Farmer's Motivations to Practice Sustainable Agriculture

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Abstract

An increasing awareness of human and environmental health issues and the destruction of family farms and rural communities have caused a significant change in the way many farmers, consumers, and policy-makers are thinking about and relating to food, the results of which can be seen largely in the growth of the organic and sustainable food industry. This paper attempts to examine and explain farmers' attitudes towards sustainable agriculture, and their motivations to use sustainable methods of production. A survey was distributed to 533 farms that are members of the Northeast Organic Food Association of New York (NOFA-NY). The data obtained from the survey are used to test the degree to which farmer's demographics and values influence their choice to use sustainable agricultural methods. As expected, there was evidence of a strong positive correlation between farmer's opinions about sustainable agriculture and the extent to which they practiced sustainable agriculture. Factors that were in general most important to the respondents were the health of their families, the environment, and the health of their community and customers. However, it was found that those farmers who are most sustainable are those who placed the most importance on the impact of their farm on the environment, the social impact of their farm on the community, and religious or spiritual factors. It was also found that the size of the farm and the income of the farm were both associated with lower levels of sustainability. Further analysis discussed other reasons the respondents may have chosen to practice sustainable agriculture, such as animal welfare and a growing organic market.

Table of Contents

Abstract.. Page ii
Introduction..Page 1

Chapter One: The Evolution of Agriculture…………………………………Page 1

From Hunting and Gathering to Farming...Page 1
Impact of Industrial Agriculture on the Environment...........................Page 4
The Green Revolution... ....Page 8
The Social Impact of Agricultural Industrialization..............................Page 14

Chapter 2: Sustainable Agriculture……………………..…………………Page 23

Sustainable Community Agriculture...Page 23
Sustainable Agriculture and Ecology..Page 29
Classifying Sustainable Farms and Products..................................Page 32
Farmer Motivations and Barriers to Growing Sustainably...............Page 34
Conclusion...Page 37

Chapter 3: Survey Methods and Analysis……………………………………Page 39
Methods...Page 39
Univariate Analysis..Page 40
Demographics..Page 40
The Farms..Page 41
Labor..Page 43
Factors Influencing Farming Practices..Page 44
Opinions about Farming Practices...Page 45
Personal Farming Practices...Page 48
Multivariate Analysis...Page 51
Likert Questions Scores..Page 52
Demographic Influences on Sustainability....................................Page 53
Decision-making and Sustainability...Page 56
Other Important Influences on Farming Practices...........................Page 58

Chapter 4: Conclusions and Suggestions for Further Research……………......Page 63

Appendix:

Survey..Page 67
Refrences..Page 74

Chapter One: The Evolution of Agriculture

In the past century, agriculture has been rapidly industrialized to the point that almost all aspects of farming, production, processing, marketing, and sale have been streamlined and mechanized. Though it has brought benefits in terms of technological advancement and economic profitability to some, studies have shown that industrial agriculture has led to a deterioration of human living conditions and well-being in rural communities, and to a deterioration of our natural environment. Such developments show that though the evolution of agriculture has allowed humans to progress in many ways, the most recent industrialization may be having unintended impacts on individuals, communities, the economy, and our environment. In response to these negative impacts, many consumers and producers are choosing to switch to more socially responsible and sustainable methods of farming, which have been shown to reverse the negative impacts of industrialized agriculture. The purpose of this study is to take a closer look at the motivations that cause farmers to choose such methods, and at the impact that the choice has made on their lives.

From Hunting and Gathering to Farming

The success of humanity, though often contributed to our intellect, is also in large part attributable to our ability to live on almost anything (Anderson 2005:12). The vast majority of hunter-gatherers in the past depended mostly on plant-foods, or on fish and shellfish. However, in areas where there was less food variety (deserts or tundras), our ancestors still managed to survive and even thrive. Hunter-gathers could usually assume that what they were eating was a reasonably well-balanced diet; foraging on nutrient-rich items such as berries, nuts, and small animals, and taking care to consume fats which were less commonly available. As agriculture became intensive, however, eating well-balanced meals became difficult, as farmers found it easiest to grow starchy and low-nutrient foods such as maize and potatoes, which fulfill only a small percentage of our dietary needs (Anderson 2005).

Horticulture can be defined as small scale agriculture, or gardening, involving the cultivation of domesticated plants by way of manual labor, and is thought to have appeared about 10,000 years ago. To put this in perspective, humans are thought to have arrived (in a primitive form) about 4 million years ago, and developed more advanced tools and communication 30,000 to 40,000 years ago. Horticultural societies are thought to have sprung up independently at somewhat similar times in regions including, but not limited to, the Middle East, Southeast Asia, and Central America. As opposed to hunting and gathering, which required a certain amount of energy (the hunt) to obtain calories, horticulture required more labor, but produced more food per unit of land, and was a more dependable food source (Heinberg 2007). Furthermore, it is thought that farming started among peoples who were comparatively well-off; hunter-gathers would leave an area when food became lacking, and therefore would not have been able to stay in one place long enough to begin domesticating plants and animals. It is also thought that trade may have led to agriculture when, as certain areas of land supported the growth of certain plants, groups of people from these areas began to trade with one another to add variety and proper nutrition to their diets. As each group realized the value of their trading product, they realized the need to keep it close to them; and thus began growing their trade crop close to their homes. Another theory suggests that ecological shifts at the end of the Pleistocene era, which caused drying in some areas and an increase in moisture in other areas, created the need for people to plant foods that did not naturally grow in oases, such as wheat (Anderson 2005).

In horticultural societies, roles were clearly defined along the lines of gender. Men are thought to have contributed by hunting, while woman's activities included caring for children, and planting, tending, and harvesting the garden. Such responsibility warranted them a relatively high status. Task delegation changed however, as agriculture advanced to include field crops, plows, and draft animals; things that men became responsible for, leaving women at home and losing some of their status and power. The majority of these new, more agriculturally advanced societies, consisted of peasants, who cultivated food for all. Large crops necessitated management and protection from raiding, which led to jobs such as scribes and soldiers. A social pyramid, something that had never existed before, began to develop. Overall, much of the changes in societal roles can be attributed to the way we relate to food. Each person was more independent before the initial development of horticulture, which then required groups to develop roles in order to work well with one another. Working together to grow small gardens brought greater prosperity, which led to increases in population sizes, to a need to expand relatively small gardens into larger agricultural fields, leading in essence to a positive feedback loop involving agricultural expansion and increasing population sizes (Heinberg 2007). From the beginning of agricultural development to the end of the twentieth century, the amount of land used for crops increased to 35 to 40 percent of earth's terrestrial biological production. After European colonization during the 1700s cropland expansion quickened. Settlement frontiers took shape in North America, South America, South Africa, Russia, and Siberia, and expanded greatly from 1830 to 1930 due to the growing world grain market (McNiell 2001).

Again, whatever the theory for the creation of agriculture, it has been generally accepted that agriculture has provided dependable source of food and a more stable livelihood. However, many researchers have recently set out to learn whether agriculture, as compared to hunting and gathering, has actually improved human nutrition. Evidence has shown that hunters and gatherers of the world are reasonably well nourished, while agricultural societies have experienced a deterioration in nutrition. A noteworthy observation is that while agricultural societies have experienced an increase in population, they have also become more dependent on starch staples. Anderson (2005) states that "only very recently, with the rise of refrigerated transport and other modern means of shipping and storing, has agriculture fulfilled its promise of providing really adequate diets to a huge population (85)." However, people all around the world, eating diets supported by modern agriculture, continue to subsist on unbalanced diets heavy on starches and low on nutrients (Anderson 2005). Our hunter-gather instincts caused us to love the taste of nutrient-packed sweet and fatty foods such as fruits, berries, animal fat, and nuts; things that were hard to come by, but provided us with excess calories (which we could store for disease or hard times) are leading to overindulgence in this age of prosperity. In other words, desire for these foods once had a specific function, whereas now, our cravings for sweets and fats leads us to the refined sugars and vegetable oils that are cheap and readily available (Anderson 2005).

Impact of Industrial Agriculture on the Environment

The development of industrial agriculture as it is today has no concrete beginning, as similar technologies were being developed at all different times around the world. However, the effects of agricultural industrialization can tell us a lot about when certain technologies became widespread. In 1900 farming was essentially the same as it had been a thousand years before, as farmers still used animal or human muscle to complete nearly all farm-work, and their fertilizers were dung, crop residues, and other locally gathered organic matter. During this time, changes in crop yield were rare, modest, and slow. Very little needed to be purchased, and pests were controlled by crop rotation and fallowing. Farms usually grew a variety of crops, and production was no more than 1 to 2 tons per hectare (as compared to the modern average of 4 or more tons) (McNiell 2001).

Up until the 19^{th} century, people ate food that came almost entirely from local sources. In years of insufficient harvest, or if stored food went bad, starvation occurred among the poorest and the weakest; a reality that was a normal and natural part of life. Despite the fact that such an existence occurred for thousands of years, most Americans today could not even imagine living that way (Heinberg 2007). In order to turn society into what it is today, we had to decrease the amount of time and human labor that went into farming so that such things could be used for a new industrial economy. To make agriculture more efficient, we used methods that would make any industrial pursuit more efficient; specialization, standardization, and consolidation of control (Ikerd 2008). Specialization, also known as "division of labor," is the process by which production is split up into tasks that, when finished, can be combined to make the final product. It was believed that when the production was split up so that each person specializes in just a small part of the process, everything would work more efficiently and collective productivity would increase. Specialized processes can then be routinized, and possibly mechanized, which allows for simplification of the management process, and consolidation of control. The industrialization of farming led to a development of "agribusiness," which is comprised of companies that sell fertilizer, machinery, fuel, and other products used to increase farming productivity (Ikerd 2008).

Farm mechanization began with draft animal drawn threshers and reapers, which were made common during the labor shortage of the Civil War. Oxen, horses, and mules pulled plows to prepare the soil for seed and hauled wagons filled with the harvest. Steam engines were developed as early as the 1850's, but did not become popular because of their size. Some weighed nearly 20 tons, and had steel wheels that would break and get stuck in wet and muddy fields. At the beginning of the 20th century, a pair of engineers named Charles Hart and Charles Parr developed the gas powered internal combustion engine- a heat engine in which the combustion of a fuel expands a gas that either moves a piston or turns a gas turbine- set the stage for big changes (McNiel 2001). Gasoline powered tractors spread quickly in the United States due to high labor costs, large fields, and the spread of gas stations, repair shops, and mechanics. The conversion to the tractor took place between 1920 and 1955 in the USA, and was soon after adopted by the USSR and Europe (Holthaus 2006). The tractor changed farming in many ways: it pulled plows, hauled loads of livestock, towed and powered planters, cultivators, reapers, pickers, threshers, combine harvesters, mowers, and balers. Many of these farm implements were newly developed, as the Industrial Revolution was happening at that time, and thus played a large role in developing and increasing the availability of agricultural machines. The combine was a particularly useful machine because it combined threshing and reaping, the two main tasks of grain harvesting. Water has been used for irrigation for 9,000 years. At the beginning of the 20th century, most farmers depended almost exclusively on rain falling directly on their crops, though some fields were irrigated by an intricate network of gated channels that fed water down crop rows. Use of water for irrigation rose from 99 to about 2725.8 cubic kilometers from 1770 to 1990; a forty-fold increase. This change can be in large part attributed to the mechanization of irrigation, which occurred in the 1940s when Frank Zybach, a tenant farmer from eastern Colorado, designed a system that consists of sprinklers attached to a pipe that run from a hub to a motorized tower on wheels, essentially functioning as a large sprinkling system. Zybach's system allowed irrigation to travel beyond the immediate confines of fertile riverbeds, expanding agriculture into formerly dry regions. The same system was later used for applying fertilizers and pesticides (McNiell 2001). With the rise of the machine, farmers began to tear down hedgerows to make larger fields, and turned more towards crops that could be easily harvested, specializing more and more in single crops, because each crop required its own set of machinery. Thus began the switch to monoculture; the cultivation of a single crop on a farm or area of land. On the international and political levels, mechanization supported countries that were well suited for grain production, with large flat fields and suitable climates; countries such as the US, Australia, and Canada (Ickerd 2008).

Since its beginning, agriculture has altered the earth's surface biologically, chemically, and physically. The earth's outer shell of rock is called the lithosphere, and the soil which sits on top of it is called the pedosphere. The pedosphere consists of mineral particles, organic matter, gasses, and living things. The soil itself takes centuries or millennia to form, and is rarely more than a couple feet deep. Eventually, it all ends up in the sea through erosion, but in the meantime is basic to human survival as the source of sustenance for plants, and the animals that eat those plants. Since the beginning of agriculture, farming has reduced the nutrient supply in soils. For thousands of years this happened only on a modest scale because most of the nutrients that plants extracted from the soil were returned to it after they went through animal and human digestive systems and tissues, and crop rotation helped limit soil depletion. When modern cities developed, however, nutrients that supplied their people with food were not returned to the land from which they came. For a time, some nutrients were returned in the form of 'night soil,' a term referring to human excrement that was collected and distributed to farmers for fertilizer (McNiell 2001). An increasing majority of it, however, ended up in sewers, rivers, and the sea. As agriculture and urbanization spread in the 20th century, soil depletion increased many times greater than before.

