as minimally as possible in order to reduce erosion, maintain soil structure, temperature, and moisture levels, as well as sequestering carbon and reducing greenhouse gas emission due to decomposition of soil organic matter. This should be practiced in conjunction with cover cropping which can serve as green manure. Lal (2004) estimates that carbon sequestration in agricultural soils have the potential to offset fossil fuel emissions by 0.4 to 1.2 gigatons of carbon per year, or 5 to 15% of the global fossil-fuel emissions. Rarely is there a solution offered for climate change that simultaneously captures carbon, prevents future unnecessary emissions, as well as mitigating other negative impacts of global warming such as increased temperatures and more extreme weather events. However, I believe that reduced and no-till agriculture offers a solution which can realistically be implemented by Midwestern farmers facing the reality of climate change's negative impacts.

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Also referenced are the following field visits and lecture:

*Dan Guenther, in-class guest lecture:

Macalester College, St. Paul, MN. September 11, 2018

*Field visit to Carlson Farm

Osceola Wisconsin, September 15, 2018

*Field visit to Common Harvest Farm

Osceola Wisconsin, September 15, 2018

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Chapter 4:
Despite a history of male dominance, there is some evidence suggesting that more and more women are becoming principal farm operators in the US. What factors might be driving the change and what are the implications of such a shift?

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Planting the Seeds of Women in Agriculture

Introduction

Although females make up about half of the population, they are much less common in the farming world. In 2012*, a quinquennial U.S. Department of Agriculture census determined that, of the nearly 1 million female farmers in the United States, only 288,264 were principal farm operators. These 288,264 women made up approximately 14% of principal operators in the U.S. (USDA September 2014). While this was nearly three times the national percentage of female principal farm operators than in 1978, it was a number which demonstrated no growth since the previous 2007 census (USDA 1982, USDA September 2014). More locally, in Minnesota in 2012, just 8% of farms had a female principal operator, one percent higher than in 2007 (USDA May 2014). Female farmers in the 1970s tended to run smaller farms and earn less than their male counterparts did (Kalbachar 1985), a phenomenon which has not changed in the decades since (USDA September 2014).

In this paper, I will be examining the constraints that exist on women becoming principal farm operators and possible solutions for them as part of the overarching question of *"What factors may be driving the increase of women as principal farm operators and what are the implications of such a shift?"* I will explain two major constraints that exist on women entering the field, both in the U.S. and worldwide: social barriers to land access and gender stereotypes. I will also enumerate four possible pathways for the normalization of gender in farming in the U.S. and discuss how modern day female farmers are taking charge of the stereotypes that once barred them from their jobs. This topic is of the utmost importance both around the world and in

*Note: The 2012 USDA census is the most recent data available. Information from the 2017 census will not be available until January of 2019.

the United States, as increasing women's agricultural productivity has been shown to be key to increasing overall agricultural productivity, empowering women, and reducing poverty (Doss 2017).

Research Methods

To begin my research for this project, I visited two farms in Wisconsin with the class. The first, owned by the Carlsson family, is a progressive and conventional farm operated in a no-till fashion. Common Harvest farm was the second; it is an organic CSA farm owned and operated by Dan Guenther and Margaret Pennings. Thereafter, I used a more literature-based approach for my research. I utilized USDA Census of Agriculture data from the 1970s to 2012 and research by Cheryl Doss of the University of Oxford and her associates. I ultimately felt that the literature in this field was lacking, as nearly all the scholarly articles I located were affiliated with Doss. I also used case studies and interviews of female farmers by both NPR and more local news outlets for the purpose of gaining perspectives from across the United States. Finally, for a more worldwide perspective, I found both World Bank and United Nations resources on gender in agriculture to be useful.

Constraints

Social Barriers to Land Access in the U.S.

When NPR ran an article in early 2011 about the rise in the number of female farmers, it was clearly intended to be heartwarming and inspirational. However, as a result of interviews with the profiled Helen Gunderson, it turned into more of a story about just how much she relied

on family ties and the men in her life to get into the business. Growing up in Iowa, Gunderson watched resentfully as her brother was groomed to take over their father's land. She inherited land from her grandparents that her "brother managed for her" and her sisters until one day, "with her father's blessing and her brother's help," she took over her acreage (Masterson 2011).

Gunderson's story demonstrates one of the main issues women in the United States face on the way to becoming farmers: land access. According to the *2014 Tenure, Ownership, and Transition of Agricultural Land Survey* conducted by the USDA, around 51% of currently operated farmland was obtained from a relative either as a gift, inheritance, or familial purchase. However, of the land that reporting farmers said would have a transfer of ownership in the following 5 years, only 23% was expected to be sold to a non-relative (USDA May 2014). These statistics demonstrate the intense familial nature of farming and how hard it is for an outsider to "break in" to the agricultural industry.

Often, as in Gunderson's life, giving farmland to a daughter or wife to manage is not even a consideration. As Dan Guenther gave our class a driving tour of the farmland near Osceola, Wisconsin, our research group noticed a conspicuous lack of women mentioned. For example, Guenther pointed out a farm in which the eldest son, who had been slated for inheritance, had died, and the youngest was unable to face the pressure to take over the family land. He made it sound as if these two sons were the only options for heirs, but we wondered if the family had daughters or female cousins who could have been just as eligible if not for gendered inheritance patterns. Similarly, fifth-generation Wisconsin farmer Scott Carlsson spoke to us about his family-run farm. Family, that is, his father, his brother, him, and his two sons. We did not ask if there were ever any daughters born into the Carlsson family — although

statistically there must have been one at some point — but we did get the chance to learn about Carlsson's wife.

Carlsson told us that she works full time "off the farm," and it was not until we asked for more information that he revealed that, on top of her regular 40 hour work weeks in a more developed area, she also works a full day on Mondays keeping the books for the farm. Although the concrete reasoning behind her decision was unclear and was likely partly financial, it also appeared as if she was not entirely welcome to have an open role on the farm.

Women seem to be forgotten in the world of family farming, and thus they become outsiders. Those raised in the farming world are not welcomed there, so it is others who must independently come up with the desire and know-how to farm, not to mention the means to buy the little land available to them. These barriers are enough to keep many women out of the industry altogether.

Gender Stereotypes Worldwide

The 2009 World Bank *Gender in Agriculture Sourcebook* discussed the impacts of many problematic worldwide farming practices on women, but one in particular stood out. While "cash and export crops are frequently regarded as 'men's' crops," so called "women's" crops consist more of subsistence crops necessary for basic survival of the woman's family (World Bank & The International Bank for Reconstruction and Development 2009, p. 523). That is, for men farming is considered to be a job, whereas for women it is considered to be a domestic chore, a responsibility for caring for her family.

Similarly, time-use surveys conducted around the world by the Food and Agriculture Organization of the United Nations found that "in general weeding and harvesting were predominantly female activities," while men were more likely to plant and sell the crops (Doss and SOFA Team 2011). Thus, men were found to be doing the jobs that require more strategizing and resulting in more glory while women were seen more as gardeners. This idea is rooted in old Western gender stereotypes in which a man must be strong, working the land in order to make the money that will feed his family, while a woman must be nurturing and do the actual day-to-day feeding.

Additionally, while it is not a stereotype to claim that the average man has more muscle mass than the average woman (Janssen et al. 2000), this statistic and resulting perception of weakness has held women back for far too long. Even in the days in which farming required incredible physical strength, it is unlikely that a woman would have been unable to operate the same equipment that a man could with the proper training. During this historical time, women served as "homemakers who raised the children, kept the family fed and clothed, and were delegated as the indispensable 'go-fer' who ran for spare parts, delivered meals out to the field and kept watch over sows during farrowing – all the while keeping hearth and home running efficiently" (Kottke 2018). In the present day, these roles and stereotypes have carried over and continued to prevent women from doing many types of physical labor and activities that they are in fact perfectly capable of doing.

