Executive Summary

In our study we are investigating how socioeconomic status in the North Country, specifically St. Lawrence County, impacts consumer food choices and the potential environmental implications of these choices. The goals of study were to examine what kinds of foods a typical consumer of the Canton and Potsdam area purchases, especially at the non-locally-owned grocery stores, to determine where the majority of purchased foods are originally coming from, and finally to determine the ecological impacts of food distribution to St. Lawrence County. We will attempt to determine where the majority of purchased foods are coming from by analyzing the top five most commonly purchased categories of consumed goods are and conjecture whether or not they were imported to the county and if there is potential for them to be produced locally in the future. We intend to determine the ecological impacts of food distribution by evaluating the carbon footprint of certain highly consumed goods.

Our investigation included an analysis of the interplay between food miles, food deserts and the socioeconomic status of St. Lawrence County. We elicited and evaluated the link between food choices and their environmental implications primarily by surveying customers at four different locations. We surveyed customers at Walmart (Potsdam), the Potsdam Co-Op, Price Chopper (Canton) and Nature’s Storehouse
At each location we asked for voluntary participation of customers entering or leaving the store. We used a written questionnaire that the participants anonymously completed themselves (Appendix A).

The surveys indicated that the top five most commonly purchased foods at the four locations we surveyed were: vegetables, dairy, bread, meat, and fruits. Each of these five foods is a dietary staple and, given the agriculture sector of New York State, could be produced locally, but instead most of these foods seem to be imported from other states and parts of the world. Additionally, our findings suggest that the Canton and Potsdam consumers we surveyed currently spend less per visit to locally owned groceries than at corporate grocery stores. Our findings also suggest that spending brackets may correlate with the income brackets reported by customers at the shopping locations we surveyed. Finally, there is a correlation between consumer awareness of the importance of eating local and the shopping location where consumers were surveyed. Specifically, shoppers at the Potsdam Co-Op were more aware of the terms “locavore” and “local food movement” than the statistical software would have predicted given the data set and shoppers at Walmart were much less aware of the terms “locavore” and “local food movement” than the statistical software would have predicted with our data set (Chi-Sq = 16.514, DF = 3, P-Value = 0.001; Figure 1). These findings may be useful in determining how to best spread awareness of the issues presented in our case study, namely reducing food miles in the North Country and lessening reliance on agriculture purchased from corporations that support environmentally irresponsible practices such as monocropping and heavy reliance on pesticides, herbicides, fertilizers and other chemicals.
Problem Definition

Food Miles: New York State has a significant and varied agricultural sector (Table 1). One might conjecture that despite production of a wide variety of crops, the majority of local people shop for groceries at locations such as Walmart or Price Chopper. Walmart imports the majority of their products, including produce, meat and dairy, although these items could be produced locally (Gogoi 2006). Consolidation in the retail food industry has led to fewer, but larger food stores (Kaufman 2000). When market power is consolidated, the stores that do exist have greater market power and are able to control the market (Bitler and Haider 2010). These stores are able to maintain their market power by offering an economic incentive: low prices (Gogoi 2006). The drive for low prices is related to bulk production, where agriculture practices such as monocultures are utilized to yield bulk crops, and extensive and wide distribution (Pirog 2004). Prices are often lower in supermarkets because supermarkets have the advantage of scale economies, which is a function yielding more profit by producing vast quantities of goods (Kaufman 2000). Produce, meat, dairy and packaged foods are distributed to supermarkets and grocery stores via truck, ship or plane. Thus, because food is distributed via these mechanisms, it often travels many miles before reaching the consumer (Miller and Spoolman 2009). In fact, food travels an average 1,300 miles from farm to plate (Miller and Spoolman 2009). Specifically, processed food travels over 1,300 miles and fresh produce travels over 1,500 miles before being consumed (Hill 2008). The term “food miles” refers to the mileage that food travels to reach consumers throughout the country (Hill 2008). Andrea Paxton initially coined the term “food miles” in 1990 (Hill 2008).
England was the first to recognize the concept of food miles and the subsequent environmental consequences of food miles. Food miles are a simplification of the multiple factors that play a role in the production and consumption of food (Hill 2008).

While many environmentalists consider high food miles a negative consequence of importing food items, food miles can be used as a cost saving strategy that occurs on the production side of the market. Large-scale farms are dominated primarily by monocultures, which allow farms to increase their scale of production and decrease the energy investment per unit of food. This strategy allows for the production of surplus crops. The large-scale farms then sell to large-scale companies, like Walmart and other transnational corporations, which makes it feasible for Walmart and other large stores to provide products at comparably inexpensive prices.

The demand for low prices by the US consumer has promoted the system that imports food from locations where land and labor costs are low (Pirog 2004). Most contemporary consumers are not willing to spend a lot of money on food. United States consumers now spend about 2% of their disposable income on food, compared to about 11% in 1948 (Miller and Spoolman 2009). Compare this with people in developing countries who commonly spend approximately 40% of their income on food (Miller and Spoolman 2009). Consumers are constantly looking for lower prices, potentially unaware of the environmental implications of “cheap”.

Because foods are being imported from regions many miles from their table so to speak, there is a high degree of separation between production and consumption; food production is essentially invisible to the consumer. In Des Moines, Iowa one comparison of locally grown food and food grown by large-scale farms yielded vastly different food
mile distances, where locally grown food traveled between 20 and 60 miles and food grown on the mass scale using “conventional” methods traveled between 1,000 and 2,000 miles. If the consumer does not know how far their food is coming from to get to them, they cannot make an environmentally responsible consumer choice—to choose the locally grown option.

Although the production-consumption model employed by large-scale farms and corporations is economically efficient and beneficial, the energy expenditure used to distribute food leads to the degradation of air and water quality (http://www.mi-net.ca). For example, in a grocery store in Iowa you might find that, “the typical carrot has traveled 1,600 miles from California, a potato 1,200 miles from Idaho and a chuck roast 600 miles from Colorado (McWilliams 2007).” Writer Bill McKibben has also asserted that, although New York State is one of the largest producers of apples in the United States, “seventy-five percent of the apples sold in New York City come from the West Coast or overseas (McKibben 2007).” Thus, it seems like the expenditure used to get apples from across the country and around the world to New York City is extraneous and is leading to unnecessary carbon emissions.

Therefore, the environmental impact of food can be analyzed according to the means by which it was produced and miles it travels to get from farm to table. Following the Industrial Revolution food distribution changed drastically. Food miles have been increasing over the last 50 years (Hill 2008). Method of transportation used to distribute food influences the carbon footprint because planes, trucks and boats all contribute to greenhouse gas emissions at differing levels. Heavy trucks with trailers emit 50 grams of CO₂ per ton per kilometer traveled, cargo vessels emit between 15-21 grams of CO₂ per
ton per kilometer traveled and airplanes emit 540 grams of CO₂ per ton per kilometer traveled (http://www.mi-net.ca). Thus, varying distribution methods have varying impacts on carbon dioxide emissions. Numerous studies have also been undertaken to evaluate the importance of food miles in the carbon footprint of food, though food miles are not the only aspect of food consumption that lead to a larger ecological footprint of foods. The carbon footprint of food includes water use, harvesting techniques, fertilizer outlays, renewable energy applications, means of transportation (and the kind of fuel used), the amount of carbon dioxide absorbed during photosynthesis, disposal of packaging, storage procedures and dozens of other cultivation inputs (McWilliams 2007).

Eating locally produced or grown food is considered as an alternative to the mass production and distribution system that is currently in place because it helps to reduce energy use and greenhouse gas emissions substantially. Local farming and regional distribution is considered less harmful to the environment due to the lessoned energy expenditure in reference to shipping, trucking and flying of food items. Due to more specialized farming methods, the prices are often higher for food produced locally. Although prices should be offset by not having to ship the food great distances, less expensive labor and land costs allow for numerous bulk products to be offered cheaply, disadvantaging local, small-scale farms (Pretty 2007). Eating locally reduces fossil fuel consumption and provides a realistic way that we as consumers can shrink our carbon footprint and be good stewards of the environment (McWilliams 2007).

However, there are alternative perspectives to this theory. New Zealand’s most prominent environmental research organization, Landcare Research-Manaaki Whenua, explains that localism “is not always the most environmentally sound solution if more
emissions are generated at other stages of the product life cycle than during transport” (McWilliams 2007). Although such conclusions have some merit, eating local has several advantages. Outputs in travel emissions are reduced. Eating locally allows the consumer a heightened awareness of the practices of producers. This relationship promotes healthy, safe and responsible ecological practices. It should be kept in mind that “While there will always be good reasons to encourage the growth of sustainable local food systems, we must also allow them to develop in tandem with what could be their equally sustainable global counterparts (McWilliams 2007).”

In St. Lawrence County the number of farms has decreased significantly over the last 60 years, while the size of the farm has generally increased (St. Lawrence County Agricultural Development plan 2001). The reduction in number and increase in size of farms in St. Lawrence County increases the need for transportation of food products. Today there are thirty-seven local farms in St. Lawrence County that produce a variety of goods including fresh produce, honey, maple syrup, meat and dairy items (Northcountryguide.com). Of these thirty-seven farms, eighteen farms in St. Lawrence County formed the North Country Grown Cooperative Inc. in 2005. This business is owned as a collective and the farms together deliver locally produced goods to colleges, restaurants, like the 1844 House in Potsdam, and other regional institutions. Cooperative members offer seasonal produce and year-round meats, honey, and maple syrup. Stephanie Hill of Windy Ridge Dairy in West Potsdam welcomes the opportunity to talk with the public. Her decade-old family farm is home to 17 grass-fed cows. The dairy provides raw milk, pasteurized milk and yogurt (Northcountryguide.com). “We farm organically, but are not certified. You should know your farmer,” she advised. “Learn
how they produce what you eat” (Northcountryguide.com). Dani and David, of St. Lawrence County have a farm stand, but they also market their products to some area restaurant and retail outlets. The describe that, “It’s a challenge making a living from a farm. One or both must have an outside job,” she said. “Our farm is a year-round operation (Northcountryguide.com).”

