THE WILLINGNESS TO PAY FOR A NATIVE CENTRAL TEXAN PLANT

AS A FOOD SOURCE

by

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ABSTRACT

The purpose of this study is to test the consumer willingness to pay rate of a native Texas plant fruit product for the restaurant industry as well as for the consumer market. Farmers' markets and restaurants specializing in either local and/or organic foods were the focus of the market samples. The survey to determine market viability was two-fold: the first part was an intercept survey of farmers' markets in multiple cities where individuals were asked to participate in the survey, and the second part was a lead-user interview survey with restaurateurs in some of the same cities as the farmers' markets. Five cities all located in the geographic area of Central Texas were included: San Marcos, Austin, New Braunfels, Wimberley, and Bastrop. Approximately 400 responses were gathered from farmers' markets during market days at market locations. Seven surveys of restaurateurs provided more in-depth qualitative data on the value of the product to specialty restaurants. Results indicate that there is potential for native plant products to be introduced to the market, as long as the price is competitive.

CHAPTER I

Introduction

Food is the stuff of life, literally. It is the basic level of the hierarchy of human needs (Maslow, 1943). Without food, nothing else of society would exist, including people. At the same time, diversity in food is essential (Kant et al., 1993). Human bodies require a particular array of fats, proteins, carbohydrates, and vitamins. From where these nutrients come depends largely on our culturally established diets (Brenner et al., 2011). Different cultures will eat different foods**.** For example, the traditional Inuit diet consists mostly of various arctic animals, with very little plant matter, while the !Kung people of the Kalahari desert in south Africa have a diet that is extremely diverse, consisting of nuts, berries, roots and tubers, other vegetation, and various animals (Hopping et al., 2010; Metz et al.,1971). These two examples illustrate how a people historically looked to the natural resources around them and figured out how to survive off those resources.

Need

Western agriculture has moved away from the use of artificed and native resources, since it utilizes industrial methods of growing and harvesting crops. Western agriculture suggests a diverse diet is too inefficient to be harvested from one field; so, certain regions that are ideal for growing particular crops have largely become monocultures, with hundreds of square miles dedicated to one particular cultivar of one particular species. While this makes growing and harvesting much easier according to economies of scale, it also increases the susceptibility of the crops to disease (Aragona and Orr, 2011). A number of these monocultures are clones and so when one plant succumbs to an infection, the whole field, if not the whole region, also succumbs. This has happened numerous times in the past, most famously during the Irish Potato Famine, where millions relied strictly on one cultivar of potato, and subsequently, approximately 1 million people died when Blight infected those potatoes, turning them to sludge (Smith and Gerald, 1962)

In addition to the dangers of monoculture, there are issues that have been raised over food safety from the import and export of produce, especially when shipped long distances. Several instances in recent years have involved contamination of vegetable crops by bacteria such as *E. coli* (CDC, 2011). These outbreaks have become difficult to track in some cases because of how often and how far the produce has been shipped. As an extension of this, there have been issues related to the importation of new plants, pests and diseases that do harm to domestic life, be it floral or faunal (Richardson and Rejmánek, 2011; Margosian et al., 2009; Pautasso et al., 2010). These novel forms of life can present problems where the native life is unfamiliar and unable to defend itself from the new threat.

Concerns over how food is grown, harvested, processed, and shipped have led to a revitalization of the local and organic movements (Curtis, 2011). The word revitalization is used because the local and organic methods were how humans fed themselves for all of history and prehistory until the last 200 years when industrial agriculture changed the agrarian landscape (Mazoyer and Roudart, 2006). The reasoning behind a resurgence of these ideas is that many of the diseases of civilization, such as diabetes, heart conditions, and high cholesterol originate from the Western industrialized diet (Diamond, 1997). Many people interested in a better diet have begun to support small, local farmers rather than large scale food corporations (Curtis, 2011). This alternative to industrial food comes with a higher price for the consumer, individually or combined as higher food costs and increased effort to purchase non-corporate food (Curtis, 2011).

The crops grown by these small farmers tend to still be the same crops grown by the large corporations, just on a smaller scale. Most of this produce is not native to where it is being grown. Grocery stores and farmers' markets in the United States are full of various produce (cabbages, peas, apples, oranges, etc.) originally cultivated in Europe, Asia, and Africa, and grown in places in which, for the most part, they did not evolve. While many of these crops can easily grow in these novel places, it can lead to more energy spent tending to the crops (Gremmillion, 1996; Clay, 2004) in the form of physical work, fertilizer application (organic or synthetic), and pest management efforts; however, possible alternatives exist.

Potential for Native Food Crops

All the crops grown by humans today were, at some point, wild plants. Humans tamed and domesticated these plants over many years to the forms known today (Standage, 2009). However, cousins, and distant relatives of these domesticates still exist, as well as other edible plants not yet commercialized (Sampliner and Miller, 2009; Arrigo et al., 2011; Bradbury and Emshwiller, 2011; Emshwiller et al., 2009). These plants are all around in the local landscapes; they need only to be identified and utilized. The edible species of plants not used by mainstream farming do have potential, whether as food or for industry (Turner, 2009).

These plants have potential to be used in the areas in which they originated. If the plant existed there, then it adapted to the local environment (OED, 2012). By growing native plants farmers could create a new niche market and reduce potential work put into keeping their crops alive (since the plants are already adapted to that soil and moisture level). This has shown to be profitable (Little et al., 2010).

If someone wants to take advantage of new and interesting plants, it would be much easier to use their own natives, rather than to create a non-native cultivar for a specific region, although, this could take time and effort on the part of whoever was taking advantage of the potential plants. In addition to the economic benefits these farmers could obtain, growing native food crops could increase the diversity in what people eat. This will ensure not only that food sources will have a safeguard against pestilence, but also that varied diets will become easier to obtain. The rare fruit from another part of the world will not be necessary for health-conscious living (Starling, 2007).

Problem Statement

The purpose of this study was to test the consumer willingness to pay (WTP) rate of a native Texas plant fruit product for the restaurant industry as well as for the consumer market.

Objectives

The objectives of the study were to:

1) Determine if the native plant selected for study had potential for marketing to consumers and restaurants in Central Texas by:

- Conducting an analysis of restaurant owner perspectives of food concepts based in the Lead User concept.

- Conducting an analysis of local farmers markets customers' perspectives based on the Intercept Model.

2) Evaluate the consumer and restaurant owners' WTP for the plant product of interest.

3) Test for the existence of a relationship between preference and WTP for native grown food and environmental opinions.

Definition of Terms

Local: The term local has many definitions, based on different consumer perceptions. These definitions vary from 100 miles, within the local region of the state, within the state itself, or even within the region of the country (DeWeerdt, 2009; Durham, 2003). For the purposes of this study, local will refer to the area within the Capital Region, as defined by the Texas Comptroller Office, comprised of the counties of Bastrop, Hays, Blanco, Lee, Burnet, Llano, Caldwell, Travis, Fayette, and Williamson (Texas Comptroller, 2002). In addition to the Capital Region, the county of Comal, which is directly south of Hays County, will be included. This will enable a well-shaped cross across the region of study, gathering as much data as possible.

Native plant: A native or indigenous species is one that occurs in a particular place without the help of humans (Plant Conservation Alliance, National Park Services, 2002). More specifically, a native plant exists within a specified geographical region of interest, and is a plant species (or other plant taxon) currently or historically present there without direct or indirect human intervention (Morse, 2006). These definitions confine the plant in space as well as time.

Willingness to pay: In this context, the concept of willingness to pay (WTP) or reservation price, is defined as the maximum price a given consumer accepts to pay for a product or service (Le Gall-Ely, 2009).

Niche Market: A niche market is a group of potential customers who share characteristics that make them receptive to a particular product or service (Niche Market, 2003).

Environmental Attitudes: A set of psychological tendencies expressed by evaluating the natural environment with some degree of favor or disfavor (Milfont and Duckitt, 2010).

Organic: There are two primary definitions for organic, one each from the Unites States Department of Agriculture and the Food and Drug Administration. For the purposes of this study, the USDA definition will be primary; products that "have been produced and handled without the use of synthetic chemicals (USDA 1995, § 2105)."

Limitations of Study

- Due to persistent drought conditions in the Central Texas area, and the fact that the fruit being gathered for the study was foraged rather than bought at a store or grown during the study, the actual amount of fruit being used in the study was limited. There were enough for each of the pertinent participants to provide their opinions on the product.
- This study focused on only one plant native to the Central Texas region.
- This study looked only at the populations that attend farmers' markets, and restaurant owners who serve organic and/or local food and, therefore, may not have opinion or habits that generalize to the overall population.

Basic Assumptions

- It is assumed that participants in the study would actually examine the fruits through a full sensory experience (sight, taste, touch, smell) and give their opinions about them.
- It is also assumed that fruit would be ready for harvesting at the normal time for its species. *Diospyros texana*, the Texas persimmon, ripens in the late summer to early fall.

CHAPTER II

Literature Review

Ethnobotany of Plants – Food

The modern world relies heavily upon grains for its sustenance. The use of corn, rice, and wheat are the source of a majority of the calories consumed by humanity (FAO, 1995). However, this does not mean that other plants could not be used instead, or in conjunction, with these staples. The number of edible plants in the world is astoundingly large, by one count reaching over 20,000 (Turner et al., 2011). Many of these plants were used in their endemic locales as a food source historically, but are unknown to more modern palettes (Turner et al., 2011). These are not recent additions to local diets; they are long-standing foodstuffs, in some places having been domesticated for 8,000 years (Fullagar et al., 2006). The crux of how people interact with plants, though, is for the purpose of sustenance. Without plants, the world's population would not exist, as there would be no life.

Studies suggest that the genetic morphology of the staples are one of the reasons early agricultural man chose these plants, since they quickly gained characteristics that either increased their yield or ease of harvest, compared to their wild ancestors (Doebley, 2004; Jaradat, 2011; National Research Council, 1989; Shavrukov et al., 2010). The transition between corn's possible ancestors and its earliest definitive forms was so quick, it took 60 years for geneticists to ascertain from whence it came (Eubanks 1995). This type of genetic and phenotypic plasticity has made corn the staple the West relies upon today (Doebley, 2004).

Of course, not just grains have been manipulated for modern needs. The potato offers a high density of starches as well as other vitamins necessary to human survival with over 1000 varieties available in its native range, the Andean Mountains (National Research Council, 1989). This diversity is a product of man's tinkering with the genetics of the potato. Most of these varieties are designed for efficient growth in particular elevations, to the extent where the side of a mountain will have 3 or 4 to a 100 varieties growing at ideal elevations (National Research Council 1989). These staples were very successful in their native ranges, displaying to this day broad genetic diversity, and helping to feed empires like the Aztec with their maize, and the Inca, with their potatoes (Biskowski, 2000; D'Altroy and Hastorf, 1984; Evans et al., 1981). The staple grains, roots, and tubers discussed are prime examples of how, with some effort, native plants have the potential to be turned into reliable sources of food that could eventually feed many.

Though these successes are impressive, there are many plants globally that have the potential for widespread crop food use. Some of these potential crops are already in use in the world, and have been used in their native ranges for a number of centuries. Elephant ear, *Colocasia esculenta*, has been grown in an agricultural sense in Southeast Asia as long ago as 8000 B.C., and is still in use today as the foodstuff taro (Fullager et al., 2006). It is used widely across the South Pacific region, where growing the staple crops mentioned above would be difficult due to land limitations as well as weather patterns.

Other plants used long ago are the lechuguilla (*Agave lechuguilla*) and the sotol (*Dasylirion texanum*), succulents of the Southwest United States. These two plants were used extensively as a food source, both during regular weather conditions for the region, but especially during droughts (Dering, 1999). The hearts of the rosettes were baked in rock ovens and turned into small cakes for long-term storage (Dering, 1999). The prolific nature of these plants in their habitats shows how efficient production of calories can be attained in harsh climates if alternative or native foods are considered. While modern reports vary as to how they taste, the sotol and lechuguilla grow readily throughout the American Southwest, and so offer a way to make this arid area produce a staple food while using little water (Bousman and Quigg, 2006), while the staple of *C. esculenta* makes excellent use of a moist, limited space while producing many calories, showing the diversity of possible caloric source possibilities. Of course, these examples only regard the starchy staples that comprise the foundation of diets. Beyond the use of foods, plants have been used for a large variety of other purposes, and the native plants are no exception.

