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Abstract

Agriculture is an essential function of contemporary human life that is bound by nature. Therefore, economic, social, and environmental perspectives must be examined to identify the most sustainable agricultural systems. This thesis argues that agriculture should be divorced from capitalist economic principles regarding specialization, trade, and production scale. Such principles have supported industrialized growing methods, which have been economically, socially, and environmentally unsustainable. In order for agriculture to be sustainable and equitable, food systems need to be de-commoditized and removed from the capitalist market. Policies should target the local control of food systems by empowering communities to subsidize localized production-consumption cycles. This thesis explains how localizing food systems can help solve many social and environmental problems. Urban farming and food hub initiatives are discussed as primary solutions to addressing the several challenges that have limited the ability of local food systems to replace the dominant industrial agricultural paradigm.

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MODERN CAPITALISM AND FOOD COMMODITIZATION: THE LIMITATIONS
OF INDUSTRIAL AGRICULTURE AND THE CHALLENGES OF SUSTAINABLE
ALTERNATIVES

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The Faculty of Social Sciences

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In Partial Fulfillment

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Master of Arts

by

Gerardo Patron-Cano

June 2015

Advisor: Dr. Chiara Piovani

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Agriculture is an essential function of contemporary human life that is bound by nature. Therefore, economic, social, and environmental perspectives must be examined to identify the most sustainable agricultural systems. This thesis argues that agriculture should be divorced from capitalist economic principles regarding specialization, trade, and production scale. Such principles have supported industrialized growing methods, which have been economically, socially, and environmentally unsustainable. In order for agriculture to be sustainable and equitable, food systems need to be de-commoditized and removed from the capitalist market. Policies should target the local control of food systems by empowering communities to subsidize localized production-consumption cycles. This thesis explains how localizing food systems can help solve many social and environmental problems. Urban farming and food hub initiatives are discussed as primary solutions to addressing the several challenges that have limited the ability of local food systems to replace the dominant industrial agricultural paradigm.

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Chapter One: Introduction

The UN predicts that around two billion more people will populate the world by 2050, half of who will be born in sub-Saharan Africa and 30 percent in Southeast and South Asia (United Nations, 2013). Malnutrition remains common in these areas even though global food production is abundant; this is mainly because food is considered a commodity to be traded on liberalized markets (Magdoff, 2012). The capitalist process has spurred farmers to produce for the sole purpose of profit accumulation, instead of production for use (Foster, 2002). In other words, food has been commoditized to a money metric like any other commodity that is traded and sold for profit. Instead of growing food for consumption, commodity crops are cultivated to be sold in international markets (de Janvry & LeVeen, 1986).

Food was commoditized with the liberalization of trade markets after the Second World War. Since then, the commodity nature of the prevailing agricultural system contributes to the poor being dependent on market fluctuations for food. Poverty and malnutrition in the US is also borne out of the capitalist principles that have commoditized food systems worldwide. Even though food is plenty in the US, the poor do not have the financial means to demand food; in fact, about 50 million people in the US are considered “food insecure” while 40 percent of the food in the US goes uneaten (Magdoff, 2012, Gunders, 2012). Since food is a commodity sold for profit accumulation,

the poor in the US must skip meals, rely on food stamps, buy food of lower nutritional value, or receive food assistance from charities (Magdoff, 2012).

The expansion of capitalism has induced farmers to specialize and export their farms' yields. The cultivation of commodity crops typically depends upon industrialized growing methods, which involve the application of chemical inputs that pollute the land, water, and air. US food and farm policies have financially supported the capitalist expansion of industrial agriculture.¹ Proponents of industrial agriculture call attention to the improvements in food production that allowed US farmers in 2000 to produce an average 12 times more farm yield per hour than US farmers did in 1950 (Fuglie, MacDonald, & Ball, 2007). While industrialized processes proved successful in producing unprecedented yields, conventional agribusiness growing practices became dependent on environmentally harmful chemical inputs (Leo, Lawrence, & Walker, 2002).

Post-WWII, farms replaced natural ecosystem services with chemical inputs to maintain pests, diseases, and weeds (Ikerd, 1993). Today, agribusinesses do not utilize local ecosystem services to produce crops because producing biologically is not profitable; indeed, industrial agriculture's main purpose is to produce profits, not sustainably grown food. As such, it relies on the application of chemical inputs such as artificial fertilizers, pesticides, or herbicides in order to successfully produce its monocultures. Before the commoditization of food, most farmers selected the plant varieties most compatible with the farm's local conditions; diversified crop production to

¹ Industrial agriculture can be defined as the modern practice of mechanizing farming, requiring intensive use of synthetic fertilizers, pesticides, and genetic technology for short-term yield increases.

hedge against any failures; managed the soil and protected its quality; did not rely on intensive inputs; and finally, considered the production-consumption cycle's externalities (Feenstra, 2014).

Currently, industrialized agriculture is lauded for supplying the developing world with the necessary food to sustain its growing population. For example, Asia's population grew by 60 percent between the 1960s and 1990s, and the Green Revolution and its agricultural advances spurred rice and wheat production to double in the continent (Pinstруп-Andersen & Hazell, 1985).² According to the mainstream view on industrial agriculture, the increased supply of grains led to a decrease in its price; the Asian continent consumed about a third more calories than before; and its poverty rate was reduced in half despite its substantial population growth (Folger, 2014).

The claimed successes of the Green Revolution in Asia broadened the use of synthetic fertilizers and chemical inputs in developing countries, particularly for use by large-scale agricultural operations (Pinstруп-Andersen & Hazell, 1985). As agricultural growing practices industrialized with the Green Revolution, food production became socially and ecologically unsustainable, particularly because the requisite new technologies were not suitable for resource-poor environments and farmers with small land-holdings (Conway & Barbier, 1990). Additionally, the intensive monocropping popularized by the Green Revolution made production increasingly vulnerable to climate shocks and invasive pests and diseases (Altieri, 2009). The agricultural efficiencies achieved in the 20th century have been narrowly analyzed through monetary costs and

² The Green Revolution was coined to denote the drastic increases in agricultural yields in the developing world between the 1940s and 1980s, particularly due to the burgeoning practices of industrial agriculture.

benefits with an explicit disregard for several social and environmental negative externalities.

Farming practices that are biological, economic, and socially equitable must be identified and supported by farm policies (Pearson, 2007). Some rural communities in the developing world have adopted community-planned sustainable farming practices (Altieri & Koohafkan, 2008); these farmers have coped best with the increased risks of crop failures from climate change by diversifying their crop production in different spatial and temporal arrangements (Douds, Hanson, Hepperly, Pimentel, & Seidel, 2005). In general, sustainable farms are publically planned and move away from market influences in order to maintain food sovereignty. Typical examples of publically shared farmland are small-scale operations that may produce a variety of grains, fruits, and vegetables in a single field per year and establish local land-based practices of production with biodiversity, crop rotation, soil maintenance, and natural weed control (Altieri & Koohafkan, 2008).

Sustainable farmers do not depend on intensive inputs such as pesticides, herbicides, or fertilizers (Pearson, 2007). By planting a diversity of crops and utilizing locally available ecosystem services, sustainable farms yield more food per acre than industrialized large-scale operations (IAAKSTD, 2009); pest deterrence and weed-mitigating problems are solved more efficiently, too (Altieri, 2009). There is growing evidence that small-scale agriculture that is biological, not chemical, and local can feed the world, as it did for centuries before the spread of capitalism and industrial agriculture (Douds, Hanson, Hepperly, Pimentel, & Seidel, 2005).

Agroecological growing practices must be re-introduced into American agriculture so that feeding consumers is biological, economic, and socially equitable in

the long-run. To reach this goal of sustainability, food markets must first become de-commoditized and power relations must be restructured such that local communities can determine their own food system. Local food sovereignty encourages a local production-consumption loop (Altieri, 2009). Farmers with food sovereignty are able to gain independence from foreign inputs and produce food self-sufficiently. Many models of agriculture based on agroecological practices exist, varying dramatically by size, growing methods, and types of consumer markets. Current market forces, however, constrain the ability of sustainable farms in the US to cover costs and be profitable, and the majority are financed primarily by grants and in-kind donations, are overworked, earn exceedingly low-incomes, accumulate massive debt, and lack health insurance and retirement plans (Smith, 2014).

The motivation of this thesis is to highlight the need to remove agriculture from the capitalist system in order to facilitate the sustainable feeding of the world's growing population. The current market makes it difficult for environmentally sustainable farms in the United States to cover costs, and food and farm policies favor large agribusinesses, making it difficult for small-scale and sustainable farms to compete in the food market (Smith, 2014). This argument may seem contradictory to the recent trends that show an increased demand for sustainably produced food. For instance, new farmers markets and Community Supported Agriculture (CSAs) programs have appeared throughout the country over the last decade in an effort to meet the demand for locally and sustainably grown produce (USDA, 2014e). As long as food remains commoditized and the supply of sustainable produce increases, farmers are forced to reduce their prices in order to compete against agribusinesses in the food market (Smith, 2014). Small-scale sustainable

growers market their products as organic and local in order to differentiate their product, but the associated price markup creates a class bias among consumers such that upper-income classes are the only ones able to afford fresh, local foods. Localized food systems face other challenges, such as production scale and labor constraints.

This thesis intends to explore the key problems the local food movement faces by analyzing the economic viability of CSAs in the US, based on the evidence that the current global environment requires a new and sustainable agricultural paradigm. Chapter 2 will focus on the US and explore the ecological and economic imbalances of industrial agriculture and its capitalist influences. In contrast, chapter 3 will define sustainable agriculture and develop an argument in favor of localized and diversified agriculture that is removed from the current capitalist system. Chapter 4 will analyze the local foods movement in the US and present policy considerations regarding the need to plan food systems at the local level. Chapter 5 summarizes the thesis and concludes that biologically and economically sustainable food must be local and diverse, which requires a restructuring of food markets.

Chapter Two: An Analysis of Industrial Agriculture

2.1 The History and Characteristics of Industrial Agriculture

According to the UN, by 2050 about a billion more people will be born in sub-Saharan Africa, and 600 million people will be born in Southeast and South Asia (Folger, 2014). These regions, with the addition of Latin America, are home to over 90 percent of the world's hungry, and globally, over one billion people are chronically hungry (Food and Agriculture Organization, 2014). In order to decrease hunger rates, proponents of industrial agriculture refer to the improved agricultural productivity sparked by the Green Revolution.

The Green Revolution refers to the increased yields in the wheat and rice produced in developing countries through the expanded use of mechanization, synthetic fertilizers, and other chemical inputs. The Green Revolution started in the 1960s in India in attempt to feed the country's rapidly booming population with cheap food. Farmland was planted with bio-engineered seeds whose economic returns depend heavily on chemical fertilizers and energy intensive growing practices (Sebby, 2010). Through these advanced agricultural technologies, Asia doubled its rice and wheat production between the 1960s and mid-1980s (Folger, 2014), which helped raise national incomes and food accessibility to a population that had grown by 60 percent in the same time period (World Food Summit, 1996). While the Green Revolution equipped countries to achieve then-

unprecedented agricultural productivity on a limited number of crops, it also initiated a worldwide reduction of biodiversity in farming that favored fewer and larger farms at the expense of many small-landholders (Rosset, 2006).

Government subsidies facilitated the proliferation of the Green Revolution's agricultural technology. Subsidies advanced access to the required technologies to farmers of large land-holdings in the developing world (Das, 1999). The general public policy during the Green Revolution encouraged farmers to enlarge the size of their farms by purchasing land or terminating previous rental agreements (Patnaik, 1990). Relatively large farms expanded their control over farmland as agricultural growing practices became industrialized (O'Donoghue, MacDonald, Vasavada, & Sullivan, 2011).

Larger farms concentrated land from small landholders and profited from their ability to earn economies of scale (Das, 1999). On the other hand, many small Indian farmers were unable to compete in the market, lost their land, and were forced to continuously spend money and amass debt in order to purchase the required chemicals necessary of the new monocultures (Laidlaw, 2008). Farmers often found themselves unable to serve their debt and financial pressures, ultimately leading many of them commit suicide (Sebby, 2010). During the height of the Green Revolution, as many as 4,000 farmers committed suicide annually in the Vidharbha region in Maharashtra, India, a region well-known for its widespread adoption of industrialized techniques (Shiva, 2013). Small-farms were cost-prohibitively excluded from the expensive agricultural technologies because of their relatively small production yields; thus, the requisite new technologies were not suitable for resource-poor environments and farmers with small land-holdings (Conway & Barbier, 1990).

Agricultural industrialization, as exemplified by the Green Revolution, is often considered a positive-sum game, where food producers gain from higher productivity and consumers gain from the resulting cheaper food prices. This claim, however, is only based on observed market outcomes and assumes that the price of food that consumers pay is reflective of food's true cost. The negative social and environmental externalities, however, are neglected; costs of production only reflect private costs. This dominant view assumes that the free market system exemplified by industrial agricultural systems, which are concentrated in the hands of few multinational corporations, will be the only ones able to increase agricultural production and food accessibility (Cleveland, Cuevas, & Soleri, 2006). The process of agricultural industrialization was supported by neoliberal trade policies and did not only affect developing countries, but was also heavily endorsed and advanced by the United States. Ultimately, industrial agriculture in the US will be the focus of this chapter's analysis.

Since World War II, US agriculture has experienced a process of industrialization and capitalist expansion into international markets, which has been unprecedented in the US economic history (Kroese, 2002). Farms from the turn of the 20th Century to the 1940s relied on horses as the main source of power, used livestock manure to add organic matter, nutrients, and natural fertilizers to the soil, and implemented systems of crop rotation to maintain pests and diseases while enhancing soil fertility (Ikerd, 2002). Small, biodiverse farms were the main source of America's agriculture, and food production was primarily intended for local consumption (Berry, 2002).

With the end of WWII, tank-making factories were reconverted to produce tractors, and the technologies used to mass-produce gunpowder and tools for chemical

warfare were redesigned to manufacture nitrogen-based fertilizers and pesticides (Kroese, 2002). This new agricultural revolution that supplied farmers with new inputs induced them to decline the production for home consumption and instead specialize crop production and trade their yield in international markets (de Janvry & LeVeen, 1986). Thus, agriculture became commoditized and globalized by the opening of long-distance trade, and policies induced farmers to specialize their crop production in order to seek profits (de Janvry & LeVeen, 1986). As a result, the farmer's diverse skill set on his small farm became standardized, reproducible, and large-scale when industrialized processes similar to the Green Revolution began to dominate US agriculture. US agribusinesses became more concerned with seeking profits than feeding people with fresh and healthy food.

The US agricultural policies of the 1950s aimed to improve productivity and monetary efficiency through crop or livestock specialization. For instance, the newly introduced agricultural technologies pressured farmers to produce crops through "biological assembly lines" (Ikerd, 2002), and improved farm machinery enabled farmers to better control pests, diseases, and weeds. US agriculture adapted to the technological advancements achieved during WWII to improve its productivity. A farmer in 2000 was on average 12 times more productive than a farmer in 1950, and on average, the yield of corn per acre increased by about 75 percent between 1950 and 2000, from 39 bushels to 153 bushels per acre (Fuglie, MacDonald, & Ball, 2007).