The reason why it is a challenge to be a small farmer in the United States is because farmers do not receive as high of a return on goods. For instance, a wheat farmer can expect to receive about six cents of each dollar spent on a loaf of bread equates approximately to the cost of the wrapping. However, farmers' markets enable farmers to keep 80 to 90 cents of each dollar spent by the consumer (Pretty 2007). Although this type of market would produce more expensive products it would benefit the economy of the community and ensure awareness of practices by farmers.

Today bulk suppliers are able to provide products at lower costs to the advantage of consumers with limited money. However, purchasing from companies such as Walmart fails to support local business and local agriculture, which limits the opportunities for a community-based market. The linkage between food miles and socioeconomic health is significant. Northern New York and St. Lawrence County have communities influenced by food miles and roles of international corporations such as Walmart. The agricultural sector over the past century has increased industrialization and use of machines. These factors combined to allow operators to increase the size of their farms and gain efficiencies (Environmental Protection Agency). Large-scale farms have increased steadily in prevalence while small-scale (generally more local) farms have been outcompeted (Environmental Protection Agency).
**Biodiversity and Agriculture:** One component of the case study focuses on the effects on landscape and organism biodiversity due to agricultural practices and food consumption. This study examines how the food choices consumers make while purchasing groceries ultimately has the capacity to detrimentally affect the environment. We argue that consumer demands operating within the market have created a perpetual cycle of demand for foods that are produced and grown using environmentally detrimental agricultural practices. Current rates of food consumption have led to a revolution in the way food is grown and produced.

**Intensive Farming:** Farming practices in today’s agriculture serve to maximize the yield of a plot of land, however farming techniques were not always this intensive. The history of farming begins with the sedentarization of human societies and plant domestication (Cunningham 2001). Small production by farmers was conducted to support families, rather than large scale commercial operations. Farming began as early as 11,000 years ago with the artificial selection of individual species that appealed to people (i.e. sweetness, fewer tannins). Eventually this led to the propagation of only a select few individuals of a species, and the loss of genetic diversity. De Candolle (1882) theorized that out of all cultivated species today, each organism could be traced back to one of six vavilovian centers of diversity, which is a geographic area in the world where biodiversity or life is theorized to have begun. This suggests that the varieties of foods we eat today are genetically similar.

Practices of artificial selection are still being used on a larger scale in today’s
agriculture production. Intensity with farming practices can be traced back to the era of the industrial revolution. In the 1850’s new farming mechanisms transferred from factories and production into agriculture; the switch from horse and ox power to steam power, crop rotation was the initial step in farming intensification (Historylink101). In this era it was also discovered that plants required nitrogen, phosphorus, and potassium, and these chemicals were used to synthesize fertilizers that increased production. The industrial revolution also coincided with an increase in human population, which created demands for more food and created a cycle. This cycle is sometimes referred to as the “agricultural treadmill”(Ward 1993). This treadmill has several definitions including the use and reliance on technologies, such as pesticides or monocultures, which leads to ecological effects such as disruption of nutrient cycling or hydraulic cycle; these factors ultimately makes land less productive and creates a higher reliance on the new technologies (Ward 1993).

Intensive farming is defined as the system of agricultural production that requires high levels of inputs of labor, capital, and pesticides (Encyclopedia’s Britannica). The development of the farming intensity present in today’s society is a result of technological and practice changes at different levels; there are advances in landscape and planting techniques and also advances in the plant organism being used at the genetic level. Planting techniques evolved from the usage of single cultivators to large cultivators that could uncover more land with less time and labor. Seed planting was also enhanced through the use seed drills that precisely placed seeds for optimal growth, rather than the earlier process of broadcasting seeds, and is thought to increase crop yield by up to eight times (Rymer 2000). Other practices that large-scale farms use are
monocropping, high yield varieties and homogenization. According the EPA agricultural corporate or large farms that use intensive farming practices are on the rise, the EPA states “In spite of the predominance of family farms, there is strong evidence of a trend toward concentration in agricultural production. By 1997, a mere 46,000 of the two million farms in the country accounted for 50% of sales of agricultural products (USDA, 1997 Census of Agriculture data). That number was down from almost 62,000 in 1992”(www.epa.gov).

Ecological Effects: Intensive farming practices combined with the demand for more food, has lead to the degradation biodiversity. Ecosystem biodiversity includes the composition, structure, and function of the ecosystem. When there is substantial biodiversity loss, many levels of the ecosystem are affected. Scholar of agricultural systems, and professor at Berkleley, Miguel Altieri suggests that in agricultural systems the degree of biodiversity depends on four main characteristics; the diversity of vegetation within and around the ecosystem, the permanence of various crops within the agrosystem, the intensity of management, and the extent of the isolation of the agrosystem from natural vegetation (Altieri 1999). When these characteristics are out of balance or overworked, ecosystem dynamics are not stable resulting in degradation of land that can be seen as result from intensive farming.

Intensive modern agriculture has lead to habitat degradation, loss and fragmentation. According to Principles of Conservation of Conservation Biology, habitat fragmentation has two components, a reduction in the area covered by a habitat type in a landscape, and/ or a change in habitat configuration with the remaining habitat
apportioned into smaller patches (Groom et al. 2006). Habitat fragmentation occurs in farming when large tracts of land are plowed and then a specific crop, or a specific few crops are planted. Effectively, the land the natural habitat already in existence in the landscape becomes fragmented or broken up. With modern intensive agriculture, the rate that fragmentation is increasing as the agriculture sector grows and more farms transition to the large corporate farming scale.

There are many biological consequences of fragmentation. The loss of connectivity prevents species from moving from one habitat to another, and thus interferes with migration (Groom et al. 2006). If species are unable to move, the survival rates may be affected by the limitation of the current ecological resources. Also, with forms of habitat fragmentation such as habitat split, essential components of the habitat may no longer be accessible. For instance, if ecosystems with both aquatic environments and terrestrial environments are fragmented, the viability of biphasic organisms becomes threatened (Becker et al. 2009). Other biological consequences include species exclusion, crowding effects, insularization and area effects, and isolation. As intensive farming spreads throughout not only the United States, but globally, habitat degradation is increasing.

Overall, biodiversity loss may be attributed to a variety of factors in farming techniques. Genetic variety, an important component to biodiversity, is seen at the landscape level. Practices like monocropping and the use of select crops decreases genetic diversity. Monocropping occurs at two different levels, when large farms chose to plant only a single crop, and also when the crop consists of only one individual variation of the planted crop. Loss of genetic diversity on the species scale directly impacts the
foods that are available to eat, and the foods we depend on for sustenance. Globally, people consume 7,000 species of plants, but only 150 species are commercially important and therefore produced for consumers (Thrupp 2000). Over all, about 103 species account for 90% of world’s food crops. The human diet has become constricted with rice, wheat and maize accounting for 60% of daily calories (Thrupp 2000). Many of these

Ultimately, a negative result of monocultures is the reduction in the variation of the species making them more susceptible to disease and pests. The process of farming monocultures allows for a higher productivity rate but also makes the crops less tolerant of disturbances (Altieri 2000). Monocultures are a form of homogenization (the process of ensuring uniform composition and structure and the use of high yield varieties), and typically propagate the same desired genetics, making all individuals in the field susceptible to the same threats. As a result, more pesticides and fertilizers are used to protect the crops. These farming techniques also discourage natural controls of pests, again leading to more dependence on pesticides. In the United States there is a yearly input of $40 billion dollars for pest control by farmers, and the economic impacts from using these pesticides, based on environmental and social costs, is $8 billion annually (Altieri 2000). While monocropping is useful to maximize crop yields, it has sacrificed natural resistance and gene variation for productivity, which leads to soil and ecosystem degradation.

Another modern farming practice designed to maximize production is the use of genetically modified organisms (GMOs). GMOs are specific varieties of crops that have undergone a genetic process to select specific genes from different organisms and insert them into the focal organism to create a desired crop (Jones 1999). The genetically
modified organisms typically enhance features such as longer shelf life, resistance to pest, and herbicide tolerance. By optimizing these features, less percentage of crops are lost, and there is more economic gain because food stay fresh longer. One area that has extensively researched is the addition of a gene that produces Bt toxins, which is theoretically used to detour pests. However, the environmental impact of this is similar to monocropping, there is a degradation of genetic diversity. Also propagation of one plant can lead to hybridization with wild species, and create a permanent loss of genetic information. Additionally, there is also concern that pests will also evolve with in response to the plants which will has the potential to create supper bugs or supper weeds that would be harder to control (Jones 1999). Along with super bugs, these toxins may also affect non-target species and have detrimental effects on ecosystem services. Additionally, consumers have also raised the question if these GMOs are safe to consume, and what effects these may have on nutrition and health.

Increase dependence on fertilizers has created detrimental effects to ecosystem services. Groom et al. state, “The most intense forms of agriculture with vast irrigated monocultures that are heavily treated with pesticides, herbicides, and fertilizers can be considered mostly “lost” to biodiversity.” (Groom et al. 2006). And in the US, The Environmental Protection Agency (EPA) agrees that most fertilizers, which are commonly used in agriculture, contain the three basic plant nutrients: nitrogen, phosphorus, and potassium, while some fertilizers also contain certain “micronutrients,” that include metals (www.epa.gov). The addition of fertilizers to soil aids in production, but too much and over use can lead to problems like nutrients not being recycled properly, and agricultural runoff. Ayoub, who has studied the interaction between
fertilizers and the environment, has stated that

“It is estimated that, by the year 2020 at a global level, 70% of plant nutrients will have to come from fertilizers. Fertilizers are thus indispensable for sustained food production, but excessive use of mineral fertilizers has roused environmental concerns. Chief among these concerns are eutrophication of fresh water bodies, global warming and stratospheric ozone depletion, proliferation of algal blooms in coastal waters and contribution towards acid rain (Ayoub 1999).”