Ethnobotany of Plants – Medicine

In addition to the widespread use of plants for food, humans have figured out other uses as well by taking advantage of the various chemical compounds in particular plants. Some of the uses include medicines and dyes (Moerman, 2009). Ethnographic knowledge over the ages has left us with an encyclopedia of the plants to use for different purposes, including details such as which parts to use, and how utilizing the plants in different ways and subjecting them to various treatments will give different results (Moerman, 2009).

Research has discovered medicinal uses for plants that corroborate how earlier peoples used them. The ancient use of willow bark as a form of pain relief led to the discovery of the compound salicin, which led to the key component of the aspirin, of which almost 45,000 tons are used every year (Warner and Mitchell, 2002). These compounds are not limited to old formulas either. Recent studies have found that barberry plants (3 of which are native to Texas) contain the alkaloid berberine, which can be used to treat diseases as diverse as diabetes, cancer, intestinal disorders, as well as depression (Kulkarni and Dhir, 2008; Li et al., 2010; Tang et al., 2009; Yin et al., 2008). This is in conjunction with Native American utilization of these plants as poultices and decoctions for a variety of illnesses (Moerman, 2009). These medicinal uses give more credence to exploring all the uses of plants native throughout many regions.

Ethnobotany of Plants – Industrial

Beyond medicinal uses, many plants have been used for dyes over the millennia. The tannins in oaks have been used to tan hides to create leather (Turner, 2009). The Celtic people used the woad plant, *Isatis tinctoria*, primarily as a form of war paint, but sources suggest it was also used as antiseptic, mirroring modern findings (Barnett et al., 2006). These, as well as countless other examples, have many economic uses as a way of providing color. While synthetic dyes have supplanted the natural dyes, for the most part, there are still niche markets for some dyes. In addition, some synthetic dyes have been shown to have less appetizing side-effects, especially when in food and drink. For example, Red 40 has been shown to cause hyperactivity in children (McCann et al., 2007). Red 40s natural counterpart (color-wise) is cochineal, and while not plant based, requires prickly pear cactus to support the beetles used in its production. These examples illustrate how natural dyes derived from plant use can still be important, even in a modernized and industrial world, and how native plants that are sometimes overlooked can offer up many uses beyond just the food sources they create.

Historically Useful Texas Plants

With the prevalence of uses for plants, one might wonder how many plants are readily available locally. The impression given so far is that many useful plants are native to locales far and away. However, a multitude of the plants in the United States have many uses, both historical and modern in origin. Texas, in particular, due in part to its geographic place and size has a wide variety of edible and useful plants within its borders (Tull, 1987). These vary from different trees and shrubs to a wide selection of herbaceous plants.

The pecan, *Carya illinoinsses*, has been in use in Texas for thousands of years (Turner, 2009). The earliest found use of pecan fruit by humans can be dated to 6750 BC, but it is very likely they were used long before that time (Turner, 2009). This drupe was used extensively in trade between Native Americans and early settlers, such was its value as a food source. It has been shown in recent years to contain such key nutrients as calcium, phosphorus, iron, magnesium, potassium, zinc, and B vitamins, as well as being a great source of protein and fats (Lombardini et al., 2008; National Geographic, 2008; Turner, 2009). The pecan has become a staple of dessert dishes such as pies, cake, and candies, and these desserts are healthier because of the antioxidants in pecans, as well as its cholesterol-lowering and metabolic rate-raising effects (National Geographic, 2008; Lombardini et al., 2008).

Another prominent food source in Texas was, and could be again, amaranth, *Amaranthus spp.* This member of the Amaranth family is a quick growing, drought tolerant, annual herb. Its tenacity in growing has been frowned upon by modern farmers, but was once praised. Amaranth seeds have been used as a pseudocereal for at least 6500 years in North America, and have now become a staple in tropical countries (Turner, 2009). Their fast growth and prolific seed production are at the same time, the bane of farmers farming other plants, and the boon of those farming amaranth. As a pseudocereal, they can be ground into gluten-free flour, or eaten as porridge, or as popcorn (Turner, 2009). However, as one consumes the seeds, they are getting a well-rounded protein content, including lysine, a protein in short supply in the major cereals (Turner, 2009). In addition to the seeds, the leaves of the amaranth provide a wide range of nutrients to those whom partake, including calcium, iron, zinc, potassium, magnesium, various B vitamins, vitamins C and A, as well as proteins, carbohydrates, and fibers (Shukla et al., 2006). In short, the amaranth is a super food that most Texans regard as a weed.

A widely used, but often derided tree growing mostly in south Texas is the Honey Mesquite, *Prosopis glandulosa*. This tree is sometimes regarded as an invasive, and is blamed for lowering the water-table for other plants in the drier counties of south Texas (Ansley et al., 2007; Pennington et al., 1999), yet it has many uses. The oldest known use for the tree is that of food, as its seeds are highly nutritious. They contain a wide variety of important nutrients including protein, calcium, magnesium, potassium, iron and zinc, in addition to being high in fiber (Turner, 2009). The Native Americans made good use of the seeds, which appear in larger numbers when there is drought, further cementing their usefulness (Steinberg, 2001). In addition, Texas, being famous for its barbeque, uses mesquite wood extensively as it adds a special kind of smoke flavor to the dish (Felker, 1996). The wood is also known for its sturdiness, in construction of buildings and furniture. The mesquite has also recently been shown to have medicinal effects, being useful as an antidiabetic agent and an antitumor agent (George et al., 2011; Kumar et al., 2011). Still, there are plenty of ranchers who regard this plant as a water hog, stealing water from various range animals and the plants where they graze. Mesquite's usefulness comes at a price.

Among Texas' herbaceous plants, there are a number of plants whose fruit bears merit. Texas has several native passion fruit vines (*Passiflora spp*.), the progenitor species of most chile peppers, the chili pequin (*Capsicum annum*), the yellow lotus flower (*Nelumbo lutea*), the archetypal prickly pear cactus (*Opuntia engelmannii*), and several grape species (*Vitis spp*.), among others.

The Columbian Exchange introduced the chili pepper to the Old World in the 1500s and beyond, exposing the berries to a wide variety of locales and cultures (Toussaint-Samat, 2009). In addition, the capsaicine and carotenoids contained in peppers have been shown to have health benefits (Krishnadev et al., 2010; Mori etal., 2006).

The passion fruit vines and yellow lotus flower both had significance to the various peoples of Texas, both pre-historic and historic. The genus *Passiflora* has been recorded many times over the centuries to be used for various medicinal purposes, mostly gastric in nature (Dhawan et al., 2004). However, they are very prone to pests, and so they tend to be more difficult when producing crops. Yellow lotus flowers were used extensively in the Southern U.S. by Native American tribes, and later Anglo settlers (Turner, 2009). The seeds and the tuber of the lotus are edible, and the seeds in particular contain up to 19% protein, making them an efficient food source. There is evidence of yellow lotus being grown as far north as Tennessee and Illinois, carried there by Native Americans as a introduced food crop (Orozco-Obando et al., 2009). The yellow lotus needs extensive wetlands to thrive, so any efforts to create it as a crop are hampered by finding the needed water resources.

Grape species native to Texas, while not as popular as wine grapes, did help save the European wine industry. In the late 19th century, a pest, *Phylloxera vitifoliae*, struck the vineyards across Europe (National Geographic, 2008; Stewart, 2011). The entire wine industry would have been decimated, were it not for the native grapes found in North America. These grapes were used as a graft to the remaining vines in France and other countries, as the grapes were immune to the pest (Turner, 2009).

As for the prickly pear, they have been a reliable food source for Native Americans as well as early Western settlers. One account from Spanish soldiers relates a reoccurring event whereupon Tohono O'odham peoples would travel on foot for hundreds of miles in order to eat the tuna, or fruit, of the cactus (Tull, 1987). Another account states that one soldier from the French La Salle expedition thought he would try one of the tuna, plucked it off a cactus and ate it (Weddle, 2009). He quickly died, however, of suffocation, as the spines, or glochids, covering the tuna have to be rubbed off before eating. As he did not do so, the glochids broke off in his throat, causing it to well up, and kill him. While Texas has plenty of edible plants, some cautions must be taken.

These examples show the diversity of Texas plants, as well as our reliance upon them, and while the chili pepper and grape have become widespread across the world, the prickly pear cactus and pecan are still more regional foodstuffs. Yet, the pecan has been spreading in popularity across the United States since the turn of the 20th century, and the prickly pear has been a regional staple across the Southwest and into Mexico (Turner, 2009). Texas native plants have potential for acceptance on a larger scale.

A Comparison of Traditional Food Production Methods versus Industrial Production Methods

To understand the potential for native Texas food crops to be used, a brief examination into current production methods and outputs of agriculture is needed. Most agricultural production can be divided into traditional methods and mechanical or industrial methods. Traditional methods comprise most of the practices that have been used to produce food up until the Industrial Revolution in the late 18th century (Overton, 2011). Some of these concepts have been shown to still be useful today, producing viable yields, and can be combined to various degrees with more industrial production methods (Horwith, 1985; Pimentel 2005; Puente et al., 2011).

Using the traditional methods has been shown to come with a price. A 2005 Pennsylvania-based study showed that, on a year-to-year basis, yields of traditional production can be comparative to that of mechanical production, but at a greater labor cost (Pimentel et al., 2005). In addition, it was shown that, overall, the profit garnered from said production will be lessened due to crop rotation schedules. Still, the study goes on to show that the cost of production for traditional agriculture is significantly less than that of mechanical production (Pimentel et al., 2005).

The question then becomes, is there actual potential for using traditional methods to grow native crops? In other words, will the potential niche market be able to support an industry with lower yields, but also lower costs? Recent studies have shown that niche markets can be profitable and create added value to their product, but the products created must be quality for the niche market to exist (Loureiro and Hine, 2002; Renting et al., 2003).

To be fair, the potential of industrial agriculture must also be examined. Industrial agriculture can be characterized, but not necessarily defined, by the use of mechanized vehicles, hybrid crops, and intensive use of fertilizer, as well as earlier concepts such as crop rotation and various forms of integrated pest management (Currie Enterprises, 1995; Overton, 2011). These traits came about due to advances brought on by the Industrial Revolution, and have helped support the levels of human population that thrive today (Biello, 2009).

A study in India showed that the cost of mechanical agriculture was lower than that of traditional agriculture (Khambalkar et al., 2010). This cost was calculated by the manpower needed to harvest the product. The study does go on to point out that the energy required to produce the mechanical harvest was significantly higher than that of the traditional harvest. This should be taken into account when calculating total costs of the farmer, as the costs of fuel can vary (Timilsina et al., 2011).

Another mainstay of industrial agriculture is that of the use of hybrid and genetically modified organism (GMO) crops. In 2009, the total U.S. corn production area was 32,168,800 hectares. Of this, approximately 30,000,000 hectares were GMO crops (FAOSTAT, 2009; GMO Compass, 2010). GMOs are the product of breeding to create offspring that bear higher yields and are less susceptible to pests (Engelen, et al., 2004). These higher yields have helped to not only sustain the higher population of the world today, but also to create more products for the burgeoning masses (Qaim and Zilberman, 2003; Yao et al. 2012). While producing better yields more research is being done to improve future generations of hybrids and GMOs (Sarkar, 2011). The downside to these hybrids and GMOs though, is the reliance the farmers using them have on the seed production companies. This is because the next generation after the first harvest of hybrids produces poor, sickly plants. Additionally, GMO plants are patented intellectual property, and therefore, the farmers are not allowed to legally re-use the seeds, necessitating the purchase of more seeds from seed companies.

Finally, one of the most important features of industrial agriculture, and one of the oldest, is the intensive use of fertilizers. First mined from guano in the 19th century, nitrogen was able to be synthesized in the early 20th century by the Haber–Bosch process (the process by which nitrogen in the atmosphere is condensed using electricity) (Dictionary.com, 2012). This led to widespread and cheap use of fertilizers into the present day. The use of fertilizers in modern agriculture has been suggested to be one of the primary reasons for the existence of half of the world's population today (Erisman et al., 2008). Still, the use of artificial fertilizers (those created by the Haber–Bosch process) has also led to the industrial problem of runoff (Lentz and Lehrsch, 2010). The excess nitrogen in the ground leaks into the river systems, and creates dead zones in the oceans at river mouths (Associated Press, 2007; Smith et al., 1999). The fertilizers cause algal blooms (due to the excess nutrients in the water). These algae use up more and more oxygen, thereby creating anoxic areas, where very little life can be sustained (Mack, 2012). Thus, both traditional agriculture and industrial agriculture come with their own individual prices.