Agricultural economists and agribusinesses prefer to report productivity measured by yield, which calculates the production per unit of a single crop produced per acre (Foundation for Deep Ecology, 2002). This is because monocrops are easiest to produce

through industrial methods versus the intercropping and rotational practices of traditional agriculture (Altieri, 2009). If agricultural production were measured in output, which measures dollar output per acre regardless of crop, then an inverse relationship exists between farm size and output (Rosset, 1999). The 1992 US Agricultural Census Report found that smaller farms were on average 2 to 10 times more productive than larger farms, and farms of 4 acres or less can be over one-hundred times more productive than farms 6,000 acres or more (US Agricultural Census, 1992). Smaller farms produce a variety of crops and utilize ecosystem services, such as rotating crops to fix nitrogen and cycling nutrients, more efficiently than larger farms.

Nevertheless, large-scale industrial agriculture produced short-term yield increases that influenced the widespread use of synthetic fertilizers and chemical inputs in US agriculture, as well as the production of monocrops. Consistent with the Green Revolution, large-scale agricultural operations in the US became better suited to benefit from agricultural technologies. Mechanizing agricultural production changed the average scale of US farms; since 1900, the average farm size has increased 67 percent while the number of farms has declined by 63 percent (Conklin, Dimitri, & Effland, 2005). Large farms in the US continue to dominate food production as improved chemical technology and the subsidization of large agribusinesses marginalizes traditional farming systems. This chapter examines the economic, social, and environmental problems of industrial agriculture, with a special focus on the US.

2.2 The Economic and Social Effects of Industrial Agriculture in the US

2.2.1 Farm Consolidation and Land Prices in US Agriculture

Small-farms are generally excluded from agricultural technologies that command industrial methods because of their cost. The subsidized technologies in the US induced farmers to grow on larger land. The average US farm size nearly doubled in acreage between 1982 and 2007 from 589 to 1,105 acres; farmers sought to achieve economies of scale by increasing the size of their farm (MacDonald, 2013). The chemical inputs necessary to produce monocultures are expensive, and it is cost-effective for farms to be large so that the cost per unit of output decreases as more output is produced (Shiva, 2012). Thus, large farms on average earn greater profits, which are their ultimate goal, and many of America's smallest farms have been coerced to consolidate into larger operations (Ikerd, 2002). Between 2007 and 2012, the number of US farms dropped by 4.3 percent because fewer and bigger farms are more readily able to achieve significant economies of scale in production (MacDonald, 2013).

Because small farms typically lack the appropriate scale for the technology, capital, and marketing systems used by agribusinesses, corporations have capitalized on the industry's trend toward fewer farms and bigger farmland through either direct ownership of farms or contracted production (Ikerd, 2002).³ Contracted production is defined as the formal agreement between buyers and producers to a specific quantity, quality, and price of an agricultural product (Contract Farming Resource Centre, 2014). The amount of US farms regulated by contracts has increased since the 1960s, and more recently, the amount of contracted production has gone up from 23-percent in the mid

³ Agribusinesses are defined as large-scale operations that produce monocultures with the use of chemical inputs, such as synthetic nitrogen fertilizers and pesticides (Barker, 2007).

1990s to 32-percent in 2011 (MacDonald, 2013). Almost 40 percent of the total value of agricultural production in the US is accounted by contracted production (O'Donoghue, MacDonald, Vasavada, & Sullivan, 2011).

Through contracts, contractors are ensured reliable product differentiation, standard crop quality, and a predictable supply; therefore, producers are subject to the standards set forth by the contractor (Farm Business Economics Branch, 1996). On the other hand, producers under contract are able to finance more debt and capital while benefiting from an established outlet for their product (O'Donoghue, MacDonald, Vasavada, & Sullivan, 2011). In most cases, contractors finance the inputs required by industrialized growing processes, but the agricultural technologies implemented through contracted production are less suitable to farmers with relatively small land-holdings and in areas where energy intensive inputs (such as synthetic fertilizer) must be imported (Conway, 2003).

The USDA supports vertically integrated contracting because agricultural output per acre increases with the percentage of value produced by contracts. However, the contracting entities earn a large proportion of farm receipts; the principal farm operator does not earn the majority of the revenue (Farm Business Economics Branch, 1996). As a result, as contracted production expands with industrialized growing methods, the farm operator receives a declining portion of farm receipts. In fact, in 2002 farmers on average earned less than one percent of the total amount that Americans spent on food, while the remaining ninety-nine percent paid for corporate purchased inputs, marketing, packaging, and distribution (Ikerd, 2002).

Vertical integration in agricultural production incorporates middlemen into the production-consumption cycle, and farmers make agreements with corporate entities in order to accumulate the capital and resources necessary to produce for capitalist markets. Presumably the contracting corporation raises the capital to build production facilities, purchases necessary farming inputs, and accepts the monetary benefits and costs associated with the farm's production (MacDonald, 2013). The reality is that corporations shift their risk to farm operators, which is especially profitable to them in periods when prices are subject to fall (Sauvee, 1998). Consequently, as the risk of failure increases, so too does the associated interest rate charged to farm operators by their contractors. Contracted productions can usually be terminated by the contractor at any time, in which case, all fixed costs and outstanding loans must be paid by the farm operator or sub-contractor (Weida W. J., 2004).

The privatization of land was an important step for the capitalist agenda to dominate agricultural markets (de Janvry & LeVeen, 1986). Fewer and larger farms absorb farmland as agriculture industrializes its growing practices (Contract Farming Resource Centre, 2014). Having fewer and larger farms implies a surplus in the agricultural population located in rural communities, and as such, many rural communities are subject to lose local employment (Heberle, 1938). This holds both for the US and developing countries. At the dawn of industrial agriculture about 60 years ago, 18 percent of developing countries' population lived in urban areas (United Nations, 2014). Currently, almost half of the developing world's population lives in urban areas (United Nations, 2014). The Foundation for Deep Ecology argues that industrial norms stripped traditional farmers of their food independence and pushed them to be landless,

thereby forcing migration into the cities and decimating rural communities (Foundation for Deep Ecology, 2002).⁴

The USDA reports that farming-dependent communities once dominated the rural economy but now less than one-fifth of non-metro counties are farming dependent (Conklin, Dimitri, & Effland, 2005). The share of the workforce employed in agriculture has declined from 21.5 percent in 1930 to less than 2 percent in 2002 (Conklin, Dimitri, & Effland, 2005). The declining percentage of the population employed in agriculture is correlated with the declining population rate in non-metro US areas (USDA, 2014a). Since the start of the 20th Century, the number of American residents living in non-metropolitan areas has continued to decrease to below 15 percent in 2014, whereas the population growth rate in metropolitan counties has risen steadily (USDA, 2014a).

With so many people moving to urban areas, there is an increasing demand to convert agricultural land into residential and commercial development (Morris, et al., 2006), and that has positive effects on farmland value (Brown, Heaton, & Huffman, 1984). Average farmland values in the US have been increasing since the late 1980s (Beckman, Ifft, Kuethe, Morehart, Nickerson, & Williams, 2012). A confluence of factors is predicted to increase farmland values, besides the demand to convert land to residential and commercial development. Additionally, zoning laws typically limit the usage of land to keep it in farming and require pre-determined production standards (Pogodzinski & Sass, 1990). Zoning policies help protect the agricultural economic base, and they can raise average farmland values (NALS, 1981). However, the most important

⁴The Foundation for Deep Ecology seeks to protect nature by promoting ecologically sustainable agricultural practices. The organization opposes the destructive practices of industrial agriculture (Foundation for Deep Ecology, 2014).

determinants of farmland value involve the soil type, slope, degree of erosion, and potential for flooding influence (Libby & Stewart, 1998). The quality of land is the most significant factor affecting production value and farmland prices. Due to the quality of US soil, demand to convert land, and zoning laws, the price of land has nearly doubled in the last decade and increased over 8 percent between 2013 and 2014 (National Agricultural Statistics Service, 2014).

Farmland values have steadily increased since World War II (Beckman, Ifft, Kuethe, Morehart, Nickerson, & Williams, 2012). Between 1969 and 1978, farmland values rose by 73 percent because of the high returns to increased production (Barnett, 2010). Soon thereafter, a speculative bubble burst as interest rates rose. Farmland values dropped by 14 percent between 1984 and 1985 (Beckman, Ifft, Kuethe, Morehart, Nickerson, & Williams, 2012), and the farm crisis of the 1980s bankrupted many farmers and caused bank failures throughout the decade (Duncan, 2008). Many argue that farm real estate values today are exhibiting a speculative bubble (Blank, Erickson, & Hallahan, 2012), and farmland values may eventually show sharp declines. Steep drops in land prices threaten to further reduce the amount of farmers and enlarge farm sizes, just as it did following the 1980s farm crisis (Doering, 2013). A reduction in the quantity of farmers and an enlargement of farm size can endanger food sovereignty and biodiversity (Altieri, 2009).

The USDA remains skeptical whether a speculative bubble is actually forming. They posit that a static supply of farmland quality, low interest rates, and high farm revenue have contributed to the spike in land prices, all of which can be maintained in the long-term (Beckman, Ifft, Kuethe, Morehart, Nickerson, & Williams, 2012). The USDA

contends that the affordability to finance debt has increased with farm incomes nationwide. In this view, stable farm incomes and persistently low interest rates will keep farmland prices high. Evidence, however, shows that farmland prices are highly dependent on “the land’s ability to generate profits from agricultural production,” and currently, farmland prices are too high relative to the agricultural production earnings (Blank, Erickson, & Hallahan, p. 62, 2012). In other words, federal financial support has paid farmers above the true value of their agricultural production. Government payments to farmers have artificially increased farm incomes relative to agricultural production, and those payments continue to redistribute the power of agricultural production from small landholders to fewer agribusinesses (Rausser, 1992). If crop prices fall, interest rates rise, or the land loses its ability to produce, then farmland prices will drop well below current values, leaving many US farmers susceptible to becoming either bankrupt or further dependent on government payments to stabilize their on-farm incomes.

2.2.2 US Farm Policies

The 2014 Farm Bill authorizes the US government to spend \$956 billion over the next 10 years (Plumer, 2014). About 80 percent of which will finance food stamps while most of the remaining amount will finance the crop insurance, commodity, or conservation programs (Roebke, 2014).⁵ The 2014 Farm Bill has emphasized no longer making direct payments to farmers to stabilize farm incomes; instead, its intention is to assist farmers in managing the risks of crop production by protecting them from crop

⁵ Crop insurance payments are contingent on the program’s definition of “Good Farming Practices,” which have been condemned by the Government Accountability Office for encouraging increased yields over one-year terms and undermining the soil’s long-term ability to produce (US Government Accountability Office, 2014).

failures and low prices (Coppess, 2014). The 2014 Farm Bill authorizes the federal government to spend almost \$90 billion over the next decade on crop insurance (National Sustainable Agriculture Coalition, 2014b).

Since farms are not limited to the amount of insurance they can receive, the largest agribusinesses have historically been the biggest beneficiaries of federal agricultural subsidies (Nixon, 2014).⁶ For example, the 1996 Farm Bill subsidized seventeen of the largest Iowa producers with \$322,000 per year over three years, while 118,000 producers received an average of around \$200 per year (Anthan, 2000). The USDA submits that large agribusinesses achieve economies of scale and through industrial agriculture's increased productivity, consumer food prices have dropped (Fuglie, MacDonald, & Ball, 2007). The US Department of Agriculture thereby justifies the disproportionate gains that larger agribusinesses collect in subsidy receipts. Throughout the 20th century, the number of farms in the US fell while the average farm size grew, leaving the country's agricultural production to fewer and larger agribusinesses. As mechanized growing processes encourage a larger farm size, the relatively few and large agribusinesses are the biggest beneficiaries of US agricultural subsidies (Nixon, 2014).

Despite the billions spent to subsidize the capitalist expansion of industrial agriculture, most of farm household income comes from off-farm sources. For instance, a principal farm operator may be the manager of another nearby business. About 91 percent of principal farm operators in 2013 relied on multiple sources of income (Brown &

⁶ Despite the unlimited amount of crop insurance the largest farmers receive, they receive a small percentage of crop insurance subsidies; most of the money pays their supplying seed and fertilizer companies, fuel distributor, and other businesses involved in the production and marketing of agricultural products (Weida, 2004).

Weber, 2013). In the past, farm income was the sole source of income for farming families, which was assumed to accrue to one family per farm. Farmland consolidation has coerced many farming households to divide the farm receipts among multiple households, so farm operators keep a declining portion of the farm business' receipts as farm size grows (Farm Business Economics Branch, 1996). Additionally, principal farm operators are on average 56 years old, a figure that has been rising for the last 30 years (Kurtzleben, 2014). New farmers are essentially barred from entering the US agricultural market on account of restrictively high land prices, concentrated market power, expensive and risky contracts for inputs, and a negative farm household income.

Before the crop insurance policy financially protected farmers from crop failures, farmers traditionally managed risk by planting a variety of crops (National Sustainable Agriculture Coalition, 2014a). If one crop failed, other crops could make up the difference. Now, more than three-quarters of federal farm subsidies financed the production of only the most profitable crops: corn, wheat, cotton, rice, and soybeans. The production of commodity crops enhances the possibilities of American agriculture to be traded in international markets. However, the crops specialization required of neoliberal policies makes agriculture more susceptible to climate change.

Crop specialization encourages soil erosion and inefficient water use. Capitalist agribusinesses producing for export only cultivate one crop per year with largely insignificant crop rotations (US Government Accountability Office, 2014). When agribusinesses produce monocultures of commodity crops, like corn and soybeans, they are insured with a price floor to protect the US agricultural market. A federal government agency predetermines a commodity crop's price, and if the market price falls below the

said amount, the farm bill's Price Loss Coverage program will subsidize farmers the difference as an insurance policy (Lavender, 2014). This type of crop insurance may be hiding the true cost of long-term risk inherent in industrial farming practices (US Government Accountability Office, 2014).

The commodity program of the Farm Bill subsidizes corn-based ethanol production, which has been shown to worsen climate change. In 2008, more than 30 percent of corn output was diverted for ethanol production (Blank, Erickson, & Hallahan, 2012). The increased proportion of corn processed as ethanol instead of food can have severe effects on global food security (Naylor, et al., 2010), and yet, energy price increases and corn subsidization have heightened the demand and capitalist investment in biofuel production (von Braun & Diaz-Bonilla, 2008). Food prices are being driven up by the lower supply of land used to grow food as well as the diversion of inputs now used for biofuel production (such as land and water). Land previously withdrawn from agricultural production and placed under conservation reserve has been reverted into corn production due to the high demand for ethanol (Naylor, et al., 2010).

The meat industry has also benefited from the commodity program of the Farm Bill, as animal feed inputs (such as corn) are subsidized as well (Wise, 2010). Hog farmers, for instance, have cut animal feed costs by 26 percent between 1996 and 2005 (Starmer & Wise, 2007). The commodity program is advantageous to cattle ranchers too. Their animal feed is subsidized, and federally owned land is rented to cattle ranchers at one-third of the price they would be paying on private land. In fact, US government spends \$500 million per year on the industry's grazing (Horrigan, Lawrence, & Walker,

2002). The meat industry is well-financed by the Farm Bill, despite its well-documented contributions to the global environmental crisis and public health concerns.