The need for fertilizers, especially of nitrogen and phosphorous, became widespread. Peruvian and Chilean 'guano,' a form of fossil manure, was imported by wealthier societies to replenish nutrient supplies. However, this was expensive, and certainly not enough guano existed to supply all the world's soils with nutrients (McNiell 2001). Eventually, a lot of land became overused and European and American farmers began to give up on their degraded and eroded plots of land. Urbanization and suburbanization took over much of this abandoned farm land, as they spilled out from the cities, accompanied by industrial pursuits. Despite all of this, agricultural land growth still doubled in the twentieth century (Ickerd 2007). The simple expansion of farmland alone however, could not have caused the immense yield increases, and subsequent quadrupling of the human population during the same time period. By the mid 1900's, the focus moved from expansion of farmland to increasing crop yield per acre (McNiell 2001).

The Green Revolution

The Green Revolution was a period of time from 1942 to the late 1970s in which agricultural scientists and business men sought to increase industrial agricultural production throughout the world. Leaders of the Green Revolution sought to spread and encourage use of existing (but scarcely used) artificial fertilizers, which chemists had developed in the past by distilling superphosphate from rock, and extracting nitrogen from the air. Superphosphate was discovered in 1842 by John Lawes, an English farmer, through a process of applying sulfuric acid to phosphate rock. In 1909, a chemist by the name of Fritz Haber found that nitrogen could be extracted from the air through ammonia synthesis. In 1966 the Soviet Union formally committed to the “chemicalization” of agriculture (McNiell 2007). These new fertilizers would be purchased by thousands of farmers, and become one of the most effective tools for crop yield increase ever developed. It is estimated, however, that more than half of fertilizers miss their targets and end up in waters of agricultural communities and communities downstream of fields, leading to eutrophication of lakes and rivers, which emerged as a pervasive problem in the 1930s. In bodies of water, the availability nitrogen and phosphorous plays a major role in plant and animal growth. Usually however, there is a limit to the amount of these nutrients in a body of water, and thus a limit to the amount of life that can be sustained. However, if large quantities of these minerals make their way into bodies of water, an equally large amount of aquatic plants and bacteria grow. And, when they die and decompose, they absorb oxygen that would have otherwise been available to other species. Eutrophication refers to this process and the explosions of algae populations it causes, which can kill all animal life and leave bodies of water unfit for drinking, swimming, navigation, and other uses. By the mid 1900s large lakes, such as lake Erie, suffered from eutrophication. However, even when nutrients did stay in the soil, long-term issues in micro-nutrient supply resulted, handicapping further growth (McNiell 2001). On a global scale, nitrogen and phosphorous cycles have been altered to the point that all species who thrive on heavy diets of these nutrients are favored.

Artificial fertilizer use increased from 4 million tons in 1940 to 150 million tons in 1990, colossally altering the chemical composition of the world's soils, and having economic, social, political, and environmental consequences as well. It is estimated that artificial fertilizers allow an extra 2 billion people to eat, a figure that could otherwise only be achieved if the world had about 30% more good cropland. Artificial fertilizers widened the gap between rich and poor farmers because those who could not afford or gain access to artificial fertilizers consequentially could not compete. Many small farms went bankrupt or were bought out by larger farms. Depending on the country, displaced farmers who moved to urban areas either contributed to great economic gains (China, Japan, Korea), or to urban social strains (India, Mexico, Philippines). Another consequence of artificial fertilizer development is fossil fuel dependance; because chemical fertilizer production depends largely on fossil fuel, our food is now highly dependent on its availability (McNiell 2007).

The increase in artificial fertilizers, especially nitrogen, caused an increase in pest and disease outbreaks in fields. Chemical pesticide use also became widespread during the Green Revolution (Conway 1998). A pesticide is any substance or mixture of substances used to repel, destroy, or reduce the impact of any pest (insects, plant pathogens, weeds, birds, mammals, fish, roundworms, and microbes), which can destroy property, spread disease, or cause a nuisance. Manufacturers began to produce large amounts of pesticides in the 1940s, when their use became widespread. Since then, their use has increased to 2.3 million tons each year (Miller 2004). Usually they are made up of chemical substances, disinfectants, antimicrobial, or biological agents. Until the 1950's arsenic-based pesticides were the most prominent, but subsided with the invention of the more effective DDT, itself being replaced by organophosphates and carbamates and pyrethrin compounds in the mid 1970s.

Once farmers began putting large amounts of pesticides, a significant amount often ended up in water supplies, and in humans. The World Health Organization estimated that pesticide poisoning killed 20,000 people in 1990, most of them agricultural workers (McNeill 2007). Alternatives to pesticides include various methods of cultivation, and biological pest controls such as composted yard waste. Some different methods of cultivation include polyculture (growing multiple types of plants), crop rotation, timing planting when pests are less of an issue, planting in areas where the pests do not live, and use of trap crops that attract pests away from the real crop. Release of other organisms to fight the pest is also an alternative; natural predators, parasites of the pest, and viruses that cause disease in the pest can be effective. Evidence for pesticide alternatives such as these have shown effectiveness equal to chemical pesticide use. Sweden halved its use of pesticides with hardly any yield reduction, and similar success stories have occurred in Indonesia and the United States, with positive long-term effects (Miller 2004). Alternatives are increasing in popularity, as they are often safer than chemical pesticides.

Other new technologies that were introduced by the Green Revolution were plant breeding and genetic modification. Scientists began using breeding techniques to develop varieties of maize, wheat, and rice that have higher nitrogen absorbing potential, which grew larger and more quickly. They bred semi-dwarfing genes into these varieties so that they would be shorter and be less likely to fall over before harvest. Plants were also modified so that growth would occur less in the stem, saving energy for grain development, which increased the effect of chemical fertilizers. Thus, when such plant varieties are treated with adequate irrigation, pesticides, and fertilizers, they outperform their natural counterparts. On the other hand, without irrigation, pesticides, and fertilizers, the natural varieties outperform the genetically modified varieties (Conway 1988).

In general, the mechanization of agriculture and the Green Revolution replaced simpler autonomous farming with more complex systems, requiring distant inputs from banks, seed banks, fertilizer manufacturers, and water bureaucrats. The Green Revolution also led the way to the alteration of species and genetic diversity of agriculture, as it encouraged certain strains of rice, wheat, and maize, and reduced the usage of crops less responsive to nitrogen and water-rich diets, which further led to the popularity of the monoculture. Cereal production, in particular, had the largest advances, more than doubling in developing nations between the years 1961 and 1980, increasing the growth of rice, maize and wheat yields during that period. For farmers, adopting the technologies of the Green Revolution was usually an easy choice because there were often economic incentives included, such as guaranteed prices, deficiency payments, and other forms of subsidy. Food crises caused by natural disasters in the late 1960's also acted as a force that brought developing-country leaders to look to the newly engineered varieties for a solution (Conway 1998).   Sharp increases in output, leading to increase in population size, also led to the dependance on the new genetically modified varieties. Furthermore, the inputs these new plant varieties required increased need for social and economic stability to insure that the necessary inputs would be produced, transported, and purchased (McNeill 2007). Farmers that did not have the monetary resources to afford the necessary inputs (costing up to 60 percent more than the traditional varieties) had to either give up on farming because they could no longer compete in the world market, or borrow money from local moneylenders, often at high rates of interest, producing a permanent state of indebtedness. Governments responded by setting up agricultural loan funds to support banks that loaned without collateral at reasonable interest rates. Thus, political action served as an important force in enabling farmers to convert to the new agricultural system of the Green Revolution (Conway 1998).

Some think that our modern way of life (i.e. the abundance of food) may be short-lived. As global oil production is projected to peak around the year 2010, resulting fuel shortages would have an extremely large impact on food production (Heinberg 2007:49). Non-renewable energy sources, such as oil, natural gas, and coal are what make possible the current supply of food in the United States. In fact, about 19 percent of all energy used in the United States is used to create our food supply; 14% of which goes into food processing and packaging, while the rest provides for preparation and transportation. Natural gas is used to make fertilizers, and Oil is used in farm machinery, irrigation pumps, the creation of pesticides and herbicides, the maintenance of animal operations, crop storage and drying, and transportation of farm inputs and outputs. The US Military uses less than half of the amount that our current system of Agriculture requires (Heinberg 2007:48). This enormous energy need is becoming an issue as petroleum and natural gas prices are increasing, reserves are becoming harder to access, and large quantities are now being purchased from other countries. While lowering calorie intake would certainly reduce the amount of food we needed to produce (on average, Americans consume 3,747 kcal of food each day, as opposed to the FDA recommended 2,000 to 2,500), there are ways in which we could reduce the amount of non-renewable resources required to produce food in the first place. There are numerous renewable energy technologies- hydroelectric, biomass, windpower, solar thermal systems, photovoltaics, passive energy systems, geothermal, biogas, and methanol- which would reduce the need for non-renewable resources. It is estimated that such alternatives could reduce non-renewable energy use by half (Pimentel 2008). On the other hand, it is suggested that technology changes in food production, processing, packaging, transportation, and consumption could reduce food system energy use by about 50% and be beneficial to both farmers and consumers (Pimentel 2008).

There is also the problem of global climate change, which effects farming because it destabilizes weather patterns which can lead to droughts, floods, and stronger storms such as hurricanes, tornadoes, and hail storms. With the current monoculture trend, catastrophic storms could lead to destruction of an entire country's crop. For example, if a catastrophic storm hit the valley in California where almost all of the country's spinach is grown, many people would be going without spinach for a while (Heinberg 2007:50). Monoculture is also harmful because it depletes certain soil nutrients faster, requiring more chemical fertilizers. Also, monoculture increases pest problems; even the genetically modified pest-resistant crops prove vulnerable to infestation over time, and farmers turn to heavier and heavier doses of pesticides. And usually, pesticides don't kill off 100% of the pests, leaving the ones who were immune to the pesticides to procreate and pass on their immunity (McNeill 2007).

An increasing scarcity of fresh water also threatens our current agricultural system, which uses over 80 percent of the national use of fresh water, due to the water intensive high yield varieties of the Green Revolution. Places that would not normally be suited for agriculture, like the American Southwest, which naturally receives only 6% of the country's rainfall, uses 36% of the nations water. Much of the water comes from underground aquifers, which, like oil, are being used up at a rate that exceeds their natural rate of replenishment. It is expected that aquifers, such as the Ogallala Aquifer of the central and southwest plain states, will dry up and render large areas of land incompatible with agriculture. Streams and rivers are also drying up at an alarming rate. All in all, very little is being done to deal with the trend of over overspending water budgets, and we are running out of time to change our practices to avoid imminent food shortages (Heinberg 2007:49).

The Social Impact of Agricultural Industrialization

The effects of the agricultural industrialization are widely contested. In terms of its impact on reducing hunger, the effects have been uneven across social and economic lines. The urban poor have experienced less under nutrition, particularly in China. Some regions were able to adopt Green Revolution technologies more quickly than others due to political or geographic reasons. Inter-regional economic disparities increased, and the rural poor have been affected in different ways. Those who were in countries that used Green Revolution technologies experienced somewhat decreased malnutrition, while those in other countries suffered as their grain yields increased very little, and they began to receive lower prices because of the saturated world market (Conway 1998). As stated earlier, there was an increase in the need for purchasing inputs such as fertilizer, pesticides, and seed, which increased class disparities because wealthier farmers had better access to credit (McNiell 2007). Now, because farmers have to dedicate so much of their monetary resources to the agribusiness that keeps them competitive in the market, they receive less than 10% of the profit generated by food sales (Ikerd 2008). Many small farmers lost their land, and because of the increased level of mechanization, many jobs were lost because less manpower was needed (McNiell 2007).

The social impacts of agricultural industrialization have been profound; individuals, families, communities, and society as a whole have been affected. Industrial Agriculture, as in most industry, has had an economic model that is based on continuous growth. Many economic forecasters present growth trends as if they will continue indefinitely, without any reference to how such growth is related to outside factors. However, recent evidence suggests that in many sectors of the economy, industrialization is slowing, has stopped, or is reversing. The new industrial model, Ikerd suggests, is one focused on "production of customized goods and services aimed at niche markets, constant innovation and focus on value-added products and specialized production (28:2008)." Further industrialization of agriculture then, such as the more recent rapid industrialization of the hog and dairy sectors, would not conform to this new industrial model. Ikerd feels that American agriculture has over-applied industrialization. At first, industrialization served to bring people out of subsistence living and made the American Industrial Revolution possible. He argues that the social benefits of this, however, were just about fully accomplished by the late 1960's, and more recent technologies and further industrialization have done more harm to the social resource base, let alone environment, of rural areas than any benefits in terms of more efficient food production have done good. In other words, the corporations which exist only on paper, seek only to gain capital and grow in order to maximize profits and please stockholders; they aren't concerned about community dynamics or the environment. This focus on growth and monetary gain leaves no room for incorporating the interests of families and communities in their economic planning, which has often led to substantial societal change (Ikerd 2008).