Solutions

Outreach for the Purpose of Normalization: Recommended Policy Changes

Though the *Gender in Agriculture Sourcebook* was directed at a more international audience, four of its suggested gender outreach guidelines can be modified to apply to agricultural communities in the U.S.; while the book was geared at increasing agricultural productivity in impoverished regions internationally, I have adapted and reapplied the guidelines below with the goal of normalizing the idea of female (principal) farmers, primarily in the U.S.

The first and most important method is mandatory training in government organizations related to agriculture, such as the USDA, regarding gender mainstreaming (World Bank, p. 51). Gender mainstreaming is defined by the UN Entity for Gender Equality and the Empowerment of Women as "ensuring that gender perspectives and attention to the goal of gender equality are central to all activities - policy development, research, advocacy/ dialogue, legislation, resource allocation, and planning, implementation and monitoring of programmes and projects" (United Nations). Gender mainstreaming would help government employees to understand and properly implement the following three methods of outreach.

The second method is providing agricultural education and outreach programs and encouraging attendance by people of all genders (World Bank, p. 51). This would serve the dual purposes of generally bolstering agriculture in impoverished areas and demonstrating equal gender treatment in agricultural communities around the U.S. The third method is employing more women in both governmental and NGO agricultural programs (World Bank, p. 52). As of 2009, only 15% of the world's agricultural extension agents were women (World Bank, p. 612), making it difficult for farming women to find role models in their field and easy for them to be

mistreated. Increasing the number of female agricultural extension agents would help to show people of all genders successful examples of women in agriculture, normalizing the concept.

The final applied method of suggested outreach is gender based quotas for USDA grant and loan systems (World Bank, p. 52). This would force the department to encourage female principal farm owners, because if they did not fulfill specific requirements they would be unable to support male farmers in need. While useful, this concept would likely prove controversial in the U.S. as it bears similarities to the heavily fought gender quotas in political party nominations and affirmative action policies.

Taking Charge of the Stereotypes and Working with Technology

Sara Kroll, a farmer in Kewaunee County, Wisconsin, points out that modern day farming "really isn't about being male or female, but being knowledgeable about what you're doing." Her female friends, she says, "handle a lot of the jobs on the farm once considered a man's job" (Kottke). Recognizing this, some tool companies are beginning to produce farm tools more optimized for women's bodies, and women, frustrated with the lack of appropriate tools, are beginning to produce their own (Wernick 2016). For example, women's farm tool businesses led by Green Heron Tools are producing shovels with shorter handles and a wider base that are healthier for women to use than other shovels. Aside from tools backed by human-power, modern day technology is also making farming more accessible: as farms continue to become more mechanized, the skill set required to be a successful farmer is evolving into a more mental strength. A near majority of farmers are earning degrees in agriculture and breeding before

returning to their family farm to begin their work (Runyon 2014), an area in which muscle mass cannot hold women back.

Additionally, some women are even embracing a stereotype that can be easily reconciled with farming: that of being nurturing, which may allow them to "bring a different perspective to an operation" (Kottke). For years, the idea that a woman should be caring for her family held the entire gender back, but now some argue that the more nurture on farms, the better. Planting seeds and watering the plants that grow from them is in itself a form of nurture. Less abstractly, 52% of the female principal farm operators in the U.S. operate farms based around animal husbandry (USDA September 2014) — literally acting as nurturing homemakers, just for a different species.

Conclusion

While it may seem as if increasing the number of female principal farm operators in the United States should be a relatively straightforward process, it could be near impossible to reverse the centuries-old traditions keeping them out of the industry. As previously mentioned, there was no growth in the national percentage of female principal operators in the five years between the two most recently available USDA censuses. In fact, the USDA found an overall decrease in the number of farms in the U.S. in these years and a corresponding decrease in the number of female operators, who fared no better than their male counterparts through the Great Recession (USDA May 2014).

Modern constraints that exist on women becoming principal farm operators in the U.S. include both social barriers to land access and remaining gender stereotypes in the industry.

Despite the fact that the stereotypes are consistently getting weaker, policy changes like the ones described in the sections above are the only way to inspire real change. Unfortunately, gender equity is just one of the many problems the agricultural industry is dealing with in the U.S., so, without the assistance of a willing government and active community participants, it may just have to wait.

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Disrupting the Face of Farming

Introduction

Women play an integral part in society, especially within the agricultural sector that feeds the world. They constitute over three quarters of the world's agricultural labor force. However, the rate at which women own land is egregiously incommensurate to male land ownership as less than 1 percent of them are majority shareholders (De Schutter, 2014). Unequal access to many economic opportunities, resources, markets, and services that is enjoyed by men blatantly displays the existence of the gender gap. Addressing the gender gap from an agricultural perspective could pay dividends by boosting agricultural productivity, reducing poverty and hunger, enhancing economic growth, and the empowerment of women in general (FAO, 2010). As categorically vital women are to many spheres in life and their potential to improve our current situations, they are unfortunately overshadowed by the patriarchal structure of the world, which is especially evident in the agricultural realm.

This paper will investigate this overarching question: *Despite a history of male dominance, there is some evidence suggesting that more and more women are becoming principal farm operators in the US. What factors might be driving the change and what are the implications of such a shift?* Contemporaneously, my sub-question asks: *What does the gender gap in agriculture look like for women internationally and in the US? What are some solutions that try to address this problem and do they really empower women?*

The roadmap of this paper is laid out as follows: first, I will approach the agricultural gender gap from a broader international perspective; secondly, I will narrow down my scope answer the questions at the domestic level; lastly, I will touch on the gender gap using the experiences of farmers from the mid-western region in the US.

Research Methods

For the first part of my paper, I will draw on reports from international agencies such as the Food and and Agriculture Organization of the United Nations (FAO) and the International Food Policy Research Institute (IFPRI). These sources provide key statistics, concise summaries, and relevant case studies regarding women and agricultural development programs. I also supplement my findings from applied economic and agricultural research papers that analyze the agricultural gender gap issue from an empirical standpoint. In addition, my paper is informed by anecdotal evidence through blogs managed by female farmers, news articles, and personal correspondence with farmers from the midwest. Putting together broader documents from an international agency level, academic articles, popular media, and stories from local farmers will hopefully provide a better holistic presentation of this gender gap in the 21st century.

Findings, Analysis, and Discussion

<u>The International Context</u>

It is common belief, at least for international development agencies, that removing economic and social barriers that prevent women from producing at their full ability is the crux of agricultural based development. The FAO famously reported in a 2010 document that "if women had the same access to productive resources as men, they could increase yields on

their farms by 20-30 percent, which in turn could raise total agricultural output in developing countries by 2.5-4 percent. This would reduce the number of hungry people in the world by 12-17 percent" (FAO, 2010). From strictly a supply-side viewpoint, empowering women is the solution to the global hunger problem. Similar conclusions were found in an NPR article which mentioned the benefits of granting women equal access to resources and assets, such as education and land tenure; the food production of the world would be enhanced by almost 20 to 30 percent and millions around the world would be lifted from hunger (Aubrey, 2018).

Olivier De Schutter, the United Nations Special Rapporteur on the right to food, believes that the future of food security is solely in the hands of women. He brings up a study in 2000 by the IFPRI which showed that elevating a woman's place in society reduced hunger by 55 percent from 1970 to 1995 (Schutter 2013; Smith & Haddad, 2000). Schutter also sets out a list to help women achieve fair access and the right to food. He mentions the following as important steps: the removal of discriminatory laws and cultural practices, advocating for the the advancement of women's cooperatives, employing more women in the extension services sector, establish titling schemes coupled with broader agricultural support, issuing titles in the name of both the husband and the wife, and finally encouraging a more diverse set of farm practices (Schutter, 2014).