Finally, there is the question in recent decades of the introduction of organic production. Organic agriculture has been defined in multiple ways (FDA, 2006; USDA, 1990), but is generally characterized by the non-use of synthetic compounds in the production of crops. This concept established itself as a niche market, attracting consumers who want the perceived qualities that are associated with organic agriculture, among these being taste, freshness, and quality (Curtis, 2011). On the other hand, organic agriculture has similar issues with traditional agriculture. This is because, while the synthetic inputs are lessened, the physical effort involved in organic agriculture is greater (Pimentel et al., 2005).

Current Status of Agriculture and Horticulture in the United States and Texas

A brief census of the current state of agriculture in the United States and Texas is in order, to put numbers to the concepts previously discussed. In the United States, in 2007, the total value of agriculture produced was $297 billion, and in Texas, the total agricultural product was $21 billion (USDA Census of Agriculture, 2008). These values are inclusive of all forms of agriculture, including animal husbandry, agronomy, and horticulture. Of these values, this study is focused on a particular division, namely that of organic production. The United States' total organic agricultural output for 2007 was $3.16 billion, and Texas' $51 million (USDA Census of Agriculture, 2008). While organic agriculture can and does use various forms of industrial agriculture, by its various definitions (FDA, 2006; USDA, 1990), it uses much less than mainstream agriculture. From the economic results presented, it can be seen that, while organic production and other niche markets are viable, they are still niche markets. This study will use organic agriculture as a model of a, so far, successful niche market and so any inferences must take this into account.

Current Areas of Food Production

The United States' production of non-meat food agriculture is divided by the United States Department of Agriculture (USDA) into three groups. The fruits, berries, and tree nuts industry created $18.6 billion worth of product in 2007 (USDA, 2008). Most of the fruit production came from the states of California and Florida. Texas' primary addition to this industry is the production of pecans, of which it is the second-highest farmed production in the U.S. The grain industry in the U.S. created $77.2 billion in 2007, mostly in the Central U.S. along the Mississippi River Basin (USDA, 2008). While Texas has many native grasses that could have potential as crops, none are domesticated as of yet. Finally, other vegetables created $14.7 billion in 2007, with a majority of that being from California.

On a more global scale, the seven most produced foods are grains coming primarily from four countries: China (with 197 million metric tons of rice and 112 million metric tons of wheat in 2008), the U.S. (with 333 million metric tons of corn and 9.7 million metric tons of sorghum produced in 2008), Russia (with 3.6 million metric tons of rye and 17.9 million metric tons of barley in 2008), and India (with 8 million metric tons of millet produced in 2008) (FAO, 2009). Other than grain production, other foodstuffs trail farther behind, with most fruits and vegetables coming from the U.S., China, Brazil, or India (FAO, 2009). What this shows is that the U.S. has an established record for producing food in vast quantities, and so any new crops have an excellent potential for growth, in both senses of the word.

As for Texas' particular contributions to the U.S., the agricultural industry of the state produces a range of vegetables, fruit, industrial crops (such as cotton, flax, hemp, etc.), and livestock that all thrive in the varied environments of Texas. In 2010, Texas produced almost 8 million bales of cotton, mostly in the Panhandle region of northwest Texas (USDA, 2010; Texas AgriLife Extension Service, 2009). In the same year, 10,500,000 tons of broccoli were produced; mostly within the south Texas Rio Grande Valley, also known as just "The Valley" (USDA, 2010; Dainello and Palma, 2007). Another major crop of Texas is the grapefruit, which is grown in "The Valley" as well (Dainello and Palma, 2007; Staples, 2009). In 2010, 681,000 tons of them were sold (USDA, 2010). The state tree of Texas, the pecan, produced 50,400,000 pounds of nuts in 2005, in several regions across the state (Lipe et al., 2012; USDA, 2010). In addition to the crops produced, Texas is also famous for its beef production, which in 2007, totaled

5,259,843 head of cattle and calves sold for meat production, with Texas having the largest head of cattle in the nation (USDA, 2010). It is because of this plentiful agricultural output that Texas is a prime location for future endeavors.

Niche Markets in Texas

A niche market would need to be established for any novel crops to be introduced, so as to create a devoted consumer base (Niche Market, 2003). The data on niche markets, at least in Texas, is sparse (Hanagriff et al., 2004). However, one major indicator of successful niches is the “Go Texan” state brand program. This was launched in 2004 to try to better market Texas products. A recent study of its successfulness showed that merchants who become an associated member of Go Texan organization could expect an average of 9% more sales equaling $76,500 (out of an average of the participants' $850,000 in total sales) (Hanagriff et al., 2004). The authors go on to state that this rise in sales is mainly due to the increased quality associated with being part of the program. The essential message from the study was that programs like Go Texan in any state must have a quality product for the brand and the market to be successful.

Another established niche market in Texas is that of organic food. In 2007, Texas generated $51 million in sales of organic food (USDA, 2008). While this is a considerably smaller industry compared with the organic industry on a national level, it does indicate that a market exists for conventionally produced foods in Texas. The organic market has dedicated shoppers who care about where their food originates and the methods of its production. These consumers also value the perceived quality associated with organic production (Curtis, 2011). This level of concern is essential in creating a viable niche market, and so the organic and its sister market, local food, will be discussed.

Marketing

The issues of monocultures and food origin are very important for society to consider so as avoiding the spread of famine and disease (Aragona and Orr, 2011). While food is essential for society to exist, food safety is also essential for society to thrive (FAO, 1995). Food safety can be seen as all conditions and measures necessary to ensure the safety and suitability of the food chain (Juanjuan, 2012). Using native crops could not only increase food safety by increasing regional food diversity, they could also attract a new alternative niche market.

When customers shop for niche market food products, they are doing so for a particular reason. There are, however, some broad trends across the board of those participating in alternative food procurement beyond the grocery store, and those customers are looking for something out of the ordinary.

Two of the establishing trends among the alternative food sources are that of the local and organic added values. However, these brands are still fairly nebulous in their definition. When attempting to define the idea of a "local food", the 100-mile radius is often cited as the border of distances to be considered "local" (DeWeerdt, 2009). Still, the exact definition seems to be largely dependent on both the physical and cultural geography of the region in question. This can result in “local” as being the same county, the same part of the state, the state itself, or the local region of the U.S. (Durham, 2003).

On top of the varying definitions of local, are the different interpretations of the term “organic.” The United States Department of Agriculture has defined organic as essentially meaning that no synthetic compounds were used in the production of the food in question (USDA, 1990). However, even within the USDA and the Food and Drug Administration, there is contention about the definition of organic (FDA, 2006). In addition, among the alternative food culture, there is debate over what organic is. With that in mind, those consumers are still interested in organic and local food, but many value interactions with the farmers to get at the heart of whether or not the produce meets the consumers’ standards.

The desire for value added food products among the alternative food culture is strong. Amongst shoppers involved in several Maine farmers’ markets, 95% of those surveyed expressed “chemical concerns” as their primary reason for shopping at the farmers markets (Hunt, 2006). In the same study, 83% of involved visitors, called "Lifestylers" for their attitudes towards alternative food procurement, and 65% of less involved visitors, called "Seasonals" for the same reason as the "Lifestylers", expressed interest in going to visit the farm from where their food was grown, reflecting the desire to have a local connection with their food source. In a study done in California, the attribute “grown by local farmers” outranked the attribute “inexpensive” among those attending the farmers market, showing that consumers are willing to pay a premium to ensure that the product they are purchasing comes from the area (Wolf et al., 2005). The consumers also outranked “organically grown” over “irradiated to kill bacteria,” illustrating that they prefer to avoid chemicals rather than bacteria or other pathogens.

However, these trends pale in comparison to the overall primary aspect consumers look for in niche market foods: quality or how well the produce meets the consumers' concept of how ideal produce appears. The large majority of surveys done amongst those obtaining their food alternatively result in the overall quality of the food being ranked most important, with the only exceptions being subgroups within the studies that put quality as the second or third most important aspect (Curtis, 2011; Hunt, 2006; Wolf et al., 2005).

Defining consumers' habits when buying niche food products largely depends on how and where they make their purchase, whether it be at the farmers' market, local grocery store, or elsewhere. Hunt's study on Maine farmers' markets split the vast majority of survey participants into two groups: the "Lifestylers" and the "Seasonal" shoppers (Hunt, 2006). These groups are defined by how they interact with the market. The "Lifestylers" are more likely to want to interact with the farmers, travel further to get to the market, and spend more than others. In addition, as mentioned earlier, they have a strong concern about chemicals used in their food production. The "Seasonal" shoppers believe that overall quality of product is the most important aspect of their purchased product. This would indicate that the "Lifestylers" are more dedicated to the farmers' market concept and the associated ideas, and that they are willing to sacrifice quality to ensure the other ideals are met (Hunt, 2006).

Dedication to this set of attitudes leads some to community supported agriculture or CSA. The idea behind a CSA is that those that put in their subscription essentially buy a part of the farm from which they then receive crops on a weekly or monthly schedule

(Galt, 2011). The benefits perceived are that the subscriber knows from where their produce comes and how it is produced because they are a part owner of the producing farm (Galt, 2011). A survey done in Nevada showed that while those attending a farmers' market have a similar set of attitudes to those who participate in CSAs, there are some key ideological differences in what the groups wanted out of their specialty crops (Curtis, 2011). For example, the CSA participants ranked "local" 4^{th} out of 11 characteristics they deemed important as opposed to farmers' market patrons who ranked "local" as 8^{th} out of 11. In addition, CSA individuals ranked "appearance" 10th out of 11 compared to farmers' market patrons 5th out of 11 ranking, "organic" was 6th out of 11 versus 9th out of 11. When asked whether they were vegetarian or vegan, CSA respondents ranked 5th out of 11 compared to farmers' market customers' response of 11th out of 11. These tendencies along with others showed both what aspects are important to individual consumers and demonstrated that those more dedicated to alternative food strongly embrace leaving the industrial food system most of the rest of the U.S. follows behind. While how individuals obtain their specialty foods is important, some demographics show other interesting trends in this field.

There appears to be an aggregate move towards more alternative products in the U.S., and this movement is being led by the youth of this country. A recent survey performed with Louisiana State University students and faculty showed that freshmen preferred organically certified food to non-organic 6% over the senior-level students (Detre et al., 2010). In addition, several studies indicated that among the frequent farmers' market shoppers, the number of younger consumers trend slightly higher than non-frequent shoppers. In the aforementioned Maine survey, the "Lifestylers" median age was 47.26, compared to the 52.55 years of the "Seasonal" shoppers (Hunt, 2006). In a California survey, the percentage of regular shoppers in the age range of 20 to 24 was 16% compared to 13% in the non-regular shoppers (Wolf et al., 2005). While alone, these numbers would not be very meaningful, the fact that in 3 separate studies on the West, East, and Gulf coasts across a six year period all showed that the younger clades are becoming more aware of the alternative added values demonstrated that these niche markets are a still growing industry with long-term potential. This potential can be directed towards supporting a native food crop industry in central Texas and beyond.

CHAPTER III

Methodology

Problem Statement

The purpose of this study was to test the consumer willingness to pay (WTP) rate of a native Texas plant fruit product for the restaurant industry as well as for the consumer market.

Objectives

The objectives of the study were to:

1) Determine if the native plant selected for study had potential for marketing to consumers and restaurants in Central Texas by:
   - Conducting an analysis of restaurant owner perspectives of food concepts based in the Lead User concept.
   - Conducting an analysis of local farmers' markets customers' perspectives based on the Intercept Model.
2) Evaluate the consumer and restaurant owners' WTP for the plant product of interest.
3) Test for the existence of a relationship between preference and WTP for native grown food and environmental opinions.

Overview

This study investigated the market potential of a native central Texas fruiting tree: the Texas persimmon, *Diospyros texana*. This tree is native to the Central Texas area, and has been used by Native Americans, European settlers, and local wildlife as a food source (Turner 2009).