Cattle ranchers and crop producers alike receive no incentive from the government to grow through methods that enhance soil fertility (Faeth & Westra, 1993). In contrast, the US government encourages profit-seekers to invest in chemically-based agricultural growing practices to the detriment of public health and the environment (Horrihan, Lawrence, & Walker, 2002). The US agricultural policy has neglected the long-term costs and risks of producing monocultures, overgrazing, and subsidizing the largest agribusinesses in efforts to expand its capitalist agenda. Resource intensive monocrops were insured \$117 billion in 2012 by the US government; discounted insurance programs create incentives for farmers to plant on marginal land that would otherwise not be cultivated (Lynch & Bjerga, 2013). Accordingly, the crop insurance program's "Good Farming Practices" encourage farmers to increase yields over one-year policy terms, which likely leads farmers to pursue profits at the expense of their soils' long-term resiliency by inefficiently watering and over-tilling their land (US Government Accountability Office, 2014). The overuse of natural resources and the depletion of soil and water are necessary externalities in the pursuit of profit and production of high industrial yields.

The US agricultural policy has consistently defined the purpose of federal subsidies since the 1930s in terms of providing aid to farm income (which is more susceptible to climate-related variations than manufacturing income, for example) while reducing consumer prices in the short-term. The USDA purports to reduce food prices with subsidies, but taxpayers pay the federal government to fund food suppliers that may

otherwise not be patronized by consumers (Weida W. J., 2004). Federal subsidies, however, artificially lower the price of industrially grown produce such that it is disproportionately cheaper and more favorable to consumers than sustainably grown produce (Muller & Schoonover, 2006). On that account, the 2014 Farm Bill budgeted \$1.2 billion over the next 5 years to support organic agriculture in general, which will not be enough to offset the subsidies that agribusinesses receive (National Sustainable Agriculture Coalition, 2014b). Resource conserving growing practices remain at a financial disadvantage, and farmers keep receiving insufficient government incentives for biologically and economically sustainable growing practices. (Faeth & Westra, 1993).

2.2.3 Globalized Agriculture and International Trade

Trade liberalization is founded on the logic of comparative advantage, on the basis of which exporting specialized commodity crops based on the lowest opportunity cost is the most efficient economic arrangement. In agriculture, however, liberalized trade certainly increases energy-use for agricultural production and transport (Shiva, 2002). Society-at-large may benefit from specific competition-based industries, but globalized agriculture can create import dependency, threaten food security, and increase the rate of energy-intensive inputs in production. The process of globalization has pressed for vertical integration in agriculture, which in other words, results in the consolidation of market power by fewer and larger farms that produce the majority of agricultural output (von Braun & Diaz-Bonilla, 2008). In the context of comparative advantage, larger agribusinesses may specialize in the production of specific crops. However, agricultural output must be measured by yield, or the dollar output of one specific crop per acre (Shiva, 2002). In cases where agriculture is not industrialized and globalized, output can

be measured as the dollar output per acre for all crops, which show that there is an inverse relationship between farm size and output⁷ (Rosset, 1999).

The rise of industrial agriculture coupled with the ability to distribute to international markets initiated a process by which the production of wage-goods became a key economic activity for farmers (de Janvry & LeVeen, 1986). Agricultural producers became less concerned with supplying local markets with their basic food needs. The process of commoditization led to a rise in wages and farmers' incomes, which was a necessary component of agriculture's industrial development (de Janvry & LeVeen, 1986). The globalization and commoditization of agriculture has seriously threatened the livelihood and food security of millions of farmers and households (Shiva, 2002). Food prices fluctuate with subsidies and other mechanisms of globalized agriculture; thus, subsidies easily hide environmental costs and "make non-local food produced through costly means appear low cost in local markets" (Shiva, 2002, p. 55).

By reducing the trade liberalization in agriculture, biological limits can provide agricultural producers with the proper incentives to produce food through local-specific methods (Berry, 2002). In this framework, the optimal level of competition between agricultural producers is local. Market prices should not ignore the climate, local ecology, and local community in the name of seeking profits and fictitiously low short-term food prices for one crop at a time. Liberalized trade fundamentally encourages the specialization of high-yielding varieties, which are produced as monocultures, but ecological diversity is better suited for food security and biological sustainability (Shiva, 2002).

⁷The relationship between farm size and output will be discussed in Chapter 3.

Corn is the paramount example of export-based monocultural production that is grown for profit only, not for improving food security. About 80 million acres of the crop are planted in the US each year, and about 20 percent of the corn is exported to other countries (Capehart, 2014). About 2 percent of the corn grown in the US is directly consumed as grain, as most of it is used as the main energy ingredient in animal feed (Baker & Allen, 2005). Almost all of the corn grown in the US is cultivated by industrial agribusinesses that intend on increasing the scope of their operations.

On the other hand, small-scale Mexican farmers produce about half of the corn grown in Mexico and depend on the crop as a direct food source (Nadal, 2000). In 1994, the US and Mexico enacted the North American Free Trade Agreement (NAFTA) under the premise that both countries would benefit from free trade and specialization. As a result, industrial agriculture spread across rural Mexico so seasonal fruits and vegetables flowed into the US; in turn, the US exported to Mexico staple crops and meats (Wise, 2010).

NAFTA was intended to withdraw tariff protection for Mexican corn farmers gradually over 15 years; instead, the Mexican government discontinued tariff protection after just 3 years (Cleveland, Cuevas, & Soleri, 2006). In the meantime, the US government paid out \$37.4 billion in corn subsidies to US farmers from 1995 to 2003 (Environmental Working Group, 2012). As tariffs in Mexico were gradually withdrawn, agricultural products from the US inundated the Mexican market and drove down output prices (Wise, 2010). US export prices, however, were artificially lower than the true cost of production because the US increased its subsidization of agriculture and pushed down real world food prices (von Braun & Diaz-Bonilla, 2008). Hence, food prices neglected

negative externalities, and the market price of corn was below its true cost. If export prices had reflected the true cost of production, real agricultural prices would have been at least 25 percent higher between 1997 and 2005, and the US would have not benefited as much as it did from NAFTA (Wise, 2010).

US farmers receive billions of dollars more than Mexican farmers, which distorts the trade equity between the two countries (Luckstead, Devadoss, & Rodriguez, 2012). The disproportionate subsidization between the two countries has left Mexican farmers vulnerable to artificially low commodity prices (Barker, 2007). Since the free-trade agreement, Mexican corn farmers have lost an estimated \$6.5 billion (Wise, 2010). The significant price decreases and subsequent losses forced many Mexican farmers to vertically integrate with agribusinesses; in practice, that meant increased landlessness and food insecurity for many Mexican peasants while few capitalist agribusinesses profited at their expense (Maiki, 2014). Mexico lost about 2 million farm jobs because of NAFTA between 1994 and 2014 (Weisbrot, Lefebvre, & Sammut, 2014) and became significantly more import dependent for its food products. As US agricultural exports to Mexico have increased, Mexico's import share of consumption has increased for all staple crops. The import share of corn consumption in Mexico was 7 percent in 1990-92, and the free-trade agreement increased imported corn consumption to about 35 percent by 2006-08 (Wise, 2010). Increasing the import of essential grains can destabilize long-term food security.

The consequences of NAFTA in Mexico and in the US reveal the exploitative nature of capitalism manifested in industrial agriculture. Just as farms in the US were consolidated into large agribusinesses and redistributed power to benefit a fortunate few, the Mexican government and its new agribusinesses figuratively bankrupted Mexican

society in the pursuit of profits. NAFTA's influence on Mexico led to the privatization of many Mexican farms and the displacement of millions of peasants, many of whom illegally immigrated into the US (Fernandez-Kelly & Massey, 2007). US farmers since the introduction of NAFTA have also become no richer. US farm incomes have dropped dramatically following the enactment of NAFTA (Organization of Organic Consumers), likely because real world prices for all major crop export commodities fell by 25 percent between 1980 and 2000 (Barker, 2007). The lower prices since NAFTA have made US farmers more dependent on government subsidies to stabilize their incomes (Barker, 2007).

2.3 The Environmental Consequences of Industrial Agriculture

2.3.1 Monocultures and Genetic Modification

Crop yields (based on a single crop's output) have greatly improved since the beginning of industrial agriculture, but the rise of monocultures directly opposes biodiversity and traditionally biological growing practices (Rosset, 2006). Producing export-based monocultures has severe ecological impacts and risks. Nonetheless, several countries have reshaped their economies to produce commodity crops for exportation, and the current capitalist market structure has driven agricultural producers to mainly cultivate monocultures (Altieri, 2009).

Commoditized agricultural systems produce monocultures, where only one crop is cultivated in an area per year. Monocultures depend on chemically-based inputs and more water than can be naturally recharged in aquifers (Shiva, 2009). In the US about 80 million acres are exclusively reserved for corn production each year (Capehart, 2014).

Producing monocultures on a large-scale requires environmentally harmful inputs to

maintain pests and diseases (Altieri, 2009). The use of chemical inputs has increased exponentially since the commoditization of agriculture during the Green Revolution, and soils that have been chemically fertilized are now lacking necessary nutrients and the organic matter to hold water moisture (Shiva, 2009). Thus, monocropping is more vulnerable to the environmental stresses associated with climate change (Conway & Barbier, 1990).

In 2000, 73 percent of all lettuce grown in the US was iceberg, which is one example of the loss of biodiversity through agriculture. More than three-quarters of agricultural genetic diversity was lost in the 20th century. 97 percent of the varieties available in 1900 are now irrevocably extinct from our food's genetic pool (Foundation for Deep Ecology, 2002). For more than 12,000 years, farmers have selected seeds from the best producing varieties, which co-evolved with the local ecology to most efficiently take-in nutrients and resist pests and diseases (Foundation for Deep Ecology, 2002). Post-World War II, US policy supported the manufacturing of seeds bred and scientifically manipulated to respond to chemicals. Seed and chemical combinations were designed to produce well regardless of local specific ecosystems. Market-oriented short-term chemical fixes, however, have reduced the potentiality of diversity from natural seed selection.⁸

Genetically modified organisms (GMOs) were first released in the 1990s and are cultivated in 28 countries, specifically on 11 percent of the world's arable land and half of US agricultural land (Folger, 2014). GM crop development has enabled few multinational corporations to enter the agricultural market and consolidate the seed

⁸ Certain genetic traits can be selected or modified in order to provide specific geographic regions with disease, drought, or flood resistant varieties of grains.

industry in the pursuit of profits (Cleveland, Cuevas, & Soleri, 2006). Seed consolidation has reduced the crop diversity planted for commercial purposes, which further encourages monocultures (Gepts & Papa, 2003). Monsanto and Syngenta, for example, are the two major corporations that acquired 27 percent of the agricultural biotechnology patents issued between 1982 and 2001 (Graff, Cullen, Bradford, Zilberman, & Bennett, 2003). GMO seeds are expensive because patents protect the corporate interest.

Several countries have disallowed the use of GM crops due to concerns over the safety and environmental effects of their associated growing practices (Organic Consumers Association, 2014). Yet, the US leads the world in developing, producing, and promoting genetically modified crops, having planted 69.5 million hectares in 2012 (James, 2012). The large-scale effects of cultivating GMOs in agricultural production stand counter to the “sound evolutionary strategies for the long-term stability of terrestrial ecosystems” (Giampietro, 2002, p. 468). Despite severe ecological risks, 95 percent of corn grown in Iowa was genetically modified in 2014 (USDA, 2014d). Commodity crops, such as corn, cotton, and soybeans are often genetically engineered to resist the pesticides and herbicides that are frequently sprayed. For example, Monsanto’s RoundUp Ready crops are genetically modified to resist RoundUp, an herbicide designed to kill weeds. In 2010, about 70 percent of the corn and cotton and 90 percent of the soybeans grown in the US carried the Roundup resistant gene, which indicates that the use of pesticides and herbicides is standard practice in US agricultural production (Neuman & Pollack, 2010).

The pervasive use of herbicides in industrial agriculture has provoked weeds to evolve into “superweeds” capable of resisting the toxic sprays, and even more toxic

herbicides must be used to combat the new superweeds (Neuman & Pollack, 2010). Farm experts suggest that finding solutions to effectively dissolve weed and pest issues will lead to higher farm and food costs and more pollution of land and water (Neuman & Pollack, 2010). As the costs of production become prohibitively expensive and externalities amass, industrialized and commoditized agriculture is losing its ability to provide food that is safely accessible to the world's growing population.

2.3.2 Chemical Inputs and Toxicity

Conventional chemical inputs in industrial agriculture explain the increase in agricultural productivity (Fuglie, MacDonald, & Ball, 2007). Higher yields from industrial growing methods, however, require enormous amounts of water, energy, and chemicals that result in high toxicity levels in soil and water systems (Union of Concerned Scientists, 2014). Industrial agriculture is responsible for a quarter of the world's carbon dioxide emissions, 60 percent of methane gas emissions, and about three-quarters of nitrous oxide emissions (Barker, 2007). Pesticides and nitrogen-based fertilizers became available in the late 1940s, but concerns about their impacts on the environment and human health were not discussed until the early 60s (van der Werf, 1996). Since the 1970s, scientists have argued that farming inputs such as fertilizers, fossil fuels, and other agricultural chemicals contribute to soil degradation, loss of biodiversity, and marine dead zones (van der Werf, 1996, Kremen & Miles, 2012).

Despite the considerable negative environmental impacts, the use of artificial fertilizers and pesticides is commonplace in commercial farming, and farmers around the world are increasing their pesticide use (Kroese, 2002, Wilson & Tisdell, 2001). From the start of the Green Revolution in the late-1950s, the use of commercial fertilizers has

increased by 20 times (Pimentel, 1996). US Farmers used about 700 million lbs of pesticides annually from 1986 to 1991, which cost about \$4 billion annually, not including any negative externalities (Pimentel, et al., 1993). Of all the pesticides applied in the US, 67% are herbicides, 23% insecticides, and 10% fungicides, and field corn alone accounts for over half of agricultural herbicide use in the US (Pimentel, et al., 1993).

The use of pesticides may cut current costs, improve yields, and maximize agribusiness' profits in the short-term, but will inevitably raise costs and lower yields in the long run because pesticide use decreases soil fertility and the proliferation of pests due to developed resistance over time (Wilson & Tisdell, 2001). For this reason, for example, the Indonesian government found that farmers who had to pay the full price of pesticides carefully regulated and reduced their use of pesticides (Pimentel, 1996). Discounting the negative effects in the long-term may lead farmers to undervalue the total disutility from pesticide use, in contrast, users may signal favorable market conditions and induce non-users to apply pesticides to avoid future economic losses in the short-term (Wilson & Tisdell, 2001). If pesticides were not used, crop losses would rise by 9 percent; preventing the loss of crops by applying pesticides returns the farmer \$4 for every \$1 spent on pesticide use, but the indirect environmental costs are not accounted by corporate interest (Pimentel, et al., 1980). Since environmental costs are not accounted, the market prices of pesticides do not reflect their true value and implicitly encourage pesticide application.

Industrial agriculture's production of "super harvests" depends on energy-intensive inputs and capital, rendering the production cycle to be biologically and

economically unsustainable in the long-term (Giampietro, 2002). Nutrient, energy, water, and waste cycles are open and difficult to recycle in industrial agricultural systems (Altieri, 1998). Farmers in the US spend about \$40 billion annually to save an estimated \$16 billion worth of US crops, and even yet, pests are responsible for about a quarter of yield losses despite the billions of pounds of pesticides used in the US (Altieri, 1998).