Revisiting the staggering statistic that women only own 1 percent of land around the world and the suggestion to have land titles with both spouses' names on them, we can include a De Sotoian view on property rights. If we are to take Hernando De Soto's view on property rights as an important development tool for transforming people into "full market citizens who are then able to invest, aiding in capital formation and thus economic growth"

(Williamson, 2001, p.95) as fact, then those who are left out, which in this case are majority women, cannot gain wealth from the market. Thus, the gender gap continues to stay wide. To finish my general discussion about the international context, I will slightly zoom in to touch on specific case studies to show some of the negative effects of the agricultural gender gap.

Women comprise of roughly 45 percent of the Global South's agricultural labour force. However, there is heterogeneity as women only represent 20 percent in Latin America to 50 percent in Eastern and Southeastern Asia and sub-Saharan Africa (FAO, 2010). Men, because of social norms and higher levels of education, are able to enjoy the freedoms to find employment away from the farm, thus are more likely to become migrants. Women are then left behind to run the farms. Although, in Sri Lanka and in the Philippines, female migrants formed over half of outgoing migrants to work as domestic workers or in the sex or garment industry (Schutter, n.d.).

Due to gender based discrimination, women have unfairly restricted access to fertilizer, seeds, credit, membership in cooperatives, and technical assistance (Schutter, 2013). In Ethiopia, female farm managers are less likely than male proprietors to have access to agricultural extension agents who are important information providers on productive seeds and fertilizers (Rasaga et al., 2012). Remittances do come back from the absent men, but do not have enough impact to empower women. The remittances could fulfill roles that are socially seen as unwomanly. For example, she could hire workers for physically demanding tasks like land preparation or buying inputs for the fields, but this is much more common in Southeast Asia (Schutter, n.d). In Bangladesh, implementing and investing in pro-female policies such as taking a more stringent stance against domestic violence, integrating women

into more decision making circles, and education opportunities are linked positively to children and their nutritional well-being (Bhagowalia et. al, 2012).

(Doss, 2018) takes a critical approach to all the claims about the benefits of targeting women in agricultural development efforts. Does this focus actually bolster gender equity and overall productivity? Doss argues that the extant empirical basis is not strong enough. Most of the recent data challenges some popular narratives about women in agriculture in most academic literature, such as the percentage of women ownership of land or the actual percentage of women labour for crop agriculture.

The IFPRI has several campaigns to address the gender gap problem in agriculture and appease Doss' worries. Examples of these are the Gender, Agriculture, and Assets Project (GAAP), and the Women's Empowerment in Agriculture Index (WEAI). The former project focuses on empirically grounded methodologies for enabling women through agricultural development projects. They are curious about women's control over money, livestock, education, and social networks. The latter project strives to compile the first comprehensive and standardized measures on women's empowerment and presence in the agricultural sector (Macneil, 2013).

The US Context

Bias towards men in agriculture have been ever-present in the U.S landscape. Women's indispensable role on the small family farm, which accounts for 90 percent of the U.S farm count in 2014, have been disrespectfully discounted (Hoppe, 2014). Pejoratively called farmwives, they have stayed in the peripheral of American farming despite their numerous contributions (Fremstad & Paul, 2016). The USDA and their methodologies of

recording agricultural statistics can be implicated for how poorly women have been represented and displayed. For example, ever since the Agricultural Census in 1840, few if not any data collection regarding women farmers have taken place. It was not until 1978 when the USDA decided to collect more agricultural statistics (Fremstad & Paul, 2016). They severely undercounted many of the small and mid-sized farms, which a majority of those were under female proprietorship. In 1997, the United States Department of Agriculture (USDA) calculated that only 9 percent of farmers were female when the actual percentage was around 15 percent. Thus, they were almost twice as likely to miss a female farmer than a male farmer. (Rosenberg, 2016)

It is quite challenging to compare the number of women farmers from the standards of antiquity to contemporary ones due to changing definitions. For example, in 1978, rural women raised livestock or sold their agricultural goods to neighbors, but generally were not demarcated as famers. In the 2012 Agricultural Census, 60% of women farmers sold less than $5,000 of total agricultural products and were now considered small scale farmers. This is significant since this statistic portrays a large percentage of women as important providers for their families and regional food systems (Rosenberg, 2016).

The remaining parts of this section will be exploring the work of Fremstad & Paul, 2016. Not much literature exists investigating the gender gap within the American agricultural sphere. Their objective was to determine, through regression analysis, if sustainable agriculture reduces the gender gap in farm income since traditional farms are more patriarchally structured. Their main finding was that women in participate in CSAs experienced a lessened disparity in farm income with men. However, direct-to-consumer

(DtC) and organic farming practices do not have any effect on the current gender gap. The authors explain this finding by saying that both DtC and organic agriculture do not fundamentally alter the structures that have been inhibiting women in farming. Examples of these are how the farm is transferred and the ways in which farming knowledge is passed down. They find a few unique virtues in the CSA model. First, there is no exclusion of knowledge. CSAs are more accessible to the community as women entrants can apply for special apprenticeship programs. Secondly, farmers have new opportunities to hedge against risk that does not exist in other practices. Lastly, CSAs offer a new ideology of "going beyond the profit maximizing behaviour" that govern some other farming models.

Conclusion

In the very beginning, I asked the sub-question of: what is the gender gap in agriculture and how it is being addressed globally and domestically. There has been a swath of literature on the potential for women to be empowered and to increase their agricultural yields if there are more pro-women agricultural development policies. Looked on from international agencies as the solution to global hunger, there are various obstacles for women such as low property ownership rates, patriarchal gender norms, and the lack of access to services. However, there has been recent debate if development policies actually have a causal effect on closing the gender gap. In the context of the U.S, historically, the USDA has failed to accurately include women in the greater portrait of American agriculture. The research paper from Fremsted and Paul show that CSAs have the greatest ability to close the agricultural gender gap over DtC or organic farming methods. Perhaps, a policy recommendation would to incentivize either the consumers to partner with CSAs or to

incentivize female farmers to take on the CSA model. Although, we should not so quickly think that CSAs are the magic bullet towards addressing the gender gap in agriculture. DeLind (2004) lays out some hesitations on the concept of the CSA farm. We must keep having productive conversations and think of new ways to close this gender gap. The role of women in society, especially in agriculture, must be rightfully acknowledged.

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Alternative Agriculture: Women's Role in Urban Gardening

Introduction

In the United States, the role of women has begun to shift in the agricultural sector. While women have traditionally had a role on farms, as bookkeepers or dairy farmers, they have not often been thought of as the principal farm operator. Oftentimes the gendered division of labor within a particular family contributed to a degree of marginalization of women from the exchange of knowledge necessary to manage the farm and make important decisions, which thereby kept women out of leadership positions (Fremstad, 2). Despite this, there is evidence that shows the involvement of women in the 'sustainable' agricultural sector. For example, in a study completed in 2013, women only accounted for five percent of principal farm operators, yet accounted for 13 percent of operators of farms with direct-to-customer sales, 12 percent of farms with organic sales, and 22 percent of farms engaged in Community Supported Agriculture (CSA) (Fremstad, 6). While these numbers are strikingly low, a trend emerges showing that women tend to be more involved with sustainable agricultural practices. Nested within sustainable agriculture is a practice of urban gardening. Given these strikingly low numbers of women in agriculture broadly, what is the role of women in the urban agricultural sector? What are the implications of women working as urban farmers?

Methodology

Nested in general category of sustainable agriculture, this paper will focus on the role of women in urban gardens in the United States. The trend of urban farming in the US is fairly new, and thus there is a limited amount of peer reviewed scholarly literature on the topic. Moreover, for this analysis, I will examine four case studies located in Detroit, New York City, Southern California and Los Angeles, and Milwaukee. I will analyze the degree to which women are involved in leadership positions and farm operations in each case. For my meta-analysis, I will be reviewing scholarly articles, a *New York Times* article, and a book titled *Land Rights*, which focuses on land access and usage. I will conclude my analysis with a comparison of the case studies, and rank them according to the extent of women's involvement and analyze the systems in place that have enabled women to maintain a primary role on the farm.