While it is recognized that the role of fertilizers is beneficial to agricultural production, the concern is overuse and overreliance.

Modern intensive farming affects nutrition levels available for modified crops. Nutrient levels of crops not only affect consumers, but also agriculture ecosystems. Genetically modified crops, or highly processed crops may often be lacking in the amount of nutrients. With fewer nutrients available in the crops, fewer nutrients are also being recycled back into the environment. Nutrient recycling in necessary for productive crop growth, and readily available nutrients may be tied up in plants and organic matter. Therefore, with intensive farming there is a higher dependence on fertilizers, which add phosphorus and potassium to the soil. “As farming became more intensified and specialized, especially since the 1950’s… many of the environmental problems with nitrate and phosphate arise from the application of excessive amounts of such wastes to minimum areas of land.”(Johnston 1995). Excessive use of phosphorus in the environment can lead to eutrophication, and with agricultural runoff, algae blooms and deoxygenation are likely to affect neighboring aquatic ecosystems.
Agriculture in New York State: In New York State, milk is the most abundantly produced agricultural product accounting for approximately half of the total agricultural exchanges (New York State Department of Agriculture and Markets 2005). In 2005 11.7 billion pounds of milk were produced, which had a retail value of almost $1.91 billion (New York State Department of Agriculture and Markets). Meat production occurs statewide as well, whereby cattle, calves, hogs, pigs, sheep, lambs accounted for $190 million in cash receipts in 2005 (New York State Department of Agriculture and Markets). Poultry production brought in $91.3 million for 2005, which included egg, chicken, duck, broiler and turkey sales (New York State Department of Agriculture and Markets). Fruit sales in New York State added-up to $244 million in 2005 and included apples, grapes, tart cherries, pears and strawberries (New York State Department of Agriculture and Markets). Vegetables generated revenue of $461 million in 2005 and consisted primarily of cabbage, sweet corn, onions, snap beans, tomatoes, pumpkins, cucumbers, squash, green peas for processing and cauliflower (New York State Department of Agriculture and Markets). Pertinently, between 1960-2004 the agricultural output of New York State decreased by between 0.4 – 0.9% (http://www.ers.usda.gov). Therefore, although New York State is agriculturally productive (Table 1), that productivity does not seem to be increasing, instead is decreasing.

Socioeconomic component: According to the United States Census Bureau's 2005-2009 American Community Survey, the total population of St. Lawrence County, New York is 110,000 people. In St. Lawrence County, New York 7.9% of the labor force is unemployed and per capita income is $19,427. Additionally, 10.2% of households have
been on food stamps and/or the Supplemental Nutrition Assistance Program (SNAP) benefits in the last 12 months and 16.6% of people and 12.2% of families are living with an income that is below the poverty level. As of 2009, there were 19,541,453 people living in New York State. Further, 7.0% of the labor force in New York State is unemployed and per capita income is $30,634, which is approximately eleven thousand more dollars annually on a per capita basis than in St. Lawrence County. The percentage of households that have been on Food Stamps/SNAP benefits in the last 12 months in New York State is 10.1%, while 13.8% of individuals and 10.5% of families are living in New York State with an income that is below poverty level. Thus, in comparison to the rest of the state, St. Lawrence County has more unemployed individuals, lower per capita income and more people and families living on incomes that are below poverty level. Therefore, in St. Lawrence County socioeconomic status has the potential to be a limiting factor for consumer food choices, where price may be a highly influential variable because many of the families in the region are living below the poverty level and are relying on government programs, like food stamps, to survive.

There are a myriad of factors that influence food insecurity including, but not limited to the prevalence of grocery stores. Regions that have a limited number or no grocery stores are termed “food deserts” (Morton et al. 2005). Tom Vilsack, Secretary of Agriculture of the United States of America, defines food deserts as, “a place where there is not access, easy access, affordable access, reasonable access, to fresh fruit and vegetables to grocery stores.” Critically, in food deserts there is a lack of availability of healthy, nutritious and affordable food and proximity to grocery stores where those foods can be purchased affordably (Beaulac et al. 2009); if the consumer is not geographically
close enough to locations that sell healthy and nutritious foods, then they are considered to be living in a food desert (Bitler and Haider 2010). Pertinently, social and economic structure can also have powerful implications for families’ ability to get access to enough food (Olson et al. 1996). Since food, or more specifically healthy and nutritious food, is an economic good, the availability of such foods is dictated not only by the supply, but also inadvertently by demand (Bitler and Haider 2010). Demand for healthy and nutritious food is determined by socioeconomic factors such as income, prices and preferences (Bitler and Haider 2010). These three factors, income, price, and preference, are all central components of our investigation of St. Lawrence County and Canton and Potsdam, New York in particular. Although consumers ultimately define demand, price and socioeconomic limitations prevent consumers from “demanding” healthier, local and organic food options (Bitler and Haider 2010).

Food suppliers, or retailers, also have an impact on food availability and depending on their market power, can actually determine whether an area can be termed a “food desert” or not (Bitler and Haider 2010). When there are few firms operating within a market, they have greater market power, which in turn means that they control the quantity and quality of food available to consumers in close proximity (Bitler and Haider 2010). When concentrated market power exists, the retailer, or few retailers, has the power to set prices and sell food at a greater cost to increase the firm’s profit margin (Bitler and Haider 2010). Firms embedded in such a market also have the market power to directly control how much food is available for purchase to the consumer (Bitler and Haider 2010). Because firms or retailers often act as the middleman between consumers and producers, they also have the power to control what foods are available to the
consumer and the location from which those foods come from. The locations where foods are produced and the types of foods available, for instance local versus non-local and organic versus non-organic, have direct impacts on the environment. Therefore, another definition of a food desert is an area where there is concentrated market power and subsequently food prices are high and food availability is low (Bitler and Haider 2010).

Food sufficiency, or rather food insufficiency, is a multifaceted component of a food desert in that it is related to one’s ability to obtain an adequate amount of food based on food abundance and price and reliance on federally sponsored supplemental programs designed to reduce hunger in the United States, such as the Supplemental Nutrition Assistance Program (SNAP) and the food stamp program. Specifically though, food sufficiency is defined as whether or not a household is able to get enough food to eat consistently throughout a month; the reason why it is measured monthly is because that is the interval that most federal programs operate on (Gunderson and Oliveira 2001).

Food security, food sufficiency and food deserts are all connected because each relates to the prevalence of healthy, nutritious foods and their accessibility, especially in rural and low-income areas (Morton et al. 2005; Beaulac et al. 2009). Fostering food security is directly related to the establishment of local economies that produce food staples, especially in rural areas. If food is produced and grown in food deserts or areas that have little access to affordable healthy and nutritious options, this would not only foster food security, but would also decrease food miles. The majority of foods that are available in grocery stores, like Walmart and Price Chopper, are often not produced or grown locally. We were able to determine this by analyzing the labels on foods sold in Price Chopper (Canton) and Walmart (Potsdam). Thus, decreasing reliance on these types
of stores and increasing reliance on a local economy would seem to minimize overall food miles for the region.

Given that 10.2% of households in St. Lawrence County rely on the food stamps program for subsistence, it is compulsory to investigate how the program operates. Notably, participation in the food stamps program is linked to having a significantly higher likelihood of being food insufficient, where food insufficient is defined as not having consistent access to food throughout a month (Gunderson and Oliveira 2001). Thus, the validity of the food stamps program as federal attempt to combat hunger in the United States may be undermined because participating in the food stamps program does not eliminate food insufficiency, but rather has no bearing on food sufficiency or insufficiency (Gunderson and Oliveira 2001). Using participants in the US food stamps program, one study found that there is a correlation between fruit and vegetable consumption and proximity to the main grocery store; main grocery store was defined as the store where each given household purchased a majority of its food supplies (Rose and Richards 2004). Findings suggest that those participants living greater than five miles from the main grocery store consumed significantly less quantities of fruit than those living within a one-mile radius from the main grocery store (Rose and Richards 2004). Also, participants living greater than five miles from the primary grocery store consumed fewer servings of vegetables than those living within a one-mile radius from the primary grocery store, though the difference in quantity of vegetables consumed by consumers from the two radii was not statistically significant (Rose and Richards 2004). Thus, it seems like household proximity to primary shopping location influences and may indicate consumer tendencies regarding fruit and, potentially, vegetables.
In Canton, 2,851 homes, out of a total of 3,736 homes, are located within five miles of a grocery store (SLU GIS lab t:Atlas). Thus, approximately 76% of homes then are located within a five-mile radius of a grocery in the town of Canton. More than half of customers (55%) in Canton and Potsdam indicated that they lived within a five-mile radius of various shopping locations and the remaining 45% of customers reported living further than five miles from shopping locations (unpublished data Lewis et al., 2011). Specifically, 100% of customers surveyed in Canton lived within two miles from the shopping location where they were surveyed, whereas 34% of customers surveyed in Potsdam lived within five miles from the shopping location where they were surveyed and the remaining 66% of customers surveyed in Potsdam lived more than five miles from the shopping location where they were surveyed (unpublished data Lewis et al., 2011). Since 55% of people surveyed reported living within five miles of the shopping location where they were surveyed, we would expect that fruits and vegetables would be amongst the top five food choices, which they were (unpublished data Lewis et al., 2011).

