KNOWLEDGE AND PERCEPTION OF ORGANIC FOODS IN COLLEGE STUDENTS WITH VARYING DEMOGRAPHICS

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Currently, there is limited research that investigates organic food trends in college students. Little is known about knowledge, perception, purchasing behaviors, and potential barriers of organic food in students. The purpose of this descriptive, posttest only, multi-factorial design study was to measure knowledge and perception of organic food buyers vs. organic food non-buyers in Northeast Ohio college students with varying demographics ($N = 1490$). An anonymous 52-question electronic survey was distributed to 21,089 students to recruit participants for the study via e-mail. The survey consisted of four sections in the following order: socio-demographic characteristics, purchasing, knowledge, and perception. This study examined gender, major, and place of residence with respect to organic food buyers and organic food non-buyers among university students. Participants for this study were at least 18 years of age and were enrolled full-time at the university’s main campus. Data was analyzed using descriptive statistics, three-way factorial analysis of variance (ANOVA), chi-square, and paired t-tests. An alpha level of 0.05 was set to determine if statistical significance was present in the data.
Results of this study indicate that students have a higher perception of organic food than conventional food with respect to being better for the environment, more humane, tastes better, is safe to consume, and that they provide additional health benefits. Conventional food is perceived as being more affordable and having a longer shelf life than organic food. Females, non-science majors, and organic food buyers have a higher perception of organic food than males, science majors, and organic food non-buyers. Findings indicate that consumers purchase organic food based on perceived benefit.

Results also revealed that place of residence does not influence whether college students purchase or do not purchase organic food. With respect to knowledge, gender and buyer type do not influence knowledge of organic food among college students. Significance was seen in major type and organic knowledge interactions. Findings indicate that students with a non-science major have a higher perception and a lower knowledge of organic food than students with a science major. Additionally, students with a science major have a lower perception and a higher knowledge of organic food than students with a non-science major. Results of this study indicate that, among science majors, organic food buyers have a lower knowledge of organic food than organic food non-buyers.
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CHAPTER I

INTRODUCTION

The term “organic” refers to the way food is produced and grown in agriculture (USDA Guide for Organic Processors, 2012). Organic farming practices have been in place for several decades and focuses primarily on implementing sustainable practices to protect and preserve the ecosystem as well as the humane welfare of animals (USDA National Organic Farming Handbook, 2015). The National Organic Program (NOP) oversees the production, handling, and processing of organically produced foods to ensure certifying agents worldwide adhere to specific organic standards and regulations set forth by the United States Department of Agriculture (USDA) (USDA The National Organic Program, 2016). Organic crops and livestock are produced without the use of synthetic pesticides, genetically modified organism (GMO), and petroleum-based or sewage sludge-based fertilizers (USDA Guide for Organic Crop Producers, 2012; USDA Organic Livestock Requirements, 2013). Organic livestock is raised free of antibiotics, growth hormones, or by-products (USDA Organic Livestock Requirements, 2013).

Originally, organic foods were produced through local farming systems on a small-scale and has rapidly expanded into a multibillion-dollar industry (Organic Trade Association, 2016). It has become the fastest growing food sector in the United States (U.S.) (Dettmann & Dimitri, 2009). The USDA reports that three out of every four traditional grocery stores sell organic products (USDA Overview, 2016). The amount of
organic food buyers has increased, however, consumer demographics have not been categorized consistently due to inconclusive research data (Dimitri & Oberholtzer, 2009).

Despite the higher cost, the demand for organically grown foods has been increasing since the 1990s (USDA Overview, 2016). Total organic food sales reached $43.3 billion in 2015 (Organic Trade Association, n.d.). Consumer perception of organic food is that it is healthier or superior to conventionally produced foods; however, research contradicts this claim (Williams, 2002). Research studies have found an overall increased nutrient content in organically produced crops, specifically in Vitamin C (Magkos, Arvaniti, & Zampelas, 2003; Mozafar, 1996). While there is evidence to show organically grown foods do possess a slightly higher nutrient content as well as significantly fewer nitrates, this difference is not enough to state that organic foods provide additional health benefits to consumers (Kouba, 2003).

College students face the new role of purchasing and preparing their meals while managing their new hectic schedules (Kelly, Mazzeo, & Bean, 2013). The transition into college has a significant impact on dietary patterns in students. The use of food labels and specific point-of-purchase (POP) messages is an effective method shown to promote healthy eating habits in students (Deshpande, Basil, & Basil, 2009). Increased knowledge of dietary guidelines is positively correlated to healthier eating habits in college students (Kolodinsky, Harvey-Berino, Berlin, Johnson, & Reynolds, 2007). College students reported a high importance and positive attitude towards organically and locally produced foods and the use of sustainable practices in agriculture (Pelletier, Laska, Neumark-Sztainer, & Story, 2013).
Students identify organic practices as environmentally sustainable (Akhondan, Johnson-Carroll, & Rabolt, 2015; Dahm, Samonte, & Shows, 2009). Akhondan et al. (2015) found a positive correlation in health consciousness and consumption of organic food among college students. Similarly, Azzurra and Paola’s (2009) study identified a positive relationship between consumer behavior of organic foods and health awareness. Dahm et al. (2009) found that college students are knowledgeable about organic foods and are in favor of incorporating organic foods into their diet; while less than half of the participants reported consuming organic foods, more than half of the respondents indicated they would purchase organic foods if they were offered in campus dining locations (Dahm et al., 2009).

**Problem Statement**

The demand for organic products in the market has rapidly expanded over the past two decades (Greene et al., 2010). Consumers report that health and nutritional value are the two reasons why they choose to buy organic foods, however there is no scientific evidence that states organic foods are nutritionally superior than conventionally grown foods (Akhondan et al., 2015; Williams, 2002). While there is evidence to state that organically grown foods do possess a slightly higher nutrient content, this difference is not enough to state that organic foods provide additional health benefits to consumers (Kouba, 2003). The USDA states that the usual consumer of organic foods is difficult to identify. Market research and previous academic studies have tried to identify demographic profiles of organic food buyers, however results are conflicting (Dettmann & Dimitri, 2009). Despite inconclusive data, researchers have noticed a trend among
consumer attitudes and purchasing behaviors such as concerns with health, the environment, and a positive attitude towards organic food (Dumea, 2012; USDA Organic Market Overview, 2016).

Studies identify the single factor that influences a consumer’s likelihood to purchase organic is education; individuals with higher levels of education are more willing to purchase organic foods (Dettmann & Dimitri, 2009; Dimitri, & Dettmann, 2012). This indicates that college students may be more likely to consume organic foods and could potentially be the future of the organic food market. Liu (2007) researched consumption and purchasing behaviors of organic food in college students and found that overall health awareness was positively correlated with purchasing and consumption behavior of organic food using The Health Consciousness Scale (HSC).

Saher, Lindeman, & Hursti’s (2006) conducted a study on attitudes towards genetically modified and organic food among Finnish students. Organic food attitudes were overwhelmingly positive while genetically modified food attitudes were mostly negative. With respect to gender, female students had a more positive attitude about organic and a more negative attitude about genetically modified food than the male students did (Saher et al., 2006). Dahm’s et al. (2009) study found that almost 50% of participants possessed factual knowledge about organic foods among college students. While less than half of participants were consumers of organic, more than half were in favor of supporting and purchasing organic products if offered at their university campus or elsewhere. The study concluded that college students are more likely to act on their opinions of organic with respect to purchasing behavior (Dahm et al., 2009).
There is very limited research that investigates organic food buying trends in college students. Despite the lack of research among this population, there are current publications about the perception of organic food in college-aged students such as being more nutritious, providing increased health outcomes, being more beneficial for the environment, and that it is safe to consume (Anderson, Wachenheim, & Lesch, 2006; Pelletier et al., 2013). Further research is needed to investigate purchasing trends of organic foods and identify potential barriers among college students. Research is also needed to assess whether certain demographic factors in college students have an impact on whether or not they choose organic foods. Among college students, it is unknown if gender, place of residence, availability in university dining halls and local markets, and whether a specific field of study influences students to purchase or not purchase organic foods.

Measuring the nutrient concentration in foods does not reflect the overall quality of the food (Magkos et al., 2003). Bioavailability is not accounted for when a food’s nutrient content is altered through different production methods. A well-balanced diet rich in fruits and vegetables with an adequate amount from other food groups can improve health, regardless if it is organically or conventionally grown (Magkos et al., 2003). The highest quality for farming organically is that it utilizes a production system that protects the environment; this is a benefit to everybody on earth (Kouba, 2003).
Purpose Statement

The purpose of this study is to measure knowledge and perception of organic food buyers vs. organic food non-buyers in Northeast Ohio college students with varying demographics.

Hypothesis

It is hypothesized that there will be a difference in knowledge of organic food among organic food buyers and organic food non-buyers.

It is hypothesized that there will be a difference in perception of organic food among organic food buyers and organic food non-buyers.

Operational Definitions

In this study, the following definitions will be used:

College student: An undergraduate or graduate student enrolled full-time during the Spring 2017 semester at Kent State university.

Conventional food: Foods that are not grown through organic agricultural practices, not raised by organic livestock standards, and not labeled as organic.

Knowledge: Acquaintance with facts or truths gained through education and/or personal experiences with a particular subject.

Organic food buyers: Individuals who intentionally purchase at least three organic products per month because it is organic.
Organic food non-buyers: Individuals who do not intentionally purchase at least three organic products per month because it is organic.

Perception: The way an individual interprets, regards, or understands a topic.

Science Major: A program of study that requires at least one of the following courses in partial fulfillment of an undergraduate or graduate diploma: anatomy, biology, biochemistry, chemistry, or physiology.

Non-Science Major: A program of study that does not require at least one of the following courses in partial fulfillment of an undergraduate or graduate diploma: anatomy, biology, biochemistry, chemistry, or physiology.
CHAPTER II

LITERATURE REVIEW

Organic Food Regulation and Standards

Organic food is cultivated, grown, and raised without the use of conventional agricultural practices. Farming organically does not mean avoiding conventional chemical inputs nor is it “the substitution of natural inputs for synthetic ones” (National Institute of Food and Agriculture, n.d.). Organic farmers utilize specific agricultural techniques that are both innovative and economically sustainable, such as the use of composted animal manures and green manure crops (National Institute of Food and Agriculture, n.d.). The term “organic” refers to the way food is produced and grown in agriculture (USDA Guide for Organic Processors, 2012). Organic crops are grown without the use of synthetic pesticides, genetically modified organism (GMO), and petroleum-based or sewage sludge-based fertilizers (USDA Guide for Organic Crop Producers, 2012; USDA Organic Production and Handling Standards, 2011). The production of organic food is done through a sustainable method that reuses resources on the farm and preserves the environment (USDA Introduction to Organic Practices, 2015). Organic livestock is raised free of antibiotics, growth hormones, or animal by-products. Livestock consume organic feed, free of GMOs and growth hormones, and must have access to the outdoors year-round (USDA Organic Livestock Requirements, 2013; USDA Organic Production and Handling Standards, 2011).
The use of GMO seeds for crops are prohibited and livestock feed cannot contain any GMO component (USDA Can GMOs be used in organic products? 2013). Conventional farmland can be overturned to organic farmland; however, this is a prolonged process requiring time and mandatory inspections. The farmland must not use any item prohibited by the USDA for 36 months before harvesting organic crops (USDA Guide for Organic Livestock Producers, 2012). Prohibited substances can be found on the Code of Federal Regulations (Electronic Code of Federal Regulations, 2017).

**Regulatory Laws for Organic Foods**

The practice of farming organically has existed in the U.S. for several decades; while originally it was produced through the use of a localized small scale system, it has now expanded into a highly organized and globally produced marketing system (The National Agricultural Law Center, n.d.). Organic agriculture is practiced in 172 countries (Willer & Lernoud, 2016). These changes sparked the organic industry to initiate standards for the production of organic foods and marketing. In 1990, The Organic Foods Production Act (OFPA) was established as a response by Congress. The OFPA was developed due to third-party certification systems differing from one third-party certifier to another and from state to state. Due to varying standards, preventing fraud was a major concern (The National Agricultural Law Center, n.d.).

In 1990, OFPA authorized the NOP which sets standards for the production, handling, and processing of organically grown agricultural products (USDA Organic Regulations, n.d.). The Act established uniform guidelines and standards for foods
produced and labeled as “organic” and has three purposes: (1) to create “national standards governing the marketing of certain agricultural products as organically produced products,” (2) to assure consumers that “organically produced products meet a consistent standard,” and (3) to facilitate “interstate commerce in fresh and processed food that is organically produced” (Agricultural Marketing Service, 2005).

The NOP has regulatory oversight responsibilities over USDA organic standards as well as accreditation of organic certifying agents, serving to protect the integrity of USDA organic standards worldwide. The NOP oversees about 80 certifying agents and over 33,000 certified organic operations all over the world (USDA The National Organic Program, 2016). The exchange of organic products is facilitated through trade agreements between the U.S. and other nations. The NOP collaborates with the Foreign Agricultural Service and Office of the United States Trade Representative to establish global trade arrangements for organic products (USDA International Trade Partners, n.d.). Products certified to the Canada Organic Product Regulations, European Union Organic Standards, and Japanese Agricultural Standards can be sold as organic in the U.S. (USDA Importing Organic Products to the U.S., 2013).

**Certification of Organic Foods**

Organic certification corroborates that the farm or handling facility adheres to USDA organic standards. Certification allows farmers to sell and legally label their product as “organic,” granting them the use of the USDA organic seal (USDA Benefits of Organic Certification, n.d.). Farm and handling facilities may be certified organic by
USDA accredited private, foreign, or state entities. These entities are known as certifying agents which are located both nationwide and worldwide. Certifying agents ensure products are meeting all USDA organic product standards. The USDA organic regulations recognize four categories of organic products including crops, livestock, processed products, and wild crops which are plants from a growing site that is not cultivated (USDA Do I Need to be Certified Organic? 2012).

Farms and handlers that sell more than $5,000 in organic products annually require mandatory certification and are required to use the USDA organic seal (USDA Do I Need to be Certified Organic? 2012). Operations that do not need to have organic certification include small organic farms or businesses that do not exceed $5,000 in annual organic sales, retail food establishments, exempt handling operations, and certain brokers, distributors, or traders whom do not process any goods; these operations are not permitted to use the USDA organic seal on their products. Exempt handling operations include companies whom “only handle products that contain less than 70% organic ingredients” and “only identify organic ingredients on the ingredient information panel” (USDA Do I Need to be Certified Organic? 2012). While certification is not mandatory, they may seek voluntary organic certification (USDA Do I Need to be Certified Organic? 2012).

To become certified, producers or handlers must apply to a USDA-accredited certifying agent. A detailed description of the operation, a written Organic System Plan describing practices and substances being used, a 36-month history of all substances applied to the land, and a list of the organic products grown, raised, or processed must be
submitted to the certifying agent. The certifying agent will then review the application to ensure the practices comply with USDA organic regulations and an inspector conducts an on-site inspection of the operation. Certification will be awarded by the certifying agency for a year, annual recertification is required (USDA What is Organic Certification, 2012). The cost to be certified organic ranges depending on the size, type, complexity of the operation, and the certifying agent. Cost varies from a few hundred to several thousand dollars. There are fees for the application, the annual renewal, the assessment of annual production and sales, as well as the onsite inspection. However, once certified, the USDA Organic Certification Cost-Share Program can reimburse eligible operations by up to 75% of their certification cost (USDA Becoming a Certified Operation, n.d.).

**Agriculture, Crop, and Seed Regulation of Organic Foods**

Organic agriculture is based on the principle of sustainability; sustainability “meets the needs of the present without compromising the ability of future generations” (Coffey & Baier, 2012). It is described by USDA organic regulations as “the application of a set of cultural, biological, and mechanical practices that support the cycling of on-farm resources, promote ecological balance, and conserve biodiversity” (USDA Introduction to Organic Practices, 2015). These regulations require organic producers to implement sustainable, ecological, and natural practices when developing their farming system. The use of synthetic fertilizers, sewage sludge, irradiation, and genetic engineering is not permitted in organic agriculture (USDA Organic Production and Handling Standards, 2011). To ensure organic integrity and sustainability, organic
producers must follow the foundational principles of organic agriculture; sustainable, ecological, biological, and natural methods are derived from these principles (USDA National Organic Farming Handbook, 2015).

Organic agriculture is not as simple as using natural fertilizers and materials and eliminating all any synthetic substances. Organic systems are more complex and involve specific land requirements, soil fertility and crop nutrient management practices, crop rotation, seed and planting stock, pest control, and post-harvest handling (USDA Guidelines for Organic Crop Certification, n.d.). Organic methods include green or animal manures without the use of sewage sludge or biosolids to the soil. Soil conservation is achieved through the use of mulches, conservation tillage, contour plowing, strip cropping, and cover crops which protect from wind and water erosion. (USDA Introduction to Organic Practices, 2015).