Urban Gardening

What is the difference between an urban farm and an urban garden? As defined by the US Census, a farm must grow and sell $1,000 worth of agricultural products in a given year. Oftentimes, given the smaller scale of urban farms, and oftentimes nonprofit models, the term *farm* does not align with that of the census. Thus for the purpose of this analysis, I will be using the term *urban garden* unless otherwise stated by an author of a particular text used in my analysis.

Both urban gardening and urban farming fall under the umbrella of urban agriculture. As defined by a report published by the Johns Hopkins Center for a Livable Future titled *Vacant Lots to Vibrant Plots: A Review of the benefits and limitations of Urban Agriculture*, "urban

agriculture encompasses the production of food and non-food plants, as well as animal husbandry, in urban and peri-urban spaces" (Santo, Palmer, and Kim, 2016). Moreover, as mentioned in the report, "the majority of published literature on urban agriculture comes from research on community gardens. This reflects the fact that gardens remain the dominant form of urban agriculture – involving far more people and growing far more food in volume and value than urban farms" (Santo, Palmer, and Kim, 2016). Thus, this analysis will in particular address the role of women in urban gardening.

Case Studies

New York City

In August of 2014, Michael Tortorello of *The New York Times,* wrote an article titled 'Mother Nature's Daughter's' spotlighting the multitude of urban gardens in New York City, and more specifically those run by women. Tortello reports, "New York's urban farmers… offer a sharply different headcount of what you might call bulls and cows. Of the 19 farms and farm programs that contributed information for this article, 15 reported having a majority women amount their leadership, staff, youth workers, student, apprentices, and volunteers" (Tortello, 2014). Moreover, when describing their own farms, it is suggested that women make up 60 to 80 percent of fieldworkers, organizers and eductors (Tortello, 2014).

Beyond growing fresh produce for local communities, the Five Borough Farm Project, and other local projects aim to tackle other social goals as well. "If you're trying to account for why so many college-educated women are attracted to urban agriculture, nearly everyone agrees that a social calling is the place to start" (Tortello, 2014). Okina Abraham, the director of Farm

School NYC, shared with the *New York Times*, "Farm school NYC receives 150 to 200 applicants annually for professional agriculture instruction. For this year's entering 30-person class Ms. Abraham said, 'the breakdown for applicants was 76 percent women and 24 percent male'" (Tortello, 2014). In the article there is also mention of the implication of women doing farm labor, and the implied feelings towards men. Kennon Kay, the director of agriculture at Queens Farms states, "women have been extremely effective in multitasking, planning, communicating and being the representatives of this public organization" (Tortello, 2014). Moreover, "there's an inverse to saying that women are attracted to work that involves children and the elderly, caring and social justice. In short, you're implying that men don't care or care a lot less" (Tortello, 2014). Tortello prompts the question, "Where are the men?" Ms. Washington mentions, "'A lot of men of color are incarcerated. Huge problem. If you tell a 21-year-old man just out of jail to go into farming, he's going to look at you as if you have two heads'" (Tortello, 2014).

This article provokes the reader to question what the implications of what women leading small farming initiatives represent. In this case study, it seems as though the leadership role of women is assumed by women out of somewhat of a necessity. While there are men in the communities that the farms are working in and for, there is an overwhelming number of women who are able to engage in the participatory work.

Detroit

In Detroit, Michigan many neighborhoods are designated as 'food insecure' the majority of the lack of access to food affects African American populations in the city. "Eighty percent of the city's residents must purchase their food at the more than one thousand fringe food retailers."

Moreover, the inadequate food supply for poor inner-city communities has been seen as a long term issue for planners and food activists. Monica M. White of Wayne State University writes an article *Sisters of the Soil: Urban Gardening as Resistance in Detroit* in which she analyzes the role of black female farmers in the resurgence of urban agriculture through an ecofeminist lense. White states, "the application [of ecofeminism] endorses a human collaboration with nature as opposed to the domination of nature" (White, 2011). Given that these women are living in an environment where food security is compromised, "gardening in Detroit, for these women activists, demonstrates self-reliance and self-determination" and farming "is an opportunity to work towards food security and to obtain more control of the food system that affects their daily lives" (White, 2011). White articulates that gardens serve as an act of resistance, and as a safe space where the garden becomes an "earthen sanctuary" (White, 2011).

White examines not only the role of women, but the use of the space of urban gardens. White states, "these new spaces teach communities the power of a different kind of inwardly focused resistance that produces creative and productive in the neighborhood" (White, 2011). In relation to one woman's experience, White states, "this lesson of viewing the farm as a cathartic space was so powerful for Lewa that she insist. One of the women interviewed for the study, proudly proclaims, "'I knew that getting out in the garden would be good for their [her children] soul. As I mother I was doing a good thing."' In addition to redefining space, White suggests that there is an inward movement of resistance. These women "connect the oppression and pollution of the earth with their own oppression and view the earth as an ally in the respective liberation struggles" (White, 2011). Overall, "black women activists engage farming as a strategy of

resistance against capitalism, corporatism of the food system, and agribusiness and its use of environmentally unsustainable food production practices" (White, 2011).

Discussion

There are overwhelmingly low numbers of women involved in agriculture, despite increasing involvement in the urban farming sector. It is particularly relevant to note the double burden that women are faced with in the workforce broadly, but especially in agriculture. Firstly, there is a historical, societal expectation that women will do the basic housework; cooking, cleaning, and other domestic chores. Now with the involvement of women in the agricultural sector, there now an expectation that women will participate on the farm as well complete the work in the domestic sphere.

In the context of urban gardening, there is yet another complexity. As denoted by the use of the word *gardening*, referring to a stereotypical female activity, the action of urban gardening is somewhat belittled in comparison to *urban agriculture* or *urban farming*. While this is an element worth noting, as described in both case studies, women's involvement and leadership in urban gardening serves as form of social justice. Women have been directly and indirectly impacted by systems of oppression, incarceration, and restricted economic opportunity, yet have chosen to work within their own communities and address the highly relevant issue of food security and nutrition.

Moreover, outside the scope of the two case studies, there has been additional publications regarding women's involvement in urban farming, which is of particular relevance to understanding the the implications of women in urban gardening. For example, Seedstock, a

consulting company that aims to "foster the development of robust urban farming and local food systems through work with municipal and private sector clients" published an article last year titled, "10 Female Urban Farmers Setting the Tone for Sustainable Cities" (Popovich, 2017). The article discussed each woman's work and means of promoting social justice in her community across the United States. Additionally, *The New York Times Magazine* published an article titled 'Street Farmer' that featured Will Allen, a prominent urban farmer and his daughter Erika Allen who has been recognized for her organization, Growing Power, which is "a nationally acclaimed non-profit organization and land trust providing equal access to healthy, high-quality, safe, and affordable food, especially in disadvantaged communities" (Post Carbon Institute, 2018). In addition, Michelle Obama published a book in 2012 titled, 'American Grown: The Story of the White House Kitchen Garden and Gardens Across America,' in which she discusses local sustainable agriculture, childhood nutrition, and national farm policy. More specifically, the First Lady describes her personal experience of food culture from Chicago to Washington, D.C. as it relates to diet and exercise. Thus, these three examples provide evidence that the role of women in urban farming, and farming and nutrition more broadly are being discussed in the american media.

Conclusion

As demonstrated by the two case studies in New York and Detroit, women are involving themselves in urban agriculture as a means of social justice for the purpose of supporting their respective communities. By actively bypassing the industrial food system, urban gardening as an alternative form of agricultural production promotes women's agency in urban centers across the

United States. Moving forward, as there is a budding conversation around urban gardening, the discourse needs to progress to include smaller community gardens run by women in the definition of urban agriculture as well as recognize the social position of women in economically depressed cities working to make change.