The tree was selected after a review of native plants with edible parts was conducted. The choice was based on the following criteria:

1. The plant has reliable distribution across the Central Texas area, facilitating harvesting for the study. This insured that the study could be performed in a reasonable time.
2. The persimmon is drought tolerant (Ladybird Johnson Wildflower Center ¶2, 2012). While this study was being performed, the state of Texas was under a level of drought that was the worst on record (Texas Comptroller, 2012; Stonewall County Courier, 2012); because of this, the normally abundant native foods were severely lacking in number (Texas Comptroller, 2012; Hawkes, 2011; Tompkins, 2011). Therefore, a plant with a drought tolerance was necessary to facilitate harvesting.
3. In addition to water requirements, the plant to be studied should have sweet, fleshy, fruits. Studies have shown the human palette enjoys sweet foods (Mennella et al., 2005), and fleshy fruits would be more appealing to the participants (Giovannoni, 2001).
4. Also, the fruit studied was from a smaller tree and detaches from the branch with ease, so the fruit was, therefore, easier to harvest, as essentially no special tools are needed.
5. Finally, the fruit should be one in which the participant lacks familiarity. Other Texas native fruits were available in grocery stores, and so any participant might have a

biased opinion on these, were they presented to the participant. Thusly, two of Texas' more famous fruits, the pecan and the prickly pear, were removed from the list of potential fruits, as any study of their appeal would be deemed futile and unnecessary.

Crops

The Texas persimmon is a small upright tree ranging in size from under 10' to rare instances of 40'. They grow in dry alkaline soils, which are common across the Edwards Plateau of Central Texas, meaning their distribution is wide. The fruit is a black berry, usually under 1" in diameter which ripen starting in late July and until September (Wrede, 2010). This fruit has a high concentration of sugar, and the flesh itself is easy to remove from the seeds and skin, thus facilitating the processing done to it on a small scale. The flesh is also black and extremely sweet due to the high concentration of sugar, and was used extensively in jams and pies by Western settlers (Turner, 2009).

The black color of the flesh was also used by Native Americans in the past and Mexicans in the present as a dye, turning whatever it touches a very dark brown to black color. In addition to this dye, there is a protein found in the flesh that appears to have anti-fungal properties, specifically disrupting the fungus that causes potato late blight (Vu and Huynh, 1994). Finally, the wood of the Texas persimmon is a hard, light amber color that turns black in older trees. This hard wood is a characteristic of the genus to which both the persimmon, and its more famous cousin, ebony (*Diospyros ebenum*) belong, while the black heartwood is shared by *D. texana* (Ladybird Johnson Wildflower Center ¶2, 2012).

Internal Review Board

To ensure that the interactions with the participants were as ethical and safe as possible, the researchers went through the safety review of the Internal Review Board (IRB) of Texas State University. It was here established that offering a taste test to the Lead Users and not the intercept participants was both ethical and safe.

The proposal was offered to the IRB that the Lead User participants would be offered a taste test with their questionnaire, and the Intercept participants would not. It was determined by the researchers that the Lead Users, with their openness for the novel would be a good choice for a taste test, as they would have a great deal of experience with which to judge the sensory features of the fruit. The Intercept participants were very numerous, and were less determined to be less sensitive to novel products, and so it was decided to not involve them in a taste test.

Harvesting, Handling, and Storage

The fruit was harvested by hand upon ripening over the course of the summer season. This was due to there being no easily attainable mechanisms for harvesting these fruit, as they are not commercially grown. After harvest, all fruit was cleaned and washed. The fruit was then stored in a safe and secure refrigerator until it was ready to be delivered to the recipients.

Preparation

The fruit was placed in sterile, re-sealable bags for transfer to the participants.

Methods

To study WTP, the Lead User concept was combined with the Intercept concept to lead to a more holistic perspective on the viability of the products through an investigation of how two ends of the food industry perceive these potential products.

Lead User Study

The Lead User concept arises out of the study of the fields of innovation and marketing research (von Hippel, 1986). The two main characteristics of a Lead User are:

1. Lead Users face the new needs of the market and do so significantly earlier than the majority of the customers in the market segment.
2. Lead Users profit strongly from innovations that provide a solution to those needs (Lüthje and Herstatt, 2004).

To utilize the Lead User concept, seven locally and independently owned restaurant owners were identified for participation in the study. This method is in conjunction with Morse's (2000) perspective that due to the "phenomenological" character of Lead User studies, only 6-10 participants are needed. These restaurant owners were chosen based on whether they currently purchased local and/or organic food. This criterion was chosen as the concept being used in the study used the local and organic movements as a proxy for a food-related niche market. Therefore, if the restaurants were already participating in a niche market, the owners' opinions of a potential new niche market would be more reliable (Niche Market, 2003). Aggregate website lists of restaurants were used to find the niche market restaurants. From these websites, only restaurant websites that explicitly noted the use of local and/or organic food were contacted.

Phone calls and in person visits were used to ascertain whether the restaurant would be participating. The participants were the first seven who responded positively after initial contact.

Participants in the Lead User study were independent restaurant owners in the central Texas communities of San Marcos, Austin, and Wimberley. These cities were chosen for their population (and therefore market size) as well as their geographic locations, taking advantage of the variety of cultural and geographic influences in the area. The cultural influences include Spanish, English, German, Native American, among others. The geographic influences include the clay soils of the Blackland Prairies, the calcareous soils of the Edwards Plateau, as well as a range of temperatures and rainfall patterns. The total population of all five communities (minus suburbs and nearby communities) is 837,910 with the vast majority of that coming from Austin, with its 790,390 residents (U.S. Census, 2010; U.S. Census 2012). The city of Wimberley was the westernmost of the three cities, and was within the geographic region called the Edwards Plateau. The cities of Austin and San Marcos lie along the Balcones Escarpment, the eastern edge of the Edwards Plateau. This region is the northern range of the Texas Persimmon. The selection of these cities allowed the researchers to investigate the opinions of areas in which the fruit grows naturally. It was assumed that from this a more complete concept of the potential of native crops can be found, due to the variety of cultural, demographic, and geographic ranges.

Lead User Questionnaire

The questionnaire for the lead users was a series of open-ended qualitative questions. These included questions regarding the restaurateurs' perceptions of the niche food qualifiers, "local," "organic," and "native" (Kelley et al., 2006; Nie and Zepeda, 2011; Robinson and Smith, 2002), the participants' sensory perceptions of the fruits being studied (Lawless and Heymann, 1998), and how the restaurateurs chose from where the produce they purchase for their establishment came (Kallas et al., 2011). In addition to attitudes and purchasing habits, the participants were also given a willingness to pay question, adapted from the Intercept survey, which asked them to rank produce prices from different production methods (Helfand et al., 2006; Schubert et al., 2010).

The participants also answered the same demographic questions as those who took the Intercept survey, namely, age, education level, household income and gender. Statements were modeled on those from a previous study (Hustvedt and Dickson, 2009) and were known to be reliable and valid. The answers provided were analyzed through descriptive statistics to discover any underlying trends. These results were then examined along with the results of the Intercept survey.

Distribution of Product

The Lead Users were given half a pound of ripe fruit, so that they could analyze the raw fruit in all its characteristics. The Lead User participants completed a similar questionnaire as the Intercept participants, but the original questionnaires for Lead Users were followed in their versions with a few open-ended questions regarding their specific thoughts and perceptions of the fruit. This method was shown to be reliable and valid in previous Lead User research (Schreier et al., 2007).

Intercept Study

The Intercept portion of research studied the WTP rate and opinions of potential retail consumers. The Intercept model of data collection is a reliable and valid method of data collection where the survey conductor asked passersby if they would like to participate in the survey (Rice and Hancock, 2005). It is a quick and efficient means of gaining quantitative information (Rice and Hancock, 2005).

The Intercept survey consisted of obtaining 384 tests at farmers' markets in San Marcos, Austin, Wimberley, Bastrop, and New Braunfels. This number was considered to be an adequate sample based on previous intercept studies (Haghiri et al., 2009; Krystallis and Chryssohoidis, 2005) and interpretation of Krejcie and Morgan's work on survey sample size (1970). The total population of all five communities is 902,868, with the vast majority of that coming from Austin, with its 790,390 residents (U.S. Census, 2010; U.S. Census, 2012). Due to this disproportionate balance of population, the number of surveys from each location was not proportionately based on the actual percentage of people in each city. Instead, approximately one-third of the total number of surveys (120) came from the four cities other than Austin. The remaining number (264) came from Austin. This was done to ensure that these smaller cities were represented fairly. The demographics of the communities chosen were fairly close to the average demographics of Texas as a whole. The residents were primarily white and/or Hispanic, and on the whole earned about the same income as the average of the state (U.S. Census, 2010; U.S.

Census, 2012). The consistency with which these communities met the averages of Texas was a good indicator that any studies done in this area had the potential to properly represent the state at large.

It was acknowledged that the survey would sample a biased population, namely, those that attend farmers' markets. As has been stated, the purpose of surveying those who attended farmers' markets was that those individuals were predisposed to participating in niche markets such as organic and local, and, therefore, these consumers were more receptive to questions regarding the use of native foods in a niche market context.

Questionnaire

The questionnaire for both groups included Likert scale (1932) questions as well as Contingent Valuation questions, and demographic questions. Likert scale questions measured the participant's opinions on both organic and local food concepts. Contingent Valuation questions measured WTP related to native foods, and local and organic foods. Demographic questions measured age, education, income, and gender. While filling out the questionnaire, the participants were able to see a bowl of the persimmons, so as to better answer the more hypothetical questions.

Likert scale questions were in regard to the general feelings the participants had on subjects related to environmental issues, and consisted of 21 questions. These questions were adapted from Cornelissen, Pandelaere, Warlop, and Dewitte's study of consumer behavior (2008) which generated Cronbach's alpha of 0.84. Some examples of questions included: "Organic agriculture is good for the environment." "All plants and animals play an important role in the environment." and "I bought a product made from native resources in the last year." Respondents answered using a scale that ranged from 5=Strongly Agree to 4=Agree to 3=Undecided to 2=Disagree to 1=Strongly Disagree, with the participant marking the corresponding box with which they most agreed. Alternate Likert questions (7 in total) measured purchasing habits of the participant, in relation to the purchase of local food and the location(s) where they shopped. The answer options for these were 4=Very Often, 3=Often, 2=Occasionally, 1=Rarely, and 0=I don't know. Two additional questions probed the participant's purchasing habits, questioning their use of native products. The answers provided for these questions were 3=Yes, 2=No, 1=I don't know, and 0=Does not apply to me.

The Contingent Valuation (CV) method estimates values for goods not yet in the market, doing so by offering a set of choices with prices attached for the participant to rank (Helfand et al., 2006). In the study, two CV methods were used: a set of prices were suggested in a table of choices, with the different columns displaying similar fruit offered at markets, as well as a set of price premiums. The table contained prices for cherries that were conventionally grown, organically grown, locally grown, and a price for the native fruit of a similar size. The CV table questions were based off of a study by Helfand, Park, Nassauer and Kosek (2006). The prices used were based on estimates from Summer, 2012 prices. The set of price premiums were based on a study by Krystallis and Chryssochoidis (2005), and gave a set of increasing prices. If the participant was not willing to pay more, there was a second question with decreasing prices.

Demographic questions included age, education level, household income and gender.

Both the Lead User and Intercept sections were coded for confidentiality.

Data Analysis

Data were analyzed using descriptive statistics and frequencies. Demographic comparisons using analysis of variance tests were conducted to determine if any groups are more responsive to the introduction of native foods. Pearson’s Product moment tests were also used to measure any possible relationships between groups. The WTP rates of respondents were compared to their demographics and responses to select questions from the survey through the use of an ordered logit model.

CHAPTER IV

Results

Problem Statement

The purpose of this study was to test the consumer willingness to pay (WTP) rate of a native Texas plant fruit product for the restaurant industry as well as for the consumer market.

Objectives

The objectives of the study were to:

1) Determine if the native plant selected for study had potential for marketing to consumers and restaurants in Central Texas by:
   - Conducting an analysis of restaurant owner perspectives of food concepts based in the Lead User concept.
   - Conducting an analysis of local farmers' markets customers' perspectives based on the Intercept Model.
2) Evaluate the consumer and restaurant owners' WTP for the plant product of interest.
3) Test for the existence of a relationship between preference and WTP for native grown food and environmental opinions.