Industrial agriculture, like other industrial systems, has not only degraded the environmental resources, but has also degraded the human resources that they depend on. Up until the late 1800s, America was an agrarian society; more than half of the population was made up of farmers or residents of rural communities, and it took half of our resources just to feed and clothe ourselves (Ikerd 2008). About 70 to 90 percent of the population worked on low technology, labor intensive farms (McNiell 2001). The agricultural industrialization that led to increases in agricultural productivity that followed this agrarian period, however, were not accompanied by an increase in farming jobs. Today, less than 2 percent of Americans are farmers, and less than 10 percent of our income is spent on food. Also, the number of farms in the US, which peaked at six million in the 1930's, is now less than two million (Ikerd 2008). One argument, as offered by Davies, states that higher crop productivity generated additional general employment, as more people were needed in trade, transport, and construction industries, and that higher farm incomes stimulated economies (2003). However, some question whether these types of jobs lead to unhappiness, and a decreased sense of well-being and dignity. Also, further industrialization has displaced many farm-workers, who go on to have difficulty finding jobs elsewhere because the simple hands-on jobs they would be qualified for, like those in factories, are being outsourced more and more (McNiell 2001).

Large factory farms need people who know how to follow instructions, not people who make independent decisions (Ikerd 2008). At the turn of the century, a study showed that only 138 men and women made up the boards of directors of the ten firms that account for over half of all food sold in the US. Such boards serve to make decisions that will increase profits for the company; decisions that rarely involve thinking about the workers who make everything possible. The principles guiding modern agricultural production have required jobs to be routinized to the point where workers within each occupational category have become interchangeable (Lyson 2004). Additionally, the specialization of farming has led to a situation where fewer and fewer people make decisions about larger and larger plots of land, capital and labor. Ikerd explains that specialization and standardization, for the purposes of agriculture industrialization, "diminish people's mental capacities because they focus on doing fewer things by the same means as everyone else, simply responding to directions or orders given by someone else (2008:37)." Since the focus is on operational and economic efficiency rather than building or maintaining the productive capacities of people, farm-workers are generally not given the opportunity to think, be creative, innovative, or entrepreneurial. Pre-industrial farming required a wealth of knowledge and understanding of the land. Farmers had to be prepared for drought, flooding, and other variables that could have a large impact on their harvest. Farming was a never-ending "blend of many long hours of work, a few hours of pleasure, and a gamble every minute" (Holthaus 2006:13). Though it was hard, it allowed farmers to develop great skill in decision-making, planning, and leadership.

Furthermore, one could argue that the industrialization of agriculture has created a sense of anomie within it's workers. Anomie is broadly defined using words such as normlessness and lawlessness (Merton 1938), and is often associated with industrial workers of lower skill and with less direct involvement with decision-making (Form 1975). In relation to industrial workers, it is commonly described as a feeling that comes about when the individual feels as though it does not belong to a society where common values are held. Instead, the worker feels like a "cog in the machine," simultaneously seeing no great value in their work and feeling like they aren't of particular value to society (Durkheim 1964). Durkheim cited anomie as a factor that increased suicide rates (1964). The industrialization of agriculture has also affected inter-personal relationships, rendering collective decision-making obsolete (generally, the decisions are already made, and each individual carries them out on their own) (Ikerd 2008).

Whether the shift from muscle powered farming to machine powered farming actually had a positive impact is up to interpretation. That it set in place an ever-increasing desire for faster speed and higher production, however, is undeniable. In terms of physical danger, the source of accidents simply switched from accidents with draft animals and tools to increasingly complex belts and gears, and eventually to sheer stress, which came along with working more and more hours in order to run the equipment and increase production. Common farm injuries were also replaced with health issues caused by exposure to chemicals and pesticides (Holthaus 2006). Overall, it can be seen that the industrialization of agriculture has had a negative impact on the individual farm workers.

Farming has often been defined as an operation in which members of the same immediate family own the land, do most of the labor, and make all the important management decisions (Ikerd 2008). Less than one hundred years ago, all members of the family contributed their time and energy to the economic maintenance and survival of the household. Much of their time was spent making agricultural products that would be consumed in their own household. Men, women, and children engaged in productive practices such as growing crops, raising animals, clearing land, building and repairing machinery, home-based manufacturing, and general maintenance. By today's standards, the typical farm in the late 1800's was very small (less than 75 acres), and produced a wide variety of commodities, such as cheese, butter, milk, tobacco, fruit, and vegetables, as well as clothes, furniture, and housewares (Ikerd 2008). Today however, this is not the way that most farms are. Many farms use the corporate contract production model, in which the farmer's main contribution is borrowed capital and low-skilled labor. In this case, agribusiness makes the majority of the management decisions. In fact, nearly all larger farms in the US (those that gross over $50,000, or have 1,500 or more acres) rely on rented land or hired labor (Ikerd 2008).

The switch from the family farm model to the industrial model brought about changes to the make-up of the farmer's life. More time became available for leisure. Prepared foods and household conveniences relieved families of a large amount of labor. Many farmers and farm hands sought work in the city; some had extra time on their hands, and others needed to supplement the income of their farms because of lowering prices and the fact that they no longer grew a wide enough variety of foods to be self-sufficient. It is easy to understand the delight of farmers at the development of new technology, as well as increased crop production. However, it is important to note the other results of new technology; many jobs cannot safely or wisely be sped up, and that such change often has adverse effects on the land, community, and social systems. Holthaus (2006) explains that, with the changes in agriculture- the freeing up of time and resources, and a new focus on ever-increasing production- the focus of society went from a religious to a secular world view. The older worldview, in which there was a more religious outlook, had a focus on securing salvation of the soul, and reverence for nature or God. The new secular worldview, Holthaus states, focuses more on achieving comfort, bodily pleasure, and higher affluence through materialism and “progress.” Such shifts in the worldview of our culture have altered the way that people look at farms and having their own family farm. Defining oneself, one's family, or one's society in terms of material gain and affluence, is markedly different than the way that family farms originally defined themselves. They focused on who they were, what they did, and where they lived. They sought to attain a life based on equilibrium, with hard work mixed with leisure, undertaken in healthful conditions, with their values, rather than material possessions, defining who they were as people.

In addition to individual workers and families, rural communities have also suffered as a result of the industrialization of agriculture. Many towns which were historically dependent on agriculture do not even exist anymore, as farms have grown larger and more specialized. This is because larger farms have replaced the many small family farms that made up the towns and supported local retail businesses, schools, churches, and public institutions (Ikerd 2008). Historically, these areas were sources of fresh fruits, vegetables, and dairy and meat products for their own needs, as well as the needs of the nearby urban centers. In cities, fruits and vegetables from nearby “truck farms” were common during the summer in many more urbanized areas. At this time, the household, community, and the economy were strongly connected, as the economy was embedded in the social relations of the farm household and the rural community. Trade and service centers in communities served the local farmers, and also served as places that nurtured civic and social affairs. For example, the boundaries of such communities often became defined by the local schools.

Communities such as those in the Mid-West often began as settlements among people of common kinship, nationality, education, social, or religious purposes, who had chosen a place to live and work together. Bartering for goods and services, mutual aid, and group social affairs were the basis of these groups. After their initial settlement, communities generally developed metal-working enterprises, wood-working shops, and related activities. Such activities reflected the way that agricultural production worked. In 1870 New England, for example, Vermont, New Hampshire, and Maine, were home to 12,162 manufacturing establishments, most of which employed fewer than 10 workers. Sawmills, blacksmith shops, flour and grist-mills, wagon-making enterprises, and leather-working shops provided the communities and farms with necessities. In other words, manufacturing, like agriculture, was local and a key part of the community and it's interactions. The industrialization of agriculture and the availability of cheap energy, however, made it possible to move food around the country at reasonable costs. Such a system has allowed cities, with virtually no local resources to produce food, to grow rapidly, while in the meantime becoming completely dependent on industrialized agriculture and cheap oil.

The interactions between large agricultural producers and distributors has not only changed the agricultural sector, but has also changed the structure and character of communities. For example, as corporations began mass-producing producing fruits and vegetables in California, the number of fruit and vegetable farms in New York decreased. Today, as a result of this general restructuring, no region in the United States is self sufficient in food production, because people depend largely on products that can be produced in climates and soils outside their regions, and there is little or no local food in their commercial channels. Furthermore, the industrialization of agriculture also changed the way we view work and the economy. As explained, in early rural America, the community and the economy were one in the same. People performed a variety of jobs, both paid and unpaid, that were essential to life. Now, we generally view work as separate from community; we work for wages in a job, which we then use to buy goods and services in the marketplace (Lyson 2004). Overall, the changes in community structure, as a result of both the industrialization of agriculture and manufacturing, have changed the way communities are structured, and the way that we view and relate to food. Food and agriculture have gone from being the central focus of our communities to an outlying factor, both socially and geographically. It is unfortunate that this non-localized agriculture system exists despite the fact that even most large American cities have a significant area of land capable of producing a range of food products surrounding them.

Chapter 2: Sustainable Agriculture

Sustainable Community Agriculture

Much like pre-industrial agriculture, sustainable community agriculture is composed of small farms that are integrated into the economic structure of their local community. Such farms produce food for their local community (as opposed to producing for the export market, though they may sometimes sell to specialty global markets), hire local labor, and provide benefits for their workers. They are tied to the community through direct marketing or integration into local circuits of food processing and procurement. Local producer and marketing cooperatives, regional trade associations and other food organizations also play and important part in sustainable community agriculture. The various farms in this system must work together, share information, combine forces, have access to the same pool of resources, and be controlled by policies that do not favor one group over the other. Economically speaking, sustainable community agriculture helps communities because money spent on food then continues to circulate through the community, as opposed to if it was put into the hands of a multinational supermarket chain (Lyson 2004).

Despite the general trend in the past century towards industrialized, large-scale, bulk commodity oriented agriculture, there is a growing number of small-scale, locally oriented farms developing throughout the US. Such farms are fulfilling the consumer demand for locally grown and processed, sustainable, or organic food. This movement is most developed in the Northeastern United States; New York, Vermont, and Massachusetts in particular are leading the trend towards local, small-scale producers and processors, which have been key parts of community revitalization efforts throughout this region. In relation to the environment, sustainable community agriculture is rooted in ecological biology. Thus, it is not necessarily compatible with industrial techniques or technologies. However, its main focus is not to simply increase yield, but to identify and moderate production in a manner that is optimal when taking into account all related factors (health, the environment, local conditions, providing a community with a range of products, etc.). Though some argue that local food systems will not do well in an expanding globalized environment, it has become clear that their positive impact on the socio-economic welfare of communities is too great to ignore (Lyson 2004). According to Ikerd, agriculture, by nature, does not fit as neatly into the mold of industrialization as say, car manufacturing, or any other largely non-biological enterprise. Therefore, full industrialization of agriculture has taken longer, been more difficult, and led to many problems. Ikerd believes that it will remain industrialized for the shortest time, and evolution towards sustainable agriculture is the only practical avenue for change (Ikerd 2008). Sustainable agriculture can go by many names and many definitions. The U.S. Department of Agriculture defines it as:

> An integrated system of plant and animal production practices having a site-specific application that will, over the long-term: 1) satisfy human food and fiber needs; 2) enhance environmental quality and the natural resource base upon which the agricultural community depends; 3) make the most efficient use of non-renewable resources and integrate, when appropriate, natural biological cycles and controls; 4) sustain the economic viability of farm operations; and 5) enhance the quality of life for farmers and society as a whole (Lyson 78:2004).

This definition not only includes an ecological element, but also a social/community, and economic element. Lyson describes a term, civic agriculture, as “the embedding of local agricultural and food production in the community”(Lyson 62:2004). Because such systems are embedded in the community, each farmer involved is forced to confront how their choices, such as choosing to use pesticides on their crops, will affect their community, and their profits.

Overall, both the sustainable agricultural and civic agricultural models seek to repair the environmental, social and economic problems caused by industrial agriculture. Such agricultural systems contribute to the health and vitality of communities in a variety of social, economic, political, and cultural ways (Lyson 2008). In doing so, they create jobs that foster individual creativity, greater dignity of work, and more attention to issues of social equity and justice (Ikerd 2008).

In conventional agriculture, farmers are treated as individual "problem solvers," who manage their farm, and are solely responsible for its success or failure. Community agriculture, on the other hand, is characterized by farmers who are bound together by place, and must utilize community problem solving. Since each component of the system- farmers, producers, processors, marketers, grocers, and consumers- are all connected to one another economically, environmentally, and socially, they each must look out for the other in a system of cooperative and mutual support. For example, because consumers in a civic agricultural community will directly be affected by the choices of farmers, they will most likely know about the consequences of such choices, and only choose to buy food from farmers who most positively impact the community. Because this will affect both the farmer's social and economic standing, the farmer will undoubtedly change his practices to better suit the community (Lyson 2004). In essence, the consumer will have more freedom to shape and regulate the practices of the local companies that produce, process, and sell their food. Even so, when conventional and sustainable community agriculture are compared, a discussion of consumer choice often ensues. It is often argued that conventional agriculture provides consumers with the variety of food items that they would want and need. By nature, however, conventional agriculture is unable to offer consumers products that come from their home-town or are bought right from the farmer. It could be argued that if consumers had had the option, and were educated about the positive effects of civic agriculture on their community, they would undoubtedly choose to buy their products in this manner (Lyson 2004).