Similarly, herbicides are sprayed on industrial farms to kill invasive weeds. Herbicide residues, however, may prevent farmers from effectively rotating crops and force them to plant the same crops (Wilson & Tisdell, 2001). The current market structure supports the employment of excessively simple crop rotations, such as corn-soybeans-corn-soybeans, which depletes the soil of its organic matter, thereby causing less diversity in soil life and fewer natural controls of potential pest problems (Altieri, 1998). Simply put, pesticides, including herbicides, contribute to the deterioration of natural habitats and the loss of biodiversity (Sattler, Kächele, & Verch, 2007). Pesticides destroy soil ecosystems by killing essential life, such as arthropods, earthworms, fungi, bacteria, and protozoa (Wilson & Tisdell, 2001).

The decline in biodiversity from pesticides and synthetic fertilizers can be analyzed systemically: an ecosystem that produces numerous tons of biomass per acre must invest necessary nutrients and water into the soil in order to sustain the process over time (Giampietro, 2002). Biologically, all agricultural production methods depend on the well-being of their local specific soil. Industrial agriculture practices a system in which it depletes the soil of its essential life and nutrients, and therefore, it relies on the increased use of pesticides and fertilizers (Altieri, 1998). Consequently, the soil base that provides

for agricultural biomass is being depleted rapidly at the behest of the chemical inputs required to produce monocultures.

The US has lost half its topsoil since 1960 and is continuing to lose it seventeen times faster than nature can create it (Pimentel, 1996). In order to maintain or increase production, agribusinesses may choose to increase the quantities of chemical inputs. Agricultural productivity then increases in the short-term, but total cost increases because inputs are added and from the chemical pollution that diminishes soil fertility, proliferates pest resistance, and causes damage to the farmers' health (Wilson & Tisdell, 2001). Thus, as more chemical inputs are applied, total agricultural output increases at a decreasing rate (Wilson & Tisdell, 2001).

The effectiveness of chemical inputs to produce high yields decreases over time, so chemical inputs such as pesticides must become increasingly more powerful, and therefore more toxic (Altieri, 1998). Some pests have developed pesticide resistance, which requires additional sprays and more powerful pesticide treatments (Pimentel, et al., 1980). Other non-pests have been harmed from pesticide use, such as pollinators that are essential to producing food. For instance, honey bees pollinate fruits, vegetables and other plants, and their significant killings due to pesticides resulted in the legislation of the Bee Indemnity Act of 1970 that paid apiculturalists losses worth \$21 million (Pimentel, et al., 1980). Bee colonies are now rented out to pollinate crop monocultures (Pimentel, et al., 1980). Similarly, the widespread use of herbicides kills milkweed, which is the only plant on which monarch butterflies will lay eggs and is the primary source of food for monarch caterpillars (Smith, 2014). Herbicides have directly decimated the monarch butterfly population, which is particularly troubling considering

monarchs are representative of general pollinator populations (Smith, 2014). At this point, farmers not only fear the rapid decline in pollinators, but they are also apprehensive to stop spraying the deadly pesticides because the population of pests may rise above levels predating the use of pesticides (Wilson & Tisdell, 2001).

Another pervasive problem involves the runoff of chemical inputs. The US Corn Belt that has created a “dead zone” in the Gulf of Mexico from nitrogen leaching into waterways (Pimentel, et al., 1993), and the pesticide runoff has killed fish populations that reside in high pesticide concentrated waters (Pimentel, et al., 1980). The heavy application of nitrogen fertilizers leads to nitrogen leaching into ground and surface water, and raising the level of nitrogen to hazardous levels (Pimentel, 1996). The most serious effects usually manifest in dense plant growth, causing the widespread deaths of fish and invertebrate populations, and the degradation of aquatic ecosystems (Pimentel, 1996). Less common problems from nitrogen leaching negatively affect communities in close proximity to agribusinesses (Lobao & Stofferahn, 2008) and agricultural workers’ health risks can be heightened due to their exposure to pesticides and herbicides.

2.3.3 Food Health and Nutrition

Despite the ecologically harmful growing practices that are common in the production of genetically modified (GM) foods, they are purported to be safe for consumption (National Research Council, 2002). Consumers must be assured the safety of GM foods in order for private agricultural corporations to profit (Victor & Runge, 2002). Indeed, a body of work has emerged revealing the safety of eating transgenic crops (ex. (König, et al., 2004, Cockburn, 2002)). However, the safety of GM food consumption remains a highly contended issue (ex. Grover, Ashhar, & Patni, 2014).

Starting in the 1970s, food manufacturers recognized that food products, such as chips, soda drinks, and bread, could be cheaply made through corn, particularly by using high-fructose corn syrup as a sugar substitute (Muller & Schoonover, 2006). The consumption of high fructose corn syrup, an added sugar, has increased over one thousand percent in the US in the last 30 years (Bray, Nielsen, & Popkin, 2004). In the US, processed foods that are high in added fats and sugars account for over half of every food dollar spent (Tillotson, 2002), and nearly one-third of all calories consumed in the US come from junk food (Block, 2004). Unhealthy products of industrial agriculture have dominated the market as added sugars and fats are now in many American food products, thanks in large part to high-fructose corn syrup (Muller & Schoonover, 2006).

The effects of consuming added sugars such as high-fructose corn syrup obviously concern public health officials (Ikerd, 2007). The quality and nutrition of the US food supply has caused increases in the rates of obesity, diabetes, and heart disease. In fact, more than one-third of American adults are obese (Centers for Disease Control and Prevention, 2014), and expenditures to treat obesity-related diseases in the US have exceeded \$75 billion per year (Muller & Schoonover, 2006). Because industrially processed foods are high in added sugars and fats, low in vitamins, minerals, and essential fatty acids, they have been linked to poor physical, mental, and behavioral health (Muller & Schoonover, 2006).

Due to farm policies, the price of food overall has dropped since the 1980s. In principle, cheap prices have allowed US households to demand a year-round supply of foods that are high in sugar and fat, and artificially shaped, colored, and ripened so that they look good (Ikerd, 2002). Moreover, corn subsidies in particular have lowered the

cost of sweetening products with high fructose corn syrup, so unhealthy foods containing sugars and fats reduced prices between 1985 and 2000 (Muller & Schoonover, 2006).

The lower prices are especially important in the US, where consumers spend less on food and value the price of food more than any other nation (Ikerd, 2002). Since the 1950s, the US has experienced a distinguishable increase in real disposable personal income, but the average American's budget allocated towards food consumption has also decreased significantly (Schnepf, 2013). The average American in 2013 allocated ten percent of disposable income towards food consumption, which is half of the budgeted food allocation of the 1950s (Schnepf, 2013).

The price of food in general has become cheaper over time, so consumers do not have to spend as much on food. However, between 1985 and 2000, the price of fresh fruits and vegetables increased almost 40 percent, while the price of products with added sugar, high-fructose corn syrup or added fats decreased (Muller & Schoonover, 2006). Accordingly, buying the cheaper and healthier foods is not a matter of choice for many poor Americans. The number of food stamp recipients almost doubled to 48 million between 2007 and 2013 (Roebke, 2014). Consumers, such as those on food stamps, are more likely to purchase unhealthy foods since farm policies make them cheaper than fruits and vegetables in the US.

2.4 Conclusion

The complex capitalist market structure that has guided industrial agriculture have been successful based on a purely monetized definition of efficiency: throughout the 20th century, the price of farm commodities decreased, the yield of monocrops increased, and the price of food relative to all other goods decreased (O'Donoghue, et al., 2011). Higher

yield varieties were introduced during the Green Revolution and increased the annual value of production per acre. Higher yields and agricultural profits were made possible by the advancements in agricultural techniques. Modern varieties of crops respond best to fertilizers and other chemical inputs, which is why improved varieties and hybrids of other food crops were developed and planted in millions of acres across the world. New technologies considerably improved the value of these different varieties, and the added value shifted common agricultural growing practices to specialize in the production of monocultures, the cultivation of a single crop variety in a field per year. Agribusinesses are now pursuing industrial efficiency in large-scale agricultural production.

Despite these changes in agriculture, between 1970 and 1990 the percentage of hungry people increased by more than 11 percent in every country except China (Folger, 2014). The tainted successes of industrial agriculture have hidden economic and environmental externalities because the agricultural efficiencies achieved in the 21st Century have been narrowly analyzed through monetary costs and benefits. The purely monetary cost-benefit analysis of industrial agriculture has led to the claim that larger farms can achieve economies of scale and have allowed agribusinesses to produce cheap food and consolidate market power. However, the price of industrially grown food is not equipped to reflect the long-term costs associated with soil degradation, nor air and water pollution, nor food related illnesses. Externalities are neglected in the name of cheap industrial foods.

Chemically-based, large-scale production of monocultures is actively endorsed by government contracts and subsidies. US growers are subsidized to apply synthetic fertilizers (Kremen & Miles, 2012) and over 90 percent of US corn farmers depend on

herbicides as a method of weed control (Pimentel, et al., 1993). Consequently, farm and food policies that support the capitalist expansion of industrial agriculture have contributed to environmental degradation and systemic disparities between small-farmers and agribusinesses. Instead of pursuing industrial profitability by commoditizing food, policies should aim at making agricultural production more socially equitable and biologically sustainable.

In order to combat the social, economic, and environmental consequences put forth by industrial agriculture, groups of new farmers are farming by the basic principles of a 'sustainable agriculture' (Ikerd, 2002), and they are made known and supported by scholarly research. Sustainable agriculture utilizes ecosystem services to fix nitrogen and build soil fertility without depending on chemically-based inputs. People all over the world practiced sustainable agriculture thousands of years before food was commoditized (Altieri, 2009). Indeed, there is increasing agreement that food import dependence does not achieve food security as well as locally-based production methods of diverse crops for local consumption (Barker, 2007).

Chapter Three: What is Sustainable Agriculture?

3.1 Introduction

The capitalist process, as manifested in industrial agriculture, has commoditized farmland and crops, such that agribusiness production is now specialized and their distribution networks internationalized. The commoditization of agriculture has depended on large-scale specialized production. Conventional farmers employ a row-crop system of one cash-grain at a time, effectively making agriculture more profitable in the short-term, yet more vulnerable to climate change in the long-run. Federal subsidies encourage the production of monocultures and food system commoditization. The impacts of agricultural commoditization induce food producers to employ energy-intensive growing methods and altogether neglect the severe environmental impacts of industrial growing practices. Intensive energy inputs are required to produce these monocultures, as agricultural technology seeks to remove the biological restraints to sustainable farming and expand corporate profits. US cropland is increasingly cultivated by fewer and larger agribusinesses, driving up the price of land and otherwise enlarging the barriers to enter the farming profession. In both an environmental and an economic standpoint, industrial agriculture is unsustainable, as is its philosophy of endorsing short-term productivity and discounting long-run effects.

Economic and environmental factors demand that agricultural systems become decommoditized and controlled at the local level in order to be economically and biologically sustainable. As it stands today, the dominant agricultural paradigm postpones or ignores negative externalities in order to achieve large-scale economic “efficiency,” defined only according to capitalist market values. The commoditized approach to conventional farming, specifically upsizing short-term production, cannot be viewed as sustainable in the long-run (Ikerd, 1993). Defining sustainable agriculture involves the consideration of several academic disciplines. Biological sustainability, economic viability, and social welfare each provides a distinct lens that contributes to defining sustainable farming systems.

Several academic papers equate organic growing methods with sustainable agriculture. Sustainable agriculture, however, is not limited to a set of growing methods. For example, there are many farms around the world that can produce vegetables, fruits, or grains in ecological ways without certification of their organic farming practices. Farms that adhere to organic practices produce within certain environmental constraints. Organic growing practices cannot capture broader economic and social implications, such as equity and scale of production (Rigby & Caceres, 2001). Defining sustainable agriculture necessitates a more systematic approach, one that simultaneously incorporates environmental, social, and economic considerations in a holistic valuation of food systems.

In a more accurate way, sustainable agriculture should be regarded as a farming system, not a particular growing practice. To be clear, a growing practice can be defined as a process by which crops are produced; it is a method of farming. A farming system,

on the other hand, is an overall approach to agriculture that is defined by a farmer's goals, values, knowledge, and available technology, and it is manifested in the growing practices employed by the farmer (Ikerd, 1993). Sustainable agriculture should be identified based on its economic and environmental outlooks.

Sustainable agricultural systems fundamentally oppose the principles of industrial agriculture. In comparison to conventional farming systems, sustainable agricultural systems do not commoditize food. As a result, they use fewer chemical inputs, cause less soil erosion, conserve water, foster biodiversity, and improve soil organic matter compared to conventional farming systems (Pimentel, Hepperly, Seidel, Hanson, & Douds, 2005). Whereas specialization is inherent to commercial farming systems, sustainable farming systems are diversified in crop production and farming practices.

Several core tenets help define sustainable agriculture, including the maintenance of soil fertility, preservation of water, protection of human health, and conservation of species diversity (Crews, Mohler, & Power, 1991). Sustainable systems do not exploit the environment and society by engaging in purely profit-seeking behavior; instead, they support the longevity of the soil and rely on biological processes to produce food. A sustainable farming system is naturally diversified and relies on local ecosystem services, which can be used to improve the region-specific management of weeds, diseases, and pests (Kremen & Miles, 2012). Accordingly, the definition of sustainability is highly specific to local ecosystems (Rigby & Caceres, 2001). To be biologically sustainable, soil fertility is not mined and soil erosion is directly proportional to the local rate of soil replacement (Crews, Mohler, & Power, 1991). Sustainable agriculture interprets agricultural production as part of a complex network of interrelated living organisms

(Ikerd, 1993). As a result, sustainable systems prefer a biological production that remains in balance with local ecosystems, and therefore, they eschew profits that would be attained with the application of chemical inputs.

Established institutions may challenge the notion that adhering to biological limits of production is economically viable, such as in areas where agribusinesses have displaced small-landholders or where incentives encourage farmers to employ environmentally harmful growing methods to expand their profits (Crews, Mohler, & Power, 1991). As such, farm profitability is often considered as the best indicator of agricultural efficiency in the Western world (Crews, Mohler, & Power, 1991). In modern capitalism, however, farm profitability is defended through government incentive programs that manipulate market outcomes. Additionally, with specific reference to the US, social norms and consumer demands differ across states, so that it is argued that ecologically sustainable farming practices may not be profitable in some areas. Overall, farm profitability is not a proxy for ecological sustainability, and food should be de-commoditized to become sustainable.

This chapter aims to analyze the key environmental and economic aspects of sustainable farming systems. By definition, sustainable agricultural systems conserve resources, produce efficiently, and enhance the quality of life for farmers and society (Ikerd, 1993). The chapter first examines the characteristics that support sustainable agriculture. Then it examines the key environmental, economic, and social aspects of sustainable farming systems.

3.2 Agroecology and Localization

Sustainable agriculture is based on “agroecology”, which is an approach resulting from the synthesis of agriculture and ecology (Altieri M. , 2009). The basic function of agriculture is to improve nature’s ability to feed people, whereas ecology presents humanity as only one component of interdependent ecosystems. Thus, sustainable agriculture’s approach in combining agriculture with ecology necessarily implies that agriculture, when practiced in an appropriate ecological balance, is constrained by its relationship with the local biosphere, regardless of market forces.