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Motivations of Women in Farming: A Comparison of Conventional and Alternative Agriculture

In the past several years many changes have been occuring in the agricultural sector. The labor done by women is getting more and more recognized as more women move into significant roles on farms. At the same time, consumers are becoming more conscious of what they are eating, and movements such as vegetarianism and local food consumption are taking off. What might these movements have to do with each other? The overarching question to which this paper is contributing refers to the growth in number of women in principal operator positions on farms, and the reasons and implications of this shift. For the purposes of this paper, I am grouping organic, sustainable, and other alternative agriculture practices into one category. It is important to understand these gender differences because it gives us a greater understanding of what is going on behind the growing statistic of women in farming. Though more women are entering into the field, it may be that they are doing so in specific sects of the farming industry, which has different implications for the future gender dynamics of a patriarchal industry. How does gendered division of labor differ between large conventional and alternative farms, and what are some of the reasons for this division?

Methods

The inspiration for this project comes from the different experiences of women on farms, as we observed on visits to two different farms. The first was a large family farm run by the

Carlsons, which focuses on growing corn and soybeans for the market. The second was a smaller Community Supported Agriculture (CSA) farm run by Dan and Margaret Guenther. During these visits there was a contrast between the involvement of women on the farms. On the Carlson farm we only met the principal farmer and his father, who had also run the farm before passing it on to his son. At Dan and Margaret's farm both farmers were present and involved in the everyday workings of their farm. This is not a criticism of the Carlson farm-- rather, an observation that informed my investigation into the differing gendered division of labor between conventional and alternative agriculture farming. Though this visit inspired the project, my main source of research relies on other sources including studies, economic reports and peer-reviewed journal articles, with examples from the field visit used throughout the paper to supplement this more traditional research.

Findings and Discussion

Types of Labor- Conventional Farming

To begin, it is helpful to explore what different types of labor women do on conventional and alternative farms. Drawing on studies by Sarah Beach and Kathryn Brasier et al., I will explore three main role definitions that most women farmers fall into: principal operators, farmwives or supplemental workers, and professionals who work off the farm (Brasier et al., 2014). These different roles are more visible on conventional farms According to a report by the Economic Research Service, census data from 2007 recorded that around 14% of farms are principally operated by women (Hoppe, 2013). Many of these farms are very small, with annual sales of less than $10,000, and most specialize in livestock (Hoppe, 2013).

Though there is a growing percentage of women working as principal operators on their own farms, a majority of women fall into the second category, working as farmwives or secondary operators on farms. In her article "'Tractorettes' or Partners? Farmers' Views on Women in Kansas Farming Households," Sarah Beach writes about the experiences of women on family farms using conventional crops and methods. She argues that women on farms are primarily "farmwives", while the men make the decisions (Beach, 2013). Farmwives are responsible for bookkeeping and other jobs that fit gender roles, including animal care and cooking. Overall, their labor on the farm is seen as secondary to that of their husband, and is therefore often unrecognized and overlooked.

Finally, there are also a number of women who seek professional careers off their farms. This was the case on the Carlson family farm. Scott mentioned that his wife worked off the farm, as do many people in the area, commuting into the Twin Cities for professional careers ("Field visit"). Beach's article also touched on this trend. Several of the male interviewees for her study responded that they were the sole decision-makers on the farm because their spouses were more interested in having other careers (Beach 2013). Though this may be the case, it is not enough to say that the reason women are not as involved as men on farms. As Beach argues, the discourse in farming communities is focused on heteropatriarchal systems that are "so entrenched in agricultural institutions it is hard for farm people to… be seen in ways that depart from traditional conceptualizations of farmers and farmwives" (Beach 2013). This is not to say that women who work professional careers do not do any labor on the farm. It is common that women are in charge of bookkeeping and other administrative tasks in addition to their careers,

as exemplified by the Carlson farm (Field visit), though again, this work often goes unnoticed when considering women's labor on farms.

Types of Labor- Alternative Farming

Women working on alternative farms engage in labor quite different to those who work on conventional farms. To explore these differences, I will look at agricultural practices through a case study on organic community supported agriculture farms. Though this case studies may not be representative of the labor all women on alternative farms perform, it certainly highlight the differences that exist between conventional and alternative farms. There are many ways in which the labor on conventional farms is inherently different from that done on alternative agriculture farms, independent of gender. However, gender is also a significant factor in these differences, especially considering how few women are involved in conventional agriculture. Although, as mentioned above, women only make up 14% of principal farmers, this number is slightly higher when looking more specifically at organic farms; around 22% of organic farms are principally operated by women (Jarosz, 2011). Certainly, there is a reason, or many reasons, why women are more involved in alternative agriculture than conventional.

In her article "Nourishing women: toward a feminist political ecology of community supported agriculture in the United States" Lucy Jarosz writes about the experiences of women on CSA farms. According to the interviews she conducted with these women, producing food is one of the more minor aspects of life on a farm. Rather, for these women, farming is about producing "a way of life" more focused on nourishment of themselves and others than "making a living" (Jarosz, 2011). In a survey explaining why these farmers became involved with CSA farming, both the options "as a lifestyle choice and a professional redirection" and "growing

food and feeding people" came before "economic self-sufficiency" (Jarosz, 2011). What does that mean for the labor women are engaging in on CSA farms? Jarosz argues that these women were as much involved in intentional Foucauldian ethics of case as they were agriculture. They report that the community engagement aspect of their work was one of the most rewarding parts of working on a CSA farm. A similar focus on the community was expressed by Margaret Guenther during our field visit. This emphasis on personal relationships and fulfillment through the enjoyment of others is decidedly gendered. The same arguments here could be used to justify the perpetuation of stereotypes that label women as more inherently emotional and less professionally ambitious, especially as farmers. However, Jarosz notes that for these farmers what is more important is the anti capitalist and non-economic motivations behind the decision to participate in community supported agriculture.

Discussion of Reasons

A common reason why many people believe that women are less active than men in farming is the idea that farming is an economic loss and most farming households need another income. Though there is relatively little scholarship on the economic distinctions between conventional farming and alternative agriculture, what does exist suggests that most farmers are reluctant to switch to organic or sustainable practices due to uncertainty about economic stability (Uematsu, 2011). This means that most generational farmers stick to the practices that have been done before them. Since women are typically more educated, they are therefore more likely to get a job in a professional sector. Furthermore, because of the heteropatriarchal history of traditional farming, women are not as encouraged to go into agriculture as men are, as exemplified by women's experiences working in conventional farming. However, this

explanation does not account for the fact that some "findings suggest that organic crop farmers are not significantly better off in terms of farm household income" (Uematsu, 2011). Jennifer Ball, writing about the motivations behind women in agriculture, also addresses this point. She writes that "changes in farm earnings also occurred, but it is less clear that this had a substantial effect" on the number of women engaged in agricultural practices (Ball 2014). If organic farms are bringing in the same yearly household income, economic motivation does not explain the gender differences in agriculture. So why are more women involved in organic and sustainable agriculture?

A more compelling reason why more women may be involved in alternative agriculture practices rather than conventional farming is due to changes in consumption patterns of society. More and more people are interested in getting their food from farmers who practices sustainability and grow organic produce. With this rising awareness of farm practices, more small farms are becoming sustainable and organic. Who is behind these changes? As it turns out, mostly women. In her article "She works hard for the money: women in Kansas agriculture," Jennifer Ball argues that women are taking on alternative agriculture because of they alignment of market changes and personal interests. She writes that "if women are more interested than men in using the methods necessary to raise organic products, and demand for these products is growing, the occupation 'principal farm operator' would move to a more preferred position in women's job queues" (Ball, 2014). Thus, if more women are interested in producing organic farms, it makes sense that more women are principal operators.

Related to this change in consumption pattern is another idea about the inherent desire of women to engage in sustainable practices. As Lucy Jarosz suggests, another reason women are

more engaged in alternative agriculture than conventional is because they have a desire to serve the desires of their community. On a similar note, Jennifer Ball suggests that women are more likely than men to engage in sustainable agriculture because "women prefer more environmentally friendly and community oriented practices or because women believe 'they can do the work' associated with these models of production" (Ball, 2014). This, again seems like a perspective based on inherent gender roles and the idea that women are nurturing, which may be true. However, the benefits of organic farming are such that these women are still breaking out of the mold when they become principal operators.