**Methodology:** In order to collect specific details about consumer food preferences and grocery shopping tendencies we conducted a survey at four local stores where consumers shop for groceries or, more generally, food items. The sites we surveyed at included Nature’s Storehouse (Canton), The Potsdam Food Co-Op (Potsdam), Walmart (Potsdam) and Price Chopper (Canton). We created our survey with a categorical scale in mind so that we would be able to make comparisons across the data and analyze relationships between questions pertaining to the different aspects of our survey. Since our case study is multifaceted, the survey included questions from several dimensions. The primary goal
of our survey was to extrapolate information pertaining to socioeconomic status, which included questions that asked about annual income and occupation, and awareness of the products consumers purchase, such as the nutritional content and the location from which they come. Thus, using a categorical scale to craft our survey allowed us to use statistical software to conduct pair-wise comparisons of different data categories to solidify our understanding of the relationships between socioeconomic status, awareness and food preferences.

Before we were able to administer our survey to local consumers we had to submit our survey and a statement of our research intents to the Institutional Review Board (IRB) at St. Lawrence University for approval. Upon approval from the IRB we submitted requests to the businesses previously mentioned to be able to survey their customers on site. We had no trouble receiving approval from both Nature’s Storehouse and The Potsdam Co-Op, both of which are locally owned businesses. Walmart also granted us approval with minimal difficulty, but we were not permitted to survey their customers within the store, only outside as customers were arriving and departing the store. Getting approval to survey Price Chopper customers proved to be an impossible task. At first we were told that our survey needed to be read and reviewed by the corporate office before permission could be given, but when we tried to submit our survey we were refused on the grounds that the manager currently on duty saw no necessity in submitting the survey to corporate at all. In the end, Price Chopper refused to allow us to survey their customers on the grounds that the corporation feared we would share our findings with their competitors. However, we were able to survey the Price Chopper’s employees, which proved to be a worthwhile experience despite the potential
for biased trends in shopping location. Finally, we were able to collect close to one hundred surveys between the four locations.

We calculated basic statistics including mean, median and mode to determine some elementary trends emergent in the data. Then, we used Minitab Version 16 statistical software to run chi square tests and binary logistic regressions of specific questions to determine correlations between the various dimensions of our survey. More specifically, some of the relationships we analyzed were between the survey participants’ awareness of the terms “local food movement” and “locavore” and the surveying site, the participants’ awareness of the terms “local food movement” and “locavore” and attention to nutritional content of goods, the shopping location and the most frequent spending category participant’s reported, and, lastly, the shopping location and the most commonly reported income brackets reported at each location.

The chi square test used to determine whether or not there is a correlation between Northern New York shopping location and awareness of the terms “locavore” and “local food movement” indicated that there is a statistically significant relationship between awareness and shopping location (Chi-Sq = 16.514, DF = 3, P-Value = 0.001) (Figure 1). The chi square test used to determine whether or not there was a statistically significant correlation between spending categories 1 and 5, where 1 represented spending between $0 - $20.00 on average per visit and 5 represented spending between $100-$150 on average per visit, reported by consumers and shopping location did not yield a statistically significant correlation (Chi-Sq = 7.449, DF = 3). The chi square test used to determine whether or not there was a statistically significant correlation between income brackets 1 and 3, where 1=10% tax bracket and 3=25% tax bracket, that were
reported by survey participants and shopping location also did not yield a statistically significant correlation (Chi-Sq = 2.555, DF = 3, P-Value = 0.466); income brackets 1 and 3 were used because they were the two most commonly reported brackets.

We used a binary logistic regression to analyze the relationship between awareness of the terms “locavore” and “local food movement” and attention to nutritional information when selecting foods while shopping (see survey listed in appendix for actual question asked; Question 13). However, there was no significant relationship determined by this analysis (G = 0.781, DF = 1, P-Value = 0.377).

From the surveys administered, we were able to calculate the top five most commonly purchased food items from our sample size (n=72). The top five most commonly purchased foods were vegetables, dairy products (such as yogurt, cheese, milk), bread, meat (like chicken, beef, pork), and fruits (Figure 4). We also specifically tallied-up the most commonly purchased foods at each of the four surveying locations. At Price Chopper (Canton) the most commonly purchased foods were dairy, bread, meats, vegetables and eggs; at the Potsdam Food Co-Op they most commonly purchased foods were vegetables, dairy, bread, fruit and whole grains; at Nature’s Storehouse the most commonly purchased foods were vegetables, dairy, meat, juice, bread and cereal; at Walmart the most commonly purchased foods were meat, dairy, bread, fruits and vegetables (Figure 5).

We analyzed the availability of fruits and vegetables, and the brands associated with each, at both Walmart and Price Chopper. Fruit and vegetables sold at Walmart and Price Chopper come from numerous locations, with the exception of “New York State apples”. Mostly, the labels proclaim origins of California, Hawaii and Mexico. Dole is
one brand prevalent in the produce section of both stores. Dole is allegedly the “world’s largest producer and marketer of high-quality fresh fruit and fresh vegetables” (dole.com). Dole conducts business in more than 90 countries, which demonstrates their capacity for large-scale production and transportation. The Dole Company was founded in Hawaii and today offers over 200 products, featuring a growing line of frozen and packaged foods (dole.com). With a section of the dole website devoted to ‘Corporate Social Responsibility’ providing information ranging from wages to environmental programs the website begins to touch on humanitarian issues. The issue of food imports or food miles is not addressed. It is evident that food is produced in a significant number of different countries (dole.com). Green Giant, a brand name seen on vegetables in Walmart is part of Betty Crocker, which is part of General Mills. The various corporations involved in each brand name emphasize the scale of the food producers. Although the website contains a ‘sustainability’ tab again the issue of distribution or food miles is not addressed (greengiant.com). With transportation from locations throughout the United States as well as locations in foreign countries the ecological footprint of the fruits and vegetables found in Walmart is significant resulting in food miles and the subsequent carbon outputs.

Since bread is one of the foods that appeared in the top five most commonly purchased foods, we surveyed the bread options available in Price Chopper (Canton). Upon surveying the bread options available in Price Chopper, it is evident that the shelves are stocked namely with the breads with brand labels including Sunbeam, Arnold, Thomas’, Freihofer’s and Country Kitchen. While the Price Chopper also sells bread “baked fresh daily” in their bakery section of the store, this bread is Price Chopper brand
and the ingredients allegedly come from Schenectady, New York, which is where their distributor and corporate office are located. The brands of bread sold in Price Chopper are all national firms that distribute across multiple states, which means that the available bread has relatively high food miles, compared with breads that might be made locally.

Sunbeam baking company known for its white breads and rolls and operates under the cooperative Quality Bakers of America (http://www.qba.com). The company has licensed bakeries across the United States and Mexico, including Maine, Indiana, Maryland, Georgia and Illinois, and distributes products all along the East coast, Midwest and parts of the Southwest United States (http://www.qba.com). Thus, Sunbeam is a national firm and its products have to be transported further distances than breads produced by smaller-decentralized bakeries, such as the Potsdam Food Co-Op’s Carriage House Bakery.

Arnold, another bakery, is a part of Bimbo Bakeries and the distribution company associated with this firm (http://www.arnoldbakery.com). Some ingredients within Arnold products utilize genetically modified organisms (GMOs), mainly from crops that have GMOs inserted in them such as corn, soybean and canola (http://www.arnoldbakery.com). These crops are typically associated with monocropping and thus the purchase of products containing ingredients derived from these crops detrimentally impacts the environment.

Thomas’ and Freihofer’s are two other brands of bread that are under the umbrella firm Bimbo Bakeries (http://www.thomasenglishmuffins.com; http://freihofers.bimbobakeriesusa.com). There is little information regarding ingredients in Thomas’ and Freihofer’s products, except that they are “quality” and “fresh” and there
is also little information regarding distribution of Thomas’ products, except that they are
delivered five days a week (http://www.thomasenglishmuffins.com;
http://freihofers.bimbobakeriesusa.com). Because Thomas’ and Freihofer’s are brands
that are part of a national distributor, Bimbo Bakeries, one might assume that Thomas’
and Freihofer’s products travel substantial distances to reach retailers and customers.

Finally, Country Kitchen is part of Lepage Bakeries and its corporate
headquarters are located in Maine, but they distribute their products to parts of the
Northeast and “beyond”, though it is ambiguous where beyond may include
(http://www.countrykitchenbread.com).

The top brands available for purchase at Price Chopper were Oscar Myer,
Hormel, Butterball, Hillshire Farm, 100% Pure Beef, Hat Field, and Shady Brooke Farm.
Many of these brands originate from a larger umbrella organization, for instance, Oscar
Mayer is band from Kraft foods, and Hillshire Farms is a part of the Sara Lee
Corporation, Shady Brook Farms is brand marketed by Cargill Meat Solutions (websites
These larger organizations are transnational corporations with large distributing locations
throughout the United States and globally. The ecological footprint of meats sold in
grocery stores includes the miles traveled from farm to consumers and the growing
conditions for the livestock.

The most common dairy products available to purchase at Price Chopper are
marketed with the brand names Clear Value, Meadowbrook, Hood, Stonyfield, Dannon,
and Cabot. Most of the dairy products are distributed from a local region, including the
greater New England area; however some of these companies do have locations
nationwide with local distribution centers in the New England area. For example, the brand Dannon is marketed as the top selling brand of yogurt worldwide, with a reported 6 million cups of yogurt produced and sold daily. This is contrasted by brands such as Stonyfield, whose mission is to provide healthy organic foods to while promoting the viability of family farms (www.stonyfield.com).