Organic producers are required to implement a crop rotation cycle, rotating the planting bed or the entire field. It is recommended to plant crops from varying families annually, which will suppress plant diseases and insects. Crop rotation is used on organic farms to maintain soil fertility and crop nutrient management; it works to balance nitrogen levels in the soil (USDA Guidelines for Organic Crop Certification, n.d.). Crop rotation provides many benefits to organic farms; it interrupts insect life cycles, overthrows soil borne plant diseases, and prevents the erosion of soil while expanding biodiversity (USDA Introduction to Organic Practices, 2015).
The soil quality is important in organic agriculture. When crops are grown in healthy soil, they are more likely to resist disease, tolerate insects, and survive droughts (USDA Guide for Organic Crop Producers, 2012). The addition of organic matter, such as manure, in soil is both a sustainable and fundamental practice implemented in organic farming because it improves soil fertility. Organic matter is part of a natural cycle. Crops strip nutrients from the soil, when they are fed to livestock, the nutrients are then found in their manure. Manure is a traditional fertilizer that is locally available. It improves the quality of the soil by adding nitrogen, potassium, and phosphorus back into the soil, these are all important nutrients used by plants. Livestock manure is most effective when combined with other sustainable practices like crop rotation and cover cropping. Manure can be applied to fields as raw manure or composted manure. Unfortunately, since manure may contain potentially fatal pathogens, like E. Coli or salmonella, the NOP established regulations as to how it will be used in organic production to prevent microbial contamination in crops (USDA Guide for Organic Crop Producers, 2012; USDA Tipsheet: Manure in Organic Production Systems, 2015).

Composting is the controlled decomposition of manure and other organic matter, like crop residue and bedding, by microorganisms while in the presence of oxygen. Compost improves soil fertility because it increases organic matter in the soil. This improves nutrient content and water retention. Additionally, compost improves soil structure and stability, increases beneficial microorganisms in the soil, and suppresses soil-borne diseases (USDA Tipsheet: Compost, 2015). The NOP regulates that compost manure should establish an initial carbon to nitrogen ration between 25:1 and 40:1. Also,
it should be held between 131 and 170 degrees Fahrenheit for three days using an in-vessel or static aerated pile system. The temperature should be held for 15 days when using a windrow composting system and must be turned a minimum of five days (USDA Guide for Organic Crop Producers, 2012; USDA Tipsheet: Manure in Organic Production Systems, 2015).

Composted manure is safer than raw manure because the process of decomposing the manure reduces pathogens, making it more environmentally safe. Raw manure must be free of soil, water, crops with pathogens, etc. It also should not be applied to frozen ground, which can cause manure runoff. Raw manure can be applied to soil that is growing crops not meant for human consumption. Manure must be composted unless it is applied to soil no less than 90 days prior to harvest when the edible portion of the crop does not have direct contact with the soil. Manure that is applied to crops in direct contact with the soil must be composted if is applied no less than 120 days prior to harvest (USDA Tipsheet: Manure in Organic Production Systems, 2015). The manure is applied through mechanical tillage, which mixes the mixture into the soil (USDA Guide for Organic Crop Producers, 2012).

Organic crop farmers are responsible for avoiding the contact of prohibited pesticides and fertilizers between conventionally grown and organically grown crops by accidental spraying of conventional agrochemicals, spray drift, and residue on equipment. The fields in which organic crops are harvested must have designated borders and buffer zones (USDA Introduction to Organic Practices, 2015). Buffer zones protect organic crops from contamination by conventional farming practices. A buffer zone is a body of
land located between land that is not maintained under organic management and a certified organic operation (USDA What Are Buffer Zones and Why Does my Farm Need Them? n.d.).

The integrity of organic crops is protected by the use of organic seeds, annual seedlings, and planting stocks (USDA Guidelines for Organic Crop Certification, n.d.). The NOP mandates that organic seeds must be used in organic farming when available through commercial purchase (California Certified Organic Farmers, 2014). Organic farmers are permitted the use of conventionally grown seeds when the corresponding organic seeds are unavailable, however, only if the seeds have not been genetically modified or treated with a prohibited substance (USDA Introduction to Organic Practices, 2015). This requirement does not apply to the production of edible organic sprouts, which must be produced with organic seeds; there are no exceptions (California Certified Organic Farmers, 2014; USDA Guidelines for Organic Crop Certification, n.d.).

**Livestock Regulation of Organic Foods**

Organic certification ensures that livestock is raised by USDA organic regulations throughout their entire lives. Livestock standards are to be implemented for any animal used for meat, milk, eggs, and all animal products sold, labeled and represented as organic (USDA Organic Production and Handling Standards, 2011). Organic livestock regulations focus on animal origin; animals are to be raised organically by the second day of life for poultry and by the last third of gestation for mammals (USDA Introduction to Organic Practices, 2015). Just like organic crop production, organic livestock is to be
raised without the use of genetic engineering, ionizing radiation, or sewage sludge. The NOP oversees livestock production to assure that biodiverse and natural resources are implemented in the management of organic livestock farming (USDA Organic Livestock Requirements, 2013).

All dairy products to be sold as organic must come from dairy animals who have been raised by organic standards for a minimum of 12 months. Animals must be kept healthy, preventative care and medical treatment should be provided to all animals. (USDA Organic Production and Handling Standards, 2011). Drugs to prevent disease and parasites may not be used; there are a few drugs, including vaccines, which are permitted. The use of antibiotics, growth hormones, and animal byproducts are strictly prohibited (USDA Organic Livestock Requirements, 2013). If an animal is treated with a prohibited substance, it cannot be labeled as organic (USDA Introduction to Organic Practices, 2015). Organic livestock producers prevent illnesses by handling exposure to disease and parasites. This is achieved by providing the animal with adequate nutrition, a low stress environment, and appropriate sanitation (Coffey & Baier, 2012).

Animals are to be given access to direct sunlight, fresh air, and year-round access to the outdoors, with the exception of inclement weather, to accommodate for their natural behavior (USDA Organic Production and Handling Standards, 2011). Producers must also provide organic livestock with clean bedding, shelter, an area for exercise, clean drinking water, direct sunlight as well as an area for shade. Producers are required to provide 100% organic feed to their livestock. Vitamin or mineral supplementation, not

During the grazing season, ruminant animals must have access to pasture. The grazing season must be a minimum of 120 days, specific to the farmer’s geographic region and climate. Weather conditions allow for the grazing season not to be continuous. A ruminant animal has a stomach divided into four compartments such as cattle, sheep, and goats. The rumen is known as the first stomach. A diet based on pasture improves the digestive tract of a ruminant animal by lowering gastric acidity. As a result, there is an increase in the production of microorganisms in the ruminant animal, which help ferment their high fiber diet. Pasture-based diets have been shown to reduce veterinary costs as well as the occurrence of hock lesions (USDA Organic Livestock Requirements, 2013). Ruminant pasture standards promote sustainable practices because legumes and grass can be turned into meat, milk, and wool. Grazing also provides farmers with manure, which can be used as a natural fertilizer (USDA Introduction to Organic Practices, 2015). Animal waste must be managed in a manner that protects the quality of both soil and water (USDA National Organic Farming Handbook, 2015).

**Pest Management of Organic Foods**

The successful management of insects on an organic farmland relies heavily on an effective pest management program. Insects can negatively influence crop health and yield (Shrivastava, Rogers, Wszelaki, Panthee, & Chen, 2010). Organic farms manage pest control through the “PAMS” strategy: prevention, avoidance, monitoring, and
suppression. The first line of defense against weeds, insects, and disease is by prevention and avoidance through a systems-based approach. USDA organic requirements and regulations are based on the fact that a well-designed and healthy organic system should have less pest problems naturally; the idea is that pest and disease outbreak should be prevented. In the event that pest or weed suppression is needed, organic producers will use mechanical and physical methods. This might be done by releasing predatory insects to reduce and eliminate the pest population or smothering weeds by laying down a thick layer of mulch (USDA Guide for Organic Crop Producers, 2012; USDA Introduction to Organic Practices, 2015).

Organic producers must focus on preventative measures over treatment modalities (Shrivastava et al., 2010). As a last resort, producers can seek approval from their organic certifier to administer permitted pesticides, like naturally occurring microorganisms or insecticides derived from plants. They may also be allowed to use one of the few permitted synthetic substances when they have exhausted all other options; producers must ensure that these substances do not come into contact with the organic crops they are growing (USDA Introduction to Organic Practices, 2015).

Pest, disease, and weed control are found to be the biggest challenges for conventional farmers who are transitioning to an organic production system. Conventional farmers can control any outbreak by the use of a chemical, which is readily available. Broad-spectrum pesticides are used to fumigate the soil for prevention of diseases, insects, and weeds. This mechanism has negative long-term effects by killing beneficial soil organisms (USDA Guide for Organic Crop Producers, 2012). Within the
ecosystem are herbivorous organisms, including insects and rodents, that feed on
vegetation; predators and parasites feed on these herbivores and helps to reduce damage
caused towards the plant community. Plants are susceptible to pathogenic fungi and
other microorganisms; however, most microorganisms in the soil play a critical role in
promoting plant health, like disease suppression (USDA National Organic Farming

The diverse organisms in the environment create a balance that controls pests
from destroying vegetation. This natural checks and balances system within the
ecosystem is stimulated by organic farmers to reduce damage to their crops. They do this
by growing plants that harbor predators which will eliminate crop pests, rotate their crops
to disrupt any pest cycles, plant cover crops that suppresses weeds, and achieve optimal
soil health to avoid soil-borne pathogens (USDA National Organic Farming Handbook,
2015). There are fewer insecticides, fungicides, and herbicides permitted on organic
crops, thus, organic farmers have fewer tools than conventional farmers do. Organic
farmers must manage their pest control from a different perspective; designing a system
that prevents pest problems is optimal. This management method reduces the likelihood
of a severe pest outbreak from occurring and will lead to fewer imbalances amongst the

The USDA Organic Seal

The USDA organic seal, initially published by the NOP, is the “official mark of
the USDA Agricultural Marketing Service (AMS)” and is limited for use only towards

A USDA-accredited certifying agent is responsible for overseeing and approving the labeling of organic products prior to its entry into the market (USDA Guide for Organic Processors, 2012; USDA What is the Organic Seal? 2016). To prevent costly errors, organic producers should seek review from their organic certifying agent before printing organic labels on their products. Operations who do not exceed $5,000 in annual organic sales do not require organic certifications, therefore are not permitted to use the USDA organic seal. However, these operations must adhere to USDA organic production and handling regulations including keeping thorough records for a minimum of three years (USDA Guide for Organic Processors, 2012; USDA What is the Organic Seal? 2016).

The USDA organic seal certifies that at least 95% of a product is organic (USDA Guide for Organic Processors, 2012). Use of the organic seal is not permitted for products that do not meet USDA organic standards. A fine of $11,000 per violation will be issued to persons who misrepresent a product using the USDA organic seal (USDA
The Organic Seal, n.d.; USDA What is the Organic Seal? 2016). There are strict limitations with regard to the use of the organic seal: the organic seal is not permitted (1) “by uncertified operations, or operations that have been suspended or revoked from organic certification,” (2) “in any displays or on labels for products not certified organic to the USDA organic regulations,” and (3) “on broad display in stores or advertisements in a way that misrepresents non-organically produced products as organic.” (USDA What is the Organic Seal? 2016). Below is a description of the USDA organic seal (See Figure 1).

“On a white background with a brown outer circle and with the term, ‘USDA,’ in green overlaying a white upper semicircle and with the term, ‘organic,’ in white overlaying the green lower half circle; or on a white or transparent background with black outer circle and black ‘USDA’ on a white or transparent upper half of the circle with a contrasting white or transparent ‘organic’ on the black lower half circle. The green or black lower half circle may have four light lines running from left to right and disappearing at the point on the right horizon to resemble a cultivated field” (Electronic Code of Federal Regulations, 2017; USDA The Organic Seal, n.d.).

*Figure 1. USDA Organic Seal*
Organic Food Labeling in the United States

The USDA has strict labeling requirements for all organic products. A product cannot be labeled as “organic” unless it is certified organic. Products that are not certified organic cannot claim that it or its ingredients are organic and are not permitted to use the USDA organic seal on any part of the packaging. A producer may identify on their packaging that an ingredient is organic only if that ingredient is certified organic; the information panel may also identify the percentage of certified organic ingredients. Organic farmers who sell $5,000 or less annually are exempt from organic certification (USDA Organic Labeling, n.d.). These producers must still comply with USDA handling and production regulations including documenting and keeping all records for at least three years. Products from noncertified operations cannot be used as an organic ingredient for products from another operation (USDA Organic Labeling Standards, n.d.).

Organic processors are overseen by a NOP certifying agent and must follow all USDA organic regulations. The NOP certifying agent ensure compliance by reviewing and approving all product labels. Products must be produced without the use of any prohibited substances or methods and per the National List of Allowed and Prohibited Substances (National List) (USDA Labeling Organic Products, 2012). The National List provides all synthetic substances that can be used and natural substances that cannot be used in organic farming. Additionally, it identifies the few non-organic substances that can be used in the production of organic products (USDA The National List, n.d.). This list can be located on the Code of Federal Regulations (Electronic Code of Federal Regulations, 2017).
The name of the USDA-accredited certifying agent must be listed on the labels of all certified products; it should include a phrase like “Certified Organic by ____.” Labels for “100 percent organic” and “organic” products may include the USDA organic seal and the seal of the certifying agent; however, the certifier’s seal cannot be shown more distinctly on the package than the USDA organic seal (USDA Guide for Organic Livestock Producers, 2012). There are four categories of labeling which are based on the organic composition of the product, these categories are: “100 percent organic,” “organic,” “made with” an organic ingredient, and “specific ingredient listings” (USDA Labeling Organic Products, 2012; USDA Organic Labeling Standards, n.d.). Each category specifies rules pertaining to the quantity of organic ingredients, if nonorganic ingredients can be used, approved processing aids, and how it should be labeled. Organic foods that have been processed are primarily composed of organic agricultural ingredients. There are certain processing methods that require nonorganic or nonagricultural ingredients (USDA Guide for Organic Processors, 2012). There are two areas on an organic package that specifies how an organic product is labeled. These areas are referred to as the Principal Display Panel (PDP) and the Information Panel (IP). The PDP is the part of the package that is most likely to be seen by the consumer during the time of purchase and the IP includes the ingredient list and any additional product information (USDA Labeling Organic Products, 2012).

The USDA defines “100 percent organic” as a raw or processed agricultural product that contains 100 percent certified organically produced ingredients. This labeling category is the strictest. All ingredients, other than water and salt, must be
certified organic and all processing aids must be organic. Salt is a naturally occurring mineral and does not need to be labeled because it is not an agricultural product; however, it must be pure salt that is free of nonorganic additives (USDA Guide for Organic Processors, 2012; USDA Labeling Organic Products, 2012). This kind of label may include the USDA organic seal and/or the “100 percent organic” claim on the PDP. The IP should identify all organic ingredients with an asterisk or marking of some sort (USDA Labeling Organic Products, 2012).

A product labeled as “organic” must contain a minimum of 95 percent certified organic ingredients, excluding salt and water. This means that non-organic ingredients, permitted by the National List, can be used for a total of five percent of non-organic content. There are certain nonorganic and nonagricultural processing aids that can be used in foods labeled “organic” but not in foods labeled “100 percent organic.” An example of this is decaffeinated coffee, which must be labeled as “organic.” It can never be labeled “100 percent organic” since nonorganic processing aids must be used in the decaffeinating process (USDA Guide for Organic Processors, 2012; USDA Labeling Organic Products, 2012). Products labeled “organic” may also include the USDA organic seal and/or organic claim as well as identify all the organic ingredients, with an asterisk or marking, on the list of ingredients (USDA Labeling Organic Products, 2012).

A product that is labeled as “made with” an organic ingredient must contain at least 70 percent certified organic ingredients, excluding salt and water. There are constraints and limitations for the ingredients that make up the nonorganic portion of the product. The remaining 30 percent of ingredients in the product is not required to be
produced organically; however, they cannot be produced by excluded methods such as genetic engineering. Any non-agricultural product should be allowed per the National List (USDA Guide for Organic Processors, 2012; USDA Labeling Organic Products, 2012). The organic seal may not be used when the percent of certified organic ingredients is between 70 and 95 percent (USDA Guide for Organic Livestock Producers, 2012). The label should state, “made with organic (insert up to three ingredients),” and cannot include the USDA organic seal on the PDP. It should never state “made with organic ingredients.” The IP should identify all organic ingredients with a specific marking or asterisk (USDA Labeling Organic Products, 2012).

The final category of organic labeling is “specific ingredient listings” which are products that cannot make organic claims on the PDP. The ingredient list may include components that are organic (USDA Guide for Organic Processors, 2012). A product with multiple ingredients that has less than 70 percent certified organic content, excluding water and salt, may list certified organic ingredients in the ingredient list. For example, this can be stated as “Ingredients: Dry Roasted Peanuts, Palm Oil, Organic Cane Sugar, and Sea Salt.” (USDA Guide for Organic Crop Producers, 2012). These products are restricted from using the word “organic” or the USDA organic seal anywhere on the PDP. The remaining ingredients do not have to follow USDA organic regulations (USDA Labeling Organic Products, 2012).

The USDA requires that all alcoholic beverages comply with the Alcohol and Tobacco Tax and Trade Bureau (TTB) regulations. Organic certifying agents and the TTB must review all organic alcohols. Sulfite labeling requirements states that the use of
added sulfites in wine means the USDA organic seal is not permitted and the wine can only use the “made with” labeling category. Sulfites can be added to wine that is made with organic fruit; however, there are specific regulations to this guideline. Sulfites can only be used in wine “made with organic grapes.” This means that a wine “made with organic apples” should not contain added sulfites while a wine “made with organic grapes” may. Textiles that are produced according to USDA organic regulations and are certified organic may be labeled organic, and display the USDA organic seal. Textiles produced in other countries can be sold in the U.S. as organic only if they meet the Global Organic Textile Standard (GOTS). (USDA Labeling Organic Products, 2012).