The social and economic benefits of a system where economic power is concentrated at the community level were shown in a study commissioned by the US Government over fifty years ago. The research showed that "communities in which the economic base was composed of a plethora of relatively small, locally owned firms would manifest higher levels of social, economic, and political welfare and well-being than communities where the economic base was dominated by a few large, absentee-owned firms" (Lyson 64:2004). It was found that small-business communities provided their residents with a more balanced economic life, and a higher level of economic opportunity. Also, they found that civic engagement was directly related to the levels of socio-economic welfare (Lyson 2004). The American Psychological Association defines civic engagement as "individual and collective actions designed to identify and address issues of public concern" (APA 2010). Communities with high levels of civic engagement manifested higher levels of general well-being and welfare. One reason that this happens is because more individuals become part of the fairly well-educated, economically independent middle class; as a part of this class, individuals have more time and money to devote to civic enterprise, have been trained in initiative, responsibility and interacting with administrative and political figures (as a result of running a small-business or farm), and will most likely benefit from civic improvement (Lyson 2004). Because their welfare, social class, and livelihood is not tied to a corporation, they are able to maintain allegiance to the community, making decisions that will benefit the people. In other words, what is good for the civic business owner is good for the community because they are dependent on the community, not on a corporation. Though these studies were referring to local manufacturing businesses, we can ascertain that communities in which a system of localized farming, production, marketing, sale, and consumption of foods was sustained, would also experience such socio-economic and civic benefits, since food production and sale is another type of economic activity (Lyson 2004).

Another study cited by Lyson, in which Walter Goldschmidt contrasted communities of large and small farms, found that residents in the large-scale farm community had a lower standard of living and quality of life. Additionally, the large-scale farm community had a more unstable population, poorer physical appearance, poorer social services, poorer schools, parks, and youth services, fewer religious institutions, poorer community loyalty, greater social segregation, less democratic decision-making, and less retail trade. The large-scale farms had skewed the occupational structure so that most of the population in their community had to subsist on wage labor for the large, exploitative farms. When a local economy exists within a community, the community becomes a source of personal identity, a topic of conversation, and the basis for social cohesion.

Sustainable community agriculture has manifested into a number of forms: farmers markets, roadside stands, U-pick operations, and CSAs (community-supported agriculture) are just a few. In whatever form, bonds are formed between the farmer and the consumer. Because of this, farmers must cater to the local tastes, and focus on quality rather than quantity. In a 1995 study of CSA members, environmental and community concerns were more important than food price in their reasons for joining. Before the development of supermarkets, farmers markets were the main source of food for everyone in the community. By the 1970's, fewer than 100 were still operating, a number that slowly rose back up to 3,000 in 2002. Again, this goes to show that shared responsibility for the common good drives the modern systems of sustainable community agriculture. And, of equal importance, such agricultural systems are a powerful tool in building relationships between persons, social groups, and institutions that have been distanced from one another.

Lyson describes sustainable farming systems as individualistic, site-specific, and dynamic. In fact, it is similar to the way agriculture was at the beginning of the 20th century. Because of this, it requires individual farmers to think about how to carry out their function as a provider of food while maintaining ecologically balanced, economically sound, and socially responsible processes of production. Lyson states, "The embedding of civic agriculture in the community and a concern for the environmental conditions fosters a problem-solving perspective that is site-specific and not amenable to the "one size fits all mentality" (Lyson 86:2004). Policy makers have mostly looked over farmers and farms, treating farms simply as places where production occurs, and farmers simply as workers who are to follow the directions given to them by a distant corporation (Lyson 2008). In other words, they are not recognized as important and necessary components of a healthy local community, or given the opportunity to be individually creative, solving problems in a way that reflects their personal morals or values.

Farming, as changed by industrial agriculture, is no longer the farming we once knew; a relationship between man in nature, in which man works with nature, recognizing that the laws of nature prevail over human laws. Farmers worked with the unpredictability of nature, knowing that they would never be completely in control. However, most farmers would say that if they had complete control over nature, they would lose something of greater value than profits and comfort; a sense of duty in being a steward of nature and humanity. As such, farming was a way of life, rather than a way to make a profit; raising children and being a necessary part of a community were things that characterized the farming way of life. Again, economic gain was just one part of a farmer's life, and was often considered less important than the beliefs, behaviors, and customs that came along with working with nature and a community. As Ikerd states, "it was the *culture* in agriculture that made a farm a farm and not an agribusiness" (Ikerd 2008:63).

Sustainable Agriculture and Ecology

Thus far we have focused mainly on the social and economic aspects of sustainable agriculture. Now, we will move towards the practices that farmers and scientists have developed which make up the ecological side of sustainable agriculture. However, it is important to keep in mind the fact that each of the three parts (social, economic, ecological) of sustainable agriculture are inherently intertwined and co-dependent. In terms of ecology, sustainable farming practices can be grouped into two areas of environmental concern: natural resources, and plant and animal protection practices, which can be further divided into sub-categories (Feenstra 2011). The inter-connectivity of these systems is stressed in sustainable agriculture, with the goal of developing " agroecosystems with minimal dependence on high agrochemical and energy inputs, emphasizing complex agricultural systems in which ecological interactions and synergisms between biological components provide the mechanisms for the systems to sponsor their own soil fertility, productivity and crop protection (Altieri 2005)."

The earth has provided us with a wealth of natural resources which have made it possible to grow and raise the plants and animals we need to survive. Maintaining these natural resources in important so that future generations will also be able to produce adequate amount of food. Water is one of the most important natural resources, having helped agriculture and societies prosper, and also destroying societies when misused. Sustainable agriculture seeks to limit the possible negative effects of poor water management by improving water conservation and storage measures, selecting crop species accustomed to the water levels in the region they will be grown, using limited-volume irrigation systems, or not planting at all if there is not enough water within reasonable distance from the growing site (Earles 2005). In addition to taking into account the supply of water, maintenance of water quality is also an important part of sustainable agriculture. As previously discussed, pesticides, nitrates, and other chemicals are threats to the quality of ground and surface waters. In order to maintain the diversity of fish and wildlife, another important natural resource, sustainable agriculture seeks to limit erosion, sedimentation, pesticides, removal of native plant species, and the diversion of water (Feenstra 2011). Sustainable agriculture also seeks to maintain plant diversity in and around agricultural areas in order to provide for diverse wildlife, which can enhance ecosystems and aid in pest management. Air is another important natural resource that often suffers as a result of agricultural production. Sustainable methods that promote the quality of air include incorporating crop residue into the soil, using appropriate levels of tillage, building wind breaks, cover crops, or strips of native plants to reduce the movement of dust (Feenstra 2011). Finally, soil erosion and depletion of nutrients in soil is a particularly large threat of conventional agriculture to this important natural resource. Methods to keep soil in place include reducing or eliminating tillage, managing irrigation to reduce runoff, covering soil with plants or mulch. As Earles (2005) explains, sustainable farmers should "Think of the soil not only as a physical and chemical substrate but as a living entity; manage the soil organisms to preserve their healthy diversity."

In terms of plant production, a diverse set of practices have been developed in order to ensure sustainability. However, all practices must take into account topography, soil characteristics, climate, pests, local availability of inputs, and the goals of the farmer. Plant production can be broken up into the following categories: site selection, diversity, soil management, input efficiency, and farmer goals/lifestyle (Feenstra 2011). Before production can start, the farmer must try to select a site with factors such as soil depth, history of the land, climate, and topography in mind. Because diversified farms are usually more economically and ecologically resistant, sustainable farmers should grow a variety of crops. Rotating each of these crops can be used to suppress weeds, pathogens, and pests (Feenstra 2011). Sustainable agricultural methods often incorporate both crops and livestock, rotating pasture and crops, which can reduce soil erosion and enhance soil quality. Soil management is another important part of sustainable plant production. Healthy soil is thought to prevent pest problems, and reduce the need for greater inputs of water, nutrients, pesticides, and energy to maintain yields. Regular additions of organic matter (preferably biomass from the farm itself) are used to increase soil stability and the diversity of soil microbial life (Alteri 2005, Feenstra 2011). Enhanced management and scientific knowledge allow sustainable farmers to use inputs more efficiently and to rely on natural, renewable, on-farm inputs, avoiding the use of chemical inputs that harm the environment. Lastly, sustainable plant production must take into account the individual goals and lifestyle choices of the farmers (Feenstra 2011).

As a result of industrialization and specialization, many farmers have moved away from the integration of crop and animal production systems, which are considered ecologically co-dependent. Despite this trend, sustainable agriculture encourages farmers to include livestock in the farming system to increase the complexity of biological and economic relationships (Alteri 2005). Animals should be selected that will fulfill the needs of the farm but also have the ability to live on local or on-farm feed sources, which will cut down on feed costs and energy use for transport (Earles 2005). Keeping livestock healthy is also an important part of sustainable agriculture, because unhealthy animals waste feed and require additional labor. Furthermore, the quantity of animals on a farm should be based on the landscape and forage sources. Confined livestock production is discouraged in sustainable agriculture because it can be a source of water pollutants, and causes a need for expensive waste management facilities (Feenstra 2011). Again, livestock should be rotated with crops so that nutrients are circulated and each area is used equally and waste is distributed in a way that it can be taken care of by natural environmental processes.

Classifying Sustainable Farms and Products

As demonstrated, differences between sustainable and conventional agriculture clearly exist, and a market for food which has been produced in a sustainable manner is growing steadily. However, the evolving nature and broad variety of practices within the realm of sustainable agriculture has made it difficult for farmers to market their products in a way that lets consumers know exactly what they are eating. Thus, consumers, farmers, and policy makers have tried to create systems in which they can classify sustainable farms and products, though there is still debate as to how effective these systems are. Though farmers had been marketing organic food since the 1970's the federal government refused to establish organic standards until 1991. The fact that consumers are willing to pay more for organic foods led to problems of mislabeling in the food market, which led to consumer confusion and unfair misrepresentation of products (Lathrop 1991). The confusion existed due to the variety of labels and the absence of a widely-recognized definition of what methods qualify as organic and what information they should see on the packages. During that time, several states developed their own organic certification programs, all of which had differing requirements for obtaining certification. Eventually, the United States Department of Agriculture (USDA) developed an organic certification program, streamlining the organic certification process, assuring quality, and preventing fraud (Lathrop 1991).

Though the development of USDA's National Organic Program's recent adoption of regulations for organic labeling “removed much of the suspicion and confusion that held back production in the early 1980s and 1990s (Watson 2005:7),” many farmers, consumers, and supporters of sustainable agriculture remain unsatisfied. Some critics feel that the USDA's program drives independent organic farmers out of business by overloading them with increased costs, paperwork, and bureaucracy (CNG 2011). As Watson (2005) notes with positivity, “today supermarkets in every part of the United States are expanding into [organics], and food industries are responding with new product lines (Watson 2005:7).” This kind of expansion, however, is exactly what destroys the prospects of small-scale farmers who are growing a variety of crops and cannot compete with 'food industries.' Certified Naturally Grown (CNG), an alternative to USDA certification geared towards helping small farms states on their website,

While the newly created certification process is affordable and pleasing to larger farming operations, especially those that specialize in growing only a few varieties of vegetable, it's not such a good fit for the thousands of small, diversified family farms using natural methods and growing many different varieties of crops (a necessary and recommended practice for disease and insect control) (CNG 2011).

Other critics of the USDA label fear that government regulation will break down organic standards by putting it in the hands of lobbyists who can push for amendments favorable to large-scale, conventional, production. For example, in 2005 lobbyists convinced the USDA to allow the use of synthetics, which allow the makers of preservative-packed foods like TV dinners and Twinkies become certified Organic. In another example, industrial-sized dairy farms decided at one point that they wanted to become organic, eventually convinced the USDA, and allowing 'organic' beef and dairy to be made from cows who spend their lives in a grass-less feed enclosure (Pollen 2006). Thus, to avoid the watering down of what the term 'organic' really means, critics believe that consumers should seek to recognize a product as organic by developing a direct relationship with the farmer, as they did before organic certifications were developed, ensuring that the small-scale farms will stay afloat (CNG 2011). Along these lines, they generally agree that "sustainable practices lend themselves to smaller, family-scale farms. These farms, in turn, tend to find their best niches in local markets, within local food systems, often selling directly to consumers (Earles 2005)." Overall, we can see that certain organic labels may not conform to the original notion or values of organic agriculture, and that the conversion of industrial farms and big-businesses agriculture could threaten small-scale family farms, which we learned earlier in the section on sustainable community agriculture, are necessary for healthy local communities, healthy local economies, families, values, and the environment.

Farmer Motivations and Barriers to Growing Sustainably

It is clear that the differences between sustainable and conventional agriculture impact the economy, society, and the environment, and that there are a variety of benefits to be obtained when farmers choose to use sustainable methods. However, in order for sustainable practices to be implemented, the decision ultimately comes down to the farmer, who must live with both the costs and benefits of converting. Research shows that farmers are far from homogeneous, and that those contemplating a switch to organic farming in particular vary greatly in many ways (Darnhofer 2005). However, there have been several studies which have shown that certain issues play a larger role in motivating farmers to convert to sustainable agriculture than do others. Despite their level of motivation, it is likely that farmers will run into a few barriers when switching to sustainable methods. Conversion to these practices by farmers is usually a process of small, calculated steps, taking into account family finances, and personal goals and values (Feenstra 2011). Padel explains that the process of conversion goes through the steps of acquisition of general knowledge, acceptance, acceptance on a trial basis and then permanent adoption, each of which works to alleviate concerns of risk associated with changing farming practices (2001). Some risks that farmers face when converting to organic include lack of governmental and institutional support, negative pressure from other farmers and farm groups, and lack of physical and financial capital (Cranfield 2010).