Biological and genetic diversity is essential to enabling farmers to adjust to changing climates, pests and diseases. Diversification is thus an essential part of the agroecological approach (Denevan, 1995). To produce agricultural diversity within an ecological balance, farming practices need to adjust to each specific location (Altieri M. , 2009). In other words, growing methods are based on the particular local soil, water, and natural habitat (Denevan, 1995). In short, the agroecological approach inherent in sustainable farming requires local-specific growing practices. Consequently, farmers attentive to agricultural sustainability, by this definition, intimately understand how their farm affects all surrounding ecosystems (Berry, 2002). Based on their knowledge of local plants and local soils, sustainable farmers are best able to answer specific land-based questions, “such as, what is the best way to plow *this* field? Or what is the best course for a skid road in *this* woodland?” (Berry, 2002). For agriculture to strike an ecological balance, it must be rooted in its local land-based context, or in other words, sustainable agriculture is localized.

Wendell Berry, a sustainable farmer in Kentucky, has written extensively to argue for agriculture to be localized so that it can truly be ecologically sustainable. His work often invites consumers disallow the destruction of their local soil or ecosystem, nor to discount any future environmental problems as a cost of production. As Berry says, the land-based practice of agrarianism would never argue in favor of soil erosion, water pollution, or the reduction of genetic diversity in the name of profits; instead, it would promote the localized farmer who does not commoditize food and instead feeds her local community on small acreage (Berry, 2002). Berry insists that scaling production to fit the local ecosystem necessitates small-scale agriculture that is planned locally and not market-oriented (2002).

Proponents of the classical theory of comparative advantage would disagree with Mr. Berry's assertions that agriculture should be localized and publically owned. Their disagreement would be based on the grounds that value is forgone when local communities diversify their production – and therefore neglect their comparative advantage – and do not engage in trade. Classical theorists would likely suppose that agroecological diversified farming systems, or sustainable farms, do not create a maximum level of money value because production is not specialized. They would likely reason that money value can only be maximized with global agricultural trade. Herman Daly and Joshua Farley, two prominent ecological economists, discuss this claim in their book *Ecological Economics*.

Daly and Farley submit that the classical theory of comparative advantage implicitly presumes transportation costs are zero (2004). Transportation is energy intensive, and many countries subsidize energy. As a result, international trade is

implicitly subsidized by energy prices that are below the true cost of energy (Daly & Farley, 2004). Regardless, if transportation costs are fully counted, classical theory would argue that specialization and free trade may still lead to an efficient allocation of resources. After specialization, Daly and Farley assert that countries lose their freedom not to trade and may be dependent on the continued cooperation of their trade partner, and that degree of dependence is especially high in agriculture (2004). High import dependence in agriculture threatens food security because it makes food a commodity dependent on global economic forces (Daly & Farley, 2004).⁹

Among ecological economists interested in sustainable agriculture, EF Schumacher is another primary scholar, and he provides a unique insight. Schumacher asserts that since the commoditization of agriculture, farmers are typically considered producers who must cut costs and maximize profits despite any harm to the local ecology (1973). The current market structure makes it difficult for farmers to abide by agroecological principles. Schumacher opposes the notion that land is merely a factor of production. He states, that since humankind has neither the ability to make land or recreate “spoiled land,” land should be considered sacred and “meta-economic” (Schumacher, 1973). Schumacher argues that agriculture should be regarded as sacred and decommoditized because human life cannot live without it, whereas humans could live without industry. In other words, human life depends on the balance of agriculture

⁹ Food import dependence decreases food sovereignty, in general. As such, famines are the result of a lack of entitlement to food, not a food supply shortage (Sen, 1981). Less developed countries are thus entitled to less food, as each country’s domestic sector must bid against the rest of the world to purchase food (Sen, 1981). Furthermore, since industrial agricultural producers neglect negative externalities, the price of food falls, which may help poor consumers, but not poor farmers, whose incentive to produce food drops with lower food prices (Daly & Farley, 2004). Poor farmers could theoretically specialize and produce cash crops for export, but monocultures require high levels of chemical inputs and are riskier investments than growing a diversity of locally stable food crops (Daly & Farley, 2004).

and ecology, not agriculture and industry. Farmers whose growing practices maintain local ecosystems will attain productivity as a by-product (Schumacher, 1973).

Agricultural output is definitely important to a sustainable farmer; so maximizing the productivity within local-specific ecological constraints is a primary goal. Schumacher believes that this approach to agriculture will ultimately benefit social well-being and the environment.

Traditionally-based farming systems produced food for local consumption for centuries before the commoditization of agriculture (Blatt, 2008). With industrialization and urbanization, agricultural specialization and trade seemed necessary to supply enough food for the large urban populace, which were made possible by the rapid development of industrial agriculture. However, non-localized agriculture has revealed issues relating to food security and sovereignty. Furthermore, the industrialization of agriculture has made it increasingly difficult to know the economic history or ecological cost of most agricultural products available (Berry, 2002). Sacred or not, sustainable agriculture is unique as an economic and human activity in that it requires local-specific diversification. Productive food sovereignty can be achieved when small-scale farmers gain access to land, seeds, and water, which then foster local production-consumption cycles (Altieri, 2009).

3.3 Environmental Considerations of Sustainable Agriculture

There is extensive evidence that small-scale agriculture causes less damage to the environment and conserves resources more efficiently than large farms (Altieri, 2009). In fact, total energy inputs are an average three times lower on small farms than on large farms because of the different uses of mechanization and chemical inputs between the

two farm types (Woodhouse, 2010). Small farms also use less land than large farms, so their use of fossil fuels is significantly lower, which explains why energy requirements are so much lower on smaller farms.

Small-scale farms, however, can produce much more per acre than larger farms when their crops are diversified, and diversification and sustainable farming practices are much more common among small farms (Altieri, 2009). A small-scale, diversified farm that produces grains, fruits, and vegetables can out-produce the output per acre of a large farm's single crop, such as corn grown on large-scale farms (Blatt, 2008). A diversified two-hectare farm in the US produced about \$15,000 per hectare, while a large 15,000-hectare farm yielded about \$249 per hectare from a singular crop (Rosset, 1999). If total agricultural output is measured instead of the yield of one crop, small farms produce much more food per acre than large agribusinesses (Altieri, 2009). In other words, diversification accounts for the inverse relationship between farm size and output.

The most successful diversified and sustainable farmers must obviously be skilled in a wide variety of farming operations, especially when adhering to agroecological principles, including but not limited to the following: preparing the soil; planting; harvesting; storing crops; controlling weeds, insects, and diseases; and managing their labor. In addition to all these skills, small farmers must be aware of current government agricultural policies, market their products, maintain their equipment, account for any expenses, record incoming revenue, and cover all costs of production (Blatt, 2008).

Profiting on a small-scale and diversified farm is difficult given the current market structure, but diversification is a fundamental aspect of sustainable agriculture (Ikerd, 1993). The diverse nature of small-scale and sustainable farming systems requires

more labor than do agribusinesses (Pimentel, Hepperly, Seidel, Hanson, & Douds, 2005). Practicing sustainable agriculture requires soil and water conservation and biodiversity, which demands more labor (Altieri, 2009), but that extra labor is focused on the local ecosystem's ability to produce in the long-run, primarily by not overtilling, applying chemical inputs, or relying on external energy sources (Yunlong & Smit, 1994). As a result, while more labor is required, small farms reduce soil erosion and conserve biodiversity better than large farms (Rosset, 1999).¹⁰

Agroecological farming systems utilize local specific knowledge to efficiently utilize ecosystem services. For example, integrative pest management (IPM) is an ecosystem service that helps farmers manage pest populations through biological methods. IPM has allowed farmers to achieve optimal productivity while minimizing external inputs (Edwards, Grove, TL, Harwood, & Pierce Colfer, 1993). Other ecosystem services can be used for carbon sequestration, water filtration, and avoiding nutrient runoff. An efficient use of an ecosystem service enables farmers to utilize a form of output from one production process as an input requirement of the next process (Ikerd, 1993). For instance, legumes naturally convert atmospheric nitrogen into organic matter, which can biologically fix nitrogen into the soil by planting legumes in different spatial and temporal arrangements.

Agrobiodiversity can be promoted through different spatial and temporal crop arrangements (Kremen & Miles, 2012). Rotating crops can allow for beneficial predators

¹⁰ No matter the dedication to environmental concerns, an excessive amount of hired labor can obviously be detrimental to the farm's profitability and long-term economic sustainability. Issues regarding farm labor and the economic and social aspects of sustainable agriculture will be further explored in the next section of this chapter. For now, this section is intended to examine the environmental aspects of sustainable agriculture.

to prevent unfavorable pest outbreaks while also encouraging a diversity of competitors (Edwards, Grove, TL, Harwood, & Pierce Colfer, 1993). In practice, a diversified farming system enhances the role of ecosystem services on agriculture – e.g., nitrogen fixation, soil quality, pollination, and pest control – by intercropping species, composting, rotating crops, and cover cropping, thereby reducing the need for off-farm inputs (Kremen & Miles, 2012). In short, maintaining diversity across spatial and temporal scales not only enhances ecosystem services but also promotes crop resilience during adverse climate or pest conditions (Kremen & Miles, 2012).

Another reason agriculture should not be commoditized results from the fact that many ecosystem services cannot be directly observed or measured. Some ecosystem services are valuable to some farmers, while they are not to others (Buttel, 2006). For example, if one farm's soil already has an above necessary rate of nitrogen, then planting legumes to fix nitrogen will not benefit her as much as it will to the farmer whose soils are low in nitrogen content. That being so, many of the costs and benefits associated with ecosystem services vary by location, and they are not easily quantified and are totally incommensurable to a money metric (Buttel, 2006).

Since ecosystem services are not easily quantifiable, several studies use certified organic farms as a proxy for sustainable farming systems. They are then able to compare between organic and conventional growing methods and provide noticeable results. In general, organic agriculture is more environmentally friendly because it favors renewable resources, recycles nutrients, utilizes ecosystem services for controlling pests and diseases, sustains ecosystems, protects soils, promotes biodiversity, and reduces pollution

(Argiles & Brown, 2010). All of the aforementioned are primarily targeted in the certification of organic food production.

Organic farm management increases soil organic matter through cover cropping and composting, which enables the soil to better retain water and nitrates from leaching inefficiently (Kremen & Miles, 2012). Microarthropods and earthworms can be twice as abundant in organic systems, which is essential to increasing the percolation of water into the soil to reduce runoff (Pimentel, Hepperly, Seidel, Hanson, & Douds, 2005). Additionally, since organic methods generate more organic matter in the soil than conventional practices, the soils on organic farms are able to hold more moisture, which means organic farms have higher yields in drought years than conventional farms (Pimentel, Hepperly, Seidel, Hanson, & Douds, 2005). Organic certification ensures that produce is grown without a range of ecologically harmful inputs (Rigby & Caceres, 2001). Differences between organic and conventional growing methods clearly indicate that organic production practices are more environmentally sound. Organic growing methods, however, must be diversified and adapted to local ecosystems in order for agriculture to be environmentally sustainable.

Biodiversity offers less vulnerability during disease, pest, drought, or other non-environmental market fluctuations (Clawson, 1985). Farmers also manage diversity as insurance to meet future climate change (Altieri M. , 2009). The specific growing methods that farms utilize to contribute to biodiversity depend on the location of the agroecosystem, not on the market (Edwards, Grove, TL, Harwood, & Pierce Colfer, 1993). An appropriate local specific sequence of crop rotations increases yields, reduces pesticide and fertilizer requirements and reduces soil erosion; additionally, sustainable

farming systems' crop sequence can fix nitrogen and biologically prevent pest and disease outbreaks (Ikerd, 1993).

Crop rotations also have significant implications on the decomposition of organic matter in soil (Edwards, Grove, TL, Harwood, & Pierce Colfer, 1993). Composting decomposes organic matter and produces soil that is rich in diverse microbial and invertebrate life, which promotes nutrient cycling (Kremen & Miles, 2012). Soil organic matter increases the biodiversity below the soil, which helps biologically control pests and supports crop pollinating insects (Pimentel, Hepperly, Seidel, Hanson, & Douds, 2005). Maintaining a healthy soil ecosystem allows soil biota to adjust appropriately to the changing conditions, and in doing so, the living soil provides more biological diversity to nutrient cycles (Edwards, Grove, TL, Harwood, & Pierce Colfer, 1993).

Traditional knowledge and local-specific information can sometimes be substituted for labor and capital, such as an appropriate intercropping system that minimizes weeds and frees up labor on weed maintenance (Edwards, Grove, TL, Harwood, & Pierce Colfer, 1993). The adoption of the best farming practices and indigenous knowledge are dependent upon the natural resources of the local environment and should not be neglected or dependent on the market; thus, the best growing practices and particular use of natural resources are results of local specific biophysical and socio-economic environments, not on current market prices (Edwards, Grove, TL, Harwood, & Pierce Colfer, 1993). As such, crop rotations must also be location specific in order for the diverse cultivation of crops and varieties to successfully meet environmentally stressful conditions (Altieri M. , 2009). Utilizing local knowledge of a particular soil,

climate, and harvest schedule is critical to implement an environmentally sustainable agriculture.

3.4 Economic Considerations of Sustainable Agriculture

3.4.1 Local Food Sovereignty

For 6,000 years before conventional farming systems became mainstream and market systems commoditized food, agriculture depended on local ecosystems and was able to conserve soil, water, energy, and biological resources (Pimentel, Hepperly, Seidel, Hanson, & Douds, 2005). The small-scale and localized farmers of the past were not necessarily better stewards of the land, but their management of fewer acres made it more likely that they practiced diversification and other environmentally sound growing practices (Hinrichs, 2003). Political movements around the world are pledging to restore the link between agriculture and local ecosystems through redistributive land reform; such movements laud the capabilities of small-scale agriculture to reestablish localized food sovereignty and rural welfare (Woodhouse, 2010, Barker, 2007). Less than two hectares of farmland per community is estimated to be enough land to provide food security to millions of people in developing countries (Altieri, 1999). Sustainable farming principles, however, must be followed, and resources must be publically and locally owned. Small-scale agrarian-based movements have been successful in practicing ecologically-safe growing methods while meeting the demands for their local communities, such as the international peasant movement called La Via Campesina (Altieri, 2009).

La Via Campesina is an international peasant movement that formed in 1993 to combat the capitalist control of their food systems. The movement contends that rural

jobs, food security, and ecosystems are best protected when food production is small-scale, diversified, and not commoditized by a global market (Altieri, 2009).

Implementing diversified farming systems by small landholders in developing countries can produce a substantially greater quantity of food than is currently being produced by corporate agribusinesses (Kremen & Miles, 2012). By cultivating a wide variety of crops in different spatial and temporal arrangements, small farmers can produce the majority of the food consumed by rural and adjacent urban communities even with climate change, escalating energy costs, and fluctuating global markets (Altieri, 1999). Farmers can also minimize crop failure and subsist through climatic extremes by using drought tolerant local varieties, harvesting water, intercropping, and implementing other traditional farming practices (Browder, 1989, Altieri & Koohafkan, 2008).¹¹

3.4.2 Organic Certification

The National Organic Program provides organic certifications to farms that, among other requirements, have not used synthetic chemicals, GMOs, and sewage sludge for the previous five years and have been verified by a third-party (Pimentel, Hepperly, Seidel, Hanson, & Douds, 2005). The certification is costly, but farms may ultimately benefit by charging a premium to consumers.¹² For some farms, however, the premium

¹¹ Organic growing methods can also help farmers build soil organic matter and help farmers face climatic uncertainties (El-Hage Scialabba & Müller-Lindenlauf, 2010). The United Nations Environment Programme (2008) reported that converting agricultural production to organic growing practices would help African food security, based on a study involving 114 cases in Africa that organic methods increased yield by 116 percent. About one-third of organic land and 80 percent of organic producers are in developing countries (Oberholtzer, Dimitri, & Jaenicke, 2012).