**Nutritional Quality of Organic Foods**

Organic has been the fastest growing food sector in the U.S. despite the generally higher food cost (Dettmann & Dimitri, 2009). The USDA reports that the demand for organically grown goods has been rapidly increasing since the 1990s (USDA Overview, 2016). Healthiness is important to consumers when purchasing food; consumers perceive foods labeled as organic to be healthier, or more superior, than conventional foods despite the lack of evidence to support this claim (Williams, 2002).

Alternative therapies for cancer treatment advocate for the consumption of organic foods because they are free of any pesticide residue (Worthington, 2001). However, there is no scientific research that supports this claim (Kouba, 2003). Prior to the use of chemicals in agriculture, organic foods were widely assumed by healthcare professionals to contain a higher concentration of nutrients due to soil management and
fertilization procedures in organic farming. It was believed that any benefit from consuming organic foods is directly linked to the absence of pesticide residue and the higher nutrient concentration in the food (Worthington, 2001).

The Total Diet Study (TDS) “is an ongoing Food and Drug Administration (FDA) program that monitors levels of about 800 contaminants and nutrients in the average U.S. diet” (U.S. Food and Drug Administration, 2016). The TDS began in 1961 as a way to monitor food contaminants, such as radioactive contaminants, “pesticide residues, industrial and other toxic chemicals, and nutrient elements” (U.S. Food and Drug Administration, 2016). The data is used to estimate the total amount of contaminants and nutrients consumed, annually, by the average American; the FDA uses this data to address potential areas of focus for food safety and nutrition programs. The study analyzes roughly 280 kinds of foods and beverages, four times a year. The list of items analyzed is updated every ten years to accommodate for changing eating patterns in the U.S. (U.S. Food and Drug Administration, 2016). The TDS is used as a continuing surveillance program to estimate and monitor exposure to both beneficial and harmful substances across the population’s diet; it provides a basis for assessing potential outcomes of public health (World Health Organization, 2011).

Data indicates a slight trend of higher nutrient content in organically farmed crops (Hornick, 1992; Smith, 1993). Worthington (2001) compared the nutrient content between organic and conventional crops. She found that organic crops showed a statistically higher level of Vitamin C, iron, magnesium, and phosphorus; significantly less nitrates were also found in the organic crops. The study concluded that organic and
conventionally grown crops have differences in nutrient content. There is inconclusive data about the concentration of Vitamin C in organic crops; some studies found an increase while other studies reported either no difference or lower concentrations (Citak & Sonmez, 2010; Lima & Vianello, 2011; Smith, 1993; Williams, 2002; Woese, Lange, Boess, & Bögl, 1997; Worthington, 1998). There has been a noted trend of higher Vitamin C concentrations in organic crops; these were reportedly found in green leafy vegetables like spinach, chard, lettuce, and Savoy cabbage (Citak & Sonmez, 2010; Magkos, Arvaniti, & Zampelas, 2003; Mozafar, 1996). Citak & Sonmez’s (2010) study found that the season impacts plant yield, vitamin C concentration, and nitrate levels in organically and conventionally grown spinach. Studies found that potatoes also revealed mixed results but with trends showing higher concentrations of Vitamin C in organically grown crops (Magkos et al., 2003; Warman & Havard, 1998).

There is very limited research comparing the composition of nutrients in organic vs. conventional crop and livestock production. Few differences have been reported, however, there have been some consistent findings of higher Vitamin C and lower nitrate levels in organically produced vegetables (European Food Information Council, 2013; Finesilver, Johns, & Hill, 1989; Williams, 2002). Due to the limited amount of published data, there is no clear evidence to support that organically produced animal products are safer or more nutritious than conventionally raised animal products (Honikel, 1998). Data comparing health outcomes in populations who consume organically vs. conventionally grown foods is extremely sparse (Williams, 2002). A recent systematic review study sought to assess evidence of nutrition-related health benefits as a result from
consuming foods grown by organic farming methods. The researchers searched for articles published in 1958-2008, they identified 12 relevant studies that could be used for the study (Dangour et al., 2010). The study found that there is a lack of evidence to conclude any nutrition-related health effect because of consuming organically produced foods (Dangour et al., 2010).

The demand for organic products in the market has rapidly expanded over the past two decades (Greene et al., 2010). Consumers report that health and nutritional value are the two reasons why they choose to buy organic foods, however there is no scientific evidence which states organic foods are nutritionally superior than conventionally grown foods (Akhondan et al., 2015; Williams, 2002). While there is evidence to state that organically grown foods do possess a slightly higher nutrient content, this difference is not enough to state that organic foods provide additional health benefits to consumers (Kouba, 2003). Measuring the nutrient concentration in foods does not reflect the overall quality of the food (Magkos et al., 2003). Bioavailability is not accounted for when a food’s nutrient content is altered through different production methods. A well-balanced diet rich in fruits and vegetables with an adequate amount from other food groups can improve health regardless if it is organically or conventionally grown (Magkos et al., 2003). The highest quality for farming organically is that it utilizes a production system that protects the environment; this is a benefit to everybody on earth (Kouba, 2003).
**Characteristics of Organic Food Buyers**

As the organic market continues to expand, the question remains, who is buying organic food? Farmers, processors, and distributors can increase their profits by gaining more insight about organic food buyers (Dettmann & Dimitri, 2009). Despite being costly, some researchers found organic food buyers generally have higher incomes. However, other researchers have not seen this relationship in their studies; high cost was identified as a barrier to buying organic but was not correlated with income (Davies, Titterington, & Cochrane, 1995; Zepeda & Li, 2007). Previous market research and a variety of academic studies have tried to uncover demographic profiles for organic consumers. Unfortunately, most results are conflicting and do not provide details about the “typical” consumer (Dettmann & Dimitri, 2009). Dettmann and Dimitri (2007) researched demographic data of organic vegetable consumers. Their study concluded that Caucasians who are well educated and have higher incomes are the most likely to purchase organic.

The USDA states that the typical consumer of organic foods is difficult to pinpoint, however, studies do reveal consumer attitudes and their purchasing behaviors (Dumea, 2012; USDA Organic Market Overview, 2016). Research has been conducted that studies organic food consumers’ buying habits and demographics; results all vary depending on the geographic area, sample size, and survey type (USDA Organic Market Overview, 2016). Despite inconclusive data, researchers have noticed a trend among the data. Organic consumers are willing to pay a higher price for organic foods due to their
concerns with health, the environment, and a positive attitude towards organic food (Dumea, 2012; USDA Organic Market Overview, 2016).

Dumea’s (2012) study also found a positive correlation between knowledge and purchasing frequency of organic foods; the more knowledgeable a consumer is with regard to organic foods, the more likely that individual will be a purchaser of organic foods. The Hartman Group and Food Marketing Institute conducted national surveys on consumers. Their research found that two-thirds of surveyed shoppers purchased organically grown foods, whether it was an occasional or a frequent purchase (USDA Organic Market Overview, 2016). Multiple study findings reveal the attitudes which motivate consumers to purchase organic food including: “organic food is safer, healthier, have better quality, they taste better, have higher nutritional value, and are more environmentally friendly” (Dumea, 2012; Padel & Foster, 2005; Radman, 2005; Robles, Vannini, De La Puente, & Fernandez-Revuelta, 2005; Wier & Calverley, 2002; Zanoli & Naspetti, 2002).

**Trends in the Organic Food Industry**

The consumer demand for organic products has been rapidly growing since the 1990s, showing double-digit growth in the market (USDA Overview, 2016). In 2007 to 2009, organic sales took a dip because of the economic recession; however, sales quickly rebounded following the recession (USDA Growth Patterns in the U.S. Organic Industry, 2013). Total organic food sales were at $3.6 billion in 1997 and have increased to an impressive $43.3 billion by 2015. In 2014, organic food sales were at $3.9 billion.
Despite challenges in meeting consumer demand as the organic production lagged behind consumption in the U.S., 2015 marked a year of significance in the organic market with the industry’s largest gain ever. Within one year, sales were at $4.2 billion by 2015, up from the $3.9 billion in 2014 (Organic Trade Association, n.d.). Of the $43.3 billion in total organic product sales, $39.7 billion were organic food sales (Organic Trade Association, 2016). Greater access to organic products from mainstream retailers could be the reason for increased sales in 2015, as conventional supermarkets, club membership warehouses, and local grocery stores expand their organic availability to consumers (Organic Trade Association, 2016).

The organic food industry shows continuous growth with an incredible 10.8 percent growth rate in 2015 while the overall food market growth rate is 3.3 percent. Millennials continue to drive organic purchasing growth primarily in urban communities. The industry is currently working to create a more secure supply chain that can support the growing demand for organic foods (Organic Trade Association, n.d.). Challenges in the supply chain continues to be a concern for the organic market. For example, in 2015 dairy and grains were the two categories that could have had even greater sales had there been enough supply to meet consumer demand (Organic Trade Association, 2016).

There is an awareness throughout the organic industry for the need to create a secure supply chain (Organic Trade Association, 2016). The industry is currently seeking efforts to secure additional organic land, encourage conventional farmers to grow organic, and to develop programs that will aid in the transition to organic farming. Currently, organic sales make up about five percent of total food sales while land
dedicated to organic agriculture is below one percent of the total U.S. farmland (Organic Trade Association, n.d.). While some companies are seeking to address tackling the supply chain problem on their own, other companies are coming together to address their concerns. For example, the U.S. Organic Grain Collaborative are seeking to increase the supply of organic grains by addressing areas in the organic production system to improve productivity and profitability as well as reduce any barriers to transitioning organic farmers. Members of the U.S. Organic Grain Collaborative include Annie’s, Stonyfield, Clif Bar, Nature’s Path, General Mills, and Organic Valley. This collaboration works directly with farmers and stakeholders across the supply chain in Aroostook County, Maine and the Northern Great Plains (Sustainable Food Lab, n.d.).

The top-selling organic category in the year 2000 was fresh produce (Dimitri & Greene, 2000). With $13 billion in sales making up 36 percent of total organic food sales, by the year 2014 organic fruits and vegetables continue to be the biggest-selling organic category, up 12 percent from the year prior. The market share for fruits and vegetables has doubled throughout the past ten years when organic produce sales accounted for only five percent of the fruit and vegetable market (Organic Trade Association, 2015). Currently, nearly 13 percent of fruits and vegetables sold in the U.S. is now organic (Organic Trade Association, 2016). In 2000, the top selling organic categories following fresh produce consisted of nondairy beverages, breads and grains, packaged foods, and dairy products (Dimitri & Greene, 2000). In 2014, the organic dairy sector made approximately an 11 percent jump in sales to $5.46 billion, which was the largest percent increase for that category in six years (Organic Trade Association, 2015).
Among total organic food sales, dairy currently accounts for fifteen percent (Organic Trade Association, 2016).

**Barriers to Consuming Organic Foods**

The main reason cited for the not purchasing organic food continues to be organic price premiums (Padel & Foster, 2005). Millock, Wier, and Andersen (2004) assessed attitudes, values, and behaviors for purchasing organic foods through real market purchase data and questionnaire data between 1997 and 2001 among 2000 households. Their study also revealed price as the major barrier for consuming organic foods. Other reported barriers included the lack of trust in health benefits from eating organic, lack of trust in the organic certification process, and simply a lack of interest in organic foods (Millock et al., 2004).

With regard to fresh produce, foreign origin seemed to be of concern; consumers reported a preference of domestically grown foods (Millock et al., 2004). However, no clear evidence suggests there is a greater risk of microbial bacterial contamination or pesticide residue contamination from imported produce than from domestically grown produce (Buzby, 2001; Zepp, Kuchler, & Lucier, 1998). American consumers demand “variety, quality, and convenience in the foods they consume” (USDA ERS U.S. Food Imports, 2016). Seasonal and climatic factors push for more imported foods into the U.S. As ethnic diversity continues to expand, so does the volume and variety of food imports. In 2013, the U.S. food consumption amounted to 635 billion pounds; of this, imports accounted for 19 percent, or 123 billion pounds (USDA ERS Import Share of...
Consumption, 2016). U.S. imports continuously grow, the largest being horticulture and tropical products (USDA ERS Agricultural Trade, 2016). In 2015, the exchange rate made foreign goods cheaper, causing the import rate to grow at two percent. However, this rate reflects a much slower growth than the seven percent average between 2000 through 2015 (USDA ERS Agricultural Trade, 2016).

The U.S. Environmental Protection Agency (EPA) states that fruits and vegetables grown with the use of pesticides are safe for consumption, in fact safer than ever before. The EPA continues to review and evaluate all pesticides to ensure, beyond reasonable certainty, that there will be no harm or adverse effects to infants, children, and adults (U.S. Environmental Protection Agency, n.d.). Between the years 1996 through 2006, the EPA canceled or restricted the use of 270 household and food pesticides because they posed a potential threat to infants and children. Additionally, the amount of permissible pesticide residue levels has been lowered in many children’s foods. The EPA states that, “just because a pesticide residue is detected on a fruit or vegetable, that does not mean it is unsafe. Very small amounts of pesticides that may remain in or on fruits, vegetables, grains, and other foods decrease considerably as crops are harvested, transported, exposed to light, washed, prepared and cooked. The presence of a detectible pesticide residue does not mean the residue is at an unsafe level” (U.S. Environmental Protection Agency, n.d.).

Additional barriers found was the perception that organically grown foods have a shorter shelf life and poorer appearance (Millock et al., 2004). These barriers were prevalent among non-buyers, as expected. However, supply shortage continues to be a
problem for organic food buyers. Overall, the topic of barriers for purchasing organic foods primarily revolved around price, limited trust in the organic food industry, overall quality, visual appearance, and availability (Millock et al., 2004)

In 2008, over two-thirds of the U.S. populations purchased some sort of organic product and more than one-quarter purchased organic on a weekly basis (Forman & Silverstein, 2012). Consumers choose organic with the notion that organic foods are more nutritious, have less additives, fewer contaminants, and are grown more environmentally sustainable. These factors motivate consumers to buy organic, however not everyone can afford or are willing to pay the price for organic. Organic food costs between 10% to 40% more than conventionally produced food. There are numerous factors contributing to the high price of organic including more expensive organic animal feed, lower productivity, and increased labor costs due to the reliance on more individuals to weed by hand (Forman & Silverstein, 2012). Multiple study findings concluded “the high price, low income, low availability, poor appearance, and design packages” to be considered barriers towards consumption of organic food (Dumea, 2012; Padel & Foster, 2005; Radman, 2005; Robles et al., 2005; Wier & Calverley, 2002; Zanoli & Naspetti, 2002).

The potential concern with increased cost of organic produce is a reduced overall consumption of fruits and vegetables despite the literature stating these foods can decrease the risk of developing chronic diseases such as, cancer, diabetes mellitus, and heart disease (Boeing et al., 2012; Ford & Mokdad, 2001; van't Veer, Jansen, Klerk, & Kok, 2000). Fifty-five percent of children born in the U.S. are eligible for benefits under
the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC). Food packages offer eligible families around $10 monthly towards fruits and vegetables that should be spent wisely for maximum food capacity (Forman & Silverstein, 2012). The purchase of more expensive organic produce could limit the amount of total fruits and vegetables consumed, especially among college students who have a limited budget.

**Recommended Dietary Intake of College Students**

In 1997, the Institute of Medicine (IOM) developed and published Dietary Reference Intakes (DRIs) which are a representation of the most current scientific knowledge of nutrient needs for healthy populations. DRIs are a set of reference values that provides an estimate of nutrient intakes that are used to assess and plan nutrient intakes in healthy individuals among varying age and gender (National Institute of Health, n.d.). DRIs were developed as an expansion of *Recommended Dietary Allowances*, published from 1941 to 1989 by the National Academy of Science, and *Recommended Nutrient Intakes*, published by the Canadian government (Institute of Medicine, 2005).

The DRIs include Estimated Average Requirements (EAR), Recommended Dietary Allowance (RDA), Adequate Intake (AI), and Tolerable Upper Intake level (UL). RDAs are a set of nutrient recommendations that meet 97 to 98 percent of sufficient daily dietary nutrient intake levels (Institute of Medicine, 2005). The Institute of Medicine (2005) assesses saturated and trans fats differently. An RDA is not specified for saturated and trans fats due to the increased risk for developing chronic diseases if these
nutrients are consumed in high amounts. Individuals should limit their intake of saturated
and trans fats while consuming a well-balanced diet.

Every five years, the USDA and Department of Health and Human Services
(HHS) revise and publish Dietary Guidelines for Americans. These guidelines are
science-based nutritional recommendations for Americans intended to promote a healthy
lifestyle while reducing the prevalence of obesity and chronic diseases (USDA A
Snapshot of the 2015-2020 Dietary Guidelines for Americans, 2016; U.S. Department of
Health & Human Services, 2016). The most recent published guidelines, the 2015-2020
Dietary Guidelines for Americans, focus on big picture recommendations. The new
edition encompasses five specific recommendations: (1) “follow a healthy eating pattern
across the lifespan,” (2) “focus on variety, nutrient-dense foods, and amount,” (3) “limit
calories from added sugars and saturated fats, and reduce sodium intake,” (4) “shift to
healthier food and beverage choices,” and (5) “support healthy eating patterns for all”
(USDA Dietary Guidelines Advisory Committee, 2015).