Conversion to organic has several dimensions to it, and can last anywhere from two years to an entire generation of farmers. Along with the technological and ecological changes a farm must undergo, links to social networks, values, and marketing strategies are also likely to transform (Lamine 2008). It is speculated as to whether organic farmers have strong relationships with other farmers due to their rejection of conventional methods. If so, those considering converting, or are in the process of converting are likely to experience changes in their relationships with farming organizations. Other studies, however, have found that organic farmers experience improved relations with the farming community as a result of their transition (Lamine 2008). Additionally, involvement in organic farming networks has been shown to be a large contributing factor in switching to and maintaining organic practices because of the information, motivation, and information it provides (Devitt 2006).

Farmers' relationships with their customers are also thought to change as a result of going organic. Organic farmers are thought to have closer relationships with consumers than to non-organic farmers (Lamine 2008). This in large part has to do with the change in marketing strategy that often comes along with converting to organic. As Devitt (2006) explains, for many, “a direct relationship with consumer and producer is regarded as the best way forward; selling and buying from each other. The form of activity that is engaged in is also that which is most likely to sustain the standard of living that is desired by the organic farmer (55).” With the recent growth in the organic market, larger organic farms, or organic farmers who don't mind giving up face-to-face marketing will most likely choose to sell their produce at natural foods stores or conventional supermarkets (Dimitri 2001). In this case, we can see that the farmers' original motivation to convert to organic farming might influence their marketing choices; a good example of how the complexity of values combined with the diversity of practices lends to the multitude of variations between organic farmers.

Research on the motivations of farmers to convert to or maintain organic practices is varied and often conflicting. In a study by Cranfield and Holiday, results suggested that health and safety concerns and environmental issues were the most prevalent motives for conversion, whereas economic motives were less important (2010). Alternatively, Lamine states that “most analyses of motivations for conversion reveal that economic motivations surpass environmental as well as food quality motivations (2008:6). However, he goes on to say that distinct categories of farmers who, for example, are either motivated by money or motivated by values, do not exist; extremely complicated webs of motivations that play into a farmer's decision-making process. Some of these motivations include what are usually called ethics or values-oriented motivations, such as health, environment, rural development, and lifestyle motivations (Lamine 2008). In a study by Darnhoffer (2005), who asserts that personal values do play an important role in decision-making, three types of sustainable farmers were identified; 'environment-conscious but not organic,' 'pragmatic organic,' and 'committed organic.' Out of the 26 farmers, 2 were found to be 'environment-conscious but not organic,' 3 were found to be 'pragmatic organic,' and 21 were found to be 'committed organic.' The 'environment-conscious but not organic' farmers were committed to environmentally friendly practices, but not certified organic. 'Pragmatic organic' farmers were not motivated by health, environment, or rural development issues, but pursued organic as a means to securing an income or development of professional or personal potential, and autonomy and control over their farm. 'Committed organic' individuals converted before the 'pragmatic organic' farmers, are passionate about the environmental, philosophical, and health-related aspects of organic farming. To them, it is not about the financial gains, and their actions are often considered to be part of a social movement as well as a political statement (Darnhoffer 2005). Padel (2001) also found differences between early and late adapters: earlier converters were motivated by more religious or animal welfare concerns, while late converters were concerned more about economics and the environment, and the lifestyle of organic farming. Overall we can see that a diversity of factors influence farmers' decision-making processes when considering converting to organic practices, and that each farmer is effected by such factors in a unique way, leading to equally diverse sets of practices and experiences for each farmer.

Conclusion

The importance of agriculture to our society is undisputed. However, the processes which have been developed within the past century cause concern for a number of reasons. First, the inputs required by industrial agriculture cause concern for human and environmental health, and for the ability of the system to be sustained for future generations. Secondly, others are concerned about the impacts of industrial agriculture on the agricultural economy. And third, there is concern about the impacts of industrial agriculture on farm families, rural communities, and society as a whole. The solution for those with such concerns has been sustainable agriculture. Whatever form it takes, sustainable agriculture must meet present needs while leaving equal or better opportunities for future generations. It must be ecologically sound, economically viable, and socially responsible. Thousands of farmers throughout America and the world have chosen to utilize sustainable and organic methods. However, their numbers are still very small in relation to the number of conventional farmers, and there is no telling whether their numbers will continue to grow, or if/when conversion rates will come to a halt. Thus, for those who wish to see sustainable farming rates continue to grow, or to increase at a faster rate, it is important to understand why farmers choose to convert to sustainable farming so that they can develop effective strategies to encourage more farmers to do so. Thus, understanding the motivations of farmers to choose sustainable practices will be a key factor in promoting and achieving sustainable agricultural goals.

Chapter 3: Survey Methods and Analysis

Methods

In order to research why farmers choose to use sustainable methods of agriculture, I chose to use quantitative methods and develop and distribute a survey to farmers at the Schenectady Greenmarket, in Schenectady, New York. After obtaining fewer than ten surveys using that method, I decided to e-mail the same survey to farmers who are members of the Northeast Organic Farmers Association of New York (NOFA-NY) in hopes of developing a larger pool of responses. All members of NOFA-NY are either certified Organic, have signed 'The Farmers Pledge,' or both. 'The Farmers Pledge' is a commitment to addressing labor issues, community values, sustainability, and honest marketing practices. In order to ensure that all of my data was coming from one population (i.e. NOFA-NY Farmers), I chose not to include the surveys I had obtained at the Schenectady Greenmarket. The survey was submitted and approved by the Human Subjects Approval Committee. Before participating, the farmers were informed that participation in the survey should be entirely voluntary, and that their answers would be kept entirely anonymous and confidential, as no names, addresses, or any other identifying information will be included in the study.

The survey was about two and a half pages in length and consisted of 37 questions that used ratio, nominal, and ordinal level measurements. There were questions on demographics, such as age, gender, location of the farm, and how many years they have been farming as well as questions about their farm in particular, such as acreage, commodities produced, labor utilized, income of farm, and types of markets they use to sell their products. There were also questions developed to determine how important several different factors were in their choice to use sustainable methods, and to what extent they personally utilized certain farming practices. Other than the demographic information and the open-ended question, all questions were measured by a likert scale.

Univariate Analysis

The survey was e-mailed to 533 farmers, of which a total of 94 chose to respond, giving the survey a response rate of 18%. This is regarded as an average response rate for a survey of this type. In this section, I will use univariate analysis to look at the data collected for each survey question or set of questions.

Demographics

In order to create a profile of sustainable farmers in New York, a variety of demographic information was collected. Though there were respondents from all regions of the state, the most respondents were from Cortland, Suffolk, Ontario, Onondaga, Allegheny, and Cayuga counties. As shown in Table 1, the majority of respondents (60%) were '41 to 60' years old, while a significant percentage (30%) were '26-40' years old or '61-70'. In Table 2 it can be seen that in terms of gender, 61% of respondents were male and 34% were female. As seen in Table 3, the respondents have been farming for all different amounts of time. The median in Table 3 was '11-20' years (19%), while the mode (22%) was '6-10' years of farming.

Table 1. Age of Respondents

	Frequency	Percentage
25 or younger	6	6%
26-40	16	17%
41-60	56	60%
61-70	12	13%
71 or older	3	3%
Total	96	99%

Note: Totals may be less than or greater than 100% due to rounding or non-responses. N = (94). A total of 1 case contained missing data.

Table 2. Gender of Respondents

	Frequency	Percentage
Male	57	61%
Female	32	34%
Total	89	93%

Note: Totals may be less than or greater than 100% due to rounding or non-responses. N = (94). A total of 7 cases contained missing data (respondent chose not to answer question).

Table 3. Number of Years Respondent has been Farming

	Frequency	**Percentage**
0-5	19	20%
6-10	21	22%
11-20	18	19%
21-30	11	12%
31-40	15	16%
41-50	6	6%
51 or more	2	2%
Total	**92**	**97%**

Note: Totals may be less than or greater than 100% due to rounding or non-responses. N = (94). A total of 4 cases contained missing data (respondent chose not to answer question).

The Farms

Data concerning the farm itself were also collected in order to develop an idea as to what the average sustainable New York farm is like. As seen in Table 4, farmers were generally at the high or very low ends of the spectrum in terms of acres in production; respondents were most likely to have either '200 or more' acres in production (29%) or 'zero to two' acres in production (21%). Looking at Table 5, one can see that there are a wide variety of products produced by the respondents. The majority of respondents produced vegetables (63%), while a significant number produced fruit (34%), berries (33%), poultry (32%), flowers (29%), beef (25%), and dairy (23%). There were also a wide variety of markets utilized by the respondents. Half used farmers markets, while 41% used wholesale, 31% sold to restaurants, 29% sold through CSAs, 26% sold through marketing cooperatives, and 24% sold through retail stores on their farms. Roadside stands, U-pick, and home delivery methods were much less common. When looking at the data, it is important to note that farmers may use more than one of these marketing methods. There was also a question about the total income of the farm. The median income range was ‘25,001 to 35,000’ (9%), while the mode was ‘More than 100,000’ (28%).

Table 4. Acres in Production

	Frequency	Percentage
0-2	20	21%
2-5	12	13%
6-10	6	6%
11-20	6	6%
21-50	7	7%
51-100	10	11%
101-200	6	6%
200 or more	26	28%
Total	**93**	**98%**

Note: Totals may be less than or greater than 100% due to rounding or non-responses. N = (94). A total of 3 cases contained missing data (respondent chose not to answer question).

Table 5. Products or Commodities Produced

	Frequency	Percentage
Vegetables	57	63%
Fruit	31	34%
Berries	30	33%
Poultry	29	32%
Flowers	26	29%
Beef	23	25%
Dairy	21	23%
Other Livestock	12	13%
Fiber	8	9%
Maple	7	8%
Sheep	6	7%
Equine	6	7%
Other	31	34%

Note: Respondents may produce more than one commodity, so percentages may add up to more than 100%. N = (94). A total of 3 cases contained missing data (respondent chose not to answer question).

Table 6. Markets Utilized

	Frequency	Percentage
Farmers Markets	45	50%
Wholesale	37	41%
Restaurants	28	31%
Community Supported Agriculture (CSA)	26	29%
Marketing Cooperatives	23	26%
Retail Store on-farm	22	24%
Roadside Stand	15	17%
Home Delivery	14	16%
U-pick	8	9%
Other	24	27%

Note: Respondents may use several types of markets, so percentages may add up to more than 100%. N = (94). A total of 4 cases contained missing data (respondent chose not to answer question).

Table 8. Total Income of Farm

	Frequency	Percentage
0 to 5,000	10	11%
5,001 to 10,000	6	6%
10,001 to 15,000	10	13%
15,001 to 25,000	8	10%
25,001 to 35,000	7	9%
35,001 to 50,000	11	12%
50,001 to 75,000	7	7%
75,001 to 100,000	4	4%
More than 100,000	26	28%
Total	**89**	**100%**

Note: Totals may be less than or greater than 100% due to rounding or non-responses. N = (94). A total of 5 cases contained missing data (respondent chose not to answer question).

Labor

In the survey, questions were also asked to determine the type and quantity of labor utilized on the farm. The goal in collecting this data was to gain more insight about the average sustainable farmer in New York. As seen in Table 7, the mode was family members, with 79% of the respondents saying that in addition to themselves, their family members also help out on the farm. The second most common form of labor were part-time workers (41%), followed by seasonal workers (33%), interns (23%), full-time (21%), migrant (11%), and other (10%). The farmers were also asked about the quantity of part-time and full-time workers employed. Most respondents hired 0-5 full-time workers, though two farmers reported hiring 25 ad 45 full-time workers. Part-time workers were a bit more common, with most farmers reporting that they hire 0-10, and four farmers saying that they hire 20-60.

Table 7. Types of Labor Utilized

	Frequency	Percentage
Family Members	71	79%
Part-time	37	41%
Seasonal	30	33%
Interns	21	23%
Full-time	19	21%
Migrant	10	11%
Other	9	10%

Note: Respondents may use several types of labor, so percentages may add up to more than 100%. N = (94). A total of 3 cases contained missing data (respondent chose not to answer question).

Factors Influencing Farming Practices

The next section of the survey asked the farmers to rate how important a number of factors were in making decisions concerning their farm. The factors were rated on a likert scale of importance from very important to unimportant. Table 8 displays the results to this series of questions. The first topic they were asked to rate was how much the impact their farm could have the local economy factored into their decision-making processes. Here, both the median and mode responses was ‘moderately important’ (28%), followed in magnitude by ‘very important,’ which was chosen by 18% of the respondents. The second factor asked about was the importance of the farmer’s health and their families’ health in making decisions about the farm. This was the most important issue to the farmers, with 64% of the farmers saying that it was ‘very important.’ The third factor discussed was the importance of the health of the farmer’s community and customers in making decisions about their farm. The mode of these responses was ‘very important’ (55%). The next question asked the farmer about the importance of the social impact the farm might have on their community when making decisions about their farm. This question received more varied responses, though the mode was still ‘very important’ (34%), followed by ‘important’ (28%). The fifth question posed by the survey was the importance of the environment in making decisions about the farm. Here, 60% of the farmers said that the environment played a ‘very important’ role in making decisions about their farms. It is interesting to note that the environment was second only in importance to the health of the farmer and his/her family. The last question in this section asked the farmers the extent to which religious or spiritual factors played a role in their decision-making process about farming practices. This question received the most varied responses. The median of the answers was ‘moderately important’ (17%), which tied with ‘of little importance’ (17%) for the mode.