Conclusion

As consumption patterns change, women have become more involved with sustainable and organic agriculture. It is possible that many difference factors are influencing their involvement with alternative agriculture over conventional farming, but women are nonetheless entering the agriculture industry. This paper outlines the differences in types of labor that women practice on both types of farms. Drawing on other research I conclude that there are several reasons why women are more attracted to alternative agriculture, including changing consumption patterns, desire to practice sustainability, as well as possible economic motivators, though this seems to be less of a factor. Overall, the fact that farming is becoming more diversified is a good thing. With more women in the field the future it is more likely to look equitable and it is possible that some of the worlds agricultural problems may be solved.

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People, Agriculture and Environment

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Community Responses to Women as Principal Farm Operators

Introduction

In history, "few women farmed in their own right. The passing of land from father to son means that women rarely owned land," coming to farms through marriage (Shortall, 2001). Throughout history, women as farmers have routinely been swept under the rug as "farmers wives" and thus not seen as imperative contributors the practice of farming. Social norms and gender roles have historically limited and thus disempowered women's engagement in cash crop production and thus as principal farm operators (Orr et al., 2016). In an age of growing concern regarding food production, access and agricultural education, it is becoming more and more crucial to include all genders in the farming community. Statistically, more women attend higher education than men and this education process creates a dynamic of new ideas and education about how to engage in more sustainable farming practices. Gender divisions are seen in all spaces, both academic and non-academic, however women in farming, although not previously talked about are becoming more commonplace. This is opening the door to conversations about women's rights and advocating for equal responsibility and being treated as such.

Working under the broad question: *Despite a history of male dominance, there is some evidence suggesting that more and more women are becoming principal farm operators in the*

US. What factors might be driving the change and what are the implications of such a shift? This paper will focus on answering the following subquestion: *How have local communities responded to the shift toward more women being principle farmholders? Has that response changed over time?*

Methods

The research for this paper was preceded by a visit to Common Harvest CSA farm, located in Somerset Wisconsin., which delivers fresh produce to the Twin Cities and areas of Wisconsin. Following the visit, the research consisted of an interview with the owner of the farm, Dan Guenther, as well as Lisa Kivirist, the founder of Soil Sisters, and Sarah Woutat the owner of Uproot Farm. Soil Sisters is an all-female farm that was founded in 2012, with the goal of encouraging women as principal farm operators. Uproot Farm was started by Sarah Woutat on her own in 2011 after she apprenticed on multiple organic farms in both Minnesota and Connecticut. In all interviews I asked questions about the roles of women as principle farmholders and the response of/impact on local communities. I further asked what challenges female farm operators face in the alternative agriculture community when compared to the conventional farm community. Information from all three interviews are included. The goal of the interviews was to gain knowledge about the divide between men and women as principal farmholders and how this might be changing and what may help break down the gender norms within the larger community. Following the interviews, I used online research on this topic to support the data, thus this paper is primarily qualitative research.

Discussion/Findings

Based on the research, it seems that there are two social spheres that provide a framework to understand community responses to women as more principal farm operators. Most notably, it seems necessary to analyze the outside community response, and the inside community response. Dan from Common Harvest Farm spoke to this in his interview, acknowledging that within his knowledge of the alternative agriculture farming community, women farmers are treated with respect and admiration. Dan alluded this divide in my research when he noted that the "problem seems to occur when a woman steps outside of this relatively small group of alternative farmers and tries to do business within the wider farming community. Purchasing equipment, inputs, feed and animals have traditionally been man's work" (D. Guenther, personal communication, September 28th, 2018). For example, Dan spoke of a friend of his who farmed on her own for more than twenty years. Although single and owning her own farm, other farmers would often ask where her husband was. Further, Dan told me of his grandmother, who was a ranch owner in Montana. She would tell him stories of being short changed on water rights or shipping cattle, needing to be constantly aware that someone may try to take advantage of her because of her status as a woman (D. Guenther, personal communication, September 28th, 2018).

In my interview with Dan, he told me about the largest organic farming conference in the country, which happens in La Crosse, Wisconsin every February. Between 3,000 and 3,5000 farmers participate and there is about a 50/50 split between men and women (not including spouses). Moreover, there are workshops geared toward women farm operators to address challenges and concerns they may have in their place. In contrast, the local co-op where Dan purchases his seed and fertilizer has a meeting every spring and it is more common that there

aren't any women present here. "Within the alternative farming community, women's voices are very much a part of the conversation….but oftentimes on the ground in their own communities there to come degree silenced by purely the numbers against them " (D. Guenther, personal communication, September 28th, 2018)

Dan directed me to two female-run farms, one of which is called Uproot Farm, owned and operated by Sarah Woutat, who voiced a unique opinion on the subject. Originally living in New York City, Sarah decided to become a farmer when she was 28 years old. She bought her farm in Princeton, MN in the Fall of 2010 and her first production season was in 2011. The farm that she bought is in a very small town filled with people who have known eachother forever. She bought the farm from an older couple (who live across the street) who were deeply involved in the local community. They were so excited that she was going to be farming there, she had the support of the community before she even arrived. That being said, most of the locals were curious about two things: (1) organic farming as a practice, and (2) the fact that she was a woman. All the farms in her community are conventional, so the farmers were curious in her irrigation techniques and wanted to "talk farming" with her. Sarah voiced that she was fortunate in that the farm she worked on in Connecticut taught her a lot about machinery and gave her enough knowledge to actually start her own farm. If anything, she encountered surprise, but never disrespect. Sarah did claim to receive a lot of help from her neighbors, however she isn't sure if it's because she's a woman or if farmers are just helpful and nice. When it comes to farming, Sarah speaks the language and her partner, who she describes as a "city guy" does not, making him less credible in the community regarding farming practices. Sarah claims to have what she calls, a uniquely easy experience. "Farmers are farmers when you get down to it" and

her prior experience and breadth of knowledge allowed her to able to connect with those in her new community (S. Woutat, personal communication, October 1st, 2018).

Although Sarah voiced that her experience may be unique, when I spoke with Lisa from Soil Sisters, I found similar trends. Lisa has been farming in southern Wisconsin for about 22 years. About 10 years ago she began meeting regularly with a group of women that eventually evolved into Soil Sisters, an organization that supports women as principle farmers and those who are passionate about soil who may or maynot actually be farmers, but are supporters of sustainable agriculture. Despite being involved in the alternative agriculture movement, Lisa actually lives in quite a conventional dairy-farm area. When I asked Lisa about about her role as both a woman and a farmer, and what that has looked like in her community, she claimed that perhaps the most challenging part is the geographical isolation. When farmers live rurally, they are more likely to be isolated from other communities and, although women make up the fastest growing group of new farmers, farmers have traditionally been majority men. This results in women farmers being isolated merely by their lower numbers in comparison. Further, because there are not as many resources for women as principle farmers, communities that are more prominently women farmers, and organizations such as Soil Sisters, are creating their own support systems. The biggest source of information is one another, especially because organic farmers, particularly women farmers, do not tend to follow traditional farming structures, i.e. there is less gender definition. I asked Lisa about her experience before Soil Sisters was established and she again spoke to the difficulty of finding a community of female farmers to gain knowledge and support from. This is even more prominent in that farms have traditionally been passed down through generations from father to son, and women who are principle

farmholders go against what a conventional farmer “should” look like (L. Kivirist , personal communication, October 6th, 2018).

From the market perspective, Lisa notes that most organic farmers need to go into more urban areas to sell their produce, and in the last couple of years more women have been taking on leadership roles in her community which helps the acceptance of women as principal farm operators, as well as the access to machinery and the dissemination of products. Challenges have arisen because traditionally, men have been in the leadership roles which can be a difficult system to change. These strong communities that exist, however, help to create even more widespread support for women--both defying traditional business knowledge and bringing in new wisdom in defining capitalism and competition, also promoting the concept that within these communities, “if the water rises all the boats rise” (L. Kivirist, personal communication, October 6th, 2018).