Reliability

A Cronbach's alpha reliability analysis determined the overall instrument to have good reliability (a=0.801) (Gall et al., 2006).

Findings related to Objective One

The first objective of this study was to determine if the native plant selected for study had potential for marketing to consumers and restaurants in Central Texas. Within this objective, there were two goals: to conduct an analysis on restaurant owner perspectives and to conduct an analysis on the perspectives of farmers' market customers. Restaurant owner perspectives were gleaned through interviews and qualitative data analysis. Descriptive statistics were used to tabulate overall results from the farmers' market responses including mean scores on the Native Plant score, the Environmental Attitude score, and the Local Food-User score for the overall sample and within each demographic group.

Restaurant Owner Perspectives

Restaurant owners or head chefs were invited to be interviewed by the researcher concerning their perspectives on organic and local food, as well as their attitudes towards native plant foods. They were also given a taste test of the Texas Persimmon. In addition, information was gathered concerning characteristics of the restaurant such as how much of their food is organic and/or local, how long the business has been in existence, and the restaurant-experience level of the interviewee. Questions were open-ended and resulted in qualitative data which was then organized and tabulated by developing themes. Due to the variety of responses given, three themes were created (positive comments, negative comments, and neutral comments) and each interviewee's response was tabulated accordingly. Each interviewee could register in more than one theme, thus reflecting the mixture of positive, negative, and neutral comments given in the interviews. These results were summarized by frequency of response by the various themes developed. For the questions where facts were needed, rather than attitudes, a simple tabulation was made for each of the responses given, and is presented.

In addition to the qualitative results proffered, the interviewees also answered the same questions concerning WTP and demographics in which those participating in the farmers' market surveys responded. The WTP of the restaurants was calculated using the ordered logit model, as described later, as well as with descriptive statistics for the questions concerning how much more or less they were willing to pay for the Texas Persimmons.

Seven restaurants participated in the interviews. Of these, two were located in San Marcos, two were located in Wimberley, and the other five were located in Austin. When interview appointments were established, it was made clear that the researcher would be interviewing the most executive individual who made choices relating to the food at the restaurants. This was usually the head chef (or derivatives of that title), and was also frequently the owner of the restaurant. Interviews lasted various amounts of time, but were mostly under 30 minutes. This was considered a valid survey, as Lead User survey samples can be quite small (Morse 2000).

Restaurant and Industry Experience

Respondents were asked about their experience both in the restaurant industry, and specifically their experience at their current restaurant. Their time in the industry varied from eight and a half years to 15 years, with all but one respondent having worked in the industry for more than 10 years. As for their time working their particular position in the restaurant, times varied from seven months to six years. The particular positions held by participants included various chef titles such as “Chef-Owner,” “Head Chef,” and “Executive Chef.” Of the duties performed by the participants, the most common had to do with either day-to-day issues such as scheduling employees shifts and ordering products (57%), and/or food management issues (86%).

Restaurant Details

The participants were asked further details about the restaurants, including how much produce was purchased each week, and what proportions were organic or local, and finally, how long the restaurant had been in operation. The amounts of produce purchased each week by the restaurants ranged from approximately 600 lbs to approximately 2500 lbs. Most (71%) of respondents had to give estimates due to the varied nature of the containers in which produce arrived at their restaurants. Of the respondents, two (40%) stated buying 80-90% organic produce. Participants generally (57%) did have even estimates on the amount of produce purchased that was locally produced, and some gave very specific rates (one participant gave the percentage of 24.19% of their produce being locally produced). Estimates included 80-100 lbs/week and 25-30% of their product. The length of time restaurants had been in operation varied from two years to 10 years, with most (71%) being in operation for at least six years.

Organic Food

When asked their attitude concerning the term “organic” as it relates to food, four (57%) responded with positive comments. Examples of positive comments included, "less pollution," "consumer views as great," and simply "positive." Negative reactions totaled three (43%), with examples of negative comments including, "jaded because it's used as a marketing tool," "Used to make food snooty," and "not better for nutrition." Neutral reactions totaled four (57%), with examples of neutral comments including, "sometimes organic is better," "different depending on food, fruits versus root vegetables," and "misunderstood."

Local Food

When asked their attitude concerning the term "local" as it relates to food, seven (100%) responded with positive comments. Examples of positive comments included, "cost-effective," "more important than organic," and simply "in support." Negative reactions totaled two (29%), with examples of negative comments including, "harder to stock everyday stuff year-round," and "customers aren't willing to pay." Neutral reactions totaled three (43%), with examples of neutral comments including, "organic is more expected" (implying that customers look for the term organic more than the term local), "it should supplement the menu," and "it should be from within 40-80 miles."

Native Food

When asked their attitude concerning the term "native" as it relates to food, five (71%) responded with positive comments. Examples of positive comments included, "customers respond well to native," "lends character", and simply "positive." Only one respondent gave a negative attitude towards native (14%), saying it "doesn't do anything. Doesn't carry a lot of weight." Neutral reactions totaled four (57%), with examples of neutral comments including, “tugs at historic heartstrings,” “thinks of foraging,” and “connects sense of nature.”

Taste of Persimmon

When asked their opinions after tasting the Texas Persimmon, five respondents (71%) answered with positive comments. Examples of positive comments included, “good for desserts with sugar,” “sweet taste,” and simply “rich.” There were no negative reactions to the taste of the fruit. Neutral reactions totaled five (71%), with examples of neutral comments including, “like a blueberry and a plum,” “not overly potent,” and curiously, “reminiscent of fish.”

Other Senses

When asked to comment on other sensory experiences with the Texas Persimmon, three respondents (43%) answered with positive comments. Examples of positive comments included, “color is unique, and surprising,” “color is cool for a plate,” and “smell is mild, like rain in El Paso.” Negative reactions totaled three (43%), with examples of negative comments including, “skins are tricky,” “and “color not good for cooking.” Neutral reactions totaled four (57%), with examples of neutral comments including, “color between a blueberry and a cherry,” “smell reminds me of plum,” and “mellow scent.”

Likelihood of Purchase of Persimmon in the Restaurant

When asked whether they would consider purchasing the Texas Persimmon for their restaurant, five respondents (71%) answered with positive comments. Examples of positive comments included, “appealing because of rarity,” “would purchase,” and “that it was unique and fun." Negative reactions totaled two respondents (29%), with examples of negative comments including that they would have to use it as a sauce "because of the seeds," "and "difficult because of seeds, skins, and processing." Neutral reactions totaled five (71%), with examples of neutral comments including, "trial period," and "needs to be organic also."

Offer of Native Fruit on Menu

When asked whether they would consider incorporating native fruit into their menu, seven respondents (100%) answered with positive comments. Examples of positive comments included, "part of identity," "a good component," and "customers would respond well." Neutral reactions totaled four respondents (57%), with examples of neutral comments including, "type of restaurant is important," and "not necessarily known for that."

Produce Properties

When asked about properties they looked for when purchasing produce for the restaurant, commonly mentioned responses included "freshness," "seasonality," "location" (meaning that it came from a local producer), and "quality."

Descriptive Statistics of Lead Users

Of those interviewed, approximately 86% (6) were between the ages of 25-34, and approximately 14% (1) were between the ages of 35-49. Additionally, approximately 71% (5) were male (Table 1).

Approximately 86% (6) of respondents were Caucasian, and a further 14% (1) were Hispanic (of any race) (Table 1).

Household incomes varied slightly more among respondents, with approximately 43% (3) earning between $25,000 and $34,999 per year, 29% (2) earning between $35,000 and $74,999 per year, 14% (1) earning between $75,000 and $99,999 per year, and another 14% (1) earning between $100,000 and $149,999 per year (Table 1).

Finally of those surveyed, five respondents had received Bachelor's degrees, and five had received Associates' degrees from culinary schools. There was an overlap of degree types earned by this group, and because the degrees were associated with the respondents' areas of expertise, totals of both degree types earned were reported (Table 1).

Table 1. Demographic analysis of the overall Lead User sample by age, gender, ethnic group, household income, and level of education achieved in the study of the market viability of native Texas Persimmon as a food source.

Variable	Sample size (no. participants)	Sample size (%)
Age		
25-34	6	85.7
35-49	1	14.3
Gender		
Male	5	71.4
Female	2	28.6
Ethnic Group		
Caucasian	6	85.7

Table 1 Continued

Hispanic	1	14.3
Household Income		
Between $25,000 and $34,999 per year	3	42.9
Between $35,000 and $74,999 per year	2	28.6
Between $75,000 and $99,999 per year	1	14.3
Between $100,000 and $149,999 per year	1	14.3
Level of Education Achieved[z]		
Associate's Degree	5	
Bachelor's Degree	5	

[z]Level of Education achieved represents multiple degrees for this table only. This is a reflection of some of the participants earning both a culinary school degree (Associate's Degree) as well as a Bachelor's degree. Because of this, sample size percentage is invalid.

Descriptive Statistics of Intercept Survey Respondents

A total of 400 farmers' market attendees responded to the Intercept method questionnaire. This was considered more than adequate according to Krejcie and Morgan's (1970) study on appropriate sample sizes given the total overall population of the Central Texas cities of Austin, San Marcos, New Braunfels, Wimberley, and Bastrop, which totaled 902,868 people. Of the five cities, Austin is much larger than the four other cities combined, with more than 700,000 people within the city limits. Due to this disproportionate balance of population, the number of surveys from each location was stratified to ensure that the smaller cities of New Braunfels, San Marcos, Bastrop, and Wimberley were represented fairly. Approximately one-third of the total number of surveys (152) came from the smaller cities. The remaining number (248) came from Austin. Of all the surveys, 62% (248) were from the Austin farmers' markets, 17% (71) from the New Braunfels market, 10% (40) from the San Marcos market, 5% (21) from the Wimberley market, and another 5% (20) from the Bastrop market.

Of the respondents, approximately 8% (34) were under the age of 25; 30% (122) were between the ages of 25 and 34; 23% (93) were between the ages of 35 and 49; 28% (115) were between the ages of 50 and 64, and 7% (30) were 65 years or older. Additionally, approximately 67% (265) were female (Table 2).

Approximately 75% (302) of respondents indicated they were Caucasian; 9% (37) indicated Hispanic (of any race); 5% (20) responded Asian/Pacific Islander; 2% (9) indicated African-American, and 5% (23) said they were another ethnic group (Table 2).

The respondents' annual household income was approximately distributed: 11% (44) earned less than $14,999; 6% (27) earned between $15,000 and $24,999; 11% (45) earned between $25,000 and $34,999; 27% (110) earned between $35,000 and $74,999; 12% (48) earned between $75,000 and $99,999; 13% (53) earned between $100,000 and $149,999, and 10% (43) earned $150,000 or more (Table 2).

Finally, when asked their level of education, less than 1% (2) had achieved less than 9th grade; less than 1% (3) had earned between 9th grade and 12th grade, but had not achieved a diploma; 1% (5) had received a high school diploma or equivalent; 19% (76) had achieved some amount of college, but no degree; 7% (30) had achieved an associate degree; 38% (152) had received a Bachelor's degree; 2% (10) had progressed through trade school, and 28% (114) had received a graduate or professional degree (Table 2).

These results generally did not match the actual demographics of the five cities (U.S. Census Bureau, 2012). The age of the respondents were more heavily weighted towards older demographic groups with 81% of the respondents being between 25 and 64, as opposed to the actual demographics, where 61% are between 25 and 64. The gender indicated in the questionnaire results was disproportionately female (67%), compared to the near even 50/50 split in the actual demographics. The stated ethnicities of the surveys were disproportionately Caucasian (75%), compared to the actual demographics of the cities (53%). Finally, 66% of the sample stated they had achieved either a Bachelor's degree or a graduate degree, compared to 43% from the actual demographic. The only result that most closely resembled those found in the census was the income level of the respondents, with 27% earning between $35,000 and $74,999, compared to the 35% in the actual demographics. However, when the results of the questionnaire were compared to other studies involving farmers' markets, they were much more comparable to the sample. In the Wolf et al. study (2005), the average participant was a woman (64%) between 25 and 60 (63%), with an income of between $30,000 and $64,999 (45%), whom had at least her bachelor's degree, if not a graduate degree (55%).