Overall, though many factors influence these farmer's decisions, the most important factor is the health of the farmer and his/her family. Following this are the environment, the health of the community and customers, the social impact of the farm, the local economy, and religious and spiritual factors, respectively.

Table 8. Importance of Various Factors in Making Decisions about Farming Practices

	Very Important	Important	Moderately Important	Of Little Importance	Unimportant	No Response
The impact of your farm on the local economy	17 (18%)	14 (15%)	26 (28%)	14 (15%)	1 (1%)	20 (23%)
Your health and/or your family's health:	60 (64%)	10 (11%)	4 (4%)	1 (1%)	0 (0%)	19 (20%)
The health of your community and customers:	52 (55%)	17 (18%)	6 (6%	0 (0%)	0 (0%)	19 (20%)
The social impact your farm might have on your community:	32 (34%)	26 (28%)	15 (16%)	2 (2%)	0 (0%)	19 (20%)
The impact your farm might have on the environment:	56 (60%)	16 (17%)	2 (2%)	1 (1%)	0 (0%)	19 (20%)
Religious or spiritual factors:	13 (14%)	12 (13%)	17 (18%)	17 (18%)	14 (15%)	21 (22%)

Note: Totals may be less than or greater than 100% due to rounding or non-responses. N = (94). The 'No Response' column indicates that the respondent chose to skip the question.

Opinions about Various Farming Practices

This section asked the farmers to answer a series of questions in which they were asked to rate the extent to which they agreed with various statements describing certain farming practices. These questions were answered using a likert scale ranging from 'strongly agree' to 'strongly disagree.' Though they were mixed within the survey, here I have separated the responses to the sustainable farming practice statements (Table 9) and the unsustainable farming practice statements (Table 10) for the purposes of analysis. To the first statement in Table 9, "When possible, methods should be used to improve water conservation and storage measures," about half of the respondents indicated that they 'strongly agree' (49%), 3 were undecided, and zero disagreed in any way. The second statement, 'When possible, methods should be used to promote plant diversity in and around both natural and agricultural areas in order to support a diversity of wildlife and aid in agricultural pest management,' was agreed with even more, with 57% of respondents saying that they 'strongly agree.' To the third statement, "Methods should be used to keep soil in place, such as reducing or eliminating tillage, managing irrigation to reduce runoff, and keeping the soil covered with plants or mulch,' just over half of the respondents (54%) indicated that they 'strongly agree.' To the last statement, 'Methods should be used to maximize reliance on natural, renewable, and on-farm inputs,' 57% of the respondents indicated that they 'strongly agree.' Overall, most respondents agreed with these statements. There were only two cases when individuals indicated that they 'disagreed' or 'strongly disagreed' with any of the statements.

Table 9. Opinions about Sustainable Farming Practices

	Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree	No Response
When possible, methods should be used to improve water conservation and storage measures.	46 (49%)	27 (29%)	3 (3%)	0 (0%)	0 (0%)	18 (19%)
When possible, methods should be used to promote plant diversity in and around both natural and agricultural areas in order to support a diversity of wildlife and aid in agricultural pest management.	54 (57%)	17 (18%)	4 (4%)	1 (1%)	0 (0%)	18 (19%)
Methods should be used to keep soil in place, such as reducing or eliminating tillage, managing irrigation to reduce runoff, and keeping the soil covered with plants or mulch.	51 (54%)	20 (21%)	3 (3%)	0 (0%)	1 (1%)	19 (20%)
Methods should be used to maximize reliance on natural, renewable, and on-farm inputs.	54 (57%)	16 (17%)	5 (5%)	0 (0%)	0 (0%)	19 (20%)

Note: Totals may be less than or greater than 100% due to rounding or non-responses. N = (94). The 'No Response' column indicates that the respondent chose to skip the question.

Again, Table 10 provides a summary of the responses to various statements describing less sustainable farming practices. To the first statement, 'When possible, chemical pesticides and fertilizers should be used to ensure maximum productivity," about half of the respondents (54%) indicated that they 'strongly disagree.' To the second statement, "It is unnecessary to use methods to reduce reliance on non-renewable energy sources (such as coal, oil, and natural gas) on a farm,' just under half (45%) indicated that they 'strongly disagree,' while 10% indicated that they 'strongly agree.' The third statement, "Smoke from agricultural burning, dust from tillage, traffic and harvest; pesticide drift from spraying; and nitrous oxide emissions from the use of nitrogen fertilizer are unavoidable consequences of farming,' had a median and mode of 'strongly agree' (40%). To the fourth statement, "Greater inputs of water, nutrients, pesticides, and/or energy for tillage are necessary to maintain yields," 37% of respondents indicated that they 'strongly disagree,' and 29% indicated that they 'disagree.' To the fifth statement, "Factors such as soil type and depth, previous crop history, and location (e.g. climate, topography) are not necessary to take into account before planting,' over half of the farmers (56%) responded that they 'strongly disagree.' The last statement, 'Agriculture is completely separate from community institutions that meet employment, educational, health, cultural and spiritual needs' mode of 'strongly disagree' (47%), and a median of 'disagree' (20%). Overall, a majority of the farmers disagreed with these statements.

Table 10. Opinions about Unsustainable Farming Practices

	Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree	No Response
When possible, chemical pesticides and fertilizers should be used to ensure maximum productivity.	2 (2%)	2 (2%)	4 (4%)	16 (17%)	51 (54%)	19 (20%)
It is unnecessary to use methods to reduce reliance on non-renewable energy sources (such as coal, oil, and natural gas) on a farm.	9 (10%)	1 (1%)	7 (7%)	17 (18%)	42 (45%)	18 (19%)
Smoke from agricultural burning, dust from tillage, traffic and harvest; pesticide drift from spraying; and nitrous oxide emissions from the use of nitrogen fertilizer are unavoidable consequences of farming.	2 (2%)	7 (7%)	2 (2%)	26 (28%)	38 (40%)	19 (20%)
Greater inputs of water, nutrients, pesticides, and/or energy for tillage are necessary to maintain yields.	1 (1%)	4 (4%)	5 (5%)	27 (29%)	35 (37%)	22 (23%)
Factors such as soil type and depth, previous crop history, and location (e.g. climate, topography) are not necessary to take into account before planting.	3 (3%)	1 (1%)	3 (3%)	16 (17%)	53 (56%)	18 (19%)
Agriculture is completely separate from community institutions that meet employment, educational, health, cultural and spiritual needs.	4 (4%)	4 (4%)	3 (3%)	19 (20%)	44 (47%)	20 (21%)

Note: Totals may be less than or greater than 100% due to rounding or non-responses. N = (94). The 'No Response' column indicates that the respondent chose to skip the question.

Personal Farming Practices

This section asked the farmers to answer a series of questions in which they were asked to rate the extent to which they agreed with various statements described their *personal* farming practices. Just like the previous set of questions, these questions were answered using a likert scale ranging from 'strongly agree' to 'strongly disagree.' And again, though they were mixed within the survey, I have separated the responses to the sustainable farming practice statements (Table 11) and the unsustainable farming practice statements (Table 12) for the purposes of analysis. To the first statement in Table 11, "I use methods to improve water conservation and storage measures," mode response was "strongly agree' with 46%, and the median response was 'agree' (31%).. To the second statement, "I make sure methods are used to promote plant diversity in and around both natural and agricultural areas in order to support a diversity of wildlife and aid in agricultural pest management," the median and mode response was also "strongly agree," with 50%. The third statement, "My farm uses methods to improve air quality such as incorporating crop residue into the soil, using appropriate levels of tillage, and planting wind breaks, cover crops or strips of native perennial grasses to reduce dust," had a median response of 'agree,' with a mode response of 'strongly agree' (38%). The fourth statement, "When site selection is an option, factors such as soil type and depth, previous crop history, and location (e.g. climate, topography) are taken into account before planting," had a median and mode response of 'strongly agree,' with 56% of the votes. The last statement, "I seek to use agriculture practices that foster community institutions which help meet employment, educational, health, cultural and/or spiritual needs," had a median response of 'agree,' and a mode response of 'strongly agree' (33%). Overall, most respondents either agreed or strongly agreed with the statements in Table 11.

Table 11. Respondents' Personal Sustainable Farming Practices

	Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree	No Response
I use methods to improve water conservation and storage measures.	43 (46%)	29 (31%)	2 (2%)	1 (1%)	0 (0%)	19 (20%)
I make sure methods are used to promote plant diversity in and around both natural and agricultural areas in order to support a diversity of wildlife and aid in agricultural pest management.	47 (50%)	22 (23%)	4 (4%)	2 (2%)	0 (0%)	19 (20%)
My farm uses methods to improve air quality such as incorporating crop residue into the soil, using appropriate levels of tillage, and planting wind breaks, cover crops or strips of native perennial grasses to reduce dust.	36 (38%)	30 (32%)	5 (5%)	2 (2%)	0 (0%)	21 (22%)
When site selection is an option, factors such as soil type and depth, previous crop history, and location (e.g. climate, topography) are taken into account before planting.	53 (56%)	17 (18%)	3 (3%)	0 (0%)	0 (0%)	21 (22%)
I seek to use agriculture practices that foster community institutions which help meet employment, educational, health, cultural and/or spiritual needs.	31 (33%)	24 (26%)	12 (13%)	4 (4%)	1 (1%)	22 (23%)

Note: Totals may be less than or greater than 100% due to rounding or non-responses. N = (94). The 'No Response' column indicates that the respondent chose to skip the question.

Lastly, Table 12 provides a summary of the responses to various statements about less sustainable farming practices. Again, the farmers were asked to indicate using the likert scale the degree to which they agreed with each statement. The first statement, “On my farm, chemical pesticides and fertilizers are used to ensure maximum productivity,” had the highest number of “strongly disagree” responses in the series of questions, with 69% of respondents indicating so. The second statement, “Only non-renewable resources (such as oil, coal, and natural gas) are used on my farm,” had a less uniform set of responses, with a median of ‘disagree,’ and a mode of ‘strongly disagree’ (30%). The third statement, “On my farm, greater inputs of water, nutrients, pesticides, and/or energy for tillage are used to maintain yields,” had a mode of “strongly disagree’ and a median of ‘disagree’ (16%). The fourth statement, “Methods are never used to maximize reliance on natural, renewable, and on-farm inputs on my farm,’ had a median and mode of ‘strongly disagree’ (51%). And lastly, the fifth statement, “Methods used to keep soil in place, such as reducing or eliminating tillage, managing irrigation to reduce runoff, and keeping the soil covered with plants or mulch, are not used on my farm,” had a mode of ‘strongly disagree’ (47%), and a mean of ‘disagree’ (14%). It is interesting to note that this statement had the highest percentage of ‘strongly agree’ (13%) out of all of the statements in this section. Overall, however, the respondents most commonly indicated that they ‘strongly disagree’ with these statements.

Table 12. Respondents' Personal Unsustainable Farming Practices

	Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree	No Response
On my farm, chemical pesticides and fertilizers are used to ensure maximum productivity.	1 (1%)	3 (3%)	2 (2%)	5 (5%)	65 (69%)	18 (19%)
Only non-renewable resources (such as oil, coal, and natural gas) are used on my farm.	0 (0%)	11 (12%)	9 (10%)	24 (26%)	28 (30%)	72 (77%)
On my farm, greater inputs of water, nutrients, pesticides, and/or energy for tillage are used to maintain yields.	2 (2%)	4 (4%)	5 (5%)	15 (16%)	45 (48%)	71 (76%)
Methods are never used to maximize reliance on natural, renewable, and on-farm inputs on my farm.	3 (3%)	2 (2%)	5 (5%)	15 (16%)	48 (51%)	21 (22%)
Methods used to keep soil in place, such as reducing or eliminating tillage, managing irrigation to reduce runoff, and keeping the soil covered with plants or mulch, are not used on my farm.	12 (13%)	3 (3%)	2 (2%)	13 (14%)	44 (47%)	74 (79%)

Note: Totals may be less than or greater than 100% due to rounding or non-responses. N = (94). The 'No Response' column indicates that the respondent chose to skip the question.

Multivariate Analysis

Now that all of the survey results are laid out, it is time to begin analysis, which will also be done using SPSS. First, the respondent's opinions about unsustainable and sustainable farming practices and their personal farming practices will be quantified. Each person will be given a score for all of their responses to each of the likert-style question sequences, as well as an average of those two scores, which will be called their 'Sustainability Score.' Next, that score will be compared to several of the demographic variables (Age, Gender, etc.) in order to see if there is any correlation between such factors and level of sustainability. Subsequently, the Sustainability Score will be compared to the importance of the different factors (local economy, health, community) on making decisions about their farming practices. In other words, answering questions like, "Which farmer is more sustainable: The farmer who felt the local economy was most important, or the farmer who felt their family's health is more important?" And finally, a summary of the answers to the open question asking about other factors that may have influence the farmer's decision making process will be provided.