Following a healthy eating pattern means being mindful of all dietary selections,
including beverages (USDA Dietary Guidelines Advisory Committee, 2015). It is best to
eat a variety of food groups while maintaining an appropriate calorie level to help achieve
and maintain a healthy body weight, nutrient adequacy, and reduce risk of chronic
diseases. This can be achieved by consuming a wide and colorful variety of vegetables
from all subtypes including dark green, red and orange, legumes (beans and peas), and
starchy vegetables. Consumption of whole fruits, grains (at least half of which are
whole), fat-free or low-fat dairy including milk, yogurt, cheese, and fortified soy
beverages is also recommended. Additional guidelines include eating a variety of protein foods, like seafood, lean meats and poultry, eggs, legumes, nuts, seeds, and soy products as well as consumption of healthy, unsaturated, oils. A healthy eating pattern limits saturated fats, trans fats, added sugars, and sodium. Key recommendation about other components of the diet that should be limited include “consuming less than 10% of calories per day from added sugars, consuming less than 10% of calories per day from saturated fats, and consuming less than 2,300 milligrams (mg) per day of sodium” (USDA Dietary Guidelines Advisory Committee, 2015). “If alcohol is consumed, it must be consumed in moderation; up to one drink per day for women and up to two drinks per day for men” (USDA Dietary Guidelines Advisory Committee, 2015).

A diet high in fiber is very beneficial for overall health (Mayo Clinic Staff, 2015). Fiber normalizes bowel movements, promotes bowel health by reducing one’s risk of developing hemorrhoids, lowers harmful low-density lipoproteins known as “bad” cholesterol, and controls blood glucose levels by slowing the absorption of sugars. Fiber also promotes maintaining a healthy weight because it tends to be more filling or satiating. High fiber foods are also less “energy dense,” meaning they are lower in calories (Mayo Clinic Staff, 2015). According to the Institute of Medicine (2005), total fiber is the amount of dietary fiber and functional fiber. Dietary fiber is defined as “nondigestible carbohydrates and lignin that are intrinsic and intact in plants” and functional fiber consists of “isolated, nondigestible carbohydrates that have beneficial physiological effects in humans” (Institute of Medicine, 2005). Dietary fiber includes the part of a plant that the body cannot digest or absorb. Instead, fiber passes through the
stomach, small intestine, colon, and is eventually excreted by the body (Mayo Clinic Staff, 2015). Fiber is found in foods including fruits, vegetables, whole grains, and legumes.

Fiber is more commonly classified into one of two categories: soluble fiber, which dissolves in water, or insoluble fiber, which does not. Soluble fiber works by dissolving in water and forming a gel-like substance. This material lower blood cholesterol and glucose levels and can be found in oats, legumes, apples, citrus fruits, carrots, and barley. Insoluble fiber adds bulk to stool and promotes movement of material through the digestive tract. It is beneficial for individuals who suffer from constipation and stool irregularity. Insoluble fiber is found in foods including whole grains, wheat brans, nuts, beans, and vegetables like potatoes, green beans, and cauliflower. Many plant-based foods such as oatmeal and beans, contain both types of fiber, however amounts vary. It is recommended to consume a wide variety of foods high in fiber to obtain the greatest health benefit (Mayo Clinic Staff, 2015; UCSF Medical Center, n.d.). The AI for total fiber is 38 grams per day for men and 25 grams per day for women. A UL has not been established due to insufficient evidence of harmful effects of high dietary fiber intake (Institute of Medicine, 2005). When increasing fiber intake, it is advised to do so gradually, making sure to drink plenty of fluids. Fiber needs water to bulk up, consuming higher amounts of fiber and not enough fluids can result in nausea and/or constipation (Larson, 2016).

Adequate hydration status is an important component of a healthy diet (Institute of Medicine and Food and Nutrition Board, 2004). Water is essential for the human body
because it serves many purposes including maintaining homeostasis. Water regulates body temperature, keeps tissues moist, helps prevents constipation, supports the supply of nutrients to cells, facilitates biochemical reactions, and maintains blood volume. It also removes waste through renal and hepatic clearance and via the cardiovascular system. There is no evidence that water intake is associated with chronic disease risk, however, an AI has been determined to prevent the onset of dehydration; harmful effects of dehydration consist of metabolic and functional irregularities. Total water intake consists of drinking water, water found in other beverages, and moisture in foods. The total water consumption recommendation for males is approximately 13 cups (3 liters) per day for males and approximately nine cups (2.2 liters) per day for females. Recommendations may vary based on one’s specific health conditions, level of physical activity, and location of residency (Institute of Medicine and Food and Nutrition Board, 2004).

The total number of calories an individual needs varies based on a person’s age, sex, height, weight, and physical activity level (Dietary Guidelines Advisory Committee, 2015; Institute of Medicine, 2005). Estimated energy needs can range from 1,600-2,400 calories per day for adult women and 2,000-3,000 calories per day for adult men. Estimated calories needs per day for females age 19-25 based on activity level is 2,000 for sedentary activity, 2,200 for moderately active, and 2,400 for an active individual. For females age 26-30, estimated needs per day decrease for sedentary and moderately active individuals ranging from 1,800-2,000 calories per day. Estimated calories needs per day for males age 19-20 based on activity level is 2,600 for sedentary activity, 2,800 for moderately active, and 3,000 for an active individual. For males age 21-25, estimated
needs per day decrease to 2,400 calories for sedentary individuals; males age 26-30, estimated needs decrease to 2,400 calories for sedentary activity level and 2,600 calories for a moderately active individual (Dietary Guidelines Advisory Committee, 2015; Institute of Medicine, 2005). Based on a 2,000-calorie diet, an individual should consume 2 cups of fruit, 2.5 cups of vegetables, 6 ounces of grains, 5.5 ounces of protein, and 3 cups of dairy per day (USDA MyPlate Daily Checklist, 2016).

(Blisard & Stewart, 2007).

**Organic Foods and College Students**

University students in America have a positive perception towards organic food. Additionally, students identify organic practices as environmentally sustainable (Akhondan et al., 2015; Dahm et al., 2009). Akhondan et al. (2015) found a positive correlation in health consciousness and consumption of organic food among college students. Similarly, Azzurra and Paola’s (2009) study identified a positive relationship between consumer behavior of organic foods and health awareness. Dahm et al. (2009) found that college students are knowledgeable about organic foods and are in favor of incorporating organic foods into their diet; while less than half of the participants reported consuming organic foods, more than half of the respondents indicated they would purchase organic foods if they were offered on campus dining locations (Dahm et al., 2009).

College students face the new role of purchasing and preparing their meals while managing their new hectic schedules (Kelly, Mazzeo, & Bean, 2013). The transition into
college has a significant impact on dietary patterns in students. The use of food labels and specific point-of-purchase (POP) messages is an effective method shown to promote healthy eating habits in students (Deshpande, Basil, & Basil, 2009). Increased knowledge of dietary guidelines is positively correlated to healthier eating habits in college students (Kolodinsky et al., 2007). College students reported a high importance and positive attitude towards organically and locally produced foods and the use of sustainable practices in agriculture (Pelletier, Laska, Neumark-Sztainer, & Story, 2013).

There is very limited research that investigates organic food buying trends in college students. Despite the lack of research among this population, there are current publications about the perception of organic food in college-aged students (Pelletier et al., 2013). Anderson, Wachenheim, & Lesch (2006) researched the perception of organic food in Midwestern university students in the U.S. Findings revealed that in general, organic food is thought to be more nutritious than conventional foods and that organic food consumption is related to increased health outcomes. Participants also felt that organic agricultural practices were more beneficial for the environment and that they were safe to consume (Anderson et al., 2006).

A study of university students in Iran aimed to address “the intentions of Iranian students toward the use of organic food” and “to investigate how well the health belief model is able to predict willingness to use organic foods” (Yazdanpanah, Forouzani, & Hojjati, 2015). The research found that perceived benefits, self-efficacy, general health orientation regarding pesticides and organic foods, and perceived barriers were the best predictors for willingness to purchase organic foods. Of those, perceived benefit was the
best predictor for student’s willingness to purchase organic foods, referring to the perception of offering a health benefit as well as conserving the environment. General health orientation referred to an individual’s consciousness with a healthy lifestyle and self-efficacy was related to the perceived level of difficulty of obtaining organic foods. This means that availability of organic foods and an individual’s wellness orientation can increase the intention of purchasing organic foods in college aged students. This study defined perceived barriers as the perceived inconvenience in both cost and time of purchasing organic foods; meaning the perceived inconvenience and time-consuming process of finding and buying organic foods impacts willingness to purchase such foods among college students (Yazdanpanah et al., 2015).
CHAPTER III
METHODOLOGY

Introduction

The purpose of this study was to differentiate knowledge and perception of organic food buyers vs. organic food non-buyers with varying demographics enrolled in the Spring 2017 semester at Kent State University. The research was a descriptive, posttest only, multi-factorial design study using survey data. This study compared knowledge and perception of organic food buyers and organic food non-buyers between gender and major. Perception of organic and conventional foods was compared among college students. This study also determined whether place of residence had an impact on buyer status in college students.

Participants

Participants for the study were students at Kent State University. Data was collected using a convenience sample of students enrolled at the university’s Kent campus during the Spring 2017 semester. Participants were at least 18 years old and were enrolled full time at the university. Students were invited to participate in a survey (Appendix D) by e-mail (Appendix A); student e-mails were obtained from the Kent State University Provost Office. A reminder e-mail (Appendix B) was sent to students one week after the initial e-mail invitation. Students who were enrolled part-time or are
below the age of 18 were excluded from this study. Participation in the study was voluntary.

**Measurement Instruments**

**Qualtrics**

The survey for this study was designed using Qualtrics software by the researchers. Qualtrics is an online forum widely used for academic research; users are able to do many kinds of online data collection. Survey data obtained through Qualtrics was exported for further analysis in Statistical Package for Social Sciences (SPSS) software version 24.

**Survey**

A 52-question survey (Appendix D), developed by the researcher, was distributed using Qualtrics software to students attending the Kent campus of the university via e-mail (Appendix A). The e-mail provided basic survey directions, a statement of voluntary participation, and the primary researcher’s contact information for additional comments or questions. If the student agreed to participate in the study, they were instructed to click on a hyperlink in the e-mail that directed them to a survey titled “Knowledge and Perception of Organic Foods Survey.” Prior to beginning the survey, the student electronically signed an IRB consent form (Appendix C), which then prompted the student to begin the survey. The survey took approximately 10 to 12 minutes to complete and contained four sections in the following order: socio-demographic characteristics, purchasing, knowledge, and perception. Students were
informed that their participation in the survey will remain entirely confidential and that they may choose to discontinue participating in the study at any point in time without penalty.

**Socio-Demographic Characteristics.** The first section of the survey contained 15 questions seeking information regarding the student’s socio-demographic information. The student provided details about their full or part-time status, class standing, major, age, gender, ethnicity, marital status, if they had children, their living arrangement, and if they were enrolled in the university dining program. Participants were also asked if they considered themselves an environmentalist, if they were the primary food buyer in their household, if they had any experience working in agriculture, and the frequency in which they purchased organic foods. Two exclusion questions were in this section; if the student is below the age of 18 they were not able to participate in the study. If the student identified that they are not enrolled in the current Spring 2017 semester as a full-time student, they were not able to participate in the study. The survey ended if either of the two exclusion criteria were met.

**Purchasing.** The second part of the questionnaire was the *purchasing* section and was made up of six questions. The purpose of this portion of the survey was to identify to the primary researcher which participants will be categorized as organic food buyers and organic food non-buyers. This section of the survey initially asked if participants purchased organic foods at least three times a month. If a participant selected “no,” they were categorized in the organic food non-buyer group and were redirected to the *knowledge* portion of the questionnaire. If the participant answered “yes” to this
question, they were categorized as an organic food buyer and continued answering the
remaining five purchasing questions. After completion of the purchasing questions, the
participant was then directed to answer the knowledge portion of the questionnaire.

The purchasing section provided the researcher information detailing which kinds
of organic foods the organic food buyers purchased and how often. They provided
details of which specific organic foods they purchased based on a five point Likert scale
ranging from the following: regularly (at least 1 x week), often (at least 3 x month),
sometimes (at least 1 x month), rarely (at least 1 x 6 months), or never. The organic food
buyers were also asked about their willingness to travel to purchase organic foods and
their likelihood of purchasing organic foods if sold at a lower price. They were also
asked if they would like to see more organic foods offered in the university’s dining halls.

Furthermore, organic food buyers were asked about their primary reasons for
purchasing organic foods; answers were also based on a five point Likert scale with the
following options: strongly agree, agree, neutral, disagree, and strongly disagree. This
question had choices regarding the participant’s motivation for purchasing organic foods
based on their concerns with the environment, the welfare of animals, their health,
nutritional reasons, safety concerns, freshness, and taste. They could also select “other”
and provide additional reasons why they purchase organic foods.

Knowledge. The following section was the knowledge portion of the survey. It
was made up of ten multiple-choice questions; each question had four answers to choose
from. This part of the questionnaire identified how much the participant knew regarding
organic foods. The survey included questions pertaining to organic food regulations, livestock and agricultural practices, identification of organic foods, international regulations, and the organic certification process. Students could score a maximum of 10 points; each incorrect answer was scored with a zero and each correct answer was scored with one point.

**Perception.** The final section of the questionnaire was the *perception* portion. It contained 21 questions regarding the participant’s perception of organic foods and conventional foods. These questions asked about the participant’s perception regarding if they felt organic and conventional foods were: better for the environment, more nutritious, safer to consume, taste better, have a longer shelf life, if production is more humane, the affordability, and if organic and conventional foods provided additional health benefits to consumers. Participants answered these questions based on a five point Likert scale with the following options: *strongly agree, agree, neutral, disagree, and strongly disagree*. Answers were scored in descending order whereby strongly agree was scored as a five and strongly disagree was scored as a one.

In this section, participants were asked if they had specific brand loyalties when purchasing groceries and were prompted to select either “yes” or “no.” They were also asked if they would buy organic foods if made available at their university dining halls based on the same five point Likert scale described earlier. The final question asked the participants to indicate primary reasons they do not purchase organic foods or reasons which prevent them from purchasing organic foods more frequently. The participants were instructed to answer 12 statements about conventional and organic foods based on
the same five point Likert scale. The statements ranged from concerns about cost, availability, current satisfaction or preference with their current food choices, transportation concerns, appearance, quality, and lack of trust in the organic certification process.

**Procedure**

An Institutional Review Board (IRB) application was submitted for the study in the beginning of the Spring 2017 semester. Upon approval from the IRB, surveys (Appendix D) were distributed to university students via e-mail. The e-mail contained information about the purpose of the study and informed students that their participation will remain completely confidential and participation would take approximately 10 to 12 minutes. The survey was available for participants to complete during a two-week period in February of 2017. A total of two invitations was sent by e-mail; this included an initial invitation (Appendix A) and a reminder invitation (Appendix B), after one week, to increase the likelihood of survey completion. Students were instructed to agree or disagree to the consent form (Appendix C) prior to beginning the survey; if the student did not agree they were unable to participate in the study. After the two-week period, the surveys expired and students were no longer able to participate in the study.

**Data Cleaning and Calculations**

Survey data collected using Qualtrics software was exported to SPSS software version 24 for data cleanup. The researcher categorized science and non-science majors based on the course requirements of each degree collected. Data was initially sorted so
that all matching degree names were identical in the way they were written; this made it possible to identify the frequency of degree types collected among the population. For example, the researcher changed the degree type to “nursing” if students identified their field of study as “RN,” “BSN,” or “nursing.” A total of 173 frequencies for field of study was initially identified. Five of the major types were excluded for invalid responses (i.e., if the student indicated that their field of study was “college of arts and science,” “EHHS,” “undecided,” or “bachelor of arts”). There were 168 valid frequencies collected for major type.

After the total frequency of major types were collected, majors were categorized as either science or non-science based on the class requirement for the degree. The researcher analyzed course roadmaps for each field of study, which was provided on the university’s website. Field of study was categorized as a science major if the university required students to take anatomy, biology, biochemistry, chemistry, or a physiology course in partial fulfillment of an undergraduate or graduate diploma. Field of study was categorized as a non-science major if the university did not require students to take anatomy, biology, biochemistry, chemistry, or a physiology course in partial fulfillment of an undergraduate or graduate diploma. There were 42 types of science majors and 126 types of non-science majors among the population. If the student indicated two fields of study, they were categorized as a science major if at least one of the fields of study met the criteria of a science major (i.e., if a participant indicated “business and nutrition” as their field of study).
Place of residence was categorized as either “on campus” or “off campus.” Off campus residence included participants who indicated that they lived “off campus alone,” “off campus with roommates or friends,” “off campus with spouse or significant other,” and “off campus with family.” Participants were categorized as an organic food buyer if they indicated that they purchased organic food at least three times a month. Participants were categorized as organic food non-buyer if they indicated that they did not purchase organic foods at least three times a month. Participants were asked to answer ten organic knowledge questions located in the knowledge section of the survey (questions 22 through 31). Each correct answer was scored with one point and each incorrect answer was scored with zero points. Student knowledge scores ranged from zero to 10 with a maximum score of 10 points. The average organic knowledge score was used to analyze interactions between gender, major, and buyer type in a three-way factorial ANOVA.