Table 2. Demographic analysis of the overall Intercept method sample by age, gender, ethnic group, household income, and level of education achieved in the study of the market viability of native Texas Persimmon as a food source.

Variable	Sample size (no. participants)[z]	Sample size (%)
Age		
Under 25	34	8
25-34	122	30
35-49	93	23
50-64	115	28
65+	30	7
Gender		
Male	128	32
Female	265	67
Ethnic Group		
Caucasian	302	75
Hispanic	37	9
African American	9	2
Asian/Pacific Islander	20	5
Other	23	5
Household Income		
Less than $14,999 per year	44	11
Between $15,000 and $24,999 per year	27	6
Between $25,000 and $34,999 per year	45	11

Table 2 Continued

Between \$35,000 and \$74,999 per year	110	27
Between \$75,000 and \$99,999 per year	48	12
Between \$100,000 and \$149,999 per year	53	13
More than \$150,000 per year	43	10
Level of Education Achieved		
Less than 9^{th} Grade	2	<1
Between 9^{th} and 12^{th} Grade, but no Diploma	3	<1
High School Diploma or Equivalent	5	1
Some College	76	19
Associate's Degree	30	7
Bachelor's Degree	152	38
Trade School	10	2
Graduate or Professional Degree	114	28

^{z}Number of respondents for each category varied due to non-responses.

Farmers' Market Intercept Method Survey

Native Plant Use score

Respondents at farmers' markets were asked two questions relating to their use of native plants (Native Plant Use score). The Native Plant Use score required respondents to report whether they used native plants in their landscape or garden or bought food products made from native plants in the last year. Questions asked were: "I bought a product made from a native Texas plant in the last year," and "My family and I have planted native Texas plants in the last year." The possible responses were, "Yes," "No," "I Don't Know," and "Not Applicable." Responses of "Yes" received four points. Responses of "I Don't Know" received three points. Responses of "No" received two points, and responses of "Not Applicable" received zero points. Non-responses to questions were left uncoded. The response "I don't know" received more points than the responses of "No" and "Not Applicable" because, while the respondent is not answering positively, they are also not giving a negative response. Since the Native Plant Use score is measuring whether or not they have made use of native plants, a response of "I don't know" would denote that the respondent acknowledges that they may have used a native plant, but are not sure.

Descriptive statistics were used to tabulate overall results including mean scores on the Native Plant Use score for the overall sample. Respondents were classified on a scale of low, medium, and high native plant use, based on their Native Plant Use score with this scale ranging from zero points to 8 points. Individuals with a score of zero to two points (indicating most responses scored one point or less) were classified as having a "null native plant use" because respondents' answers for questions were the response "not applicable." Those with a score of three to four points (indicating most responses scored one or two points) were classified as having "low native plant use." Those with a score from five to six (indicating most responses scored three or fewer points) were classified as having "medium native plant use," and those with a score of seven to eight (indicating at least one of their responses scored four points, and the other either three or four points) were classified as having "high native plant use." Respondents included 16 participants classified having a null native plant use (4%), 26 participants with no/low native plant use (7%), 106 participants with medium native plant use (27%), and 251 participants with high native plant use (63%). The mean overall score for all the respondents on the Native Plant Use score was 6.82, or a medium to high native plant use (Fig. 1) (Table 3).

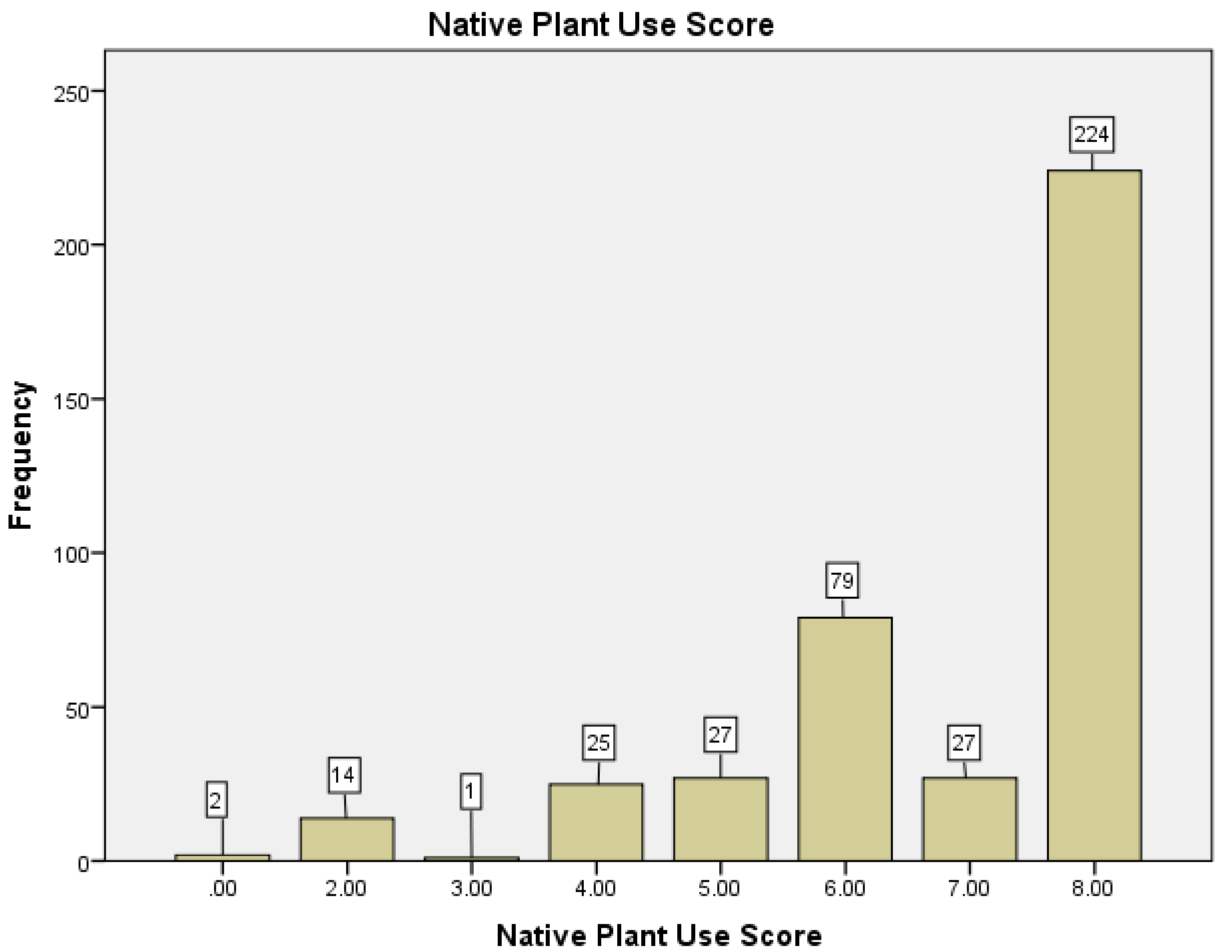

Figure 1. Bar graph indicating frequency of Native Plant Use score in the study of the market viability of native Texas Persimmon as a food source.

[z]Native Plant Use questions were adapted from Cornelissen, Pandelaere, Warlop, and Dewitte's study of consumer behavior (2008).

[y]Native Plant Use score ranged from zero points to eight points. Greater Native Plant Use score indicated a greater use of native plants and a lower Native Plant Use score indicated a lesser use of native plants.

Table 3. Descriptive statistics indicating frequency of responses to statements in the Native Plant Use score[z] in the study of the market viability of native Texas Persimmon as a food source.

Statement	Does Not Apply to Me (1)		No (2)		I Don't Know (3)		Yes (4)		Mean (Out of viable range)	SD
	(no.)	(%)	(no.)	(%)	(no.)	(%)	(no.)	(%)		
Native Plant Use score[y]									6.82	1.65
I bought a product made from a native Texas plant in the last year.	19	4.8	18	4.5	54	13	306	77.1	3.63	0.78
My family and I have planted native Texas plants in the last year.	38	9.5	81	20.4	28	7.0	250	62.8	3.24	1.08

[z]Native Plant Use questions were adapted from Cornelissen, Pandelaere, Warlop, and Dewitte's study of consumer behavior (2008).

[y]Native Plant Use score ranged from zero points to eight points. Greater Native Plant Use score indicated a greater use of native plants and a lower Native Plant Use score indicated a lesser use of native plants.

Findings related to Objective Two

The second objective of this study was to evaluate the consumer and restaurant owners' WTP for the plant product of interest. An ordinal logit model was used to ascertain this, wherein the respondents' WTP rate was calculated and compared to the other scores obtained from the questionnaire, the Native Plant Use score, the Environmental Attitude score, and the Local Food-User score (the latter two of which will be discussed later). This comparison resulted in a set of probabilities as to whether or not a respondent would pay more for the Texas Persimmon, based on their scores.

Respondents were asked two questions relating to their WTP. The questions both put forward a hypothetical situation presenting a pound of Texas Persimmons for $2.99. One question asked how much more they would be willing to pay in increasing increments of 10 cents from $0.10 cents to a maximum of $0.70 cents, with the options of "Other" and "None of the above" as alternatives. If "None of the above" was chosen, respondents would continue to the next question asking how much less they were willing to pay, in the same increments and the same range as the first question, with the opt-out answers of "Other" and "I would not be willing to pay for Texas Persimmons, no matter the price." These questions were adapted Krystallis and Chryssochoidis (2005).

The responses given were coded as one range of answers between the two questions with a value of zero being assigned to, "I would not be willing to pay for Texas Persimmons, no matter the price," and the value of 16 given to the "Other" response in the positive range of price options, and the intervening responses valued according to their place in between those two values. These codes were combined into one range of possible scores, as both questions were asking, essentially, the same question, and any who provided positive responses would, by the nature of the questions, not provide negative responses, therefore, one range could be applied to all possible answers. These responses gave one WTP rate for each respondent, the results of which are broken down as follows: respondents included 26 participants not wanting to pay for the Texas Persimmon at all (6.5%), 9 participants who would pay another price besides those offered, but lower than the positive values offered (2.3%), 3 participants who would pay $0.70 cents less (0.8%), 1 participant who would pay $0.50 cents less (0.3%), 1 participant who would pay $0.40 cents less (0.3%), 4 participants who would pay $0.10 cents less (1%), 11 participants who would pay $0.10 cents more (2.8%), 17 participants who would pay $0.20 cents more (4.3%), 22 participants who would pay $0.30 cents more (5.5%), 15 participants who would pay $0.40 cents more (3.8%), 78 participants who would pay $0.50 cents more (19.5%), 37 participants who would pay $0.60 cents more (9.3%), 101 participants who would pay $0.70 cents more (25.3%), and 61 participants who would pay a higher price other than those offered, and higher than the negative values (as they did not select a lower price); i.e., the positive “Other” response (15.3%) (Fig. 2). The average WTP rate was a $12.36, or between “$0.40 more” and “$0.50 more” than the base price of $2.99, or between $3.39 and $3.49 for a pound of Texas Persimmons.