As another component of our case study we interviewed Phil Harnden, Executive Director of GardenShare. GardenShare is a non-profit organization located in Northern New York working to end hunger in the region and decrease the prevalence of food insecurity in the area. GardenShare is working to accomplish its goals by connecting local consumers with local farmers participating in Consumer Supported Agriculture (CSA). GardenShare also publishes a local food guide to help consumers in the area become aware of goods grown and produced locally, which is another attempt to link the consumer directly to the producer or farmer. We chose to examine GardenShare’s work in Northern New York because, as is previously mentioned, they are striving to seek local, healthy solutions food shortages by fostering personal bonds between producers and consumers. Food insecurity, especially in rural areas like our study region, is linked to community perceptions of civic structure (Morton et al. 2005). Thus, GardenShare’s role in our study area may play a vital role in diminishing food insecurity locally.

In the interview Phil Harnden discussed the practicalities of connecting the farmers with the consumers. One initiative created by GardenShare is Bonus bucks this program provides 150$ discount off the Community Supported Agriculture to local residents who qualify in having a limited budget. The aim of this program is to make CSA affordable for people on limited income. Phil Harnden provided the simple
application form, mentioning the increase in membership that the program has received since its implementation. Additionally GardenShare makes it possible to use food stamps or EBT at the farmers market. In addition to increasing healthy, fresh and local choices available to those with a limited income, this creates opportunity to bring federal dollars to local farmers.

The yearly Local Food Guide distributed by GardenShare provides information to local people about farming and the products available in the North Country region. This publication functions in listing programs including CSA Bonus Bucks and the Farmers’ Market Nutrition Program as well as listing regional farms and listing their products (GardenShare Local Food Guide). GardenShare also sends out a newsletter to local subscribers informing its readers on up to date information on local food issues. Such publications couple with GardenShare initiatives to inform local people of their options and enhance the options for people with limited incomes.

We also interviewed Rainbow Crabtree, owner the Nature’s Storehouse in Canton, New York. Rainbow has owned Nature’s Storehouse for nine years and worked there three years prior to her ownership of the business. Nature’s Storehouse is locally owned and operated and advertises itself as St. Lawrence County’s “most complete natural products store (http://www.natures-storehouse.com/).”

Identification of Stakeholders

Consumers: One of the primary stakeholder groups pertaining to our evaluation of food choices in Northern New York is the consumers in the region. Consumers are directly impacting the demand side of food availability, but concurrently they are also at the
mercy of food distributors since our study region is rural and the access consumers have to various food items is determined by the prevalent market participants, or food retailers and farmers. The consumers we focused on in our study were those we surveyed in both Canton and Potsdam, New York at our selected survey locations.

At each location, customers reported being in the 15% tax bracket, which indicates that on average customers shopping at all four locations make between $8,501-$34,500 if they file singly and between $17,001-$69,000 if they file jointly with their husband or wife. However, the most common reported annual income at Nature’s Storehouse, the Potsdam Co-Op and Walmart was in the 10% tax bracket or that their annual income is below $8,500 if they file singly and below $17,000 if they file jointly. Our surveys also revealed that customers shopping at Nature’s Storehouse spent, on average, between $20-$50 per visit to the grocery store and customers shopping at the Potsdam Food Co-Op on average spent a similar amount, between $20-$50 per visit. Customers shopping at Walmart reported spending between $50-$80, as did the employees at Price Chopper. Additionally, when asked, “Which is more important to you, health and nutrition facts or low prices?” consumers at both Nature’s Storehouse and the Potsdam Co-Op overwhelmingly reported that health and nutrition influence their choices more strongly than price. However, customers at Walmart and the employees at Price Chopper on average reported that price and nutritional value are both important, yet at Price Chopper it was more common for price to influence food choice than for health and nutrition to influence food choice.

Non-local businesses: Another vital stakeholder group is the non-locally-owned
businesses that serve as food or grocery suppliers to the residents of Canton and Potsdam, New York, and potentially residents of other towns in the local vicinity. We focused on two non-locally owned businesses for our study: Price Chopper and Walmart. Interestingly, it is obvious that Price Chopper was concerned about maintaining their market power because their corporate office refused to allow us to survey their customers for fear that we would grant access to our findings to their main local competitor, namely Walmart.

Walmart has more than 9,005 retail units today operating in 15 countries worldwide; Walmart’s sales reached $405 billion in the fiscal year 2010 (http://walmartstores.com/AboutUs/). Walmart’s corporate headquarters are located in Bentonville, Arkansas. According to Walmart’s 2011 Global Sustainability Report, Walmart is committed to global sustainable agriculture and aims to sell $1 billion in food from small to medium sized farms by 2015 and aims to train 1 million farmers in sustainable farming practices, however, this sustainable farming practices will include the use of both pesticides and fertilizers (http://walmartstores.com/AboutUs/). Despite feasibly good intentions, the sustainable agriculture initiative spearheaded by Walmart seems to be a meager attempt at actually supporting sustainable farming practices.

The Price Chopper firm began as a local store in Schenectady, NY in 1932 with the name Central Markets, which was originally designed to provide the neighborhood community with one-stop shopping for local products such as dairy and meat. The franchise changed their name to Price Chopper in 1973 and has grown to include 116 stores located within New York, Pennsylvania, Connecticut, Massachusetts, New Hampshire and Vermont. While the distribution center still remains in Schenectady, NY,
the firm now incorporates a larger northeastern region retaining a commitment to providing low prices and local healthy foods.

**Local Businesses:** Another primary stakeholder to the situation is the small local business owners. The study surveyed and focused on Nature’s Store House and the Potsdam Co-Op, although we recognize that there are a variety of other local businesses. These businesses are privately owned and are therefore much more vulnerable to the trends in the market. While some businesses attempt to carry a majority of local foods with limited amounts of foods that are mass distributed (i.e. Nature’s Storehouse and Co-Op), other businesses such as Price Chopper and Walmart specialize in selling mass distributed goods chose to sell mass distributed goods which can be purchased cheaper. The availability of foods produced locally greatly affects the business of privately owned shops.

Local business owners must compete with the larger corporations that have established stores in the area. Explaining the perspective of a local business, Rainbow Crabtree, owner of Nature’s Storehouse, pointed out that she cannot compete with the larger stores. Rainbow indicted that because larger corporations have the ability to buy produce in bulk, places like Price Chopper are able to sell products at a cheaper price than she actually purchase the items herself; therefore to sell the same items she would have charge a higher price than Price Chopper. As a result, instead of competing with the larger businesses the Nature’s Storehouse provides many goods that are not offered in the chain grocery stores. This has effectively created a niche that provides healthy, nutritious, supplements or alternatives to many grocery store brands.
The Nature’s Storehouse mainly markets foods that are local, or in other words foods that are available within a fifty-mile radius of Canton. The challenges with this, Rainbow explains, are the growing seasons. Within Northern New York, it is hard to provide local foods that obviously cannot be grown regionally given the winter conditions. For that reason foods must be purchased from slightly farther away. The most common items that Nature’s Storehouse purchases and sells are bulk quantities are oatmeal, raisins, (organic) produce, and fresh bread. In general, local business owners that provide local goods, have an interest in not only the economic market impacts of food miles and food deserts but the ecological affects as well.

**Local Farmers:** An important group of stakeholders for the case study are the local farmers and producers of St. Lawrence County. According to the St. Lawrence County farms website 400,000 acres in the county are used for farming, which equates to 25% of the land area in the county. The agricultural census data available from 1997 indicates that the total number of farms in St. Lawrence County is 1,363 and the amount of cropland used is 220,000 acres. Dairy is the primary farming enterprise in the county, with 577,200 pounds of milk produced annually (1997 agriculture census data). It is difficult to estimate how much food is being produced and distributed outside of the county. Factors that affect the distribution of goods and products are the markets that are available. The market in St. Lawrence County is often difficult for farmers to sell product to because of the presence of supermarkets and grocery stores that are able to buy produce and milk at lower prices.

Another interest that affects local farmers as stakeholders is the cost to not only
growing foods sustainably, but also purchasing labels associated with sustainable farming practices. That amount of local farmers is that are no longer producing organic labeled or other sustainable certified foods are decreasing, however the number of farmers that are still growing sustainably remains relatively constant (interview with Rainbow Crabtree, local business owner). This is due to the fact that farmers can no longer afford the cost of the label. Organic certification and labels will be further addressed in the Government regulations portion of the case study.

**Oil Companies:** High input industrialized agriculture has provided a need for oil at the production level in order to increase yields for farmers (Miller and Spoolman 2009). Industrialized agriculture requires high input of fertilizers, pesticides and water. Many of the fertilizers used in large-scale farmer are petroleum products. The global marketplace has established a heavy reliance on processing and distribution of goods. This dependency on transportation and industrialization is in large part a reliance on oil companies. The initial input of energy needed to produce a unit of food has fallen considerably due to large-scale and monocropping production. It appears that most crops provide an amount of energy in the form of food greater than the amount of energy used to grow the food item. However when energy required to grow, store, process, package, transport, refrigerate, and cook plant and animal products is taken into account about 10 units of non-renewable fossil fuel energy are needed to put 1 unit of food energy on the table (Miller and Spoolman 2009).
Transporters and Food Distributors: Food distribution has become its own business as trucking company’s profit from transporting products from location to location. Outbound Shipment Intelligence is one of these companies and has been employed by Price Chopper (Supply Chain Intelligence). It is evident that Price Chopper distributes from Schenectady, as revealed by their packaging. This does not provide overall information about where the food item actually comes from and also does not reveal where or how it is grown. In comparison to the outsourcing of Price Chopper, Walmart owns its shipping and distribution system. Walmart has more than 140 distribution centers that service more than 4,200 stores across the U.S. Claiming to consistently be increasing transportation efficiency Walmart has reached a “38 percent increase in efficiency” by reduction in miles driven. This has allowed them to avoid adding “200,000 metric tons of CO2 into the atmosphere” (http://walmartstores.com/sites/sustainabilityreport/2009/en_logistics.html). This figure illustrates the significance of transportation for Walmart in the distribution of their products. Profits are yielded as products are distributed to locations of demand, although increasing efficiency allows for a more substantial profit margin. Price Chopper and Walmart employ different means of distribution and transportation but both exhibit the scale of this stakeholder.