Each respondent was asked his or her perception with respect to organic and conventional processes in the perception section of the survey (questions 32 through 49). There were 18 questions that made up nine sister pairs of perception questions. Each pair asked the same question regarding organic and conventional processes (i.e. questions “35. Organically produced foods taste better” and “42. Conventionally produced foods taste better’ were a pair). Participants answered these questions based on a five point Likert scale with the following options: strongly agree, agree, neutral, disagree, and strongly disagree. Answers were scored with a five being strongly agree, four being agree, three being neutral, two being disagree, and one being strongly disagree.
Overall organic perception score was computed by taking the average perception score of the nine organic perception questions among participants. Overall conventional perception score was computed by taking the average perception score of the nine conventional perception questions among participants. The two average organic and conventional scores were analyzed for statistical significance using a paired t-test. The average organic perception and conventional perception scores were used to analyze interactions between gender, major, and buyer type in a three-way factorial ANOVA. The nine sister pairs of perceptions were statistically analyzed using paired t-tests. A comparison was made using the average perception score of each production method between each sister pair of perceptions.

**Data Analysis**

Survey data collected in Qualtrics was exported to SPSS software version 24. Descriptive statistics was used to present all socio-demographic characteristic data and some purchasing data. A paired t-test was used to compare Likert scale results of organic food perceptions and conventional food perceptions; a t-test was also used to compare Likert scale results among overall organic and conventional food perceptions. Participants answered perception questions based on a five point Likert scale with the following options: *strongly agree, agree, neutral, disagree, and strongly disagree.* Answers were scored in descending order whereby strongly agree was scored as a five and strongly disagree was scored as a one.
Chi square was used to determine if place of residence had an impact on buyer status in college students. A three-way factorial analysis of variance (ANOVA) was used to measure knowledge of organic food among gender, major, and buyer type. Student knowledge scores ranged from zero to 10 with a maximum score of 10; each incorrect answer was scored with a zero and each correct answer was scored with one point. A three-way factorial ANOVA was also used to measure perception of organic food among gender, major, and buyer type. A significance level of 0.05 was used to determine statistical significance. Majors were categorized as science and non-science majors. Place of residence was categorized as on campus or off campus.
CHAPTER IV

JOURNAL ARTICLE

Organic is a farming method that refers to the way foods are grown and produced in agriculture (USDA Guide for Organic Processors, 2012). Foods produced organically are free of synthetic pesticides, genetically modified organisms (GMOs), and petroleum-based or sewage sludge-based fertilizers (USDA Guide for Organic Crop Producers, 2012; USDA Organic Production and Handling Standards, 2011). Livestock is raised without the use of antibiotics, growth hormones, and by-products. Livestock is also given access to the outdoors, fed organic feed, and grass fed during the grazing season (USDA Organic Livestock Requirements, 2013; USDA Organic Production and Handling Standards, 2011). Organic farming systems utilize sustainable practices whereby resources are reused on the farm to preserve the environment (USDA Introduction to Organic Practices, 2015). Organic is strictly regulated by the USDA and must meet very specific production and labeling standards (USDA Organic Production and Handling Standards, 2011).

Organic food, originally produced on a small scale, has rapidly expanded into a multibillion-dollar industry (Organic Trade Association, 2016). Despite the increased cost, it is the fastest growing food sector in the U.S. and can be found in three out of four grocery stores (Dettmann & Dimitri, 2009; USDA Overview, 2016). Current perceptions of organic food is that it is healthier or nutritionally superior; however, research does not
support this claim (Williams, 2002). Organic foods may have higher nutrient levels and fewer nitrates than conventional foods due to organic production methods. This difference is not significant enough to determine that organic foods provide any additional health benefits to consumers (Kouba, 2003). Measuring the nutrient concentration in food does not reflect the overall quality of the food because different production methods alter nutrient bioavailability (Magkos et al., 2003; Mozafar, 1996).

Regarding safety, the Environmental Protection Agency (EPA) continuously oversees pesticides and other contaminants in food to ensure, beyond reasonable certainty, that there will be no harm or adverse effects to infants, children, and adults (U.S. Environmental Protection Agency, n.d.). The EPA also states that the presence of pesticide residues on a fruit or vegetable does not make that food unsafe for consumption (U.S. Environmental Protection Agency, n.d.). A well-balanced diet rich in fruits and vegetables can improve health, regardless if it is organically or conventionally grown (Magkos et al., 2003). The biggest benefits for farming organically is that it utilizes a production system that protects the environment; this is a benefit to everybody on earth (Kouba, 2003).

The United States Department of Agriculture (USDA) states that the usual consumer of organic food is difficult to identify. Market research and previous academic studies have tried to identify demographic profiles of organic food buyers, however results remain conflicting (Dettmann & Dimitri, 2009). Despite conflicting data, researchers have seen a trend in consumer attitudes such as concerns with health, the environment, and an overall positive attitude towards organic food (Dumea, 2012; USDA
Organic Market Overview, 2016). Studies show that a higher education level influences the likelihood that consumers purchase organic food (Dettmann & Dimitri, 2009; Dimitri, & Dettmann, 2012). Additionally, income and health have also been motives for purchasing organic food (Zepeda et al., 2006).

College students may be more inclined to be purchasers of organic food because of their higher education level. Transitioning into college requires students to take on the role of purchasing and preparing their meals (Kelly, Mazzeo, & Bean, 2013). This transition affects eating patterns and dietary behaviors in college students either negatively or positively (Deshpande, Basil, & Basil, 2009). College students reported a positive attitude towards organic food, local food, and the use of sustainable farming practices (Pelletier, Laska, Neumark-Sztainer, & Story, 2013).

Knowledge of dietary guidelines is positively correlated with healthier eating habits in college students (Kolodinsky et al., 2007). College students state that organic agricultural practices are environmentally sustainable and are in favor of incorporating organic foods into their diet (Akhondan et al., 2015; Dahm et al., 2009). Dahm’s et al. (2009) study found that while less than half of the participants reported consuming organic food, more than half of the participants indicated they would purchase organic food if they were offered on campus dining locations. In addition, studies have found a correlation with health consciousness and consumption of organic food in consumers, including college students (Akhondan et al., 2015; Azzurra & Paola, 2009).
Little research investigates organic food buying trends in college students. Some studies identify perceptions of organic food in college-aged students such as being more nutritious, providing increased health outcomes, being more beneficial for the environment, and being safer to consume (Anderson et al., 2006; Pelletier et al., 2013). More research is needed to study organic food buying habits and barriers in college students. Research is also needed to investigate whether specific demographics influence organic food consumption in college students.

**Methodology**

The purpose of this descriptive, posttest only, multi-factorial design study was to differentiate knowledge and perception of organic food buyers vs. organic food non-buyers in Kent State University college students with varying demographics. Demographic factors, including gender, major, and buyer type, were analyzed to determine if significance was found between knowledge and perception. This study also compared overall perceptions of organic and conventional foods as well as buyer status and place of residence. The Kent State University Institutional Review Board (IRB) approved this study.

**Participants**

Participants for this study were full-time Kent State University college students enrolled at the Kent campus in the Spring 2017 semester. Participants below the age of 18 or taking courses on a part-time basis were excluded from this study. Participants for this study were recruited via e-mail. Data was collected throughout a two-week time
period. Two e-mails were sent to increase participant in the study including one initial e-mail (Appendix A) and one follow-up e-mail (Appendix B), which was sent one week after the initial e-mail invitation. After two weeks, the survey expired and students were unable to participate in the study. Participation in the study remained voluntary and confidential. Participants were able to complete the survey after voluntarily agreeing with the consent form (Appendix C).

Survey

The survey used for this study was developed by the researcher to collect information about knowledge and perception of organic foods, primarily between organic food buyers and organic food non-buyers with varying demographics. The survey (Appendix D) was distributed via e-mail using Qualtrics software; it consisted of 52 questions and was divided into four sections in the following order: socio-demographic characteristics, purchasing, knowledge, and perception. The survey took the participants approximately 10 to 12 minutes to complete. Students attending the Kent campus of the university were invited to participate in the study.

If the student agreed to complete the survey, they were directed to click on a hyperlink in the e-mail invitation to a survey titled “Knowledge and Perception of Organic Foods Survey.” The survey also included a voluntary consent form (Appendix C). If the student agreed to the consent form, they were prompted to continue the survey. If the student did not agree to the consent form, the survey ended and the student was excluded from the study. After consenting to the study, the students were asked two
exclusion questions in the first section of the survey; if they indicated that they were below the age of 18 or a part-time student, the survey ended and they were excluded from the study as well.

**Socio-Demographic Characteristics.** *Socio-demographic characteristics* were obtained in the first section. It consisted of 15 questions and asked participants to identify details about their demographics including class standing, major, age, gender, ethnicity, marital status, if they had children, their living arrangement, and if they were enrolled in the university dining program. Participants were also asked if they considered themselves an environmentalist, if they were the primary food buyer in their household, if they had any experience working in agriculture, and the frequency in which they purchased organic foods. The researcher categorized majors into two groups for further analysis: science and non-science. Majors were categorized based on the courses required to fulfill their degree. Participants were categorized by living arrangement: on campus and off campus. Living arrangement was used for further analysis as well.

**Purchasing.** The second part of the questionnaire is the *purchasing* section and was made up of six questions. The purpose of this portion of the survey was to identify to the primary researcher which participants will be categorized as organic food buyers and organic food non-buyers. Participants were identified as an organic food buyer if they indicated that they purchased at least three organic foods every month. Participants were identified as an organic food non-buyer if they indicated that they did not purchase organic foods at least three times a month. Organic food non-buyers did not complete the remaining five *purchasing* questions and were prompted to the *knowledge* section of
the survey. The remaining purchasing questions obtained information regarding which specific organic foods the buyers purchased and how often. Information about willingness to travel, likelihood of purchasing organic foods at reduced cost, and likeliness of purchasing organic foods if they would like organic foods offered at their university dining hall. Food buyers were also asked to indicate the primary reasons they purchase organic foods. After completion of the purchasing questions, the organic food buyers were then directed to answer the third section of the survey.

Knowledge. The third section was the knowledge portion and was made up of ten multiple-choice questions. This portion of the survey to assessed participant’s understanding of organic food regulations, organic agricultural and livestock practices, as well as labeling and certification of organic foods. Each correct answer was scored with one point while each incorrect answer was scored with zero points out of a possible 10 points.

Perception. The final section of the questionnaire was the perception portion and consisted of 21 questions. The main purpose for this section was to compare organic food perceptions vs. conventional food perceptions. Participants were instructed to indicate how likely they agreed with perception statements listed in this survey. Answers were based on a five point Likert scale ranging from strongly agree to strongly disagree. Answers were scored in descending order whereby strongly agree was scored as a five and strongly disagree was scored as a one. Each organic perception had a matching conventional perception, which totaled nine pairs of identical questions. Participants also indicated whether they had specific brand loyalties while grocery shopping and whether
they would purchase organic foods from their university dining halls. The final question asked the participants to indicate primary reasons they do not purchase organic foods or reasons which prevent them from purchasing organic foods more frequently. The barriers questions included statement about concerns with cost, availability, current satisfaction or preference with their current food choices, transportation concerns, appearance, quality, and lack of trust in the organic certification process. Answers were based on a five point Likert scale ranging from strongly agree to strongly disagree.

**Procedure**

Upon Kent State University IRB approval, surveys were distributed to student e-mail addresses using Qualtrics software. Student e-mails were obtained from the university’s Provost Office. Included in the e-mail was a hyperlink that directed students to the consent form and the survey. Participants must voluntarily agree to the consent form (Appendix C) prior to starting the survey. The consent form provided a general overview of the survey, the name and contact information of the primary researcher, informed the participant that they were at minimal risk, and explained that they could withdraw from the study without penalty at any point. The survey ended if students did not voluntarily agree to the consent form.

The e-mail also provided details about the purpose of the study and explained that their participation would be valuable in understanding knowledge and perception of organic foods in college students. Students were also informed in the e-mail that no personal identifiable information would be obtained with their responses (i.e., IP address.
or name). A total of two e-mails were sent to students to increase participation in the study. An initial e-mail (Appendix A) was sent out to 21,089 students and a follow up e-mail (Appendix B) was sent out to 21,028 students after one week. If students chose to unsubscribe to the e-mail, they did not receive a follow up e-mail. The survey was active for two weeks before the survey hyperlink expired.

**Data Cleaning and Calculations.** Survey data collected using Qualtrics software was exported to SPSS software version 24 for data cleanup. Data was initially sorted so that all matching degree names were identical in the way they were written. For example, the researcher changed the degree type to “nursing” if students identified their field of study as “RN,” “BSN,” or “nursing.” A total of 173 frequencies for field of study was initially identified; five of the major types were excluded due to invalid responses, making up a total frequency of 168 major types among participants.

Majors were then categorized as either science or non-science. Course roadmaps were obtained via the university’s official website for each field of study. Field of study was categorized as a science major if the university required students to take anatomy, biology, biochemistry, chemistry, or a physiology course in partial fulfillment of an undergraduate or graduate diploma. Field of study was categorized as a non-science major if the university did not require students to take anatomy, biology, biochemistry, chemistry, or a physiology course in partial fulfillment of an undergraduate or graduate diploma.
Place of residence was categorized as either “on campus” or “off campus.” Off campus residence included participants who indicated that they lived “off campus alone,” “off campus with roommates or friends,” “off campus with spouse or significant other,” and “off campus with family.” Participants were asked to answer ten organic knowledge questions located in the knowledge section of the survey. Each correct answer was scored with one point and each incorrect answer was scored with zero points. Student knowledge scores ranged from zero to 10 with a maximum score of 10 points. The average organic knowledge score was used to analyze interactions between gender, major, and buyer type.

Each respondent was asked his or her perception with respect to organic and conventional processes in the perception section of the survey. There were 18 questions that made up nine sister pairs of perception questions. Each pair asked the same question regarding organic and conventional processes. Participants answered these questions based on a five point Likert scale and were scored with a five being strongly agree, four being agree, three being neutral, two being disagree, and one being strongly disagree.

Overall organic perception score was computed by taking the average perception score of the nine organic perception questions among participants. Overall conventional perception score was computed by taking the average perception score of the nine conventional perception questions among participants. The two average organic and conventional scores were analyzed for statistical significance. The average organic perception and conventional perception scores were used to analyze interactions between gender, major, and buyer type in a three-way factorial ANOVA. Each sister pair of
perception statments were statistically analyzed. A comparison was made using the average perception score of organic and conventional processes between each sister pair of perceptions.

**Data Analysis**

Data obtained using Qualtrics software was exported into SPSS software version 24 for further analysis. An alpha level of 0.05 was set to determine if statistical significance was present in the data. Socio-demographic characteristic data and some purchasing data was presented with descriptive statistics. Paired t-tests were used to analyze perceptions of organic and conventional foods. Buyer status and place of residence was analyzed using a chi-square test. Three-way factorial ANOVA measured knowledge and perception of organic food interactions between gender, major and buyer type.

**Results**

A total of 21,089 Kent State University students were invited to participate in the survey. Among 1,499 students who began the survey (7.11% response rate), nine students were excluded from the study due to age (younger than 18 years old) and enrollment status (not being a full-time student). A total of 1,490 students participated in the study.
Socio-Demographic Characteristics

Table 1 shows descriptive statistic outputs whereby the mean age of participants was $22.3 \pm 5.8$ years. Of all participants, 73.9% of students identified themselves as females while 24.7% reported as males. The most prominent ethnicity was Caucasian, making up 81.2% of students. Black or African American consisted of 5.8% of students and Asian was 2.2% of students. Majority of participants were seniors (21.7%), freshman (21.5%), and juniors (19.3%). Most participants indicated that they lived on campus (34.6%) or off campus with roommates or friends (26.5%).

Table 2 identifies which participants were organic food buyers and organic foods non-buyers. Participants were categorized as organic food buyers if they indicated that they purchased organic foods at least three times a month. Participants were categorized as organic food non-buyers if they indicated that they do not purchase at least three organic foods per month. This study had almost identical amounts of organic food buyers (51.5%) and non-buyers (48.5%). Majority of students were single, making up 90.7% of the population; married students consisted of 8.2% while divorced students were 1.0% of the population. Participants who indicated they had children made up only 6.3% of the population.

Table 3 provides additional descriptive characteristics of participants. Over half of the population indicated that they: were not enrolled in the university dining plan (64.3%), were an environmentalist (57.3%), and had no experience with agriculture or farming (65.1%). The amount of participants who are and aren’t the primary food buyer
in their household were almost identical; 738 (50%) reported being the primary food buyer while 739 (50%) were not. Table 4 shows no significance found between buyer type and place of residence among college students ($p = 0.895$).

**Perception**

A paired t-test identified a significant difference ($p = \leq 0.001$) between overall organic food perception (3.42 ± 0.59) and overall conventional food perception (2.93 ± 0.50), which can be seen in Table 5. Participants answered perception questions based on a five point Likert scale with the following options: *strongly agree, agree, neutral, disagree, and strongly disagree*. Answers were scored in descending order whereby strongly agree was scored as a five and strongly disagree was scored as a one. In Table 6, three-way factorial ANOVA revealed a significant difference in organic food perception between gender and buyer type ($p = \leq 0.001$). Among males, organic food buyers (3.63 ± 0.59) perceived organic foods higher than organic food non-buyers (3.02 ± 0.66). Among females, organic food buyers (3.63 ± 0.49) also perceived organic foods higher than organic food non-buyers (3.29 ± 0.56). Among both buyer types, female students (3.46 ± 0.55) perceived organic foods higher than male students (3.29 ± 0.70).