These were interesting to compare with the literature reviewed for this paper, particularly because discussion on modern women farmers is less common within the literature. The literature was more focused on past dynamics among farmers and I was surprised to see the overwhelmingly positive experiences of women in these farming communities. Those living in alternative agriculture communities find that support in alternative agriculture itself, being non traditional farming already. Further, it defies common thoughts on what a farmer “should” look like.

Conclusion

Together, these three interviews paint a fascinating narrative. That being said, being a woman farm holder does not go without challenges. The two most prominent barriers that were

repeated in all three interviews were the geographical isolation of women farmers in rural areas and the difference in numbers between male and female farmers--creating an isolation merely due to the discrepancy of numbers. Although women are the most rapidly growing group of farmers (L. Kivirist , personal communication, October 6th, 2018), it appears that because of this difference, women farm operators face roadblocks in advocating for themselves, possibly just due to the fact that there are so few of them in comparison. More specifically, disadvantages are seen in machinery purchasing, such that during auctions often women's voices are ignored and it this repetitive disregard can be quite tiring and frustrating. This is where alternative farming comes into play because, according to Dan, in general the alternative agriculture farmers tend to find ways to support each other. Even having their farms nearby in itself creates a close, supportive community, echoed by both Sarah and Lisa. Implementation of policy is a bit complicated in this realm due to challenges that may arise in regulation in rural areas, however it seems that the creation of women-farmer groups, as well as making more resources available for women farmers, would be crucial places where policy could benefit these communities. One way this could be operationalized would be to create more workshops meant for women farmers, similar to the ones mentioned by Dan, that happen at the annual organic farming conference in La Crosse, Wisconsin. This would not only connect women farmers that otherwise might not occur due to location, but also provide resources and knowledge sharing among those with similar experiences.

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People, Agriculture, and the Environment

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Gender on Minnesota-Wisconsin Farms: How do modern women's roles on farms differ from traditional roles?

Farming has long been a profession heavily divided by gender. The man's role was to work long hours in the fields, while the woman would find work around the house, whether it was caring for the animals or keeping track of finances. Despite a history of male dominance, there is evidence suggesting that more and more women are becoming principal farm operators in the US. My research group investigated the possible factors driving the change and the implications of such a shift. I spoke with farmers in the Minnesota-Wisconsin area to investigate how women's roles on farms and the division of labor deviate from historical demographics. By doing this, I wanted to learn if and where gender gaps exist in farming so that they can be addressed to allow equitable farming across gender boundaries in the future.

To get a sense of farmers in my area, I visited two different types of farms with my class. We first visited the Carlson Family Farm, a commercial grain farm in western Wisconsin, and Common Harvest Farm, a vegetable CSA in Osceola, Wisconsin run by Dan Guenther and Margaret Pennings. I then spoke to five women farmers in the Minnesota and Wisconsin via phone: Kat Becker of Cattail Farm in Athens, Wisconsin; Sarah Woutat of Uproot Farm in Princeton, Minnesota; Khaiti of LTD Farm in West Central Wisconsin, Kristen Kordet of Blue Moon Community Farm outside of Madison, Wisconsin, and Joan Olson of Prairie Drifter Farm

in Litchfield, Minnesota. I asked them a series of questions about the history of their farms, their personal histories in farming, their relationships with other women farmers, their marital/business partnerships, the division of labor on their farms, their histories with children, and if they perceive their roles as traditionally gendered. The women I interviewed exhibit stark similarities in age, farming history, and difficulties farming with children. I also consulted USDA census data and journal articles about women farmers: "The Changing Role of Women in Minnesota Agriculture" by Doris Mold and "The world's gender gap in agriculture and natural resources: Evidence and explanations" by Radel and Coppock. By examining these Midwestern farmers' lives, I work to understand the roles they have taken on and how these roles differ from traditional gender roles on farms.

Our first stop was Carlson Farm, a commercially-oriented and highly mechanized grain farm in western Wisconsin. Their work requires very little labor because of their investment in advanced machinery. Here I noticed an increasingly common gender dynamic. Both of the brothers who do the majority of the farm work have wives that commute to the Twin Cities to their jobs off the farm. Even though the Carlson wives have transitioned to a second income, their lives are still heavily entrenched in traditional gender roles. Scott Carlson reported that his wife still does all the bookkeeping for the farm (which is a historically female task), even though she has a seperate job in North Saint Paul. Carlson says very few farm wives stay home these days, with the exception of dairy farmers, whose work requires a lot more manual labor (Carlson, pers convers, 2018). This gender dynamic has long been present in Minnesota-Wisconsin farms: "Nearly all women, regardless of off-farm employment status were involved in bookkeeping, recordkeeping, running errands and picking up supplies" (Mold, 2008, p. 66).

We then visited Common Harvest Farm, vegetable CSA at a much smaller scale (in acreage and machinery) in Osceola, Wisconsin run by Dan Guenther and Margaret Pennings. Both Dan and Margaret seem to contribute equal amounts to the farm, but as they showed us around, a clear division in labor appeared. Dan does a lot of work with the soils in the fields, while Margaret personally handles a lot of the crops. Margaret informed us that before they owned the farm, a woman ran the chicken coup--this was a traditionally woman's job. Collecting eggs and milking cows have historically been women's tasks because of their correlation with fertility and femininity (Pennings, pers convers, 2018). When I spoke with Khaiti Hallstein, who runs her own duck egg farm called "Living the Dream," or LTD, farm in West Central Wisconsin, she corroborated this notion of the historical role of women in animal care. She argued that because of women's gentle touch and inclination to nurture, along with their attention to detail, they are drawn toward work with animals. Although Farmer Khaiti performs what could be considered a traditionally female farming role (caring for ducks and collected their eggs), she defies gender roles in many ways as well. Like many of the women I spoke with, she is the sole farmer in her business, meaning she performs all tasks herself, including lugging heavy bags of feed across her farm and managing finance. Khaiti addressed the traditional divide between men and women, stating that men often cultivated the fields, and women worked around the homestead, whether it was caring for the animals or keeping the books (Hallstein, pers convers, 2018).

Women's attention to detail plays a role not only in animal care, but in vegetable farming as well. I spoke with Kat Becker, who owns and operates Cattail Farm in Athens, Wisconsin. She is now divorced, but she originally ran a vegetable farm with her former husband. She told me

that her ex husband would usually operate most of the machinery, but not because it required more strength or expertise--it was actually the contrary. She informed me that operating the machinery is actually the easiest work on the farm, and it is not as labor or skill intensive as working with the vegetables. Kat often did most of the planting, caring for, and harvesting the vegetables herself because it required a lot more care and attention to detail. During my interviews, it also became clear to me that these women are expert multitaskers. With a farm to manage and three children to raise, Kat often farmed with babies strapped to her chest, which is not a new concept in women's agriculture (Becker, pers convers, 2018). When I spoke with Kristen Kordet, who owns Blue Moon Community Farm, she was picking green beans as we spoke. Doris Mold corroborates the presence of multitasking I've found in these women. She states, "Modern farm women continue on the multi-tasking traditions of their forebears: 37% of the women in the survey reported having a child younger than 18, and 39% reported caring for an elderly relative, while 17% reported both" (Mold, 2008, p. 68). With a lot to get done, female farmers aren't wasting any time.