Governmental Issues

Agricultural and Farm Regulations: Agricultural policies put in place by state and federal government sets regulations on many different aspects of food production from trade to safe minimum standards. There are a vast number of acts and regulations that govern
agriculture and the conditions required for the actually growing of foods to be consumed. Some critics argue that some of these regulations may in fact serve to may favor larger corporations by placing a barrier to suppress local production rather than the measures of safety for consumers. The federal government, through the departments of the Environmental Protection Agency and the United States Department of Agriculture, sets forth these regulations. These laws are also subject to the state government modifications and requirements as well. The most notable and pertinent acts include, The Clean Water Act (CWA), Federal Insecticide and Rodenticide Act (FIFRA) Food Quality Protection Act, Toxic Substances Control Act (TSCA), Resource Conservation and Recovery Act (RCRA) and the Clean Air Act (Environmental Protection Agency Agricultural Counselor Office of the administrator 2007).

The Federal Food, Drug and Cosmetic Act (FFDC) determines the FIFRA and it authorizes EPA to set maximum residue levels, or tolerances, for pesticides used in or on foods or animal feed. The use of pesticides in food production increases the cost of production but also contributes to a higher crop yield. This became an important point of contention with large-scale intensive farming operations favoring higher thresholds and concentrations of pesticide usage. The Food Quality Protection Act (1996) amended FIFRA and FFDCA setting tougher safety standards for new and old pesticides and to make uniform requirements regarding processed and unprocessed foods; this significantly changed the way EPA regulates pesticides (US EPA Agricultural Counselor Office of the administrator 2007).

Another aspect governing agricultural practices is the US farm bill. The farm bill is a package of federal legislation that is reassessed every five to seven years and is
responsible for setting the general direction of America’s farm and food policy (American Farmland Trust). The 2008 US Farm Bill, also known as The Food Conservation and Energy Act, has been acclaimed to provide many improvements to the existing legislation. According to the American Farmland Trust, its major improvements include: strengthening conservation and farmland protection programs, increased support for local foods, farmers markets and healthy diets, funding for renewable energy, and increases in food assistance for families struggling with rising food costs (www.farmland.org). Supporters of this bill claim that it is a step in the right direction for our future conservation efforts and sustainability goals.

There is also an issue of bureaucratic power dynamics within the establishment of governmental regulations. Because of the influence of big corporate farms FDA regulations may be set by the agenda of big businesses. Large firms can afford lobbyist groups, which can fight for regulations that enable the use of pesticides and other chemical based practices, which result in fewer crop losses and longer shelf life, which ultimately give users a larger profit from the crops. Often small business will also go along with these unsafe practices because they don’t negatively impact their business regulatory framework. Government regulations on agricultural practices not only affect the safe standards for human consumption, but in part the regulations determine the cost of food production farmers will incur and ultimately affect the ability of small farms to enter the market.

An example that is pertinent to the St. Lawrence County is the requirements for milk pasteurization. While previous temperature requirements were acceptable to safe minimum standard laws, recent regulations aim to increase the lowest acceptable
temperature for pasteurization. This essentially affects local farmers and large corporate farms because they now must increase energy expenditures to meet the new requirements. Small farmers may not be able to compete and afford such changes, as larger business would be able to. Also, the Federal Milk Marketing Order system sets minimum domestic prices for milk products and two-thirds of the milk produced in the United States is sold under federal marketing orders (Edwards 2009). This ultimately affects the income of small farms and may hinder them from entering the market.

**Development of Solutions to the Problem**

**Parameterizing solutions:** Development of solutions to the problem of food deserts, food scarcity and how those lead to increased food miles and support farming practices that are detrimental to the environment are multifaceted and can broken down into categories. These categories are as follows: shifts in agricultural practices, focus on fostering community relationships linking farmers and producers to consumers, and finally restructuring the market to be less centralized. Satisfactory solutions to this problem would encompass any solution that leads to a reduction of food miles on a mass scale and also a decrease in reliance on foods produced by companies, either agricultural or industrial, which employ environmentally irresponsible practices.

**Potential Solutions:** Reducing food miles is necessary in order to minimize energy expenditure, which contributes to global climate change and increases the food industry’s reliance on oil companies. In order to preserve biodiversity, our society should return to traditional and more responsible farming practices and work to maintain the existence of
local, small-scale farms; ideally, industrialized farming should be minimized and the remaining large scale farms should reduce their dependency on monocropping. Restructuring and decentralizing the market would also contribute to decreased food miles, but this type of approach involves creating a market for local and organic goods at a price that is realistic for the consumer base, which in the case of Northern New York, is relatively low-income. Preserving and maintaining small, local farms is dependent on the local community’s support, so working towards community-based solutions to connect local farmers and local producers, of baked goods and other food products, would help to solidify the market for these goods. Also, grass roots initiatives that teach communities how to buy healthy, local, organic products in bulk and also how to cook bulk foods, would increase people’s knowledge of the feasibility of eating locally and organically grown foods; health would be a positive side effect of such an approach. Finally, implementing a public transportation system in Northern New York, St. Lawrence Country specifically, might also mitigate the problems we address in this case study by reducing consumers’ dependence on their own vehicles to get to shopping locations where they can purchase groceries.

Potential solutions regarding the prevention of biodiversity loss entail modifying or changing agricultural approaches and practices. Intensive farming practices not only degrade the habitat through fragmentation and habitat loss, but can also ruin the viability of land and soil. Therefore one possible solution would be to no longer use intensive agriculture and return to traditional farming practices. Traditional farming utilizes sustainable planting and harvesting methods that center around a few themes. They typically use low levels of inputs that equate to a low dependence on off-farm
products such as fertilizers, pesticides and purchased seeds (Kazimirski 1998). This is beneficial because excessive amounts of phosphorus from pesticides and other agriculture run off will not cause eutrophication or create pests that are resistant. With low levels of input there is a dependence on family and the community for labor, other farmers for reciprocal exchange of goods and seeds, and local markets or neighbors for non-agricultural products (Kazimirski 1998). Effectively, traditional farming practices will keep locally produced goods in the local community. Another aspect of traditional farming practices that could be implemented is the diversification of crops by mixing crops and having more than one variety. Diversity within crops will help to maintain genetic variation. Also, intercropping and crop rotation prevents the degradation of the soil, and consequently does not lead to as much habitat loss.

Traditional farming practices are potential solution because the energy output is greater; intensive systems in the United States can yield as low as one tenth as much food energy as is invested in energy inputs while swidden, or slash and burn, farming can yield food energy up to 20 times the human energy invested (Kazimirski 1998). The drawbacks of switching to traditional farming practices are that more people would have to have to become farmers; currently the majority of people depend on supermarkets and the ability to purchase foods, with smaller farms providing food for few people there need to be farms producing goods and this would require a lifestyle change.

Another possible solution that relates to farming practices would include the consumption of only foods that can be produced locally. This is similar to the concept of a locavore. Many items that are purchased by today’s consumers come from the global salad bowl; in other words, we consume items that have been produced from all over the
globe. By transitioning to consuming foods that are produced locally, the amount of miles food travels could be reduced, which would decrease carbon emissions generated from food transportation. For example, in the North Country and St. Lawrence County, instead of purchasing oranges that are grown in Florida or California, locally grown apples may be substituted. The negative aspect of this solution is that consumers in the North Country will no longer have as large of a selection when purchasing goods. Also, given the climate and seasons locally, this may present a problem in the winter when few products can be grown regionally. However this could potentially be solved using preservation methods.

Another solution to the energy output in storing products and an alternative to artificial preservatives would be the usage of traditional preserving methods available in Northern New York. In the past, large blocks of ice were carved from frozen rivers and used to preserve crops, grown in the summer, throughout the winter in the North Country (Nummer 2002). Another effective measure used for preservation is the use of vinegar to pickle fresh produce for consumption later in the year. Other traditional methods of preservation like canning should be used for locally produced goods as well. The benefits of this solution allow people to still eat locally through the winter months when food is not being grown in the area, effectively decreasing food miles. This is also beneficial because farmers will not need to use as many artificial chemical preservatives on the actual food, making the food healthier to eat and does not negatively impact the cropland it was grown on (Leifert 2007). The negative aspects of this solution are very few. One possible drawback is that it may be difficult and time consuming to freeze, pickle and preserve your own vegetables and other foods.
Another possible solution to consider that could facilitate changes on the agricultural side of the issue would be to implement a tax system that charges companies and individuals that employ farming practices that lead to environmental degradation. Specifically, taxing the use of fertilizers and pesticides on the farming side and taxing the use of preservatives on the packaging side would greatly deter companies from using harmful farming practices. Also, the money generated could be recycled back to the smaller farmers, and through subsidies smaller farms might be able to compete with larger corporations. Additionally, the idea of a soil tax based on the amount of degradation an operation causes would be similar to the recently established carbon emissions market. If companies want to still practice intensive farming practices they must offset the damage through a tax, and in turn the money collected could either be used to fix environmental problems or subsidize traditional farms.