There was a significant different in organic food perception between major and buyer type ($p = \leq 0.001$). A significant difference was also found in organic food perception and buyer type ($p = \leq 0.001$). Gender by buyer type interactions were found significant in organic food perception ($p = 0.005$). Gender by major interactions were not found significant in organic food perception ($p = 0.368$). Major by buyer type ($p = \leq 0.001$).
and gender by major by buyer type \( p = 0.516 \) interactions were also not found significant.

Table 7 highlights the comparison of perception between organic and conventional foods in college students. College students perceived organic foods as: better for the environment \( p = \leq 0.001 \), safer to eat \( p = \leq 0.001 \), more humane \( p = \leq 0.001 \), safer for children \( p = \leq 0.001 \), tastes better \( p = \leq 0.001 \), and that organic foods provide additional health benefits \( p = \leq 0.001 \) than conventional foods. However, conventional foods were perceived to be more affordable \( p = \leq 0.001 \) and have a longer shelf life \( p = \leq 0.001 \) than organic foods. There was no significant difference \( p = 0.647 \) between organic foods \( 3.63 \pm 0.95 \) and conventional foods \( 2.70 \pm 1.00 \) with regard to being more nutritious. Table 8 shows descriptive statistical data with regard to whether college students would purchase organic foods if they were available at the university dining halls; the majority of students indicated that they disagree (34.6%) or strongly disagree (28.6%) with the statement. As expected, the majority of organic food buyers in students strongly agree (61.6%) that they would buy organic foods if made available in the campus dining halls, which can be seen in Table 10. Additionally, the majority of organic food buyers in students strongly agree (78.5%) that they would purchase organic food more often if sold at a lower price.

**Knowledge**

Table 9 highlights comparisons of organic food knowledge on gender, major, and buyer type interactions. Student knowledge scores ranged from zero to 10 with a
maximum score of 10; each incorrect answer was scored with a zero and each correct answer was scored with one point. Three-way factorial ANOVA revealed no significant difference in organic food knowledge between gender and buyer type ($p = 0.803$). There was a significant difference in organic food knowledge between major and buyer type ($p = 0.012$). Among science majors, organic food non-buyers (4.67 ± 1.75) had a higher knowledge than organic food buyers (4.51 ± 2.13). Among non-science majors, organic food non-buyers (4.40 ± 1.77) also had a higher knowledge than organic food buyers (4.31 ± 2.17). Among both buyer types, science majors (4.59 ± 1.96) had a higher knowledge of organic foods than non-science majors (4.36 ± 1.99). There was no significant difference ($p = 0.381$) found in organic food knowledge and buyer type. Gender by major ($p = 0.077$), gender by buyer type ($p = 0.877$), and major by buyer type ($p = 0.885$) interactions were not found significant in organic food knowledge. Gender by major by buyer type ($p = 0.985$) interactions were also not found significant.
<table>
<thead>
<tr>
<th>Demographic</th>
<th>( \bar{x} \pm SD^a )</th>
<th>Frequency n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age</strong></td>
<td>22.3 ± 5.8</td>
<td>1490 (100)</td>
</tr>
<tr>
<td><strong>Gender</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>367 (24.7)</td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>1096 (73.9)</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>9 (0.6)</td>
<td></td>
</tr>
<tr>
<td>Do not wish to specify</td>
<td>11 (0.7)</td>
<td></td>
</tr>
<tr>
<td><strong>Ethnicity</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>American Indian or Alaska Native</td>
<td>7 (0.5)</td>
<td></td>
</tr>
<tr>
<td>Asian</td>
<td>62 (4.2)</td>
<td></td>
</tr>
<tr>
<td>Black or African American</td>
<td>86 (5.8)</td>
<td></td>
</tr>
<tr>
<td>Caucasian</td>
<td>1202 (81.2)</td>
<td></td>
</tr>
<tr>
<td>Hispanic</td>
<td>32 (2.2)</td>
<td></td>
</tr>
<tr>
<td>Native Hawaiian or Other Pacific Islander</td>
<td>3 (0.2)</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>59 (4.0)</td>
<td></td>
</tr>
<tr>
<td>Do not wish to specify</td>
<td>30 (2.0)</td>
<td></td>
</tr>
<tr>
<td><strong>Class Rank</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Freshman</td>
<td>321 (21.5)</td>
<td></td>
</tr>
<tr>
<td>Sophomore</td>
<td>252 (16.9)</td>
<td></td>
</tr>
<tr>
<td>Junior</td>
<td>288 (19.3)</td>
<td></td>
</tr>
<tr>
<td>Senior</td>
<td>324 (21.7)</td>
<td></td>
</tr>
<tr>
<td>Masters</td>
<td>196 (13.2)</td>
<td></td>
</tr>
<tr>
<td>Doctoral</td>
<td>109 (7.3)</td>
<td></td>
</tr>
<tr>
<td><strong>Place of Residence</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>On Campus</td>
<td>512 (34.6)</td>
<td></td>
</tr>
<tr>
<td>Off Campus Alone</td>
<td>128 (8.6)</td>
<td></td>
</tr>
<tr>
<td>Off Campus with Roommates or Friends</td>
<td>393 (26.5)</td>
<td></td>
</tr>
<tr>
<td>Off Campus with Spouse or Significant Other</td>
<td>214 (14.4)</td>
<td></td>
</tr>
<tr>
<td>Off Campus with Family</td>
<td>234 (15.8)</td>
<td></td>
</tr>
</tbody>
</table>

^a \( \bar{x} \pm SD \) = Mean ± Standard Deviation
Table 2
Demographics of College Students who are Organic Food Buyers and Organic Food Non-Buyers cont’d (N=1490)

<table>
<thead>
<tr>
<th>Demographic</th>
<th>Frequency n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Marital Status</td>
<td></td>
</tr>
<tr>
<td>Single</td>
<td>1333 (90.7)</td>
</tr>
<tr>
<td>Married</td>
<td>121 (8.2)</td>
</tr>
<tr>
<td>Divorced</td>
<td>15 (1.0)</td>
</tr>
<tr>
<td>Widowed</td>
<td>1 (0.1)</td>
</tr>
<tr>
<td>Do you have children?</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>92 (6.3)</td>
</tr>
<tr>
<td>No</td>
<td>1373 (93.7)</td>
</tr>
<tr>
<td>Do you purchase organic foods at least three times a month?</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>754 (51.5)</td>
</tr>
<tr>
<td>No</td>
<td>711 (48.5)</td>
</tr>
<tr>
<td>Furthest you would travel to buy organic foods</td>
<td></td>
</tr>
<tr>
<td>Less than 5 miles</td>
<td>207 (27.5)</td>
</tr>
<tr>
<td>6-10 miles</td>
<td>260 (34.6)</td>
</tr>
<tr>
<td>11-15 miles</td>
<td>149 (19.8)</td>
</tr>
<tr>
<td>16-20 miles</td>
<td>84 (11.2)</td>
</tr>
<tr>
<td>More than 20 miles</td>
<td>52 (6.9)</td>
</tr>
</tbody>
</table>

Table 4
Place of Residence and Buyer Type\(^a\) among College Students (N=1464)

<table>
<thead>
<tr>
<th>Place of Residence</th>
<th>Organic Food Buyers n (%)(^b)</th>
<th>Organic Food Non-Buyers n (%)(^b)</th>
<th>P value(^c)</th>
</tr>
</thead>
<tbody>
<tr>
<td>On Campus n=502</td>
<td>257 (51.2)</td>
<td>245 (48.8)</td>
<td>.895</td>
</tr>
<tr>
<td>Off Campus(^d) n=962</td>
<td>496 (51.6)</td>
<td>466 (48.4)</td>
<td></td>
</tr>
</tbody>
</table>

\(^a\) Buyer type was categorized as an organic food buyer or non-buyer; buyers indicated that they purchased organic foods at least three times a month.

\(^b\) Percentages totaled among buyers and non-buyers in each category.

\(^c\) p value based on chi-square

\(^d\) Note: Off campus residence include students living off campus alone, off campus with roommates or friends, off campus with spouse or significant other, and off campus with family.

*Denotes significance p \(\leq 0.05\)
<table>
<thead>
<tr>
<th>Demographic</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n (%)</td>
</tr>
<tr>
<td>Enrolled in Dining Plan</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>529 (35.7)</td>
</tr>
<tr>
<td>No</td>
<td>951 (64.3)</td>
</tr>
<tr>
<td>Do you consider yourself an environmentalist?</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>847 (57.3)</td>
</tr>
<tr>
<td>No</td>
<td>630 (42.7)</td>
</tr>
<tr>
<td>Do you have experience with agriculture/farming?</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>516 (34.9)</td>
</tr>
<tr>
<td>No</td>
<td>961 (65.1)</td>
</tr>
<tr>
<td>Are you the primary food buyer in your household?</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>738 (50)</td>
</tr>
<tr>
<td>No</td>
<td>739 (50)</td>
</tr>
<tr>
<td>I purchase organic foods at least</td>
<td></td>
</tr>
<tr>
<td>Once a week</td>
<td>547 (37.4)</td>
</tr>
<tr>
<td>Once a month</td>
<td>534 (36.5)</td>
</tr>
<tr>
<td>Once every six months</td>
<td>175 (12.0)</td>
</tr>
<tr>
<td>Once a year</td>
<td>208 (14.2)</td>
</tr>
</tbody>
</table>
### Table 6
*Comparison of Organic Food Perception on Gender, Major, and Buyer Type*<sup>a</sup> among College Students (N=1307)

<table>
<thead>
<tr>
<th>Demographic</th>
<th>Organic Food Buyer &lt;span&gt;x±SD&lt;sup&gt;b&lt;/sup&gt;&lt;/span&gt;</th>
<th>Organic Food Non-Buyer &lt;span&gt;x±SD&lt;sup&gt;b&lt;/sup&gt;&lt;/span&gt;</th>
<th>x Total&lt;sup&gt;c&lt;/sup&gt;</th>
<th>P value&lt;sup&gt;d&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Gender</strong></td>
<td></td>
<td></td>
<td></td>
<td>≤ 0.001&lt;sup&gt;*&lt;/sup&gt;</td>
</tr>
<tr>
<td>Male &lt;i&gt;n&lt;/i&gt;=327</td>
<td>3.63±0.59</td>
<td>3.02±0.66</td>
<td>3.29±0.70</td>
<td></td>
</tr>
<tr>
<td>Female &lt;i&gt;n&lt;/i&gt;=980</td>
<td>3.63±0.49</td>
<td>3.29±0.56</td>
<td>3.46±0.55</td>
<td></td>
</tr>
<tr>
<td><strong>Major</strong></td>
<td></td>
<td></td>
<td></td>
<td>≤ 0.001&lt;sup&gt;*&lt;/sup&gt;</td>
</tr>
<tr>
<td>Science &lt;i&gt;n&lt;/i&gt;=330</td>
<td>3.55±0.50</td>
<td>3.09±0.58</td>
<td>3.32±0.59</td>
<td></td>
</tr>
<tr>
<td>Non-Science &lt;i&gt;n&lt;/i&gt;=977</td>
<td>3.64±0.51</td>
<td>3.26±0.60</td>
<td>3.45±0.59</td>
<td></td>
</tr>
<tr>
<td><strong>Buyer Type</strong></td>
<td></td>
<td></td>
<td></td>
<td>≤ 0.001&lt;sup&gt;*&lt;/sup&gt;</td>
</tr>
<tr>
<td>Organic Food Buyer &lt;i&gt;n&lt;/i&gt;=650</td>
<td>3.63±0.51</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Organic Food Non-Buyer &lt;i&gt;n&lt;/i&gt;=657</td>
<td>3.21±0.60</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<sup>a</sup> Buyer type was categorized as an organic food buyer or non-buyer; buyers indicated that they purchased organic foods at least three times a month.

<sup>b</sup> x±SD = Mean ± Standard Deviation

<sup>c</sup> x Total = Mean Total

<sup>d</sup> p values were based on three-way factorial ANOVA

*Note:* Likert scale was scored with a 5 being strongly agree, 4 being agree, 3 being neutral, 2 being disagree, and 1 being strongly disagree.

*Denotes significance *<i>p* ≤ 0.05
Table 7
Comparison of Organic Food and Conventional Food Perceptions among College Students (N=1312)

<table>
<thead>
<tr>
<th>Statements</th>
<th>Organic(\bar{x}\pm SD^a)</th>
<th>Conventional(\bar{x}\pm SD^a)</th>
<th>P value(^b)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Farming system is better for the environment (n=1312)</td>
<td>3.94(\pm 0.94)</td>
<td>2.43(\pm 1.0)</td>
<td>(\leq 0.001^*)</td>
</tr>
<tr>
<td>Safer to eat (n=1307)</td>
<td>3.68(\pm 0.95)</td>
<td>2.53(\pm 0.84)</td>
<td>(\leq 0.001^*)</td>
</tr>
<tr>
<td>Have a longer shelf life (n=1304)</td>
<td>2.28(\pm 0.89)</td>
<td>3.84(\pm 0.81)</td>
<td>(\leq 0.001^*)</td>
</tr>
<tr>
<td>Livestock systems are more humane (n=1304)</td>
<td>3.71(\pm 1.00)</td>
<td>2.29(\pm 1.00)</td>
<td>(\leq 0.001^*)</td>
</tr>
<tr>
<td>Safe for children to consume (n=1301)</td>
<td>4.13(\pm 0.76)</td>
<td>3.23(\pm 0.89)</td>
<td>(\leq 0.001^*)</td>
</tr>
<tr>
<td>Taste better (n=1307)</td>
<td>3.39(\pm 0.93)</td>
<td>2.94(\pm 0.97)</td>
<td>(\leq 0.001^*)</td>
</tr>
<tr>
<td>More affordable (n=1299)</td>
<td>2.34(\pm 0.93)</td>
<td>3.90(\pm 0.83)</td>
<td>(\leq 0.001^*)</td>
</tr>
<tr>
<td>Provide additional health benefits (n=1298)</td>
<td>3.62(\pm 0.96)</td>
<td>2.50(\pm 0.83)</td>
<td>(\leq 0.001^*)</td>
</tr>
<tr>
<td>More nutritious (n=1301)</td>
<td>3.63(\pm 0.95)</td>
<td>2.70(\pm 1.00)</td>
<td>0.647</td>
</tr>
</tbody>
</table>

\(^a\)\(\bar{x}\pm SD = \text{Mean } \pm \text{ Standard Deviation}\)
\(^b\)P values based on t-test

*Note:* Likert scale was scored with a 5 being strongly agree, 4 being agree, 3 being neutral, 2 being disagree, and 1 being strongly disagree.

*Note:* Each respondent was asked their perception of each of the above statements with respect to organic and conventional processes and a comparison was made using the average perception score of each production method.

*Denotes significance \(p \leq 0.05\)

Table 5
Comparison of Food Perception among College Students (N=1322)

<table>
<thead>
<tr>
<th></th>
<th>(\bar{x}\pm SD^a)</th>
<th>P value(^b)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Organic Perception (n=1322)</td>
<td>3.42(\pm 0.59)</td>
<td>(\leq 0.001^*)</td>
</tr>
<tr>
<td>Conventional Perception (n=1322)</td>
<td>2.93(\pm 0.50)</td>
<td></td>
</tr>
</tbody>
</table>

\(^a\)\(\bar{x}\pm SD = \text{Mean } \pm \text{ Standard Deviation}\)
\(^b\)P values based on t-test

*Note:* Likert scale was scored with a 5 being strongly agree, 4 being agree, 3 being neutral, 2 being disagree, and 1 being strongly disagree.

*Note:* Each respondent was asked their perception with respect to organic and conventional processes, the values above list the average perception score of each production method.