¹² Many agricultural producers are joining the US organic market; organic production in the US doubled between 1992 and 1997 (Pimentel, Hepperly, Seidel, Hanson, & Douds, 2005). In 1997, organic food sales were \$3.6 billion (Dimitri & Oberholtzer, 2009), and by 2010, organic sales were almost \$60 billion (Oberholtzer, Dimitri, and Jaenicke, 2012). However, only about .5 percent of US cropland was certified organic in 2005 (Barker, 2007).

that consumers pay for their organic certification may not be worth the \$800 per year to remain certified organic. Farms that grow and sell a large amount of produce are able to reduce the relative marginal cost of becoming certified organic. Thus, large corporations in the US are realizing the potential for profit, moving into the organic foods industry, and shipping organics across the country to meet the consumer demand of having a steady supply of produce year-round (Dimitri, 2010).

Agribusinesses trying to get into the organics industry have lobbied to reduce the US National Organic Standards; they have succeeded in allowing toxic sludge and irradiation in organic production, for example (Barker, 2007). The National Organic Standards have made some farmers and consumers believe that organic production can actually neglect some fundamental environmental principles of sustainable agriculture (Dimitri, 2010). As a result, some farmers choose not to certify their farms as organic, because the requirements for certification do not truly require sustainable farming practices.¹³

Marketing and distribution mechanisms have made consumers perceive that purchasing organic food supports small-scale family farms (Dimitri, 2010). However, large farms provide the majority of organic produce in the US. The share of organic importation has increased over the last decade because large firms have utilized their already established international supply chains (Oberholtzer, Dimitri, & Jaenicke, 2012).

¹³ Social issues arise given the current state of income inequality in the US. Lower-income populations do not have enough money to buy organic foods because of the associated price premiums with organic certification. The prices for organic corn and soybeans can range from 20 percent to 140 percent higher than conventionally grown corn and soybeans (Pimentel, Heppertly, Seidel, Hanson, & Douds, 2005). High priced organic foods are sold primarily to upper-income classes, which threatens the equitability of the organic market.

As a result, many large retail stores now supply a variety of organically certified food products (Dimitri, 2010). The issue of appropriate agricultural scale and principles of localization can become muddled with the commoditization of organic produce. It remains unclear how the international trade of organic products will end up affecting farmers and consumers in the long-run (Oberholtzer, Dimitri, & Jaenicke, 2012). Very few studies discuss of the economic viability of organic farming, which depends on local and international market forces (Argiles & Brown, 2010). Instead of relying on market forces, organic food production and distribution should be locally planned and owned.

3.4.3 Food Transportation

Localized sustainable farmers not only produce food within local ecological constraints; they must the costs of production to provide consumers with fresh food. Some farmers adjudge their sustainability based on the “food miles” of their produce (Rigby & Caceres, 2001).¹⁴ Farmers who produce for local consumption are frequently able to avoid costs associated with “middlemen” in charge of packaging, marketing, and distribution. By producing for local consumption and cutting out transportation costs, farmers are also able to reduce their farm’s ecological footprint, which may be more important to some farmers than strictly pursuing farm profitability.¹⁵

Industrial farms neglect the environmental implications of their food miles because they are only concerned with their profits. In 2002, one-third of every US acre was planted for export (Blatt, 2008). In fact, in 2008 the average carrot consumed in Iowa

¹⁴ “Food miles” is a measure of distance between a farm and its primary consumer market.

¹⁵ Ecological footprint is a measure of the human demand of natural resources relative to the planet’s ecological ability to regenerate (Global Footprint Network., 2013). A high ecological footprint implies a great cost to the environment, and as such, it has a negative connotation among advocates of sustainability.

traveled 1,600 miles, potatoes consumed in Idaho traveled 1,200 miles, and three-quarters of the apples consumed in New York City were imported from either the West Coast or overseas, even though the state of New York produces many more apples than the city's residents consume (Blatt, 2008). To develop agriculture that is sustainable, it must be localized and de-commoditized. The local food movement can grow as more consumers become concerned with the growing practices of their food, but small-scale, local farmers struggle to market their produce because the capitalist market structures in place only support the needs of large agribusinesses (Strom, 2014).

Given that food is currently commoditized and not controlled locally, some consumers have reported that they are willing to pay a premium for local produce, regardless of farm size (Darby, Batte, Ernst, & Roe, 2008). The local food attribute may imply a higher premium than foods with organic or GMO-free labels (Loureiro & Hine, 2001). Consumers willing to pay a premium for local food have reported freshness and quality as primary reasons to buy locally produced food (Zepeda, Leviten-Reid, & Catherine, 2004).

3.4.4 Direct-to-Consumer Food Market

A localized farm can be defined as one that sells at least 50 percent of their produce within 100 miles, and by this definition, more than 65 percent of US organic farmers sell their products locally (Dimitri, 2012). Smaller farms are even more likely to sell locally and directly to consumers, restaurants, or small independent food stores (Dimitri, 2012). The market for locally grown produce has expanded recently; farmers markets grew by more than 200 percent between 1994 and 2009 (Onken & Bernard, 2010). The expansion of farmers markets is correlated with the idea that local foods are

fresher, less processed, and retain more nutrients, which may also provide health benefits from better nutrition, obesity prevention, and risk of diet-related diseases (Martinez, et al., 2010). The growing interest in local foods in the US can also be attributed to several other movements, such as the environmental movement that motivates people to consider geographic aspects of food travel because long-distance food transport contributes to greenhouse gas emissions (Martinez, et al., 2010).

One of the reported benefits of local food systems is that they create more jobs than commercial enterprises (Jones, Comfort, & Hillier, 2004). In fact, the US Secretary of Agriculture Tom Vilsack has confirmed through the New York Times that local food systems generate more employment than agribusinesses (Strom, 2014). Similarly, money spent on local foods circulates locally by nature, which directly supports local enterprises (Fieldhouse, 1996). The American Independent Business Alliance reports that on average, about 48 percent of revenue earned by local independent businesses circulate locally, whereas less than 14 percent of purchases at chain stores were kept locally (American Independent Business Alliance, 2015). In Arkansas, for example, the Meadowcreek Project alongside Hendrix College students increased their in-county food purchases from 1% to 15% of total food purchases, which generated thousands of dollars in the local economy (Feenstra, 1997). Localized agriculture is clearly important to its community's welfare.

Policies that connect consumers with local farmers help promote local food systems (Feenstra, 1997), and for this reason, the USDA has committed to investing \$30M a year into marketing programs for farmers markets and other local food venues, in addition to reserving \$70M to distribute as grant funding to research fruits and vegetables

(Strom, 2014). Agriculture Secretary Vilsack has said that the increased investment in local food systems will “support the livelihoods of farmers and ranchers, especially smaller operations, while strengthening economies in communities” (USDA, 2014f, p. 1).

Most farms that perform direct-to-consumer marketing are small-scale farms. They tend to cultivate a variety of crops, and place greater importance on environmentally sound growing practices than profits (Martinez, et al., 2010). Through local food markets, such as farmers markets and community supported agriculture (CSA) programs, farmers sell directly to consumers and eliminate the corporate interest of “middlemen.”¹⁶ Localized sustainable farmers inherently place greater importance on their community’s well-being by eliminating those middlemen and utilizing local food markets. The federal government has recognized the economic benefits of local food systems, but its relatively marginal investment will not be enough to overcome the challenges to commoditized food. Policies need to directly distribute food system control to local communities. By doing this and de-commoditizing agriculture, local food policies will be able to supply communities with fresh food.

3.4.5 The Market for Community Supported Agriculture

The current market for commoditized food has created a premium for locally produced food, which is dependent on a strong bond between the farm and its consumers (Mount, 2012). Thus, a larger farm size can make it difficult for farmers who are seeking to strengthen their direct-to-consumer relationships (Mount, 2012). CSAs provide a platform by which farmers and consumers can connect. In 2005, there were about 1,100

¹⁶ Middlemen are entities that market and distribute, but do not directly produce or consume the food products.

US farms that operated a CSA (Martinez, et al., 2010), and by 2007, there were about 3,000 registered CSAs (Barker, 2007). In typical CSA farm models, local community members can become shareholders of a farm's operation by providing a certain amount of money at the start of each growing season and implicitly share in the inherent risks of farming.¹⁷ The farmers give shareholders a variety of fresh produce weekly in return for their shareholder's financial commitment.

CSA farms originated with small, diversified vegetable farms that produce over 40 kinds of crops during the growing season (Hendrickson & Ostrom, 1999). The growing season in the US typically stretches from May through October, during which time different crops develop at their own rates and must be planted on separate dates accordingly. Before the growing season, the principal farm operator must thoroughly organize the crop plan in order successfully plant and harvest an adequate amount each week for each shareholder.

According to Hendrickson and Ostrom's thorough surveys (1999), the farms that earn a full-time income typically produce for at least 80 to 100 shareholders and sell each share for over \$400 per season. Selling at the beginning of the season clearly defines the farmer's budget, but in order to continually plant, maintain, and harvest crops throughout the growing season, CSA farms must hire one seasonal worker for every 20 to 40 shares on average.¹⁸

¹⁷ By their nature, CSA farms thrive when they are in close proximity to urban centers (Hendrickson & Ostrom, 1999).

¹⁸ The market for local foods can be limited by its need to employ high quantities of labor, inconsistent availability and quality, difficulty harvesting large volumes at a pre-specified date, and supplying produce of a standardized quality year-round (Martinez, et al., 2010). These and other challenges will be explored in depth in the following chapter.

Comparably, organic farmers have reported significantly higher wage costs than their conventional counterparts (Argiles & Brown, 2010). Sustainable agriculture relies more heavily on human resources to manage the multitude of necessary farm operations at any given time (Ikerd, 1993). The inherently labor-intensive diversified farming systems are certainly no longer the norm in agriculture. Industrial agriculture is lauded for its ability to decrease the percentage of people employed in agriculture, which dropped by about 20 percent between 1930 and 2000 (Conklin, Dimitri, & Effland, 2005). The decreased demand for agricultural labor is correlated with the increased urbanization witnessed over the last hundred years. Less people were needed in the fields to supply enough food for those in the city; however, a growing number are realizing that the growing methods that enabled fewer agricultural labor, greater agribusiness' profits, and a rapid urban transition were economically and biologically unsustainable. Advocates for a sustainable agriculture stress the importance of labor-intensive and small-scale, diversified and localized food production, even in urban areas.

Urban agriculture is largely small-scale and diversified; therefore, it is also labor intensive (Rajput, 2013). Given a large available labor supply and high levels of unemployment in the US, urban agriculture can increase local food security, reduce transportation costs, and create employment opportunities in its respective city area (Rajput, 2013). Since they require more labor, urban farms have the potential to reduce unemployment rates and food insecurity in their communities (Conner & Levine, 2007). Initiatives to boost urban agriculture must be controlled by local communities in order for all urban consumers to enjoy food security with fresh and healthy produce.

Owning land is essential to the adoption of environmentally sound growing practices. Farmers who do not own the land on which they farm are less likely to employ the labor necessary to sustain agroecological growing practices (Horrigan, Lawrence, & Walker, 2002). As more people become urbanized, the need for local communities to regain access to controlling their food systems will become more and more dire.

3.5 Social Considerations of Sustainable Agriculture

CSAs and farmers markets, two of the most common examples of local food systems, offer consumers a place to connect with their source of food. Consumers have reported that farmers markets helped them positively rethink their place in the food system and become more aware of ecological processes inherent in agriculture (Turner & Hope, 2014). Consequently, bringing consumers and farmers in more direct contact will help keep agriculture's production and consumption within the constraints of its local ecosystems (Feagan, 2007). The direct producer-consumer relationship that is fundamental to local food systems is naturally place-based. That is to say, the shortened food supply chain in CSA models, for example, are centered on the location of the farm and associated with its ecology and tradition (Feagan, 2007). The characteristics that enable and constrain the production-consumption cycle are embedded in unique place-oriented ecological relations (Feagan, 2007).

Within the scope of a farmers market or a CSA, the relationship between farmers and consumers is familiar, rooted in place, and embedded in social ties and mutual appreciation for sustainable, local food (Hinrichs, 2000). Both parties, through their habitual interactions, learn the circumstances and interests of the other, implying that the relationship is embedded in its local ecosystem as well as its social and economic

conditions. As such, a CSA's economic motivations are necessarily embedded in their social context. Since the producer-consumer relationship incorporates shared values in CSAs and farmers markets, in addition to being locally bound and involving regular face-to-face interactions, it is difficult to separate economic and social aspects of food production-consumption cycles.

CSAs involve close, non-market based relationships and tend to inspire consumer awareness of the quality of their food. Over the course of a growing season, many CSA shareholders become familiar with their farms' nuances and the significance of their sustainable growing practices. CSAs have the opportunity to quickly build a community comprised of the farm's consumers and farmers and become embedded in the social and environmental relations (Feagan & Henderson, 2009).

Beyond the embeddedness, the producer-consumer relationship also has an element of marketness, where both farmers and consumers attempt to maximize their respective utilities through the local foods market (Hinrichs, 2000). On that account, belonging to a CSA appears to be a privileged activity where only upper-income classes can afford the local food premium (Farmer, Farmer, Shubowitz, Wilk, & Wiley, 2011). In order to be profitable in the current market structure that has commoditized food, CSA farmers most often sell shares to those who are already food secure rather than food insecure populations, particularly those in urban areas (Bellows & Hamm, 2001). Localizing food in urban areas does not automatically rid communities of social injustice or inequity; instead, if they are to successfully improve the food security of the urban poor, efforts must commit to work against inequities more than focusing on the current capitalist market-based incentives (Allen, 2010).

Advocates for equitable local foods must promote the de-commoditization of food to achieve local community food sovereignty, defined by the right of peoples to determine their own system of agriculture (Donkers, 2014). Goals of social equity in fresh and healthy food distribution, such as food sovereignty, can be more easily developed and evaluated at the local level, in part because community-owned efforts can address the basic needs to ensure sustainable local foods (Allen, 2010). One oft-cited method to attaining food sovereignty is redistributing land debt-free to the landless and/or urban poor (Barker, 2007). Large agribusiness subsidies must be diverted to the interests of marginalized populations who wish to regain their rights to grow their own food without relying on market mechanisms to supply foreign food imports.

As an example, during Brazil's dictatorial period between 1979 and 1983, millions of peasants were evicted from their land in the push for capitalist and neoliberal agricultural policies. The Landless Rural Workers' Movement, otherwise known as the MST (Movimento dos Trabalhadores Sem Terra), made up of a million or so peasants, occupied and cultivated fifteen million acres of idle land that had been privatized. By controlling their communities' food systems locally, towns with MST occupations significantly reduced malnutrition and poverty. The Brazilian government has since legalized the MST occupations and recognized the many non-monetary benefits of local food systems (Barker, 2007). This brief example shows how trade rules should prefer the option that de-commoditizes food so that local production-consumption cycles are able to improve local self-reliance and food security regardless of a liberalized market. International trade interests and food policies should not create obstacles for the landless

or urban poor to access land, seeds, and water for self-reliant food production-consumption cycles (Barker, 2007).