Before considering how and why we need to decentralize the market, one must acknowledge that the market is in fact centralized. Another word for centralization, which is more commonly known by the general public, is the buzzword “globalization.” Unarguably, the market today is centralized due to globalization, whereby large national and transnational corporations control the economic atmosphere and dictate the functions of the world market (Amin & Luckin 1996). Additionally, once we accept that globalization is a reality and that the market essentially only operates on the large scale, we realize that it is rare for local economies to be established and flourish due to the impediments put in place by the mere existence of large transnational corporations. The market was consolidated in order to increase profit margins; the consolidation of the market was facilitated by the commodification of labor power, nature, and money itself.
(Amin & Luckin 1996). The commodification process is explained by Karl Polanyi, political economic theorist, as “Polanyi shows that the commodification of the labor force, of nature and of money can only create chaos and intolerable social deprivation” and thus is why Polanyi argues in favor of a “double-movement: (Amin & Luckin 1996). Polanyi predicted that the development of one omnipotent market, where bigger is analogous with better, would lead to social strife and environmental destruction if there was no force to counteract such power (Polanyi 1944). Polanyi argues that,

“The economic argument could be easily expanded so as to include the conditions of safety and security attached to the integrity of the soil and its resources—such as the vigor and stamina of the population, the abundance of food supplies, the amount of character of defense materials, even the climate of the country which might suffer from the denudation of forests, from erosions and dust bowls, all of which, ultimately, depend upon the factor land, yet none of which respond to the supply-and-demand mechanism if the market. Given a system entirely dependent on market functions for the safeguarding of its existential needs, confidence will naturally turn to such forces outside the market system which are capable of ensuring common interests jeopardized by that system (Polanyi 1944).”

In other words, Polanyi acknowledges that the health of the environment, what he terms “soils and its resources”, is subject to the whims of variation of the market, because industries that utilize natural resources, like agriculture, logging, etc. depend on nature and the environment to supply such materials. However, Polanyi explicitly states that the environment does not change or increase supply simply because the market demands it, so the preservation of the environment, which would benefit all of society and the sustainability of the market in the long run, is dependent on a force to counter the market, which is subsequently independent of the actual market. Such a counter force he terms a double movement. A double movement must be facilitated by social forces that
benefit little from the overexploitation and extrapolation of natural resources at the rate demanded by the environment.

The issue of overexploitation of the natural world is the same as the use of highly intensive agricultural practices and monocropping that take immense tolls on soil and land health, as previously discussed. Therefore, a solution to the issue of decreasing our society’s reliance on such an agricultural system may also come from a double movement, whereby the omnipotent, mass agricultural market that exists today is decentralized by facilitating the establishment of small, local agricultural market economies. Vandana Shiva writes that, “Biodiversity conservation takes on the significance of a struggle for self-reliance and decentralization (Shiva 1991).” Shiva concurs that decentralization is key to preserving biodiversity.

Addressing the issue of establishing a framework for small-scale, local farmers to succeed requires minimizing their production costs so that they can sell their own locally grown products at prices that are competitive with those the large-scale industrial farms can sell their products for. One way that production costs might be reduced for small-scale, local farmers is by minimizing the price of gasoline and diesel, as both are necessary for production; farmers rely on gasoline and diesel in order to operate their farming equipment, like tractors. Establishing a system of tax breaks on gasoline and diesel, especially for farmers in New York State because the taxes on gasoline and diesel in New York are amongst the highest in the nation. New York has the second highest taxes on gasoline in the United States, where gasoline is taxed 65.6% as a market good (http://www.api.org). Additionally, New York has the fifth highest tax rate on diesel in the United States; diesel is taxed 69.9% as a market good (http://www.api.org). Because
large agricultural firms are able to produce on a mass scale, their production costs are offset by their ability to sell mass quantities of goods, thus they are impacted less by taxes, such as those on fuel. However, smaller farmers naturally do not produce as much, and so limited supply of goods dictates a higher market price, but if consumers are primarily concerned with price, then they may be more prone to purchase the cheaper good from the larger farm. Therefore, tax breaks on gasoline and diesel, especially in New York State, for small farms would decrease the production costs of farming on a small scale and would allow them to sell their goods at prices comparable to those offered by larger farms. Gasoline and diesel tax breaks could create a place in the market for more, small, local farms. Although it seems counterintuitive to suggest a solution the encourages the use of gasoline, keep in mind that the encouraged use of gasoline is still at a small scale and the development of more small farms means that more regions will have local farms present and food miles overall would be decreased by increased local food production.

Implementing programs to strengthen the social structure of rural communities can offset the detrimental effects of living in food deserts or regions where price is a limiting factor in food choices (Morton et al. 2005). Thus, organizations that work to strengthen community ties and help to foster relationships between farmers and producers and consumers are key to developing a niche for a local market and healthier overall community.

Community Supported Agriculture (CSA) functions in providing local, healthy and fresh food to the community. GardenShare has attempted to make this more reasonable economically to those with limited income by providing membership to a
CSA at a lower cost. Increase in CSA membership directly reduces the transportation costs in both monetary and carbon outputs. CSA’s not only provide local food but also build community bonds and strengthen food security. This relationship ensures to the degree that the consumers demand that local farms are practicing reasonable farming techniques. Additionally this increased responsibility to local people brings more attention to bear on environmental awareness.

Rainbow Crabtree proposed the implementation of an organization teaching community members how to cook bulk food. Providing workshops and classes in cooking would provide a source of information about cooking but additionally about the role of food production on the environment. Cooking meals from scratch using items that can be bought in bulk is economically beneficial. Cooking increases awareness of the products used and could increase the use of natural foods. Purchasing these natural foods in bulk allows for this option to be economically feasible, an important aspect in St. Lawrence County. This allows for local produce that is fresh and healthy to be a good option for consumers. Increased information creates interest and support of sustainable agriculture. Secondary effects include health and increased community ties.

The combination of CSA’s and a program providing cooking lessons allows for community members to have fresh local food at a reasonable price and gives options on how to use this food. GardenShare distributes a local food guide each year that allows for meals to incorporate produce that is available locally. By listing numerous farms and their products information is provided to consumers. Promoting educated decisions regarding food choice should enhance consumption of local goods. Together these community programs and initiatives can cater to both the economic need for reduced
prices as well as sustainability of environmentally conscious farming and distribution practices.

In 2003 St. Lawrence University joined the Farm to School Network (St. Lawrence green pages). This program functions in connecting schools with local farms and food producers. The Farm to School Network is a national program that has been implemented in 48 states (Farmtoschool.com). The program passed legislation in 2002 charging the New York State Department of Education work with the Department of Agriculture and Markets to facilitate the purchase of New York State products by Universities and schools (Farmtoschool.com). On a more regional level St. Lawrence University is also a member of North Country Grown Cooperative Inc. The Cooperative markets and delivers local products to restaurants and colleges in the North Country (Northcountrygrown.com). These programs enhance the feasibility of institutions addressing sustainable food choices.

Of the potential solutions discussed above, the unfeasible options include the following solutions. Returning to traditional, non-intensive farming practices on a nationwide scale is unfeasible because it is unlikely that several industrial and corporate farms would be willing to adopt these practices without any economic incentive. Total regional diet shifts, where local populations consume only foods produced and grown in their immediate proximity, is unfeasible because the agricultural and economic infrastructures are not in place to be able to make such a massive diet shift; additionally, this type of shift might be rejected for cultural reasons. People have become accustomed to having their choice of any product, despite how far it had to travel to get there. For example, in the North Country oranges, pineapples, grapefruits and other tropical fruits are available
in Price Chopper and Walmart though they cannot be grown anywhere near the North Country, unless it were in a greenhouse. Third, the decentralization of the entire food market and the establishment of small, local economies that are entirely self-sustaining is relatively unfeasible because, again, the agricultural and economic frameworks need to be established before a shift like this could take place. Finally, it is unlikely that Walmart and Price Chopper, due to the scale of their purchasing and corporate standing, would combine forces to use the same distributing company based on the nature of the market—they are competitors—though this would help to reduce food miles.

Although we present several solutions that are unlikely to be implemented, some of the solutions outlined above are promising and feasible. The feasible and best solutions involve community initiatives by organizations, such as GardenShare, that work to promote food security and local economy, which leads to reduction of food miles, without food scarcity, and has an overall beneficial impact on the environment especially if local economies are encouraged to engage in sustainable agriculture. The encouragement of sustainable agriculture could be promoted by the instilling a system of tax breaks on gasoline that would help local farmers and businesses to produce at a lower cost, which would help them to succeed in the market. Also, establishing a system of taxes on a nationwide or statewide scale on pesticides, insecticides, herbicides would incur costs for corporate companies that support or practice industrialized farming and monocropping.

Returning to the ideas concerning the establishment of community development, another feasible and optimal solution involves creating an organization that teaches and promotes cooking with organic, local, bulk foods. Cooking initiatives would
create a niche in the market for organic products and increase local food consumption, thereby reducing food miles overall. A program with a goal to promote lifestyle changes would also work to educate people about environmental issues pertaining to food and sustainable agriculture.

Though some of these solutions are not feasible to the degree we suggest, in other words shifting agricultural practices entirely and altering regional diets on a mass scale, but they would be beneficial to the extent that they are implemented. Any diet or agricultural shifts would be beneficial, but expecting them to occur on a mass scale is unrealistic in a short timeframe.