Likert Question Scores

In order to quantify the likert-style question sequences asking about the farmers' opinions and practices, each possible answer was given a number on a scale from -2 to -2. For the sustainable (positive) statements, 'Strongly Agree' was given 2 points, 'Agree' was given 1, 'Undecided' was given 0, 'Disagree' was given -1, and strongly disagree was given -2. For the unsustainable (negative) statements, the opposite number of points was given (for example, 'Strongly Agree' was given -2 points). Each respondent's points were then added up, giving them each a score measuring the sustainability of their opinions and the sustainability of their practices (Table 13). Using the Pearson's Correlation Co eficcient to compare the Opinion Scores and the Practices Scores, we learn that 26% of the variance in the farmer's practices can be accounted for by the variance in farmer's opinions, and vice versa, and that the correlation is statistically significant at the 0.01 level, which tells us that there is evidence of a strong association between a farmer's practices and his opinions about sustainable agriculture. The scores for opinions and practices were then averaged, giving them an overall 'Sustainability Score,' measuring their sustainability as a combination of their opinions and practices. Though it was possible for the applicants to get a score anywhere from -20 to 20, no respondent scored below a 1. So, relatively speaking our respondents were on the more sustainable side, but we will still treat 1 as least sustainable and 20 as most sustainable for the purposes of analysis. Table 13 displays the final sustainability scores for all of the respondents. The median Sustainability Score was 14, while the average was 12.87.

Table 13. Sustainability Score

	Opinions	Practices	**Sustainability Score**
1-5	6 (8%)	5 (7%)	**4** **(5%)**
6-10	13 (18%)	12 (16%)	**18** **(24%)**
11-15	33 (45%)	29 (40%)	**30** **(41%)**
16-20	22 (30%)	28 (38%)	**22** **(29%)**
Total	**74**	**74**	**74**

Note: Totals may be less than or greater than 100% due to rounding or non-responses. N = (94). A total of 20 cases contained missing data (respondent chose not to answer question).

Demographic Influences on Sustainability

The demographic variables we will look at in this section are age, gender, years farming, acres in production, and income. We chose not to look at labor, markets utilized, or products produced. The relationship between age and sustainability score can be seen in Table 14. At first glance, there appears to be little correlation between the variables. Because there are few respondents outside of the 41-60 age range, leading to many empty cells, it is impossible to say whether this comparison will apply to the broader population. However, calculating Pearson's r (a measure of association appropriate to Interval/Ratio-level data), we find that there is a -.095 level of association between the two variables. This confirms the assumption that there is a weak/uninteresting level of association between the two variables. Table 15 displays the relationship between gender and sustainability. As can be seen, gender does not seem to have much of an impact on sustainability score. Looking at an analysis of the means, we can see that there was an insignificant difference (.09) between the average male respondent's sustainability score and the average female respondent's sustainability score. The next variable we compared to the sustainability score is the number of years each of the respondents had been farming. Similar to the comparison of age and sustainability, there are again less than 5 respondents in many of the cells, making it impossible to say whether this comparison will apply to the broader population. And again, looking at Pearson's r correlation coefficient (.036), there is weak correlation between the variables. Table 17 displays the relationship between the number of acres the respondents used in production and their sustainability scores. In this case, Pearson's Correlation Coefficient is -.188, which tells us that there is a moderate negative association between number of acres in production and sustainability. In other words, the fewer acres a farmer has in production, the more likely he or she is to have a high sustainability score. Unfortunately, we cannot say for certain that this applies to the broader population of farmers (those that did not participate in our experiment) because there are many cells in the table that have fewer than five cases, meaning that a test for level of significance would be unattainable. Lastly, Table 18 displays the relationship between the respondent's income and their sustainability scores. The Pearson's r for this correlation is -.104 which indicates a moderate, negative level of association between the two variables. This tells us that as the respondent's income increases, their sustainability scores decrease. However, we can again apply this to only the respondents to our survey, because many of the cells had fewer than five cases within them.

Overall, we found that age, gender, and number of years farming have little to do with a farmer's level of sustainability. On the other hand, we found that both the size of the farm and the income of the farm were negatively associated with sustainability. This makes sense because income and size of the farm are usually related. In some ways, I am surprised that the number of years the respondent has been farming is unassociated with sustainability because one would think that the longer a person has been farming, the bigger their farm would be, which is as we just found out, moderately correlated with a lower sustainability score.

Table 14: Age and Sustainability Score

		Age					
		25 or Younger	26-40	41-60	61-70	71 or Older	Total
Sustainability Score	1-5	0 (0%)	0 (0%)	4 (8%)	0 (0%)	0 (0%)	4 (5%)
	6-10	2 (50%)	4 (36%)	10 (20%)	1 (11%)	1 (33%)	18 (24%)
	11-15	2 (50%)	5 (45%)	20 (41%)	3 (33%)	1 (33%)	31 (41%)
	16-20	0 (0%)	2 (18%)	14 (29%)	5 (55%)	1 (33%)	22 (29%)
	Total	**4**	**11**	**48**	**9**	**3**	**75**

Note: Totals may be less than or greater than 100% due to rounding or non-responses. N = (94). A total of 19 cases contained missing data (respondent chose not to answer question).

Table 15: Gender and Sustainability Score

		Gender		
		Female	Male	Total
Sustainability Score	1-5	1 (4%)	3 (6.5%)	4 (6%)
	6-10	3 (11%)	14 (30%)	17 (23%)
	11-15	15 (55%)	15 (32%)	30 (41%)
	16-20	8 (30%)	14 (30%)	22 (30%)
	Total	**27**	**46**	**73**
	Mean	**12.74**	**12.65**	

Note: Totals may be less than or greater than 100% due to rounding or non-responses. N = (94). A total of 21 cases contained missing data (respondent chose not to answer question).

Table 16: Number of Years Farming and Sustainability Score

		Years Farming						
		0 to 5	6 to 10	11 to 20	21 to 30	31 to 40	41 to 50	Total
Sustainability Score	1-5	0 (0%)	0 (0%)	2 (13%)	1 (11%)	0 (0%)	1 (20%)	4 (5%)
	6-10	5 (29%)	3 (18%)	2 (13%)	4 (44%)	3 (25%)	1 (20%)	18 (24%)
	11-15	9 (53%)	6 (35%)	6 (40%)	3 (33.3%	6 (50%)	1 (20%)	31 (41%)
	16-20	3 (18%)	8 (47%)	5 (33%)	1 (11%)	3 (25%)	2 (40%)	22 (29%)
	Total	**17**	**17**	**15**	**9**	**12**	**5**	**75**

Note: Totals may be less than or greater than 100% due to rounding or non-responses. N = (94). A total of 19 cases contained missing data (respondent chose not to answer question).

Table 17: Acres in Production and Sustainability Score

		Acres in Production							
		0-5	6-10	11-20	21-50	51-100	101-200	200 or more	Total
Sustainability Score	1-5	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	4 (20%)	4 (6%)
	6-10	5 (29%)	2 (67%)	1 (25%)	0 (0%)	2 20%	1 (20%)	5 (25%)	16 (25%)
	11-15	7 (41%)	0 (0%)	2 (50%)	2 (40%)	4 (40%)	2 (40%)	6 (30%)	23 (36%)
	16-20	5 (29%)	1 (33%)	1 (25%)	3 (60%)	4 (40%)	2 (40%)	5 (25%)	21 (33%)
	Total	**17**	**3**	**5**	**5**	**10**	**5**	**20**	**64**

Note: Totals may be less than or greater than 100% due to rounding or non-responses. N = (94). A total of 30 cases contained missing data (respondent chose not to answer question

Table 18: Income and Sustainability Score

		Income							
		2500.00	8000.00	13000.00	30000.00	40000.00	60000.00	90000	Total
Sustainability Score	1-5	0 (0%)	0 (0%)	0 (0%)	0 (0%)	1 (11.1%)	0 (0%)	0 (0%)	1 (1.9%)
	6-10	0 (0%)	2 (40%)	2 (15%)	1 (12%)	2 (22%)	0 (0%)	1 (50%)	8 (15.4%)
	11-15	5 (55%)	2 (40%)	6 (46%)	5 (62%)	3 (33%)	3 (50%)	1 (50%)	25 (48.1%)
	16-20	4 (44%)	1 (20%)	5 (38%)	2 (25%)	3 (33%)	3 (50%)	0 (0%)	18 (34.6%)
	Total	**9**	**5**	**13**	**8**	**9**	**6**	**2**	**52**

Note: Totals may be less than or greater than 100% due to rounding or non-responses. N = (94). A total of 42 cases contained missing data (respondent chose not to answer question).

Decision-making and Sustainability

The series of likert-style questions in which the respondents were asked, “In the following table, please rate how important each of the following were in making decisions about how to run your farm,” will also be compared to the sustainability score. This should tell us how the importance of certain issues to farmers during their decision-making process relates to their level of sustainability. In comparing each factor to sustainability, gamma (the measure of association appropriate to ordinal level variables), and chi-square (a test of significance) were calculated using SPSS.

Table 19 displays the relationship between attitudes about the level of importance certain factors played in farmers' decision-making processes and their sustainability scores. There appear to be differences in sustainability scores across each issue. However, the gamma measure of association tells us that there is evidence of a strong and extremely interesting positive relationship between each of the factors and sustainability score. This tells us that, for example, the more a person felt that the 'health of their community and customers' was important, the more they are likely to use sustainable methods of agricultural production. We can see however, that all the factors were not equally related to sustainability. The factor, if thought to be important by the respondent, which had the strongest association to sustainability (.993) was the 'impact [their] farm might have on the environment.' This of course makes sense, because sustainability is closely tied to the environment. The second most important factor was the 'social impact [their] farm might have on [their] community.' If we square gamma, we see that a 41% reduction in error would occur by guessing a farmer's level of sustainability based on the value they place on their community. The impact of the respondent's farm on the environment, on their community, and on the health of their customers were each statistically significant at the .05 level, as shown by chi-square. This confirms our belief that there is a relationship between sustainability and each of these two variables, and tells us that we can generalize this to the larger population of farmers. On the other hand, chi square also shows that the importance of religious or spiritual factors, the local economy, and family's health in relation to sustainability was not statistically significant at the .05 level. Thus, we cannot generalize these to the larger population. Overall, we have found out that the value a farmer places on each of these factors is important in determining whether or not they will practice sustainable agriculture. When a farmer feels that the environment, their community, and religious or spiritual factors were important or very important to their decision-making processes, they will be more likely to have a high level of sustainability.

Table 19: Strength of association between Importance of Certain Factors to Decision-making and Sustainability Score

Likert Question	The impact your farm might have on the environment.	The social impact your farm might have on your community.	Religious or spiritual factors.	The health of your community and customers.	The impact of your farm on the local economy.	Your health and/or your family's health.
Gamma	.933	.637	.378	.376	.352	.300
Reduction in Error	87%	41%	14%	14%	12%	9%

Other Important Influences on Farming Practices

For the last section in the analysis, we will look at other factors that may be important to farmers in deciding whether to grow sustainably or conventionally. Though the farmers were initially asked how important certain factors were (the environment, their family's health, etc.) an open-ended question was included as a supplemental way for them to indicate other important factors that may not have been covered by the likert-style questions. Specifically, the survey stated "If there were any other factors that you would say were "Important" or "Very Important" in influencing your farming practices, please list or describe them in the space below." The variety of answers received was exceptionally broad, but were able to fit loosely into certain categories. Such categories included animal welfare, lifestyle, research, holism, position to educate and influence, costs, and niche market.

Many respondents indicated that animal welfare was of concern to them, and that it influenced the choices they made when farming. Respondents said that animal welfare plays an important role in being organic, and that "going organic seemed to be a better way of life for the farm, community, and animals," (as well as the bees)?? Sorry, I don't get the meaning here.

There were also a significant number of respondents who said that the lifestyle that farming sustainably provides is what draws them to it. One person said that they "try to keep with old fashioned style farming," and that it maintains purity and integrity. Similarly, others said that sustainable farming allows them to live honestly with themselves, their employees, customers, and the ultimate consumers of their products; that it allowed them to treat others as they would want to be treated, and have peace of mind knowing they are doing the best they can for their families, animals, and soil. One farmer said that though he came "from a conventional farming background," he switched over to organic/sustainable practices because it allows him to meet his 'own standards of stewardship."

Another commonly mentioned reason for using sustainable farming methods was because of research. Either they had done research on it, which convinced them of its value, or they were currently attempting to expand the research available about the subject by documenting their own farming practices. One farmer said that 'providing on-farm research (not necessarily on a scientific level) on sustainable methods of farming" is important to him because he believes that eventually "all farms will need to be farming sustainably," due to the fact that "oil will not last forever, and the environment can't be ignored either." On the other hand, one farmer said that he was a supporter of the "Back to the Land Movement," which encourages people to educate themselves about farming. This research, he said, had a substantial influence on his choice to use sustainable methods of farming. Along similar lines, another respondent said that "work, research and visits to many farms around the world allowed us to integrate a system that takes something from all the best fruit farms."