3.6 Conclusion

Sustainable agriculture implies that agriculture should be controlled locally and de-commoditized. Local community control of food systems will adapt growing practices to fit local conditions. For example, public community interests can disallow growing practices that are suited for a high-rainfall area from being employed in an arid climate (Horrigan, Lawrence, & Walker, 2002). Locally planned food systems can allow farmers to vary their growing methods temporally and spatially depending on their local environment in order to successfully produce crop diversity (Rigby & Caceres, 2001).

The nature of localized farming is localized and also diversified. The ecological benefits to diversified farming systems are most significant at the local scale, and they also clearly affect regional landscapes (Kremen & Miles, 2012). Local food systems are embedded in their environmental, economic, and social relations, so food holds a different status than other goods and should not be commoditized. The producer-consumer relationship in a CSA incorporates shared values that cannot be monetized. Thus, it is difficult to separate the economic and social implications of food when discussing community controlled local food systems (Fieldhouse, 1996).

Localized food systems are reuniting farmers and consumers, but in an inherently different way than before. Rural landscapes have been transformed, and the subsidization of commoditized food has led consumers to become acclimated to low food prices, convenient markets of year-round produce, and standardized quality (Mount, 2012).

Despite these transformations, some upper-income consumers are expanding the demand

for local foods by paying a price premium. The localization of food should not be left at to the market and should serve as a guiding post for future research and policy agendas (Rigby & Caceres, 2001).

Chapter Four: The Challenges of Local Food Systems

4.1 Introduction

People around the world are depending more and more on the market to supply them with food that is imported from other regions. In fact, food traveled 25 percent farther in 2000 than it did in 1980, and food import dependence increased globally (Halweil, 2002). Neoclassical economists often submit that long-distance food trade may be efficient because regions can buy food from the lowest-cost providers (Halweil, 2002), but as previously explained, the lowest cost producers are subsidized to employ environmentally harmful growing practices in their pursuit of profits. A recent UN report urges policy makers to strongly consider the benefits of local food systems to ensure sustainable agricultural systems (UNCTAD, 2013). The UN's Food and Agriculture Organization has emphasized the need to develop the capacity of future generations to feed themselves because the food trade paradigm has left many malnourished and underfed. In the US, many urban poor do not even possess the demand to have supermarkets in their own neighborhoods. In order to feed themselves, communities must become self-reliant and control their own food systems, suggesting a reduced dependence on market fluctuations, and they must find ways to foster non-exploitative trading relationships (Hendrickson, 1995).

Localized production and self-reliance depends on each locality's climate, soil well-being, and access to fresh water, which are all local-specific (Halweil, 2002). Only local site-specific knowledge can be employed in diversified agriculture in order to successfully apply farm management strategies aimed at long-term sustainability in food production, such as the development of beneficial crop rotations and building up soil fertility without chemical inputs (Carolan, 2005). The assessment of local food systems depends primarily on the definition of "local" in local food systems; thus, only few case studies have examined their non-monetized benefits and impacts (Jones, Comfort, & Hillier, 2004).

Food system localization does not intend to demonize all forms of globalization (Hinrichs, 2003). When portraying all globalization as evil, food localism can seem xenophobic and defensive (Feagan, 2007). Cooperation and openness in the community planning of local food systems can help solve issues of equity and food security. The current capitalist mode, however, dictates that local food systems are based on competition and appropriable or sold at a price, which easily allows for territories to be cultivated for the local elites that can pay the highest premium for local foods (Hinrichs, 2003). Access to fresh, local food can thus seem elitist and only founded on market incentives.

A different, and arguably more positive, interpretation of localism can suggest a rootedness in a sense of place (Feagan, 2007). This sense of place can be local and still have permeable and ever-changing boundaries; however, those boundaries that constrain the locality serve to connect food producers and consumers in a geographically bound, place-based setting (Feagan, 2007). Even though local food systems are contextualized

spatially, a more nuanced knowledge of each local food system's physical space will implicate its inherent social issues (Hinrichs, 2003). Thus, the determination of what is "local" in a food system also necessarily involves its social, ecological, and political circumstances (Feagan, 2007). All local-specific circumstances must be understood in order for power relations to be redistributed. By de-commoditizing agriculture and allowing for community to plan their own food system, governments can advance other related social, economic, and environmental goals.

Since the latter parts of the 21st century in particular, the local food movement has been spreading across the nation, promising local communities to employ biological growing methods while meeting food needs as local as possible. An example of this growing market for local foods is realized in the increased number of farmers markets and CSA models in the US. However, the percentage of direct-to-consumer food sales only accounted for 0.4 percent of total agricultural sales in the US in 2007 (Martinez, et al., 2010). Market structures that inhibit the distribution of local foods to all populations must be eliminated and not supported by government policy.

Recently, the USDA and federal government have revamped their efforts to increase the demand for direct-to-consumer foods. The 2014 Farm Bill tripled the funding intended to market and promote local food systems. Now, the USDA has an annual \$15 million to support food hubs, food distribution businesses, and processing and storage sites, while another \$15 million will contribute to the marketing of farmers markets and other direct-to-consumer venues (USDA, 2014e). The local food movement will grow as more consumers become concerned with the growing practices of their food.

Despite the USDA's investment in local foods, many localized farms are unable to cover costs while providing their communities' food needs. Issues regarding reliability, volume, and seasonality have limited the ability of local foods to replace the currently predominant capitalist and industrial food system (Jones, Comfort, & Hillier, 2004). Localized food cannot provide consumers with the convenience of year-round variety that they are now accustomed to getting at the supermarket (Jones, Comfort, & Hillier, 2004). Since food is commoditized in global markets, localized farmers must compete with the convenience provided by industrial agriculture. They must not only continue to sell their environmentally-friendly produce directly to consumers, but they also must cooperate with one another in order to "capture the marketing and distribution advantages that come with scale" (Halweil, 2002, p. 41). Through collaboration, farmers can identify barriers preventing them from supplying their local markets with local foods (Anderson, 2007).

By removing food from the capitalist market, direct-to-consumer food networks, such as farmer cooperatives, can play a pivotal role in the well-being of local economies. Diverting the subsidies that support industrial agriculture to farmer cooperatives will help the local food market earn economies of scale in production and distribution. This chapter will draw from several case studies that review established local food systems in order to identify some of the market challenges surrounding the movement.

4.2 The Economic Challenges of Local Food Production

While covering costs is an important objective, many farmers are more motivated by an environmental ethic than the expansion of their consumer market. Ostrom (1997) mapped the CSA landscape in Wisconsin and Minnesota; her study focused on 24 CSA

farms and 2 food cooperatives in the region. The grand majority of the farmers she interviewed were primarily motivated by an environmental ethic to restore the soil and preserve their natural habitat while feeding households with quality organic produce (Ostrom, 1997). Pilgeram's (2011) similar case-study found that localized farmers in the Pacific Northwest are also primarily motivated by the same environmental ethic, in addition to feeding households with sustainably-grown, local produce. In other words, these localized farmers are not solely pursuing profits; their primary goal is to feed the local community by employing environmentally sustainable growing practices.

Based on the social and environmental goals expressed by many local food entities, measuring the well-being localized food based on financial profitability can be overly limiting (Matson & Thayer, 2013). The rest of the US food supply chain demotes social and environmental missions as secondary to profits, whereas localized food ventures serve as institutions that support public interests by being controlled at the local level (Matson & Thayer, 2013). Since local food systems are embedded in social and environmental relations, unlike systems with capitalist characteristics, many of the benefits and costs associated with local foods cannot be measured by a money metric (Buttel, 2006).

The reasoning that benefits and costs of local foods are not easily monetized was observed in a case-study conducted on Devon Acres Organic Farm in Brant County Ontario, Canada, where shareholders had more market-based perceptions of their CSA's costs and benefits than their supplying farmers (Feagan & Henderson, 2009). Some CSA members have commoditized their share based on the opportunity costs present in the marketplace. Other shareholders, however, did not commoditize their share and perceived

a responsibility to provide their farmer with enough to cover the costs of biological growing practices.

Farming is a lifestyle through which the perpetuation of values and longevity of a community can be as important to a farmer as an income (Edwards, Grove, TL, Harwood, & Pierce Colfer, 1993). Nonetheless, CSAs must at least cover their costs of production to be able to meet their social and environmental goals. Public subsidies that support industrial agriculture, however, have distorted the food market. Currently, many CSAs rely on alternate sources of income such as public subsidies, grants, or donations to cover their basic production costs (Allen, 2010, Guthman, Morris, & Allen, 2006). Furthermore, the subsidies that fund industrial and capitalist agriculture inhibit the ability of CSAs to feed low-income populations.

Due to industrial agriculture's heavy subsidization, many localized farmers reflected that the amount of labor that went into production far exceeds the market value of the produce. Farm labor requires long and bodily taxing hours, and there is a tendency for farmers to self-exploit themselves, which is not socially sustainable (Pilgeram, 2011). Pilgeram, Ostrom, and Feagan & Henderson all found this to be the case. Out of the extensive list of interviewed localized farmers in the Pacific Northwest, all were subsidizing the food they sold at farmers markets or CSAs with either off-farm income, their unpaid or poorly paid labor, or both (Pilgeram, 2011). Pilgeram notes that surviving as a sustainable farmer requires an off-farm income, some form of wealth, or the willingness "to live extremely, extremely simply" (Pilgeram, 2011, p. 388). Additionally, poorly paid interns and volunteers are essential to maintaining the viability of many of the interviewed farms in the Pacific Northwest (Pilgeram, 2011).

Similarly, Ostrom's (1997) case-study of the local food systems in Minnesota and Wisconsin found that all but two CSA farmers who were surveyed supplement their income with off-farm employment during the winter season. Their high labor costs for seasonal workers and low share prices were causes for their slender farm receipts and low farm incomes (Ostrom, 1997). In addition to their financial challenges, it was not uncommon for the surveyed farmers to work 80 to 100 hours per week. Unsurprisingly, many reported labor shortages and an inability to pay employees a fair wage.

The capitalist system that has commoditized food and supported industrial agriculture has not allowed CSA incomes to support their necessary labor requirements, nor to finance other expenses such as health and retirement plans, land, equipment, and housing. Even the majority of shareholders strongly agreed that their farmers were underpaid and overworked (Ostrom, 1997).

Feagan and Henderson's (2009) case-study of Devon Acres Organic Farm also indicated concern over inadequate wages, lack of capital, and an inability to secure volunteer work. Guy and Rice (2000) similarly conducted an extensive interview with one farmer, Ben Larson, the principle farm operator of the Old Trail Market CSA in Moorhead, MN. Larson reported to being challenged by the need to spend time away from the fields in order to market his products. Like many CSA farmers, Larson's income is inconsistent and exceedingly low, challenging his farming operation (Guy & Rice, 2000).

CSA is regarded as a model to sustain and amplify local control of food systems by revitalizing small-scale farming. A CSA farm is a formal alliance between sustainable farmers and their area's like-minded consumers; the socially-embedded economic

relationship depends on committed community members to keep farmers from becoming over-worked and under-paid (Ostrom, 1997). However, as Ostrom adequately puts it, “many farmers struggle to establish a stable and committed membership base. Rather than having a community of members supporting the farmers, most farmers were supporting the community” (Ostrom, 1997, p. 216).

CSA farmers can only set their share prices based on the upper limits of their members’ demands, which are arguably influenced by the cheap foods abundant in the globalized marketplace. Consequently, farmers do not set higher share prices in accordance with the real costs of production, subjecting them to a severe undervaluation of their labor and produce (Ostrom, 1997). Ideally, shareholder participation would increase to alleviate some of the time and labor constraints associated with the farmers’ low wages; however, without a federal effort to change the capitalist market structure in agriculture, CSAs will not be able to overcome these constraints.

Localized farms may not be able to cover costs because farmers must sell their produce at socially and economically unsustainable prices just to compete with the artificially low-priced food products that are available year-round at grocery stores. Policy strategies should de-commoditize food and end all subsidies to industrial agribusinesses. Additionally, policies should directly subsidize the local control of food systems so that even impoverished populations can have food security regardless of general market fluctuations. With these farm and food policies, localized farmers can earn stable and adequate incomes.

4.3 The Possibilities and Challenges of Urban Agriculture

Local food systems capture interrelated social and economic issues concerning race, poverty, community development, and public health (Gatrell, Reid, & Ross, 2011). Recent research has shed light on issues concerning community food security in predominantly urban and low-income communities (Young, Karpyn, Uy, Wich, & Glyn, 2011). During the 20th century, as agricultural production was commoditized and consolidated by capitalist agribusinesses, rural populations moved to urban areas. The large demand created by the concentration of mid- to upper-class consumers determined where food would become allocated in cities. Eventually fresh and healthy food was not sold to the poor because they did not have the resources to demand it (Hinrichs, 2000).

In order to establish food sovereignty, communities must control the arrangements of their agricultural production and distribution so as not to be reliant on the market. The current organization of the market prevails upon the commoditization of food, and corporate producers respond by pursuing the largest profits. In this state of affairs, low-income populations neither have access to become food sovereign, nor have the financial means to demand fresh and healthy food options in the market. As a result, food deserts have emerged in areas where the urban poor, typically comprised of minority communities, live. In general, the capitalist market does not create an incentive for firms to distribute fresh, healthy, and local produce to the poor, especially those in urban areas.

The capitalist market stratifies food quality access by class; particularly the American poor and racial minorities lack access to healthy food (Macias, 2008). Given the current condition of income inequality in the US, the currently marginalized populations can be fed with the local control of de-commoditized urban food systems.

Community-planned urban agriculture would incorporate the agricultural processes of production, distribution, and consumption within urban areas. Urban agriculture has the potential to reduce energy costs and food miles, all while improving food security for poor communities (Horrigan, Lawrence, & Walker, 2002). The successes of urban agriculture, however, are measured by many as the farm's sales and profitability, rather than the other social goods provided, such as a community's food sovereignty (Hale, 2014). Regarding farm profitability as a farm's key economic output can result in low-income populations not being present in policy and financial planning decisions concerning urban food development, which highlights the ethical imperative to de-commoditize food systems (Hale, 2014).

Although some farmers may have the social objective to feed the urban poor, they are limited by access to land in urban areas (Pilgeram, 2011). Finding land suitable for CSA farming only requires small parcels of land, and by their nature, CSAs thrive when in close proximity to the populations they serve. Consequently, obtaining affordable land near cities is difficult because land values are more inflated when in close proximity to a city. The capitalist persuasion has induced farmers to produce on urban land for local elites. Subsidizing the urban poor to acquire urban land for food production will help guarantee their access to local food, and ideally, the de-commoditization of agriculture will prompt them to produce for their local communities.¹⁹

Converting unused urban land into spaces for agricultural production requires resources such as seeds, equipment, labor, and water. Nonetheless, policy support should

¹⁹ Under the stipulation that vacant land will be farmed for local consumption, redistributing land ownership to those who will farm for the urban poor's consumption can have positive effects on their access to fresh and local produce (Metcalf & Widener, 2011).

provide poor urban residents with the power to make decisions about their food systems. After all, the impacts of land-use change under community control in urban areas can have positive social and environmental externalities, such as public health, lower ecological footprint, and food security for the urban poor.²⁰

4.4 Addressing Issues of Scale

Many believe that local food systems will not be able to meet the demand for food compared to the capitalist process that has manifested in industrial agriculture. Large-scale food production has been produced and processed in select facilities. Having many community-based food processing plants requires changing the way in which waste disposal, smell, and aesthetics in food production are addressed (Jones, Comfort, & Hillier, 2004). Establishing local food systems can imply that economies of scale in production and distribution cannot be achieved. Localized food production may not be able to earn the same kind of economies of scale acquired by large-scale agribusinesses when assessed from by purely monetary definition of efficiency. Nonetheless, localized food cannot provide consumers with the convenience of year-round produce that they are now accustomed to getting at the supermarket (Jones, Comfort, & Hillier, 2004).