When I asked about demographics in her area, Kat Becker told me that most of the vegetable farms were run by women, even if the women did not admit to being the principal farmer. In Doris Mold's article "The Changing Role of Women in Minnesota Agriculture," she concurs that, for various reasons, census data on women in farming have been drastically lower than reality: "When asked generally how involved she is, a farm woman may reply that she 'just helps out a bit.' But when asked about specific tasks (feeding, bookkeeping, decisions on buying and selling land), she may answer in the affirmative" (Mold, 2008, p. 66). She argues, too, that when their husbands would go off to war (World War II), women would often take on work in

the field and receive no credit. Farm families were often hesitant to reveal when women were working outside. Undocumented work by women skews census data and common ideologies about farming demographics. Mold also reveals another flaw in historical census data: it only lists the principal farm owner, and excludes any secondary owners (often female) who influenced the farm dramatically. Because this data underrepresents the number of female principal farmers, and women as influencers on farms, they are often left out of consideration by policy makers. Kat informed me that the women on the farms near her are usually in charge of calendars and management, decision-making, and field planning. When I asked how this was different than bookkeeping, a traditionally female role, Kat made it very clear that these roles could not be more distinct. Bookkeeping often involved keeping track of receipts and farm finances, while managing and planning the farm requires full knowledge of farm processes. Kat informed me that women are doing a lot more labor management (a traditionally male role). I was left wondering why labor management would usually fall to the men (Becker, pers convers, 2018).

While talking with Farmer Khaiti, I think I got my answer. I asked Khaiti how she got into farming, and she told me that in her 20s, she worked in the grocery department of a coop in Stillwater, Minnesota. After years of working there, she was pushed into a management position and began to hate her job. As Khaiti put it, “management often involves being a jerk.” I immediately associated this sentiment with the traditional female workplace persona enforced by the nature of men in workplaces, and the subsequent impulse to be perpetually polite and cognizant of other people’s feelings. After her mother’s death, Khaiti felt the kick in the pants to fully commit herself to her farm, but she has no employees and no one to manage, in part because of her fear of being a jerk. As the standards for feminity change (as it becomes more

acceptable for women to be firm and in charge), I believe women are becoming more comfortable stepping into management positions, as Kat described (Hallstein, pers convers, 2018).

Throughout my interviews, I spoke with many women who operate their businesses by themselves, but they all told me this is uncommon. I spoke with Sarah Woutat, who runs Uproot Farm in Princeton, MN. She had been living in New York City when she decided to give farming a try. She got an apprenticeship on a farm in Connecticut, where she first became connected with other women farmers, many of whom were waiting for a partner (usually a husband) before starting their own farms. Sarah did not want to wait, so she founded her CSA all by herself. With her scientific agricultural training, this was completely doable, but Sarah relayed the difficulties, unrelated to gender, of being a solo farmer. Having a partner to bounce ideas around helps tremendously in the process of decision-making and planning. Sarah sustained her farm because of the openness of the farming community, especially among women. She told me she stays very connected with other women farmers, and she feels comfortable calling them to discuss her ideas even if she has never met them (Woutat, pers convers, 2018).

One example of a couple-owned CSA is Prairie Drifter Farm in Litchfield, MN, co-owned by Joan Olson and her husband Nick. Nick does the fieldwork, equipment maintenance, and deliveries, while Joan does the planning, greenhouse work, ordering, financials, customer communication, and emailing. Joan says her farm would have looked very different had she started it alone: “machinery was never my interest.” Joan also told me she doesn’t think Nick would have gotten into farming at all if it wasn’t for her. Like Sarah and many of the other women I spoke with, Joan became interested in farming in her 20s as a result of her

interest in food. While Joan and Nick contribute in different ways on the farm, Joan says they split household duties 50-50. This comes in handy with their two kids, who have been a part of the family since they started farming seven years ago. Joan says Nick's contributions in the house allow them equal time to complete their farm duties which helps her to not get burnt out in the house (Olson, pers convers, 2018).

Having a child, with or without a partner, is draining--when Sarah had her daughter in 2016, the dynamic on her farm changed completely. In a traditional farming partnership, the woman had more time to spend raising children, but when Sarah had her daughter, it became very difficult to balance being a mother with running her own vegetable farm (as it is difficult to balance children with any full-time job). Sarah told me that having a baby was much easier when the baby didn't move around, but now that she is two years old, it is almost impossible to get any work done. Sarah divulged that this will be her last season farming. Sarah's new life partner works in the cities, a reverse of the Carlsons' situation, in that the woman owns and operates the farm while her male partner works elsewhere (Woutat, pers convers, 2018).

Similarly, Kristen Kordet owns Blue Moon Community Farm while her husband works a separate job from a home office. Kristen has been operating the farm for 15 years--she has always been the primary decision-maker and manager, but, like Sarah, having a baby completely transformed her life. When her son was born 5 years ago, she had to hire two additional farm managers (both female) to help with day-to-day management. She also manages five to seven (usually female) field crew members, depending on the year. Kristen validated Sarah's statement about the farming community being very open. When Kristen wants to bounce ideas around, she does not turn to her husband, but to other farmers in her network, many of whom are female.

When she started the farm 15 years ago, it was hard for her to find solo women farmers. Kristen believes this has shifted: “there are definitely more people that fall into that category now--the model is changing.” She argues this dual-income model is a lot more stable and reduces financial risks (when one partner operates the farm and one has an outside job). Although she thinks solo women farmers are more common, most of her closest friends still work in partnerships (Kordet, pers convers, 2018).

After hearing from a string of solo women farmers, I wondered if many men also farmed on their own. Doris Mold writes, “The number of women principal operators has steadily increased over time, while the number of men farming as principal operators has been generally trending downward” (Mold, 2008, 63). Like the Carlsons, there are many men are the principal operators on conventional farms, but men-owned CSAs and other alternative farms seem less common. Kristen told me that she did have a few male friends who farmed by themselves, either after a divorce or with a wife working at a separate job, but she told me that the business of CSAs is largely relationship-based. Because CSAs focus on helping households cook their own healthy meals (an area of traditional female expertise), Kristen hypothesized that women and couples (the primary consumers of CSAs) may not trust a man operating a CSA as they would a woman (Kordet, pers convers, 2018). I later spoke to Joan, who echoed Kristen’s skepticism of CSAs run solely by men--she told me many of the male CSA-owners she knows have quit (Olson, pers convers, 2018).

Radel and Coppock’s research (Coppock, 2013) validates my findings. In their article “The World’s Gender Gap in Agriculture and Natural Resources,” they argue when women step into new roles in their communities that are not considered “normal”, they challenge local ideas

and in turn change the landscape of gender roles. Many of the women I spoke with said their traditional neighbors were "impressed" with the work they were able to do. As solo women farmers become increasingly prominent, they will in turn change the mindset of the farmers around them.

Women are not only stepping into new roles in the fields, but in the classroom as well. Doris Mold writes:

> "The entrance of women and girls into agriculture and related education programs has increased in a substantial way over the decades. This is particularly true in the case of the University of Minnesota College of Food, Agriculture and Natural Resource Sciences, where women now outnumber men in undergraduate degree programs. The natural extension of this is more women in agricultural careers and eventually more women in agricultural leadership positions" (Mold, 2008, 69).

Education is a major avenue to more women in farming. With the dominating force of women in higher-level education, encouraging them to pursue agricultural pathways is an important step in closing the gender gap. Additionally, because census data underrepresents women's work on farms, the striking numbers of women in agricultural education programs provides us an alternative way to look at demographics.

After speaking with these women, it is difficult to identify what roles continue to be predominantly female. While they have taken on more traditionally masculine roles, women still maintain their nurturing nature and their attention to detail, which makes them incredible managers, decision-makers, laborers, and all-around farmers. They continue to care for animals and keep the books, but they have also transitioned into every aspect of farming, without boundaries. As the roles blur, we see every situation (women running the farm and the men working elsewhere, men running the farm and the women working elsewhere, single women running farms by themselves, and couples running farms together and dividing the labor), and I

believe updated census data would reveal higher numbers of women-owned farms. If I had talked to large-scale commercial farmers, I might have found a much clearer division of labor that adheres more strictly to traditional roles. I also might have found a clearer division of labor had I spoken with more couples running farms together. Because women farmers are underrepresented in census data, they are in turn underrepresented in policy. In the United States, gender has become altogether less confining--we need comprehensive and nuanced statistics to match.

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