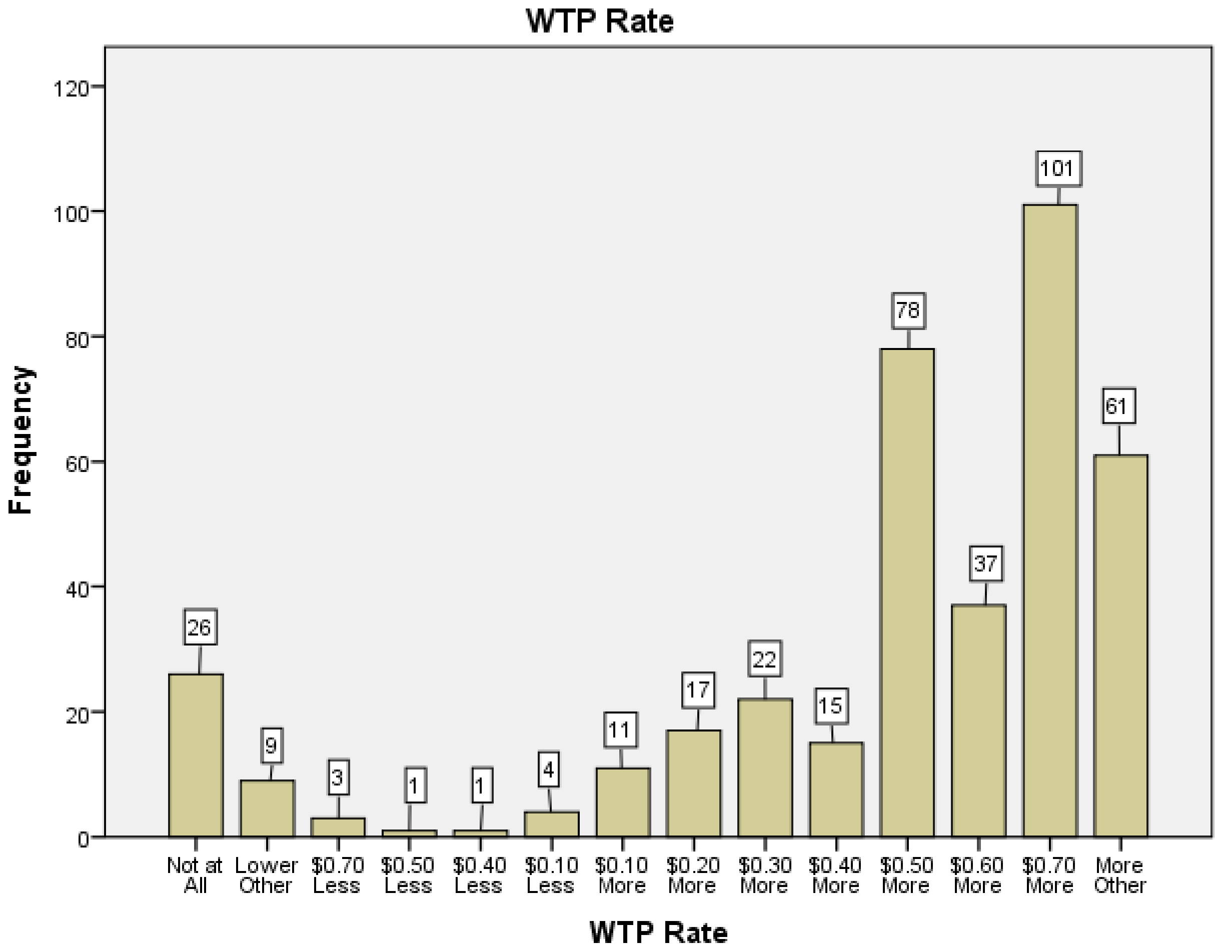

Figure 2. Bar graph indicating frequency of WTP rates in the Intercept method survey section of study of the market viability of native Texas Persimmon as a food source.

There were a number of strong predictors which came out of the ordinal logit model. When asked how often they shopped at a box store, those whom responded "Rarely (<24% of the time)" (29.9% of respondents) were more likely to pay more for the Texas Persimmon (*a*=0.010). When asked how often they purchased locally produced fresh produce, those whom responded "Rarely (<24% of the time)" (0.8% of respondents) were less likely to pay more for the Texas Persimmon (*a*=0.015), as were those whom responded “Occasionally (25-49% of the time)” (4% of respondents) (*a*=0.001). Participants were asked whether they take ecological considerations into account when buying products. Those whom responded either “Disagree,” (3.8% of respondents) “Undecided,” (14.8% of respondents) or “Agree” (49.1% of respondents) were all less likely to pay more for Texas Persimmon (*a*=0.013, 0.000, and 0.005, respectively). When they were asked whether they preferred to buy locally, those whom responded “Agree” (30.3% of respondents) were less likely to pay more for Texas Persimmon (*a*=0.002). When participants were asked whether “USDA Certified Organic” agriculture was important to them, those whom responded “Undecided” (7.8% of respondents) were less likely to pay more for Texas Persimmon (*a*=0.043). When participants were asked whether they thought of themselves as environmentally responsible shoppers, those whom responded either “Undecided” (8.5% of respondents) or “Agree” (53.3% of respondents) were less likely to pay more for Texas Persimmon (*a*=0.005 and 0.009, respectively) (Table 4). From the results found in the use of the Ordered Logit Model, researchers found very few indicative results as to who would be the ideal consumer of the Texas Persimmon.

Full results of questionnaire, including non-significant results are found in Appendix A.

Table 4. Ordered Logit Model test comparing WTP rate with individual survey statement responses in the Intercept method survey section of study of the market viability of native Texas Persimmon as a food source.

	Estimate[z]	Std. Error	Wald	df	*P*
Shopping Habits					
Box Store					
Rarely (<24% of the time)	0.711	0.274	6.714	1	0.010*
Local Produce					
Rarely (<24% of the time)	-1.260	0.521	5.863	1	0.015*
Occasionally (25-49% of the time)	-1.023	0.302	11.485	1	0.001*
Ecological Considerations					
Disagree	-1.313	0.531	6.124	1	0.013*
Undecided	-1.307	0.340	14.805	1	0.000*
Agree	-0.634	0.228	7.735	1	0.005*
Buying Local					
Agree	-0.685	0.223	9.424	1	0.002*
USDA Organic					
Undecided	-0.772	0.382	4.090	1	0.043*
Environmentally Responsible					
Undecided	-1.191	0.420	8.047	1	0.005*
Agree	-0.705	0.270	6.800	1	0.009*

[z]Estimates are logarithmic in value.
*Statistically significant at the 0.05 level.

Another ordered logit model was used to compare respondents' Native Plant Use score, Environmental Attitude score, and Local Food Use scores with their WTP rate for Texas Persimmons. This would measure WTP significance on a more aggregate scale. If a respondent attained a score of 12 on their Environmental Attitude score (which would categorize them as having a “mediocre environmental attitude”), it was less likely that they would pay more for Texas Persimmons (*a*=0.000). However, very small portion of respondents earned a score of 12 (0.3%). It was also less likely that they would pay more for Texas Persimmons if they received a score of 18, 19, 20, or 21 (*a*=0.027, 0.037, 0.010, and 0.047, respectively), which were respondents classified as a “mediocre environmental attitude” (scores of 18, 19, 20) and a “positive environmental attitude” (score of 21). This would indicate that when comparing respondents’ Environmental Attitude with their WTP rate, more than a third of the respondents (39.9%) were less likely to pay more for the Texas Persimmon, given their classification of “mediocre” to low “positive” Environmental Attitude scores. There were no statistically significant patterns for Local Food-Use score or Native Plant Use score, when compared to the WTP rate (Table 5).

Full results of aggregate score, including non-significant results are found in Appendix B.

Table 5. Ordered Logit Model test comparing WTP rate with respondents’ aggregate scores in the Intercept survey section of study of the market viability of native Texas Persimmon as a food source.

	Estimate[z]	**Std. Error**	**Wald**	**df**	***P***[*]
Environmental Attitude score					
12	-23.768	2.189	117.848	1	0.000*
18	-1.063	0.480	4.902	1	0.027*
19	-0.931	0.445	4.369	1	0.037*
20	-0.891	0.346	3.933	1	0.037*
21	-0.730	0.368	3.653	1	0.010*

[z]Estimates are logarithmic in value.

*Statistically significant at the 0.05 level.

In summation, the only group that was willing to pay more for Texas Persimmon was those who “Rarely (<24% of the time)” shopped at box stores, when using an individual comparison ordinal logit model comparing WTP with their survey responses.

In addition to the two questions contributing to the WTP which listed prices in 10 cent increments, participants also were asked to rank four different choices in a hypothetical market situation. Their choice was to reflect the order of the probability of purchase of the items given fruit choice and the established prices in order of preference from one to four, their least likely choice to their most likely choice. The choices to be ranked included, “Cherries grown using fertilizers and pesticides” (“$2.99 for a 12 oz. container”), “Cherries grown in a USDA Certified Organic method” (“$3.99 for a 12 oz. container”), “Cherries grown within the Central Texas Area” (“$3.49 for a 12 oz. container”), and “Native fruit Texas Persimmon (similar in sweetness to cherries, with a larger pit)” (“$4.99 for a 12 oz. container”).

Responses were analyzed using an ordered logit model. The choice of “Native fruit Texas Persimmon (similar in sweetness to cherries, with a larger pit)” was given a value of four because the focus of the study was to investigate the WTP for a native fruit. The choice of “Cherries grown within the Central Texas Area” was given the value of three because the “local” food term was the most desired food quality in previous studies concerning farmers’ markets. The choice “Cherries grown in a USDA Certified Organic method” was given the value of two because, while it is one of the proxy terms used in this study to compare native plants to other niche markets (like the “local” term), “organic” was cited as a less important quality than “local” in previous farmers’ market studies. Finally, the choice “Cherries grown using fertilizers and pesticides” was given a value of one because it represented conventional agriculture, which is used outside of niche markets. Since the study was focused on niche markets, this meant that conventional should be the least valued choice.

Each rank given to each option was multiplied by the value given to the corresponding option. The products of the multiplications were then added together to form each respondent’s contingent valuation (CV) score. This score reflects the value each respondent gave to the four choices in an aggregate score, in which valid values range from 20-30. Lower values signify that the respondent was less inclined to pay for niche market choices such as locally-produced cherries and Texas Persimmons. Higher values signify that the respondent was more inclined to pay for niche market choices. Values lower than 20 reflect respondents who did not rank all four choices. Of the valid responses, 71 (21%) obtained a 20 for their CV score, 101 (29.9%) obtained a 21, two (0.6%) obtained a 22, 87 (25.7%) obtained a 23, 35 (10.4%) obtained a 24, three (0.9%) obtained a 25, 10 (3%) obtained a 26, 17 (5%) obtained a 27, one (0.3%) obtained a 28, seven (2.1%) obtained a 29, and four (1.2%) obtained a score of 30 (Fig. 3). Values from 20 through 23 are categorized as a “low CV,” values from 24 through 27 are categorized as a “medium CV,” and values from 28 to 30 are categorized as a “high CV.” There were 261 (77.2%) respondents in the “low CV” category, 65 (19.3%) respondents in the “medium CV” category, and 12 (3.6%) respondents in the “high CV” category. The average CV score was a 22.4, meaning that the average respondent valued the food terms "organic" and "conventional" higher than they valued "local" or "native".