Institutional kitchens, such as hospitals, schools, and restaurants, prefer to support local food producers in order to appease customers with freshness, variety, and detailed information on the food's local history. However, those who purchase foods for restaurants, hotels, supermarkets, and cafeterias find it more convenient to deal with one

²⁰ Cuba is one oft-cited example of the successes of urban agriculture. Since the US enacted a trade embargo with Cuba, over 8,000 urban gardens in Havana have emerged to meet the demand for locally produced food (Barker, 2007). Since then, Cuba has depended heavily on urban agriculture; about 90 percent of the produce consumed in Havana is grown in the city's area (Halweil, 2002). The US embargo forced Cuba to supply its own food without agrochemicals or food imports, so officials pragmatically supported its citizens to secure vacant land, seeds, and water.

or two wholesalers that can supply any food product on a year-round basis (Halweil, 2002). When working independently, small-scale producers are unable to cover costs, much less build the infrastructure necessary to supply food to institutional kitchens (Borst, 2010). Issues regarding reliability, volume, and seasonality must be addressed by local food systems so that localized farmers can sell to their local institutional kitchens (Jones, Comfort, & Hillier, 2004).

To make it more convenient for institutional kitchens to support local food, groups of farmers have begun pooling their resources together to supply a greater amount collectively. A farmer cooperative can benefit from the employment of a marketer or broker, along with shared storage and distribution facilities. CSA farmer-to-farmer collaboration in the form of food hubs can allow farmers to farm, instead of engaging in the multitude of social relationships often demanded of them. In other words, by pooling resources farmer cooperatives can hire marketers, distributors, and other necessary personnel to satisfy all the necessary roles for local food systems to grow. The collaborative nature of food hubs delivers both the benefits of direct exchange and economies of scale in distribution (Mount, 2012). CSA farmer-to-farmer collaboration would enable them to exchange useful knowledge, share resources and equipment, organize marketing efforts, and develop other methods to achieve economies of scale in production (Ostrom, 1997).

In 1992, one of the first CSA farmer-to-farmer networks was formed in Madison, Wisconsin called the Madison Area Community Supported Agriculture Coalition (MACSAC). Comparably, the Minnesota-Western Wisconsin Community Farm Association (MWCFA) was launched in 1993 with similar goals, to help farmers pool

their resources and ideas. Members of the MACSAC and MWCFA characterize their relationship with other farmers as one that is mutually beneficial and sustained by a common purpose to progress the movement for localized food systems (Ostrom, 1997). Ostrom writes that knowledge is circulated with a common ethic among CSA producers that unselfishly offer “assistance to one another” (Ostrom, 1997, p. 276). As an intermediary between producers and consumers, the functions of a food hub can help a local food supply chain develop (Borst, 2010).

Since 2009, the number of food hubs has increased by over 65 percent (Rural Cooperatives, 2014). One example of a food hub was started in Vermont, where compared to the rest of the US, local food systems have quickly developed. Vermont farmers who sold produce directly to consumers earned \$9.5 million in 2002, and in only five years, that figured jumped to \$22.8 million by 2007 (Schmidt, Kolodinsky, DeSisto, & Conte, 2011). The Intervale Food Hub in Vermont was uniquely positioned to help in the collaboration between farmers, consumers, distributors, marketers, and the like, all parties in the Vermont food supply chain. A farmer collaborative, like the Intervale Food Hub, can allow the sharing and co-ownership of resources, such as storage space, distribution channels, equipment, and consumers. The Intervale Food Hub serves as a place that pools farmers’ produce into the Hub’s CSA, from where it is then distributed and sold to different consumer markets (Schmidt, Kolodinsky, DeSisto, & Conte, 2011).

Focus groups and interviews across the state were conducted with the guidance of research staff from the University of Vermont along with several staff from the Intervale Food Hub; those studies employed robust methods to understand the needs of the Hub’s supplying farmers and their consumers alike (Schmidt, Kolodinsky, DeSisto, & Conte,

2011). What they found was that the food hub increased all participating farmer's food production, sales, and income while marketing to new customers and meeting their consumer demand. To achieve these impressive results, Schmidt, et. al. (2011) identified that the Intervale Food Hub staff were able to market and distribute their produce primarily because grant funds were secured. The USDA, private donors, and other public and private grant funds provided about \$229,000 to support the Vermont local foods start-up; the grants helped offset start-up costs and staff salaries that would have otherwise been too much of a financial burden for the participating farmers to provide independently (Schmidt, Kolodinsky, DeSisto, & Conte, 2011). The dominant capitalist influence on agriculture and the subsidization of agribusinesses prevent the initiation of local food hubs without external sources of funding. Instead of relying on grants and donations, communities in control of their food systems should directly subsidize the generation of food hubs.

For successful collaboration, forming cooperatives out of the preexisting informal networks of farmers may overcome the challenge of scale in production and distribution. The collaboration between CSA farmers and consumers in regional networks has allowed coalitions, such as the MACSAC and MWCFA in the Midwest, to overcome the economic constraints of purely monetized efficiency standards (Ostrom, 1997). Nonetheless, food should be de-commoditized, and food hubs should be directly supported by local policy agendas.

Policy makers at the federal level must recognize that each city's local food system is different and enact policies that enable communities to independently manage and plan the formation of their food hubs. Experimentation with the pre-existing local

food networks may be necessary to establish long-term viability. Food hubs provide a general venue through which resources can be exchanged among stakeholders more efficiently. However, each food hub will need to adapt its decision making process based on its particular circumstances and then clearly designate responsibilities to its stakeholders. Research should also explore the production levels required to produce enough for large-scale demand, the optimal number of farms for a profitable food hub, as well as the optimal allocation of resources and money that farmers should pay to invest in and take ownership of a food hub (Schmidt, Kolodinsky, DeSisto, & Conte, 2011). Additionally, policy makers should consider how external market forces and realities of current neoliberal policies would affect the formulation and evolution of food hubs in their area.

4.5 Conclusion

Both farmers and consumers attempt to maximize their respective utilities through the local foods market (Hinrichs, 2000). This is especially the case today because food remains commoditized. For example, CSA members may not return as shareholders if the share prices are too high (Farmer, Farmer, Shubowitz, Wilk, & Wiley, 2011). Conversely, if share prices are too low relative to their marginal cost, then CSA farmers will likely self-exploit themselves with the desire to keep customers (Hinrichs, 2000). As a result, the balance of power usually benefits CSA shareholders, such that farmers must carefully evaluate market fluctuations in order to maintain their direct, social ties with existing members (Hinrichs, 2000).

Despite efforts to price food accurately, farmers from different case studies reflected that the amount of labor that went into production far exceeds the market value

of the produce. Their CSA income did not support their necessary labor requirements, nor did it finance other expenses such as health and retirement packages, land, equipment, and housing. CSA farmers can only set their prices based on the upper limits of their members' demands, which are influenced by the subsidization of industrial foods abundant in the marketplace. Consequently, farmers do not set higher share prices in accordance with the real costs of production, subjecting them to a severe undervaluation of their labor and produce (Ostrom, 1997).

In their efforts to cover costs of production, most localized farmers sell shares to members of the upper-classes, which serves to further stratify access to fresh, quality food. In particular, the American poor and racial minorities lack access to healthy food (Macias, 2008). One method by which cities can provide greater food security to urban and marginalized populations is through locally planned urban agriculture, which incorporates the agricultural processes of production, distribution, and consumption within urban areas. The local public planning of urban agriculture will facilitate the serving of fresh, local food to its urban residents while also reducing energy costs and food miles. A common point of debate in urban agriculture is that some only consider the financial worth of the urban agricultural projects in their sales, rather than the other social goods provided, such as a public health and food security (Hale, 2014). Policy measures must move beyond the purely monetized definition of efficiency.

Local land use decisions should consider its city's vacant lots as opportunities to employ the urban poor to farm that land. Some may contend that despite worthy social and environmental goals that extend beyond the market, local food systems are inherently too small-scale to feed growing populations. Food hubs can be developed by local policy

makers to meet the growing consumer demand for food, but these policies must be coupled by a structural economic transition to de-commoditize food.

By pooling resources farmer cooperatives can hire marketers, distributors, and other necessary personnel to satisfy all the necessary roles for effective collaboration. The collaborative nature of food hubs can deliver both the benefits of direct exchange and economies of scale in the production and distribution of food (Mount, 2012). Certain food hubs in the Minnesota, Wisconsin, and Vermont have enhanced all their participating farmer's food production and distribution networks. Private foundations, donations, and grants, however, are primary sources of funding for food hub in the US (Matson & Thayer, 2013).

Local foods must be recognized as desirable in order to shift agricultural subsidies to small-scale producers that will form food hubs. Collaborative methods should be specific per locality; the local climate conditions and land availability with respect to population density and production possibilities should be addressed in the planning of each local cooperative (Donkers, 2014). By establishing local control of de-commoditized food systems, food producers can be subsidized to cover the full costs of food production.

Chapter Five: Conclusion

The Green Revolution of the 1960s commoditized agriculture by expanding farm specialization and liberalizing trade flows in efforts to feed the developing world's rapidly booming populations. The Green Revolution enabled the rapid improvements in agricultural productivity and monetary efficiency; however, it also initiated a worldwide reduction in biodiversity in farming and favored fewer and larger agribusinesses at the expenses of small-landholders (Rosset, 2006). Governments around the world have valued the capitalist expansion of industrial growing practices based on a purely monetized definition of efficiency. The price of food paid by consumers, however, does not reflect the food's true cost of production. Negative social and environmental externalities were neglected by the Green Revolution, while short-term yield (not output) increases influenced the widespread use of environmentally harmful growing practices.

Consistent with the Green Revolution, large-scale agricultural operations, which have developed since WWII in the US, became better suited to profit from the commoditization of agriculture and its subsequent neoliberal trade policies. Specialized agricultural production helped to change the average scale of farms such that small-scale farms were consolidated into large-scale agribusinesses. US agricultural policy has supported this trend by increasing the farm income of the largest farms relative to their agricultural production. Additionally, small-scale farmers find it difficult to enter the US

agricultural market on account of restrictively high land prices and concentrated market power.

The “Good Farming Practices” of the USDA have encouraged farmers to increase yields over one-year time periods, which have ultimately diminished soil long-term resiliency by inefficiently watering and over-tilling land (US Government Accountability Office, 2014). In other words, federal subsidies have contributed to the primary pursuit of agribusiness profits while overusing natural resources. Biologically sustainable growing practices remain at a financial disadvantage given the current market structure. The social equity of food distribution also remains heavily dependent on favorable market outcomes.

Agricultural practices that require enormous amounts of water, energy, and chemicals that result in high toxicity levels in soil and water systems should be banned in the US. The negative environmental effects of industrial agriculture, such as the deterioration of natural habitats and the loss in biodiversity, should be accounted in the real cost of industrial agriculture. The many economic, social, and environmental problems inherent in industrial agriculture have led scholars, activists, and farmers to support sustainable agriculture, which stands in contrast to industrial agriculture. Instead of engaging in profit seeking behavior by depending on chemically based inputs, sustainable agriculture utilizes ecosystem services and does not only pursue profit generation. Efficient agricultural production cannot be evaluated only based on market values, because sustainable agriculture captures broader economic, environmental, and social needs.

In general, sustainable agricultural systems cause less soil erosion, conserve water, foster biodiversity, and improve soil organic matter compared to conventional

farming systems. More specifically, sustainable farming systems rely on local ecosystem services to produce a diversity of crop varieties, and thus, food production that is sustainable is highly specific to each farm's location. The localized nature of sustainable agriculture requires more labor per acre than conventional farming in order to biologically manage the farm's biodiversity.

Many localized and sustainable farmers are motivated by social and environmental concerns. Since local food systems are embedded in social and environmental relations, unlike systems with industrial characteristics, many of the benefits and costs associated with local foods cannot be measured by a money metric. Because of the current market structure, CSA farmers have reported inconsistent incomes, long hours, and off-farm responsibilities as key challenges in sustaining their operations each year. Other issues regarding reliability, volume, and seasonality have limited the ability of local food systems to replace the dominant capitalist and industrial agricultural paradigm.

Some communities have committed to finding solutions to these issues by establishing local food and farm cooperatives. By collaborating, farmers can exchange useful knowledge, share resources and equipment, organize marketing efforts, and in the end, help each other overcome some of the challenges facing the local food movement. While many challenges are inhibiting the spread of local food systems, the need to develop long-term food security in the US and abroad is dire. Shifting the focus of food policies to the local level can help solve economic, social, and environmental issues.

Local food systems promote the local production of goods that were once imported and dependent on the market. For example, constructing unheated greenhouse

frames in the northern parts of the US would replace vegetables currently shipped from outside the regions (Bellows & Hamm, 2001). Zero food trade may not be totally feasible (bananas and avocados do not grow in Colorado), nor is it responsible (floods and droughts may require food importation to regions most affected by climate change). Thus, equitable trade policies must be developed, but they should prefer local production-consumption cycles (Clancy & Ruhf, 2010). When planned locally, small-scale CSAs are better able to provide food security to their local communities in the short term. CSAs also contribute a perspective that can help de-commoditize and value food as more than another commodity that is bought, sold, and distributed solely based on profitability. Food systems that are measured only by their profitability will perpetuate the class bias among consumers of localized products.²¹

Policies must discontinue the support given to capitalist agribusinesses. By remaining a commoditized market, the food industry continues to be subject to systemic inequity and unfavorable outcomes. Currently, the commoditized food market creates a need to expand the demand-side of the market for local foods in order to make it economically viable for small, environmentally sustainable farms to provide their local communities with diverse, low-energy food, especially in urban areas. The USDA has shown that it believes in investing more into local foods' marketing programs to drive up consumer demand by investing in local foods, which may prove beneficial to the industry's expansion. After all, lack of consumer demand is one reason why many localized farmers report to not being profitable.

²¹ Given the current commoditization of food, the local food's class bias can be reduced with policies aimed at addressing the flat wages observed in the US since the late 1970s, particularly given the higher price of localized food.

The supply-side of the local foods market is inhibited from producing a profitable output because subsidies support large-scale, specialized, and export-oriented agricultural systems. Those subsidies are a reflection of the commoditization of agriculture, and the federal government must end those subsidies to eliminate the market distortion that is driving down the price of industrially grown food below socially optimal levels. If food remains commoditized, the price of food should reflect the full costs of production, including all externalities, and subsidies should not distort the producer competition between localized and industrialized farms.

Structural changes are needed to assist in the de-commoditization of food. This thesis has argued that the US government must realize the non-monetary benefits of localized and diversified farming systems. Communities should gain access to controlling their own food systems by being given the necessary means to subsidize farmers pursue social and environmental goals. By de-commoditizing and subsidizing local food systems, agricultural production can lead to socially equitable and environmentally sustainable outcomes.

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