**Ease of Implementation**

Implementation of the solutions that we have addressed comes down to acceptance or support by the stakeholders. We assert that consumers, particularly consumers in the North Country, base decisions concerning food options on price. Thus, purchase and consumption of local food is based on the price relative to competing goods. If the price is competitive and local food is available, the consumers are likely to support local foods. Local farmers profit economically from the solutions we have addressed too and we can assume that due to this profit opportunity, local farmers would be in support of selling their products to regional consumers. Small-scale local farms do not significantly affect large and industrialized farms in the current market situation, but tax incentives or subsidies provided for local farms could make small, local farms more competitive in the market. For this reason we do not think that large-scale farms would support programs that enhance the opportunity for profit of small or local agriculture.
Cultural and societal values in the United States have changed since the Industrial Revolution to focus on a large output of cheap goods. Cooking and preparation of meals from scratch has in many cases been removed from the activities of the typical family. In order to shift towards local foods in an economically feasible manor, attention must be paid to cooking initiatives. Additionally, the typical American diet has changed in a way that does not favor local food—in the sense that people in the North want strawberries in January. Thus, a cultural shift would be necessary to prioritize local food consumption. We assert that through education we could inspire a change in values that promote purchase and consumption of local food. Education would be necessary to help people make the shift as they become more aware of what is available locally and how this can translate into healthy meals through cooking initiatives.

**Step-by-Step Implementation**

Any optimal solution would be one that incorporates a multifaceted approach, agricultural shifts, including market-based alterations and community initiatives. The successful implementation of a solution includes the implementation of three overarching steps. The first step requires community initiatives. The priority of a community initiative should be to raise awareness about the negative effects of food miles and eating foods that are produced on large-scale farms that do not employ environmentally sustainable practices. The next component of a community initiative would be to further consumer education on how local people can buy local products and how they can use these products to sustain themselves and their families. This component would be most effective if consumers are taught how to buy local foods in bulk. As consumers become
educated they will be more aware of the bigger picture, and understand the implications of agriculture and food miles. As people understand the relationship between food choices, the loss of biodiversity, and the loss of revenue for local stakeholders, their habits may change and begin to reflect a more sustainable attitude. A critical aspect of this step is informing the public how much of an impact their actions have on conservation efforts and revolutionizing the market so that it can be decentralized. Community members and organizations like, GardenShare have already begun this process, but it needs to expanded upon to have a more influential role.

The second phase of implementation to our solution calls for a policy initiative. This includes the use of tax breaks to help develop local economies and meet the consumer demand, if consumption of local foods were to increase. Polices that offer tax breaks would have the ability to promote small farms and businesses. As local farmers and businesses are able to enter the market regionally, the result would entail revenue staying within the community and thus contributing to the health of the regional economy.

The final step in the implementation process is to raise enough awareness among consumers so that as consumers become more aware and conscious of their choices. Hopefully, they will expand their desire to change the current agriculture system as far as to include the government regarding such a change. A change life this mandates that the government structure responsible for the propagation of irresponsible farming practices and food miles is held accountable for their actions. Citizens could actively lobby the Environmental Protection Agency (EPA) and the United States Department of Agriculture (USDA) for regulations that promote more responsible farming practices and
allow local farmers to be more competitive within the market. This is an important step because it involves individuals at the local community level and the governmental level.

Appendices

Appendix A: Food Choices Survey Administered to Local Consumers

Please answer the following questions honestly and to the best of your ability. If there are any questions on this survey that you would not like to answer, please feel free to omit them. The purpose of this survey is academic. With this survey, we are investigating ecological implications of consumer food choices in Northern New York, namely the Canton-Potsdam area. This survey is anonymous. Choosing to fill-out this survey will help us to learn more about food choices in this region and will contribute to our overall goal of completing a case study for our Conservation Biology course at St. Lawrence University. If you have any questions concerning this survey please feel free to ask. You are free to withdraw your consent and discontinue participation in taking this survey at any time without prejudice to you as a participant.

Any further questions regarding this survey should be directed to: Dr. Erika Barthelmess at (315) 229-5712.

1.) How many miles do you live from this shopping location?
   1 = 0-2
   2 = 2-5
   3 = 5-8
   4 = 8-12
   5 = 12 or more

2.) How often do you go grocery shopping here?
   1 = never
   2 = infrequently
   3 = sometimes
   4 = frequently
   5 = always

3.) What % (percent) of your grocery shopping do you do at this store?
   1 = less than 25%
   2 = 25%-50%
   3 = 50%-75%
   4 = 75%-100%

4.) If this store is the most frequent place you shop for groceries, what is the second most common place?
5.) If this store is not the most frequent place you shop for groceries, what store is?

6.) How much do you typically spend per visit to the grocery store?
   1 = $0 - 20.00
   2 = $20.00 - 50.00
   3 = $50.00 - 80.00
   4 = $80.00- 100.00
   5 = $100.00 - $150
   6 = $150 and above

7.) How many people are you shopping for?
   1 = Yourself only
   2 = Yourself and a significant other
   3 = Yourself and a family of three of less
   4 = Yourself and a family of four or more
   5 = Other __________

8.) How often do you prepare a meal from scratch?
   1 = never
   2= infrequently (example: once per month)
   3= sometimes
   4= regularly /frequently (example: twice per week)
   5= always

9.) How often to eat a microwavable meal?
   1 = never
   2= infrequently (example once per month)
   3= sometimes
   4= regularly /frequently (example: every other time I visit the store)
   5= always

10.) How often do you eat fast food?
    1 = never
    2= infrequently (example once per month)
    3= sometimes
    4= regularly /frequently (example: every other time I visit the store)
    5= always

11.) Do you know what locations your food comes from?
     1 = No idea
     2 = Somewhat aware
     3 = Aware and concerned
     4 = Where my food comes from strongly determines my purchases
     5 = Other

12.) Does the location influence your choice in products?
1 = never
2 = infrequently (example once per month)
3 = sometimes
4 = regularly /frequently (example: every other time I visit the store)
5 = always

13.) Which is more important to you; health and nutrition facts or low prices?
   1 = Health and nutrition is my only priority
   2 = Health and nutrition influence my choices more strongly than price
   3 = Price and nutritional value are both important
   4 = Price is influences my choices more strongly than health and nutrition
   5 = Price is my only priority

14.) Please list the five most common food items you buy when grocery shopping (1. being most commonly bought)?
   1.
   2.
   3.
   4.
   5.

15.) Are you familiar with either the terms “local food movement” or “locavore”?
   YES or NO

16.) What is your occupation?

17.) If you feel comfortable answering, what is your annual household income? If you are married please circle a choice from the left column and if you are single please circle a choice from the right column.

<table>
<thead>
<tr>
<th>Married</th>
<th>Single</th>
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<tbody>
<tr>
<td>Below $17,000</td>
<td>Below $8,500</td>
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<tr>
<td>$17,001 – $43,000</td>
<td>$8,501 – $21,500</td>
</tr>
<tr>
<td>$43,001 – $69,000</td>
<td>$21,501 – $34,500</td>
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<tr>
<td>$69,001 – $104,000</td>
<td>$34,501 – $59,050</td>
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<tr>
<td>$139,351 – $175,825</td>
<td>$83,601 – $129,000</td>
</tr>
<tr>
<td>$175,826 – $212,300</td>
<td>$129,001 – $174,400</td>
</tr>
<tr>
<td>Over $212,301</td>
<td>Over $174,401</td>
</tr>
</tbody>
</table>
Appendix B: Figures

Figure 1. Actual and expected number of shoppers that were familiar with the terms “locavore” and “local food movement” at four locations: Price Chopper (Canton), The Potsdam Food Co-Op (Potsdam), Nature’s Storehouse (Canton), Walmart (Potsdam) (Chi-Sq = 16.514, DF = 3, P-Value = 0.001).

Figure 2. Most frequently reported on-average spending categories reported by customers at Nature’s Storehouse (Canton), Price Chopper (Canton), Walmart (Potsdam), and The Potsdam Food Co-Op (Potsdam) where the possible spending brackets were as follows: 1=$0 - 20.00 per visit, 2=$20.00 - 50.00 per visit, 3=$50.00 - 80.00 per visit, 4=$80.00- 100.00 per visit, 5 = $100.00 - $150 per visit, and 6 = $150 and above per visit.
Figure 3. Most frequently reported income brackets reported by customers at Nature’s Storehouse (Canton), Price Chopper (Canton), Walmart (Potsdam), and The Potsdam Food Co-Op (Potsdam) where the possible income brackets were as follows: 1=10% tax bracket, 2=15% tax bracket, 3=25% tax bracket, 4=28% tax bracket, 5=33% tax bracket.

Figure 4. Overall top five food choices including survey results from all four locations: The Potsdam Food Co-Op (Potsdam), Nature’s Storehouse (Canton), Price Chopper (Canton) and Walmart (Potsdam).
Figure 5. Top food choices by location, where the locations were: Walmart (Potsdam), The Potsdam Food Co-op (Potsdam), Price Chopper (Canton), and Nature’s Storehouse (Canton). The number is the amount times a particular food choice was reported on the survey.
Figure 6. Map of New York State with inset of St. Lawrence County. New York State major roads are highlighted. Additionally villages in St. Lawrence County are labeled.
Appendix C: Tables

<table>
<thead>
<tr>
<th>Product</th>
<th>Revenue</th>
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</thead>
<tbody>
<tr>
<td>Milk</td>
<td>$1.91 billion</td>
</tr>
<tr>
<td>Cattle, Calves, Hogs, Pigs, Sheep, Lambs</td>
<td>$190 million</td>
</tr>
<tr>
<td>Poultry</td>
<td>$91.3 million</td>
</tr>
<tr>
<td>Apples, Grapes, Tart Cherries, Pears and Strawberries</td>
<td>$244 million</td>
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<tr>
<td>Cabbage, Sweet Corn, Onions, Snap Beans, Tomatoes, Pumpkins, Cucumbers, Squash, Green Peas for processing and Cauliflower</td>
<td>$461 million</td>
</tr>
</tbody>
</table>

Table 1. Table of agricultural products produced and grown in New York State in 2005 from data collected by the New York State Department of Agriculture and Markets (http://www.agmkt.state.ny.us/agfacts.html).

Works Cited

Literature


**Websites**