Additionally, respondents said that as farmers they chose to use sustainable methods because it would put them in the position to educate and inform people about global climate and environmental issues. One respondent said that they "believe that the current level of 'popular' awareness and acceptance of the reality of global warming/climate change is perilously low. Therefore, anything I can do to help communicate that we ALL need to act NOW to be as environmentally responsible as possible, I will do." Another said that they chose to farm sustainably because it gave them the ability to educate the public about the atrocities of the American diet. A few respondents said that they educate people by having students and volunteers come to their farm to learn about sustainable agriculture. Others said that when farming and the sale of sustainably-grown produce is exposed to a community, the public is given the chance to learn about alternatives to conventional farming methods, get to know their farmer, and buy their food locally. Many farmers felt that it is very important for people to know where their food comes from or to grow their own if possible.

One of the most commonly cited reasons for pursuing sustainable agriculture were consumer interest and a niche organic market, which make it cost effective and economically feasible. Many explained that in the past several decades it has been nearly impossible for small farmers to survive when competing against large-scale conventional farms. One respondent noted, "Organic fruit is a very profitable niche market in our area. I'm the only organic apple farm which makes it easy to move product in a market with hundreds of acres of apples." Also, many explained that when the demand for organic food began to grow, small farmers were able to convert more easily to sustainable methods, and because of the higher prices they are able to sell organic produce at, they were able to stay financially afloat. And, because sustainable agriculture requires significantly fewer off-site inputs, they are able to save money by using their own on-farm organic inputs (for example, using compost instead of fertilizer). One farmer stated that "I would have been motivated to grow in the fashion that we do for personal reasons but the fact that growing "organically" is also an in roads for small farms to enter an otherwise saturated vegetable market is important." Other respondents declared that "from a financial point organic farming has been more profitable for us," and "individual economic reasons [motivated us] because if it is not profitable we can't stay in business or live." Alternatively, a few mentioned the difficulty and expense of becoming certified by the USDA, but said that they were able to become certified by an independent organization called "Certified Naturally Grown," which helped them promote their organic produce without going through the government agency.

By far, the most frequently mentioned reason for pursuing sustainable agriculture was the *combination* of health and the environment. In the likert-question sequence, I mentioned each of these factors separately. However, it appears that in the open-ended question the respondents found it essential to articulate that it was the combination of these that motivated them because the two are intertwined. Many expressed the belief that a healthy environment means healthy people and that fresh, local and organic produce have higher nutrient-density and are therefore healthier. One farmer said that they were doing it for children; "research [shows that] children not fed an organic diet had 9 times the amount of pesticides [and] insecticides in their urine than what was deemed safe by the EPA." The same individual explained that "the commercial way of farming is destroying the very fabric of society." Another stated, "factory farms and mono-culture crops are destroying our land and our health; these practices are cruel and unnecessary," and "natural farming practices benefit the land, environment, livestock, wildlife and the consumers." One farmer offered an explanation that was more specific about his personal practices, and how they related to health and the environment; "I'm trying to focus this year on getting my soils re-mineralized, because I believe that almost all agricultural land is extremely deficient in the minerals our bodies need to be healthy. I feel its much more than just applying organic NPK fertilizers." Others mentioned the importance of making healthy food available to low-income populations. And lastly, I think that one respondent summed up what they all said with a simple equation; "healthy environment, soil, food = improved consumer health."

Chapter 4: Conclusions and Suggestions for Further Research

It is amazing that something considered to be a basic necessity- a substance that enables life and growth on this planet- can be surrounded by so much controversy. However, distressing and confusing words like pesticides, poverty, cancer, GMOs, overpopulation, obesity, malnutrition, and pollution, are all intertwined with this seemingly simple thing, but rarely to come into our heads during any one of the three meals we eat each day. However, an increasing awareness of climate change, human and environmental health issues, and the destruction of family farms and rural communities has caused a significant change in the way of many farmers, consumers, and policy-makers are thinking about and relating to food.

The results of this change can be seen largely in the growth of the organic and value-added food industry. Large-scale agribusiness, and what are now considered 'conventional' agricultural practices, which found their beginnings first in the industrialization and then in the chemicalization of agriculture, are no longer the only forces controlling our diets and farming practices. Sustainable agriculture takes into account ecological, sociological, and economic systems, while aiming to meet our present needs and maintain our resources so that future generations will be able to meet their needs just as well.

This study sought to create a profile of organic farmers in New York State and to understand what motivates them to practice sustainable agriculture. A survey was distributed to the 533 members of NOFA-NY, and received a response rate of 18%. The results showed that the average farmer is male, 41 to 60 years old, and has been farming 6-10 years. However, there were a significant number of respondents who did not necessarily conform to this profile. The average farm has either a very small (0-2) or very large (200 or more) number of acres in production, grows vegetables and fruits, sells their produce at farmers markets, to wholesale dealers, and to restaurants. The income ranges of the farms varied widely. Most farms used family and part time labor, and had between 0-10 employees.

For these farmers, the most important motivating factors were the health of their families, the environment, and the health of their community and customers. Motivating factors of less, but notable, importance included the social and economic impacts of their farm on their community, and religious or spiritual factors. Age, gender, and number of years farming had little to do with level of sustainability. Alternatively, the size of the farm and the income of the farm were both negatively associated with sustainability.

The open-ended question, dedicated to a further understanding of farmers' motivations to use sustainable practices, produced a range of responses that further reflected the heterogeneity of our sample. Respondents cited animal welfare, the lifestyle, research and education concerning sustainable practices, the ideas of ecological holism and inter-connectivity, the decreased costs and increased income due to the niche organic market,as important factors in their decision to pursue sustainable agriculture. A common theme expressed by the respondents was the fact that many of these factors- such as health and the environment- are related to one another. Others stressed the fact that farming sustainably allowed them to live honestly with themselves, their employees, and their customers, and to maintain purity and integrity in their lives.

The intention of this study is to add to the already existing body of knowledge concerning sustainable farmers and their motivations to practice sustainable agriculture. However, there a few shortcomings within this study that should be addressed. First of all, I feel that the study would have provided much more accurate portrayal of farmers if the response rate had been higher. For example, much of the data provided by the multivariate analysis was unable to be considered significant or representative of the broader population due to the lack of data. Furthermore, I feel that the survey was lacking several questions which, when answered, would have produced valuable information. In hindsight, I would have liked to include a set of questions that would assess whether the farmer had ever used conventional or unsustainable practices. Also, looking back, I realize that I never directly asked the farmers about the impact of economics, or prospective income, on their decision-making process. And finally, I think that the survey questions should have been more concise and comprehensive. Such changes may have increased the response rate by making the survey seem less daunting.

Overall, the survey served to reinforce the work of previous studies. It demonstrated the diversity of factors influencing farmers' decision-making processes when considering converting to organic practices, and that each farmer is affected by such factors in a unique way. One would assume that such a dynamic would lead to diverse sets of practices and experiences for each farmer. This demonstrates that for those who might be looking to encourage farmers to convert to sustainable practices, a one-dimensional approach will not be satisfactory. Differences between farmers should be taken into account when developing educational materials, policy, and general encouragement for conversion. Abaidoo (2002), explains that potential converters should be educated first about the environmental and social reasons for converting first, due to the fact that farmers must conceptually endorse the idea of organic farming before they begin practicing it on their farms.

Further research should focus on a more in-depth understanding of farmers' motivations, as opposed to a superficial categorizing of now well-recognized and acknowledged motivations such as environment and health. Studies should also seek to identify the educational methods which will be most effective at convincing farmers to convert to sustainable agriculture. Additional research might also look at the endurance of the organic market in the face of, for example, an economic depression. Which farmers will maintain their sustainable practices, and which will abandon them in need for higher profits? Will consumers with a sudden drop in income continue buying sustainably-grown produce, despite its higher cost?

Survey

Union College Thesis Student Survey

My name is Kimberly Floeser, and I am a student at Union College**.** I am inviting you to participate in a research study. Involvement in the study is voluntary, so you may choose to participate or not.

I am interested in learning more about sustainable community agriculture. You will be asked to complete a short survey. This will take approximately 15 minutes, and all information will be kept anonymous and confidential.

All of my questions have been answered and I wish to participate in this research study.

____ ____________________________

Signature of participant Date

____

Print name of participant

____ ____________________________

Name of investigator Date

1. Age:

□ 25 or younger

□ 26-40

□ 41-60

□ 61-70

□ 71 or older

2. Gender

□ Female

□ Male

3. Years you have been farming:

□ 0-5

□ 5-10

□ 11-20

□ 21-30

□ 31-40

□ 41-50

□ 51 or more

4. Acres in production:

□ 0-2

□ 2-5

□ 6-10

□ 11-20

□ 21-50

□ 51-100

□ 101-200

□ 200 or more

5. Products or commodities produced: (check all that apply)

- ☐ Dairy
- ☐ Beef
- ☐ Sheep
- ☐ Swine
- ☐ Equine
- ☐ Poultry
- ☐ Other Livestock
- ☐ Fiber
- ☐ Fruit
- ☐ Vegetables
- ☐ Maple
- ☐ Flowers
- ☐ Other

6. Market outlets you utilize: (check all that apply)

- ☐ Commodity Markets
- ☐ Community Supported Agriculture
- ☐ Home Delivery
- ☐ Wholesale
- ☐ Farmers Markets
- ☐ Marketing Coop
- ☐ U-Pick
- ☐ Restaurants
- ☐ Roadside Stand
- ☐ Retail Store on-farm
- ☐ Other

7. In addition to yourself, what types of labor do you utilize? (Check all that apply)

□ Family Members

□ Interns

□ Full-time

□ Part-time

□ Seasonal

□ Migrant

How many full-time and part-time workers do you employ?

______ Part-time workers

______ Full-time workers

8. What is the total income of your farm?

□ 0 to 5,000

□ 5,001 to 10,000

□ 10,001 to 15,000

□ 15,001 to 25,000

□ 25,001 to 35,000

□ 35,001 to 50,000

□ 50,001 to 75,000

□ 75,001 to 100,000

□ More than 100,000

9. Where is your farm located?

State: _________________________ County: ________________________

In the following table, please rate how important each of the following were in making decisions about how to run your farm by putting an X in the box below the statement that describes your sentiment. (Check only one box for each).

	Very Important	Important	Moderately Important	Of Little Importance	Unimportant	No Opinion or N/A
10. Income:						
11. The impact of your farm on the local economy:						
12. Your health and/or your family's health:						
13. The health of your community and customers:						
14. The social impact your farm might have on your community:						
15. The impact your farm might have on the environment:						
16. Religious or spiritual factors:						

17. If there were any other factors that you would say were "Important" or "Very Important" in influencing your farming practices, please list them in the space below:

To what extent do you agree with the following statements concerning various farming practices? Put an X in the box below the statement that describes your sentiment. (Check only one box for each).

	Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree	No Opinion or N/A
18. When possible, methods should be used to improve water conservation and storage measures.						
19. When possible, chemical pesticides and fertilizers should be used to ensure maximum productivity.						
20.When possible, methods should be used to promote plant diversity in and around both natural and agricultural areas in order to support a diversity of wildlife and aid in agricultural pest management.						
21. It is unnecessary to use methods to reduce reliance on non-renewable energy sources (such as coal, oil, and natural gas) on a farm.						
22. Smoke from agricultural burning, dust from tillage, traffic and harvest; pesticide drift from spraying; and nitrous oxide emissions from the use of nitrogen fertilizer are unavoidable consequences of farming.						
23. Methods should be used to keep soil in place, such as reducing or eliminating tillage, managing irrigation to reduce runoff, and keeping the soil covered with plants or mulch.						
24. Greater inputs of water, nutrients, pesticides, and/or energy for tillage are necessary to maintain yields.						
25. Factors such as soil type and depth, previous crop history, and location (e.g. climate, topography) are not necessary to take into account before planting.						
26. Methods should be used to maximize reliance on natural, renewable, and on-farm inputs.						
27. Agriculture is completely separate community institutions that meet employment, educational, health, cultural and spiritual needs.						

To what extent do you agree with the following statements concerning your personal farming practices? Put an X in the box below the statement that describes your sentiment. (Check only one box for each).

	Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree	No Opinion or N/A
28. I use methods to improve water conservation and storage measures.						
29. On my farm, chemical pesticides and fertilizers are used to ensure maximum productivity.						
30. I make sure methods are used to promote plant diversity in and around both natural and agricultural areas in order to support a diversity of wildlife and aid in agricultural pest management.						
31. Only non-renewable resources (such as oil, coal, and natural gas) are used on my farm.						
32. My farm uses methods to improve air quality such as incorporating crop residue into the soil, using appropriate levels of tillage, and planting wind breaks, cover crops or strips of native perennial grasses to reduce dust.						
33. Methods used to keep soil in place, such as reducing or eliminating tillage, managing irrigation to reduce runoff, and keeping the soil covered with plants or mulch, are not used on my farm.						
34. On my farm, greater inputs of water, nutrients, pesticides, and/or energy for tillage are used to maintain yields.						
35. When site selection is an option, factors such as soil type and depth, previous crop history, and location (e.g. climate, topography) are taken into account before planting.						
36. Methods are never used to maximize reliance on natural, renewable, and on-farm inputs on my farm.						
37.I seek to use agriculture practices that foster community institutions which help meet employment, educational, health, cultural and/or spiritual needs.						

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