*Denotes significance \(p \leq 0.05\)
Table 10
*Purchasing Behaviors of Organic Food Buyers among College Students (N=752)*

<table>
<thead>
<tr>
<th>Statement</th>
<th>Frequency</th>
<th>n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>If organic foods were sold at a lower price, I would buy organic foods more often n=752</td>
<td>Strongly Agree</td>
<td>590 (78.5)</td>
</tr>
<tr>
<td></td>
<td>Agree</td>
<td>115 (15.3)</td>
</tr>
<tr>
<td></td>
<td>Neutral</td>
<td>42 (5.6)</td>
</tr>
<tr>
<td></td>
<td>Disagree</td>
<td>4 (0.5)</td>
</tr>
<tr>
<td></td>
<td>Strongly Disagree</td>
<td>1 (0.1)</td>
</tr>
<tr>
<td>I would buy organic foods if they were available at the University Dining Halls n=750</td>
<td>Strongly Agree</td>
<td>462 (61.6)</td>
</tr>
<tr>
<td></td>
<td>Agree</td>
<td>147 (19.6)</td>
</tr>
<tr>
<td></td>
<td>Neutral</td>
<td>136 (18.1)</td>
</tr>
<tr>
<td></td>
<td>Disagree</td>
<td>5 (0.7)</td>
</tr>
<tr>
<td></td>
<td>Strongly Disagree</td>
<td>0 (0)</td>
</tr>
</tbody>
</table>

Table 8
*Purchasing Behaviors in College Students (N=1307)*

<table>
<thead>
<tr>
<th>Statement</th>
<th>Frequency</th>
<th>n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Do you have specific brand loyalties when purchasing groceries? n=1307</td>
<td>Yes</td>
<td>602 (46.1)</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>705 (53.9)</td>
</tr>
<tr>
<td>I would buy organic foods if they were available at the University Dining Halls n=1305</td>
<td>Strongly Agree</td>
<td>56 (4.3)</td>
</tr>
<tr>
<td></td>
<td>Agree</td>
<td>87 (6.7)</td>
</tr>
<tr>
<td></td>
<td>Neutral</td>
<td>338 (25.9)</td>
</tr>
<tr>
<td></td>
<td>Disagree</td>
<td>451 (34.6)</td>
</tr>
<tr>
<td></td>
<td>Strongly Disagree</td>
<td>373 (28.6)</td>
</tr>
</tbody>
</table>
Table 9

Comparison of Organic Food Knowledge on Gender, Major, and Buyer Type\(^a\) among College Students (\(N=1434\))

<table>
<thead>
<tr>
<th>Demographic</th>
<th>Organic Food Buyer (\bar{x}\pm SD)(^b)</th>
<th>Organic Food Non-Buyer (\bar{x}\pm SD)(^b)</th>
<th>(\bar{x}) Total(^c)</th>
<th>P value(^d)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male (n=358)</td>
<td>4.23(\pm)2.22</td>
<td>4.39(\pm)1.79</td>
<td>4.32(\pm)1.99</td>
<td>0.803</td>
</tr>
<tr>
<td>Female (n=1076)</td>
<td>4.40(\pm)2.15</td>
<td>4.50(\pm)1.76</td>
<td>4.45(\pm)1.98</td>
<td></td>
</tr>
<tr>
<td>Major</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Science (n=355)</td>
<td>4.51(\pm)2.13</td>
<td>4.67(\pm)1.75</td>
<td>4.59(\pm)1.96</td>
<td>0.012*</td>
</tr>
<tr>
<td>Non-Science (n=1079)</td>
<td>4.31(\pm)2.17</td>
<td>4.40(\pm)1.77</td>
<td>4.36(\pm)1.99</td>
<td></td>
</tr>
<tr>
<td>Buyer Type</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Organic Food Buyer (n=737)</td>
<td></td>
<td></td>
<td>4.36(\pm)2.16</td>
<td></td>
</tr>
<tr>
<td>Organic Food Non-Buyer (n=697)</td>
<td></td>
<td></td>
<td>4.47(\pm)1.77</td>
<td></td>
</tr>
</tbody>
</table>

\(^a\) Buyer type was categorized as an organic food buyer or non-buyer; buyers indicated that they purchased organic foods at least three times a month.

\(^b\) \(\bar{x}\pm SD\) = Mean \pm Standard Deviation

\(^c\) \(\bar{x}\) Total = Mean Total

\(^d\) p values based on three-way factorial ANOVA

Note: Student knowledge scores ranged from zero to 10 with a maximum score of 10; each incorrect answer was scored with a zero and each correct answer was scored with one point.

*Denotes significance \(p \leq 0.05\)

Discussion

The purpose of this study was to measure knowledge and perception of organic food among organic food buyers and organic food non-buyers in college students. The researcher also sought to determine whether certain demographic factors, such as place of residence, gender, and major, influenced organic food consumption among college students. Since the 1990s, organic remains the fastest growing sector in the U.S. food industry, however, the question still remains, who is buying organic food? (Dettmann &
Dimitri, 2009; USDA Overview, 2016). Organic consumers remain a mystery, in fact, many studies find conflicting data (Dettmann & Dimitri, 2009). One thing remains certain, organic consumers typically have a high regard for health and wellbeing, the ecosystem, and animal welfare (Dumea, 2012; USDA Organic Market Overview, 2016). Furthermore, increased education level remains a primary influential factor in whether consumers purchase organic food (Dettmann & Dimitri, 2009; Dimitri, & Dettmann, 2012). The results of this study support the research hypotheses. Findings revealed that organic food buyers perceived organic food as nutritionally superior than organic food non-buyers. However, organic food non-buyers were more knowledgeable about organic food than organic food buyers.

**Socio-Demographic Characteristics**

The population for this study was reflective of the university’s population with respect to ethnicity and gender (Kent State University, 2017). Organic food buyers (51.5%) and organic food non-buyers (48.5%) were distributed almost equally among the population. There are more organic food buyers than organic food non-buyers because buyers may have an overall higher interest in organic food than non-buyers. There were three times more female respondents than there were male. Previous studies also had similar finding of higher response rates from females (Gracia & de Magistris, 2013; Padel & Foster, 2005; Williams & Hammitt, 2000). Curl et al. (2013) found that women are 21% more likely to consume organic produce than men are. Williams & Hammitt (2000) conducted their study, regarding organic and conventional food, among grocery store shoppers and found that females were overrepresented in their study. There was a higher
response rate from females in this study possibly because females typically have the role as the primary food shopper in the household. Lake et al. (2006) researched food shopping and preparation responsibility in adults and found that women were significantly more responsible for food shopping and preparing than men were.

When looking at furthest distance college students would travel to purchase organic food, most students stated they would travel up to 10 miles. Almost 35 percent of students indicated that they lived on campus. Many students who live on college campuses do not have the appropriate means of transportation (i.e., a car) to travel far distances, which could explain why the majority of students would travel within a 10-mile radius to purchase organic foods. Chi-square revealed that place of residence and organic buyer type were independent, or unrelated, to each other. This means that place of residence in college students, on campus or off campus, does not influence whether or not college students consume organic food.

**Perception**

This study was conducted among college students concerning their thoughts and beliefs of organic and conventional foods. Both organic food buyers and non buyers had a more positive attitude towards organic food than conventional food. While looking at specific perceptions, college students reported that organic food is more humane, environmentally sustainable, provides health benefits, tastes better, and is safer to consume, for both children and adults, than conventional food. These findings support previous research studies regarding organic perceptions in college-aged students such as
being nutritious, safe, environmentally friendly, and providing health benefits (Anderson et al., 2006; Pelletier et al., 2013). Pelletier et al. (2013) also found that college students support the use of sustainable farming practices, which are used in organic farming. This could also have an impact on why organic is positively perceived among college students.

In this study, college students report that conventional foods are more affordable and have a longer shelf life than organic foods. The most common reported barrier of purchasing organic food is the high price premiums, which is due to costs associated with organic production, regulation, and agricultural practices (Padel & Foster, 2005). In a previous study, younger consumers showed a more positive attitude towards organic food while older consumers were more likely to be purchasers (Hughner et al., 2007). The results of this study indicate that students positively perceive organic food, however, financial instability as a student makes buying organic food unaffordable. The majority of college students indicated that they would not purchase organic food if available at the campus dining halls, which contradicts Dahm’s et al. (2009) study. Level of education influences the likeliness of being an organic food purchaser (Dettmann & Dimitri, 2009; Dimitri, & Dettmann, 2012). Students may become organic food buyers after they graduate and establish financial stability. Additionally, college students perceive that organic foods have a shorter shelf life than conventional foods. Organic food is free of preservatives that do not occur naturally; fresh food and food free of preservatives degrade more quickly, causing them to have a shorter shelf life (U.S. Food and Drug Administration Natural and Organic Foods, n.d.).
Female students indicate that they have a higher perception of organic food than male students do. A similar study conducted in 2013 found that women, younger individuals, those with a higher education, and those living in urban communities were much more likely to be organic food buyers. The female students in this study fit the same description found of likely organic food consumers (Curl et al., 2013). Results from this research are consistent with previous studies, which reveal that women purchase organic food more frequently than men do (Curl et al., 2013). Since organic food is free from synthetic pesticides, women of childbearing age may be more likely to favor organic food. Thompson & Kidwell (1998) found that households with children below the age of 18 were more likely to purchase organic food. Females may be more concerned with consuming foreign contaminates believed to be in their food, which may be reflective upon what they feed their children. Despite the majority of participants in this study not having children, females may have the same opinion regarding organic food, with or without children. Safety for children had the highest mean score (4.13±0.76) from the data collected with regard to organic and conventional food perceptions among college students.

Knowledge

Individuals may abstain from consuming certain foods due to increased cost, lack of trust in any perceived benefit, or a lack of knowledge about that food. A recent study found that, among consumers, increased organic knowledge led to greater congruity in responses toward organic products (Hidalgo-Baz, Martos-Partal, & González-Benito, 2017). Consumers with more familiarity in organic purchase organic products more
frequently (Hidalgo-Baz et al., 2017). Similarly, Zanoli and Naspetti’s (2002) study also found that organic consumers were knowledgeable about organic, however, this study did not have similar outcomes. Organic food buyers (4.36±2.16) had a lower mean knowledge score than organic food non-buyers (4.47±1.77). While this study did not find statistical significance on buyer type and organic food knowledge, significance was seen among major and organic knowledge.

This study found that non-science majors had a higher perception of organic than science majors. It is still unclear why degree type, science and non-science, influences consumers on organic food consumption. This study reveals students with a science major were significantly more knowledgeable about organic food than those with a non-science major; however, students with a science major also had a significantly lower perception of organic food when compared with non-science majors.

There are limited studies that research organic consumer trends and type of education. Thompson & Kidwell’s (1998) study found that individuals with a science education consumed more organic food than those with a general education. Their study was consistent with Lawrence, Norton, & Vanclay (2001), who indicated that people who understand the genetic engineering of food are more likely to reject those foods. The findings of this study contradicts Lawrence et al. (2001) and shows that students with the highest knowledge score were organic food non-buyers with a science major. The researcher hypothesizes that students with a science degree have a better understanding of topics such as human nutrition, human metabolism, food science, and genetic engineering and are able to determine that perceptions of organic foods being more nutritious,
healthier, and safer is not supported by research. Furthermore, science majors may be more accepting of science and change.

**Limitations**

There were several limitations to this study. To begin with, a convenience sample was used to recruit participants for the study through a randomly distributed survey. This could result in some sampling bias and potentially skew the data; individuals who have a general interest in organic food may be more likely to participate in the study. Additionally, individuals who purchase organic food may also be more likely to participate in the study. Another limitation is that survey participants self-reported if they purchased or did not purchase organic foods at least three times a month; this resulted in them being categorized in either the organic food buyer group or organic food non-buyer. Some organic food non-buyers contacted the researcher to report that they indicated they purchase organic foods at least once a year, when in fact they never purchase organic foods and were unable to report that in the study due to the lack of a “never” option.

Furthermore, the survey was not set up to force a response; this caused some incomplete surveys and missing data. The survey used in this study was developed by the research and is not a validated questionnaire. The survey was also unintentionally set to allow for multiple responses for three of the survey questions including organic food buying frequency, motivations for purchasing organic, and barriers to purchasing organic. This resulted in many invalid responses. No statistical analysis was conducted to analyze
this data, which could have provided more information that is descriptive to the researchers.

**Implications**

In this study, the data collected indicates that organic food buyers among college students have a higher perception of organic yet show a low knowledge with regard to organic regulations, certification, and agricultural and livestock practices. The best benefit to consuming organic is the protection it provides to the environment (USDA Introduction to Organic Practices, 2015). Organic farming utilizes environmentally sustainable agricultural practices by recycling natural resources (Kouba, 2003; USDA Introduction to Organic Practices, 2015).

The research findings highlight the need for increased public education about food safety and farming practices to ensure consumers make informed decisions in the marketplace. Many college students adopt unhealthy eating behaviors, primarily due to the reduced cost of snack foods and fast food items. It may be difficult for college students to adopt healthy eating behaviors on a student’s budget. It is important to educate students that consuming a well-balanced diet rich in fruits and vegetables can be affordable, healthy, and safe regardless if it is organically or conventionally grown.

University campuses should promote affordable, healthy, and balanced meals for college students to ensure students have access to nutritious meals. Furthermore, the university this study was conducted at utilizes a debit food plan system. Students have a dollar amount on their student-dining plan and each food item is charged à la carte. This dining
plan system could potentially influence students to avoid consuming fruits and vegetables due to the additional cost for a meal. A dining plan system based on total meals available per semester could promote students to consume a more nutritious diet with a variety of fruits, vegetables, and other healthy choices. This dining method does not limit students on the variety of foods they can choose for each meal.

There are limited studies that investigate characteristics of organic consumers, especially among college students. Furthermore, college students are not well educated about organic policies. College courses should include organic in their criteria so that students can acquire a better understanding of what constitutes organic. Future research concerning demographic characteristics of organic food buyers and non-buyers in college student is needed. This study was not able to determine why science and non-science majors had varying organic perceptions, knowledge, and purchasing behaviors. Previous studies have been able to determine that education level impacts whether an individual purchases organic, however, there are limited studies that research why type of degree influences responses to organic.

**Conclusion**

In summary, the results of this study found that college students have a perception that organic foods are superior to conventional foods, such as being better for the environment, more humane, tastes better, are safer for children and adults to consume, and that they provide additional health benefits. Conventional foods were perceived as being more affordable and having a longer shelf life than organic foods. Gender, major,
and buyer type influences perception of organic food. Overall, females, non-science majors, and organic food buyers had a higher perception of organic food than males, science majors, and organic food non-buyers among college students. Findings indicate that consumers purchase organic foods based on perceived benefit.

Results also revealed that place of residence, on campus or off campus, did not influence whether college students purchase or do not purchase organic foods. With respect to knowledge, gender and buyer type did not influence organic knowledge among college students. However, major type influenced knowledge of organic foods. Research findings indicate that students with a non-science major have a higher perception and a lower knowledge of organic food than those with a science major. Students with a science major have a lower perception and a higher knowledge of organic food than those with a non-science major. Results of this study indicate that, among science majors, organic food buyers have a lower knowledge of organic than organic food non-buyers.

The organic food industry continues to grow and expand. Consumers, both organic buyers and non-buyers, perceive organic as healthier and safer than conventional foods. However, they also perceive conventional foods as more affordable, indicating that cost is a potential barrier to organic. The perceived benefits of consuming organic outweigh its higher price premiums among organic food buyers. Based on the average knowledge score among consumers, primarily organic food buyers, healthcare professionals, such as Registered Dietitians, and food service professionals should educate consumers about the facts and myths of organic. College students are the future of the organic food market. Additional research is needed with respect to college
students and organic food purchasing behaviors, barriers, and motivations for consuming organic due to the limitations of this study.
APPENDICES
APPENDIX A

INITIAL E-MAIL
Appendix A

Initial E-Mail

Dear Student,

You have received this e-mail as an invitation to participate in a brief, 10 to 12 minute, survey regarding knowledge and perception of organic foods. You have been randomly chosen to partake in this study. Participation will be voluntary and remain completely confidential. Personal identifiable information will not be obtained with your responses. You may choose to discontinue participating in this study at any point in time without penalty.

Your participation will be very valuable in understanding knowledge and perception of organic foods in college students. If you would like to complete the survey questionnaire, please click on the hyperlink below.

Your time and participation are very much appreciated. Thank you for your cooperation in this study.

Kindly,

Sarah Katirji

Dietetic Intern
Graduate Student
School of Health Sciences
Kent State University
APPENDIX B

FOLLOW UP E-MAIL
Appendix B

Follow Up E-Mail

Dear Student,

You have received this e-mail as a reminder to participate in a brief, 10 to 12 minute, survey regarding organic foods in college students. If you have already completed the survey, thank you, and please disregard this e-mail. Participation will be voluntary and remain completely confidential. Your responses in this study will be valuable in understanding knowledge and perception of organic foods in college students.
If you would like to complete the survey questionnaire, please click on the hyperlink below.

Your time and participation are very much appreciated. Thank you for your cooperation in this study.

Kindly,

Sarah Katirji
Dietetic Intern
Graduate Student
School of Health Sciences
Kent State University
APPENDIX C

CONSENT FORM
Appendix C

Consent Form

Knowledge and Perception of Organic Foods

Welcome to “Knowledge and Perception of Organic Foods,” a web-based survey that examines college students’ knowledge, perception, and purchasing trends of organic foods. Before taking part in this study, please read the consent form below and click on the "I Agree" button at the bottom of the page if you understand the statements and freely consent to participate in the study.

Consent Form

This study involves a web-based survey designed to understand knowledge, perception, and purchasing trends of organic foods in college students. The study is being conducted by Dr. Natalie Caine-Bish of Kent State University, and it has been approved by the Kent State University Institutional Review Board. No deception is involved, and the study involves no more than minimal risk to participants (i.e., the level of risk encountered in daily life).

Participation in the study takes approximately 10 to 12 minutes and is strictly anonymous. Participants begin by answering a series of questions about their socio-demographic characteristics, after which they answer more questions regarding purchasing trends of organic foods. The survey will then ask a series of questions that will evaluate knowledge. The final set of questions will evaluate perception of organic foods.

All responses are treated as confidential, and in no case will responses from individual participants be identified. Rather, all data will be pooled and published in aggregate form only. Participants should be aware, however, that the experiment is not being run from a "secure" https server of the kind typically used to handle credit card transactions, so there is a small possibility that responses could be viewed by unauthorized third parties (e.g., computer hackers).

Many individuals find participation in this study enjoyable, and no adverse reactions have been reported thus far. There will be no credit or monetary compensation for taking the survey. Participation is voluntary, refusal to take part in the study involves no penalty or loss of benefits to which participants are otherwise entitled, and participants may withdraw from the study at any time without penalty or loss of benefits to which they are otherwise entitled.

If participants have further questions about this study or their rights, or if they wish to lodge a complaint or concern, they may contact the principal investigator, Dr. Natalie Caine-Bish, at (330) 672-2148; or the Kent State University Institutional Review Board, at (330) 672-2704.

If you are 18 years of age or older, understand the statements above, and freely consent to participate in the study, click on the "I Agree" button to begin the experiment.

I Agree  I Do Not Agree
APPENDIX D

KNOWLEDGE AND PERCEPTION OF ORGANIC FOODS SURVEY
Appendix D

Knowledge and Perception of Organic Foods Survey

Socio-Demographic Characteristics
1. Please indicate your age ______________. (end of survey if <18 years old)

2. Are you currently enrolled as a full-time undergraduate (12 or more credit hours) or graduate (9 or more credit hours) student at Kent State University during the Spring 2017 semester?
   a. Yes
   b. No (end of survey)

3. What is your current class standing?
   a. Freshman
   b. Sophomore
   c. Junior
   d. Senior
   e. Masters
   f. Doctoral

4. Please indicate your program of study ______________.

5. What is the gender you identify with?
   a. Male
   b. Female
   c. Other
   d. I do not wish to specify

6. Please indicate your ethnicity.
   a. American Indian or Alaska Native
   b. Asian
   c. Black or African American
   d. Caucasian
   e. Hispanic
   f. Native Hawaiian or Other Pacific Islander
   g. Other (please specify) ______________
   h. I do not wish to specify

7. Please indicate your place of residence.
   a. On campus
   b. Off campus alone
   c. Off campus with roommates or friends
   d. Off campus with spouse or significant other
8. Are you currently enrolled in the Kent State University Dining Plan?
   a. Yes
   b. No

9. Do you consider yourself an environmentalist?
   a. Yes
   b. No

10. Have you had experience with agriculture/farming (i.e., I've worked on a farm, I grew up on a farm, My family members have a farm)
    a. Yes
    b. No

11. Are you the primary food buyer in your household?
    a. Yes
    b. No

12. I purchase organic foods at least ______________.
    a. Once a week
    b. Once a month
    c. Once every 6 months
    d. Once a year

13. Please indicate your marital status.
    a. Single
    b. Married
    c. Divorced
    d. Widowed

14. Do you have any children?
    a. Yes (redirect to 15)
    b. No (redirect to knowledge)

15. Please indicate how many children you have _____________.

**Purchasing**

16. Do you purchase organic foods at least 3 times a month?
    a. Yes (redirect to 17)
    b. No (redirect to knowledge)

17. What is the furthest you would travel to buy organic foods?
    a. Less than 5 miles
b. 6-10 miles
c. 11-15 miles
d. 16-20 miles
e. More than 20 miles

18. If organic foods were sold at a lower price, I would buy organic foods more often.
   a. Strongly Agree
   b. Agree
   c. Neutral
   d. Disagree
   e. Strongly Disagree

19. I would like to see more organic foods offered in the University Dining Halls.
   a. Strongly Agree
   b. Agree
   c. Neutral
   d. Disagree
   e. Strongly Disagree

20. Please indicate how often you purchase the following organic foods.
    ➢ **Fruits** (i.e., apples, oranges, pears, peaches, melon, kiwi, avocado, berries)
      o Regularly (at least 1 x week)
      o Often (at least 3 x month)
      o Sometimes (at least 1 x month)
      o Rarely (at least 1 x 6 months)
      o Never
    ➢ **Vegetables** (i.e., broccoli, dark leafy greens, carrots, potatoes, peppers, tomatoes, squash, onions)
      o Regularly (at least 1 x week)
      o Often (at least 3 x month)
      o Sometimes (at least 1 x month)
      o Rarely (at least 1 x 6 months)
      o Never
    ➢ **Meat and/or Poultry** (i.e., ground beef, chicken, pork, lamb, ham, veal, turkey)
      o Always (at least 1 x week)
      o Often (at least 3 x month)
      o Sometimes (at least 1 x month)
      o Rarely (at least 1 x 6 months)
      o Never
    ➢ **Eggs**
      o Always (at least 1 x week)
      o Often (at least 3 x month)
      o Sometimes (at least 1 x month)
- Rarely (at least 1 x 6 months)
- Never

- **Milk and/or Dairy Products** (i.e., milk, cheese, yogurt, ice cream)
  - Always (at least 1 x week)
  - Often (at least 3 x month)
  - Sometimes (at least 1 x month)
  - Rarely (at least 1 x 6 months)
  - Never

- **Legumes** (i.e., beans, lentils, peas, peanuts, soybeans, alfalfa, etc.)
  - Always (at least 1 x week)
  - Often (at least 3 x month)
  - Sometimes (at least 1 x month)
  - Rarely (at least 1 x 6 months)
  - Never

- **Whole and/or Refined Grains** (i.e., flour, barley, bread, pasta, oatmeal, cereal, crackers, rice, cornmeal)
  - Always (at least 1 x week)
  - Often (at least 3 x month)
  - Sometimes (at least 1 x month)
  - Rarely (at least 1 x 6 months)
  - Never

- **Soy Products** (i.e., soymilk, tofu, soy flour, etc.)
  - Always (at least 1 x week)
  - Often (at least 3 x month)
  - Sometimes (at least 1 x month)
  - Rarely (at least 1 x 6 months)
  - Never

- **Nuts and/or Seeds** (i.e., peanuts, almonds, coconut, pistachios, pecans, pumpkin seeds, sunflower seeds)
  - Always (at least 1 x week)
  - Often (at least 3 x month)
  - Sometimes (at least 1 x month)
  - Rarely (at least 1 x 6 months)
  - Never

- **Plant and/or Vegetable Oils** (i.e., canola oil, vegetable oil, olive oil, coconut oil, sesame oil)
  - Always (at least 1 x week)
  - Often (at least 3 x month)
  - Sometimes (at least 1 x month)
  - Rarely (at least 1 x 6 months)
  - Never

- **Juices and/or Carbonated Beverages** (i.e., orange juice, apple juice, tomato juice, ginger ale, cola, lemon lime soda)
  - Always (at least 1 x week)
- Often (at least 3 x month)
- Sometimes (at least 1 x month)
- Rarely (at least 1 x 6 months)
- Never

**Tea and/or Coffee**
- Always (at least 1 x week)
- Often (at least 3 x month)
- Sometimes (at least 1 x month)
- Rarely (at least 1 x 6 months)
- Never

**Herbs, Spices, and/or Condiments** (i.e., cinnamon, basil, paprika, vanilla extract, cilantro, parsley, ginger, sugar, pepper, ketchup, mustard, BBQ sauce, Worcestershire sauce)
- Always (at least 1 x week)
- Often (at least 3 x month)
- Sometimes (at least 1 x month)
- Rarely (at least 1 x 6 months)
- Never

**Chocolate**
- Always (at least 1 x week)
- Often (at least 3 x month)
- Sometimes (at least 1 x month)
- Rarely (at least 1 x 6 months)
- Never

**Supplements** (i.e., protein powder, protein shakes, wheat grass, vitamins, biotin, fenugreek)
- Always (at least 1 x week)
- Often (at least 3 x month)
- Sometimes (at least 1 x month)
- Rarely (at least 1 x 6 months)
- Never

**Alcohol**
- Always (at least 1 x week)
- Often (at least 3 x month)
- Sometimes (at least 1 x month)
- Rarely (at least 1 x 6 months)
- Never

21. Please indicate the primary reasons you purchase organic foods.

- **Concerns with the environment**
  - Strongly Agree
  - Agree
  - Neutral
  - Disagree
Strongly Disagree

- Concerns for the welfare of animals
  - Strongly Agree
  - Agree
  - Neutral
  - Disagree
  - Strongly Disagree

- Health reasons
  - Strongly Agree
  - Agree
  - Neutral
  - Disagree
  - Strongly Disagree

- Nutritional reasons
  - Strongly Agree
  - Agree
  - Neutral
  - Disagree
  - Strongly Disagree

- Safety reasons (to limit exposure to hormones and pesticides)
  - Strongly Agree
  - Agree
  - Neutral
  - Disagree
  - Strongly Disagree

- Freshness
  - Strongly Agree
  - Agree
  - Neutral
  - Disagree
  - Strongly Disagree

- Taste
  - Strongly Agree
  - Agree
  - Neutral
  - Disagree
  - Strongly Disagree

- Other (please specify) ______________

Knowledge
22. Which governing body oversees organic food producers?
   a. The U.S. Food and Drug Administration
   b. The U.S. Department of Agriculture
   c. The U.S. Department of Health and Human Services
d. The U.S. Environmental Protection Agency

23. Conventional farms can be converted into organic farms _____________.
   a. Requiring a 36 month transition period
   b. Requiring a 24 month transition period
   c. Requiring a 18 month transition period
   d. Requiring a 12 month transition period

24. Identify which symbol indicates a certified organic product to consumers.
   a. ![Certified Organic](image1.png)
   b. ![Certified Organic](image2.png)
   c. ![Certified Organic](image3.png)
   d. ![Certified Organic](image4.png)

25. Organic foods are produced without the use of synthetic pesticides, petroleum based fertilizers, GMOs, growth hormones, and _____________.
   a. Synthetic alginates
   b. Manure based fertilizers
   c. Sewage sludge based fertilizers
   d. Chlorine materials

26. Organic is _____________.
   a. The fastest growing food sector in the United States
   b. Growing at a similar rate as the food industry
c. A stagnant food sector in the United States
d. Slower than the beverage industry in the United States

27. Are “natural” and “organic” foods the same?
   a. Yes, natural foods follow organic regulations
   b. Yes, all foods labeled organic means it is a natural product
   c. No, natural and organic are not the same
   d. No, organic foods are safer than natural foods

28. Is organic food less likely to contain potentially fatal contaminants, such as E. coli and salmonella?
   a. No, composted manure, used as fertilizer in organic farming, put organic foods at higher risk of contamination
   b. No, both conventional and organic farmers work to control potential contamination by pathogens that cause food borne illness
   c. Yes, the organic label signifies that organic food is safe to consume
   d. Yes, organic farming practices prevent contamination from occurring

29. What portion of a food must be organic that will allow a producer to use the organic seal?
   a. 50%
   b. 70%
   c. 95%
   d. 100%

30. Organically raised cows ____________.
   a. Are strictly grass fed
   b. Are strictly fed 100% organic feed
   c. Are required to consume at least half of their diet from 100% organic feed
   d. Are fed 100% organic feed and grass during the grazing season

31. Are certified organic foods produced locally?
   a. Yes, certified organic means the food is locally produced
   b. Yes, certified organic foods must be sold in the region they are produced
   c. No, certified organic foods can be locally, nationally, or globally produced
   d. No, certified organic foods, sold in the U.S., are nationally produced

Perception
32. Organic farming systems are better for the environment.
   a. Strongly Agree
   b. Agree
   c. Neutral
   d. Disagree
   e. Strongly Disagree
33. Conventionally produced foods are more nutritious.
   a. Strongly Agree
   b. Agree
   c. Neutral
   d. Disagree
   e. Strongly Disagree

34. Organically produced foods are safer to eat.
   a. Strongly Agree
   b. Agree
   c. Neutral
   d. Disagree
   e. Strongly Disagree

35. Conventionally produced foods taste better.
   a. Strongly Agree
   b. Agree
   c. Neutral
   d. Disagree
   e. Strongly Disagree

36. Organically produced foods have a longer shelf life.
   a. Strongly Agree
   b. Agree
   c. Neutral
   d. Disagree
   e. Strongly Disagree

37. Conventional farming systems are better for the environment.
   a. Strongly Agree
   b. Agree
   c. Neutral
   d. Disagree
   e. Strongly Disagree

38. Organic livestock systems are more humane.
   a. Strongly Agree
   b. Agree
   c. Neutral
   d. Disagree
   e. Strongly Disagree

39. Conventionally produced foods are affordable.
   a. Strongly Agree
b. Agree
c. Neutral
d. Disagree
e. Strongly Disagree

40. It is safe for children to consume organically produced foods.
   a. Strongly Agree
   b. Agree
   c. Neutral
   d. Disagree
   e. Strongly Disagree

41. Conventional livestock systems are more humane.
   a. Strongly Agree
   b. Agree
   c. Neutral
   d. Disagree
   e. Strongly Disagree

42. Organically produced foods taste better.
   a. Strongly Agree
   b. Agree
   c. Neutral
   d. Disagree
   e. Strongly Disagree

43. Conventionally produced foods are safer to eat.
   a. Strongly Agree
   b. Agree
   c. Neutral
   d. Disagree
   e. Strongly Disagree

44. Organically produced foods are affordable.
   a. Strongly Agree
   b. Agree
   c. Neutral
   d. Disagree
   e. Strongly Disagree

45. Conventionally produced foods have a longer shelf life.
   a. Strongly Agree
   b. Agree
   c. Neutral
   d. Disagree
e. Strongly Disagree

46. Organically produced foods provide additional health benefits.
   a. Strongly Agree
   b. Agree
   c. Neutral
   d. Disagree
   e. Strongly Disagree

47. It is safe for children to consume conventionally produced foods.
   a. Strongly Agree
   b. Agree
   c. Neutral
   d. Disagree
   e. Strongly Disagree

48. Organically produced foods are more nutritious.
   a. Strongly Agree
   b. Agree
   c. Neutral
   d. Disagree
   e. Strongly Disagree

49. Conventionally produced foods provide additional health benefits.
   a. Strongly Agree
   b. Agree
   c. Neutral
   d. Disagree
   e. Strongly Disagree

50. Do you have specific brand loyalties when purchasing groceries?
   a. Yes
   b. No

51. I would buy organic foods if they were available at the University Dining Halls.
   a. Strongly Agree
   b. Agree
   c. Neutral
   d. Disagree
   e. Strongly Disagree

52. Please indicate the primary reasons you do not purchase organic foods or prevent you from purchasing organic foods more frequently.
   ➢ I do not feel organic foods are better than conventional foods
     o Strongly Agree
Organic foods are too expensive
- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

Organic foods are not available where I shop
- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

I am satisfied with consuming conventional foods
- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

I do not know where to find/buy organic foods
- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

I do not have the transportation to buy organic foods
- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

I am used to consuming conventional foods
- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

I do not like the appearance of organic foods
- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

- **I do not like the overall quality of organic foods**
  - Strongly Agree
  - Agree
  - Neutral
  - Disagree
  - Strongly Disagree

- **I prefer consuming conventional foods**
  - Strongly Agree
  - Agree
  - Neutral
  - Disagree
  - Strongly Disagree

- **I am not familiar with organic foods**
  - Strongly Agree
  - Agree
  - Neutral
  - Disagree
  - Strongly Disagree

- **I do not trust the certification process of organic foods.**
  - Strongly Agree
  - Agree
  - Neutral
  - Disagree
  - Strongly Disagree
APPENDIX E

KEY FOR KNOWLEDGE TEST
Appendix E

Key For Knowledge Test

The following is the knowledge section from the survey. The bolded responses indicate the correct answers.

Knowledge

22. Which governing body oversees organic food producers?
   a. The U.S. Food and Drug Administration
   b. The U.S. Department of Agriculture
   c. The U.S. Department of Health and Human Services
   d. The U.S. Environmental Protection Agency

23. Conventional farms can be converted into organic farms ____________.
   a. Requiring a 36 month transition period
   b. Requiring a 24 month transition period
   c. Requiring a 18 month transition period
   d. Requiring a 12 month transition period

24. Identify which symbol indicates a certified organic product to consumers.
   a. 
   b. 
   c. 
25. Organic foods are produced without the use of synthetic pesticides, petroleum based fertilizers, GMOs, growth hormones, and _____________.
   a. Synthetic alginates
   b. Manure based fertilizers
   c. **Sewage sludge based fertilizers**
   d. Chlorine materials

26. Organic is ______________.
   a. **The fastest growing food sector in the United States**
   b. Growing at a similar rate as the food industry
   c. A stagnant food sector in the United States
   d. Slower than the beverage industry in the United States

27. Are “natural” and “organic” foods the same?
   a. Yes, natural foods follow organic regulations
   b. Yes, all foods labeled organic means it is a natural product
   c. **No, natural and organic are not the same**
   d. No, organic foods are safer than natural foods

28. Is organic food less likely to contain potentially fatal contaminants, such as E. coli and salmonella?
   a. No, composted manure, used as fertilizer in organic farming, put organic foods at higher risk of contamination
   b. **No, both conventional and organic farmers work to control potential contamination by pathogens that cause food borne illness**
   c. Yes, the organic label signifies that organic food is safe to consume
   d. Yes, organic farming practices prevent contamination from occurring

29. What portion of a food must be organic that will allow a producer to use the organic seal?
   a. 50%
   b. 70%
   c. **95%**
   d. 100%

30. Organically raised cows ______________.
a. Are strictly grass fed
b. Are strictly fed 100% organic feed
c. Are required to consume at least half of their diet from 100% organic feed
d. **Are fed 100% organic feed and grass during the grazing season**

31. Are certified organic foods produced locally?
   a. Yes, certified organic means the food is locally produced
   b. Yes, certified organic foods must be sold in the region they are produced
   c. **No, certified organic foods can be locally, nationally, or globally produced**
   d. No, certified organic foods, sold in the U.S., are nationally produced
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