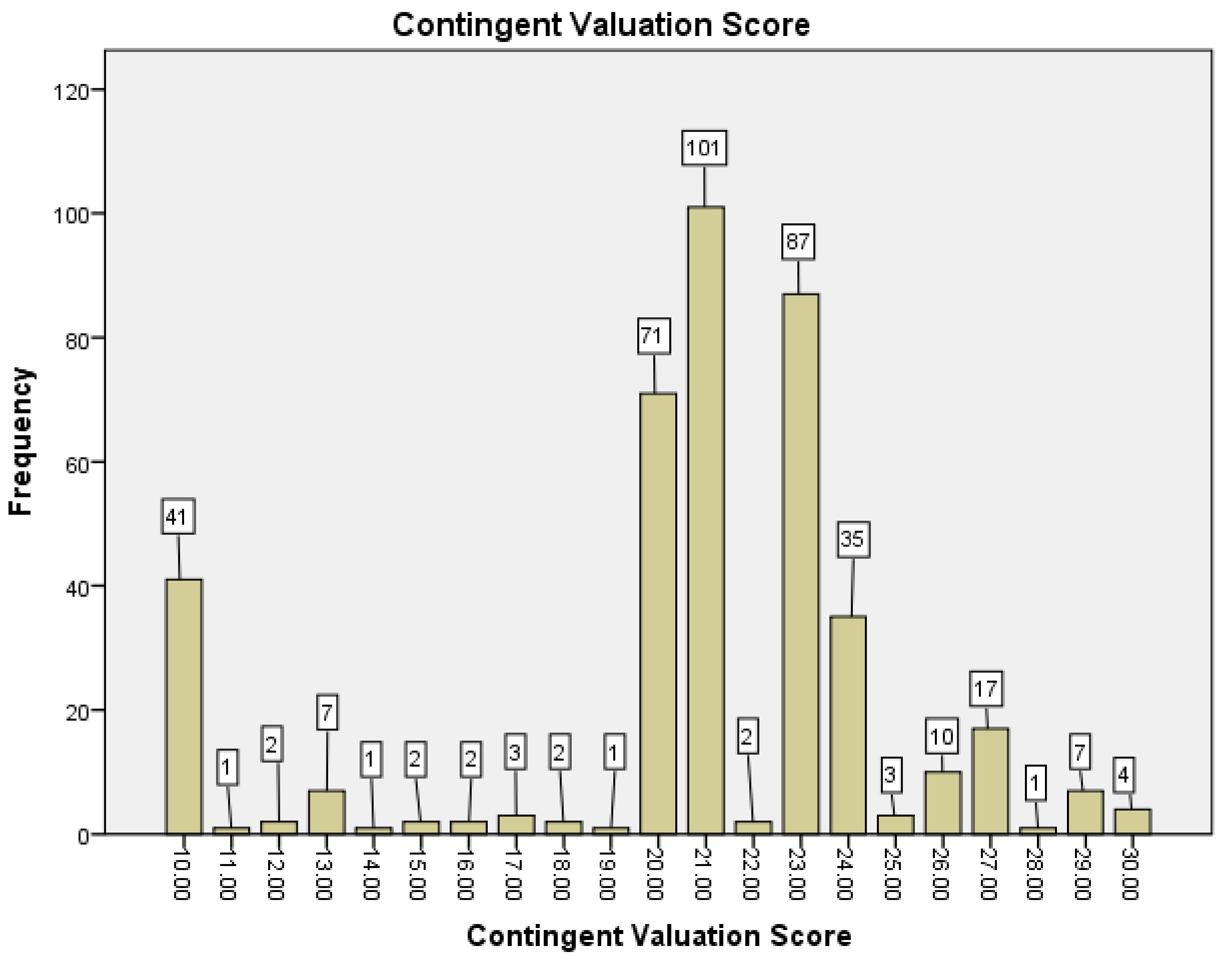

Figure 3. Bar graph indicating frequency of CV scores in the Intercept survey section of the study of the market viability of native Texas Persimmon as a food source.

The CV scores were measured against select survey questions responses, demographics, and the WTP rate, the Native Plant Use score, the Environmental Attitude score, and the Local Food-Use score. Results are as follows.

Of those who “Rarely (<24% of the time)” “Occasionally (25-49% of the time)” or “Often (50-75% of the time)” shop at box stores, all are less likely to have higher CV scores (*a*=0.000, 0.000, and 0.003 respectively). When asked how often they bought locally produced produce, those who responded “I Don’t Know” were more likely to have higher CV scores (*a*=0.001). When asked whether each individual should be aware of environmental concerns, those who responded “Disagree” were more likely to have higher CV score (*a*=0.034). Those who were “Undecided” on either whether they took ecological considerations into account when shopping or viewed themselves as an environmentally responsible shopper were both more likely to have a higher CV score (*a*=0.013 and 0.037 respectively) (Table 6).

Table 6. Ordered Logit Model test comparing CV score with individual survey statement responses in the Intercept method survey section of study of the market viability of native Texas Persimmon as a food source.

	Estimate^{z}	**Std. Error**	**Wald**	**df**	***P***
Shopping Habits					
Box Store					
Rarely (<24% of the time)	-1.150	0.277	17.220	1	0.000*
Occasionally (25-49% of the time)	-1.080	0.309	12.167	1	0.000*
Often (50-75% of the time)	-0.732	0.244	9.017	1	0.003*
Local Produce					
I Don’t Know	3.855	1.147	11.287	1	0.001*

Table 6 Continued

Each individual should be aware of environmental concerns					
Disagree	2.366	1.117	4.490	1	0.034*
Ecological Considerations					
Undecided	0.924	0.373	6.151	1	0.013*
Environmentally Responsible					
Undecided	0.933	0.448	4.332	1	0.037*

[z]Estimates are logarithmic in value.
*Statistically significant at the 0.05 level.

When reporting their age, those who responded “Under 25 Years” were more likely to have higher CV scores (*a*=0.008). Those who reported their level of education as being either “9th to 12th Grade, no diploma” or “Some college, no degree” were both less likely to have higher CV scores (*a*=0.005 and 0.016 respectively) (Table 7). These results would indicate that younger respondents were more likely to pay more for the Texas Persimmon, and that those with less education are less likely to pay more.

Table 7. Ordered Logit Model test comparing CV score with demographic responses in the Intercept method survey section of study of the market viability of native Texas Persimmon as a food source.

	Estimate[z]	Std. Error	Wald	df	*P*
Age					
Under 25 Years	1.318	0.499	6.963	1	0.008*
Education Level					
9th to 12th Grade, no diploma	-3.340	1.188	7.898	1	0.005*
Some college, no degree	-0.703	0.293	5.751	1	0.016*

[z]Estimates are logarithmic in value.

*Statistically significant at the 0.05 level.

Full results of select survey questions and demographics including non-significant results are found in Appendix C.

Finally, when aggregate scores were compared to the CV scores of respondents, most of the significant results indicated a higher likelihood of a higher a CV score. Those with Environmental Attitude score of 15 or 19 were both more likely to have a higher CV score (*a*=0.002 and 0.023 respectively). Those with a WTP rate of two, eight, or 13 were all more likely to have a higher CV score (*a*=0.015, 0.003 and 0.028 respectively). The rates of two and eight (meaning willing-to-pay "$0.70 less" and "$0.10 less", respectively) being more likely to have a higher CV could be seen as meaning that they value the niche markets offered (local and native), but that the starting price offered for the Texas Persimmon was too high for them to consider paying. The rate of 13 (or willing-to-pay "$0.50 more") having a higher likelihood of a higher CV value would indicate that "$0.50 more" than the base price of $2.99 might be an ideal amount at which to offer the Texas Persimmon. Meanwhile, those who obtained either a two or a six on their Native Plant Use score were both less likely to have a higher CV score (*a*=0.022 and 0.036 respectively) (Table 8). A Native Plant Use score of two is placed in the "null native plant use" category, so it would follow that such respondents would value the niche markets at a lower value, as they either felt that neither Native Plant Use question was applicable to them, or they did not answer one or both questions. A Native Plant Use score of six places the respondent in the "medium native plant use" category. That such respondents would more likely attain lower CV values might be connected with the cost of the niche market choices in the CV table of choices.

Table 8. Ordered Logit Model test comparing CV score with respondents' aggregate scores in the Intercept method survey section of study of the market viability of native Texas Persimmon as a food source.

	Estimate[z]	Std. Error	Wald	df	*P*
Environmental Attitude score					
15	2.933	0.929	9.977	1	0.002[*]
19	1.037	0.454	5.206	1	0.023[*]
Native Plant Use score					
2	-1.280	0.557	5.275	1	0.022[*]
6	-0.557	0.265	4.412	1	0.036[*]
WTP rate					
2	2.673	1.098	5.922	1	0.015[*]
8	2.810	0.952	8.723	1	0.003[*]
13	0.742	0.338	4.820	1	0.028[*]

[z]Estimates are logarithmic in value.
[*]Statistically significant at the 0.05 level.

Full results of aggregate score comparisons including non-significant results are found in Appendix D.

WTP of Restaurateurs

In addition to the Intercept portion of the survey conducted at farmers' markets, the restaurateurs interviewed for the Lead User portion also had both a WTP rate and a CV score calculated from their responses. As the Lead User group only responded to the WTP rate questions, the CV score table, and the demographic questions, data gleaned from their responses is more limited.

Of those interviewed, all were willing to pay more for the Texas Persimmon when asked for a specific price above or below the median of “$2.99.” Specifically one respondent was willing to pay “$0.30 more” (14.3%), two respondents were willing to pay “$0.60 more” (28.6%), one respondent was willing to pay “$0.70 more” (14.3%), and three respondents were willing to pay “Other” (on the positive end of the spectrum) (42.9%) (Fig.4). The mean WTP rate for the Lead Users was 14.57, meaning that they were willing to pay between “$0.60 more” and “$0.70 more” than the base price of $2.99 for a pound of Texas Persimmon, or between $3.59 and $3.69.

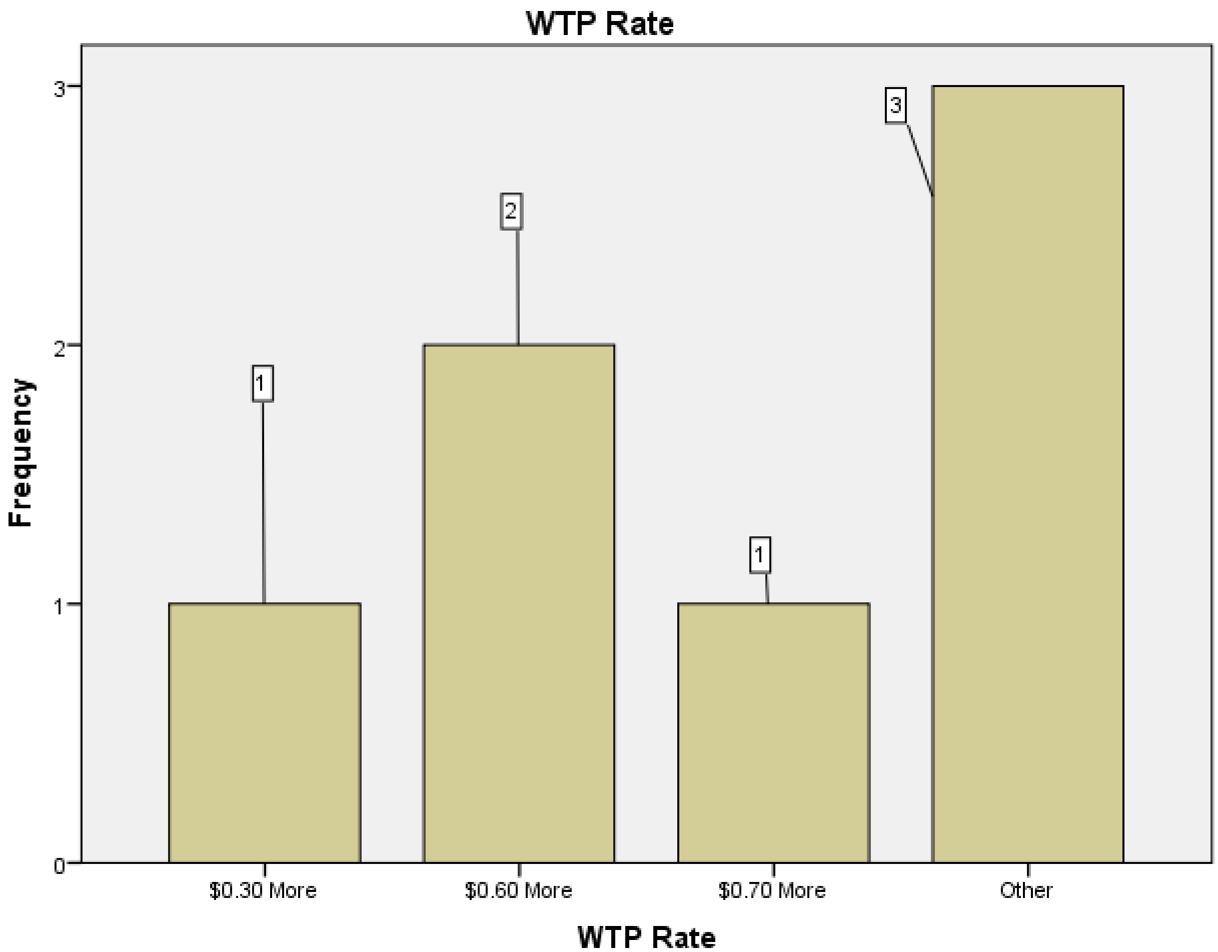

Figure 4. Bar graph indicating frequency of WTP rates in the Lead User section of the study of the market viability of native Texas Persimmon as a food source.

There were no strong indicators when an ordered logit model was applied to the WTP rate of the restaurateurs, and compared to their demographics.

Interviewees' CV scores were calculated from their responses in the same manner as those of the Intercept method portion of the survey. All seven participants' responses were valid (meaning that all four choices were given a rank), one interviewee (14.3%)

obtained a score of 25, two (28.6%) obtained a 27, and four (57.1%) obtained a 29 (Fig. 5). The mean CV score for Lead Users was 27.86, meaning that they valued the food terms “local” and “native” higher than the terms “organic” or “conventional,” which would translate to the high end of the category of “medium CV.”

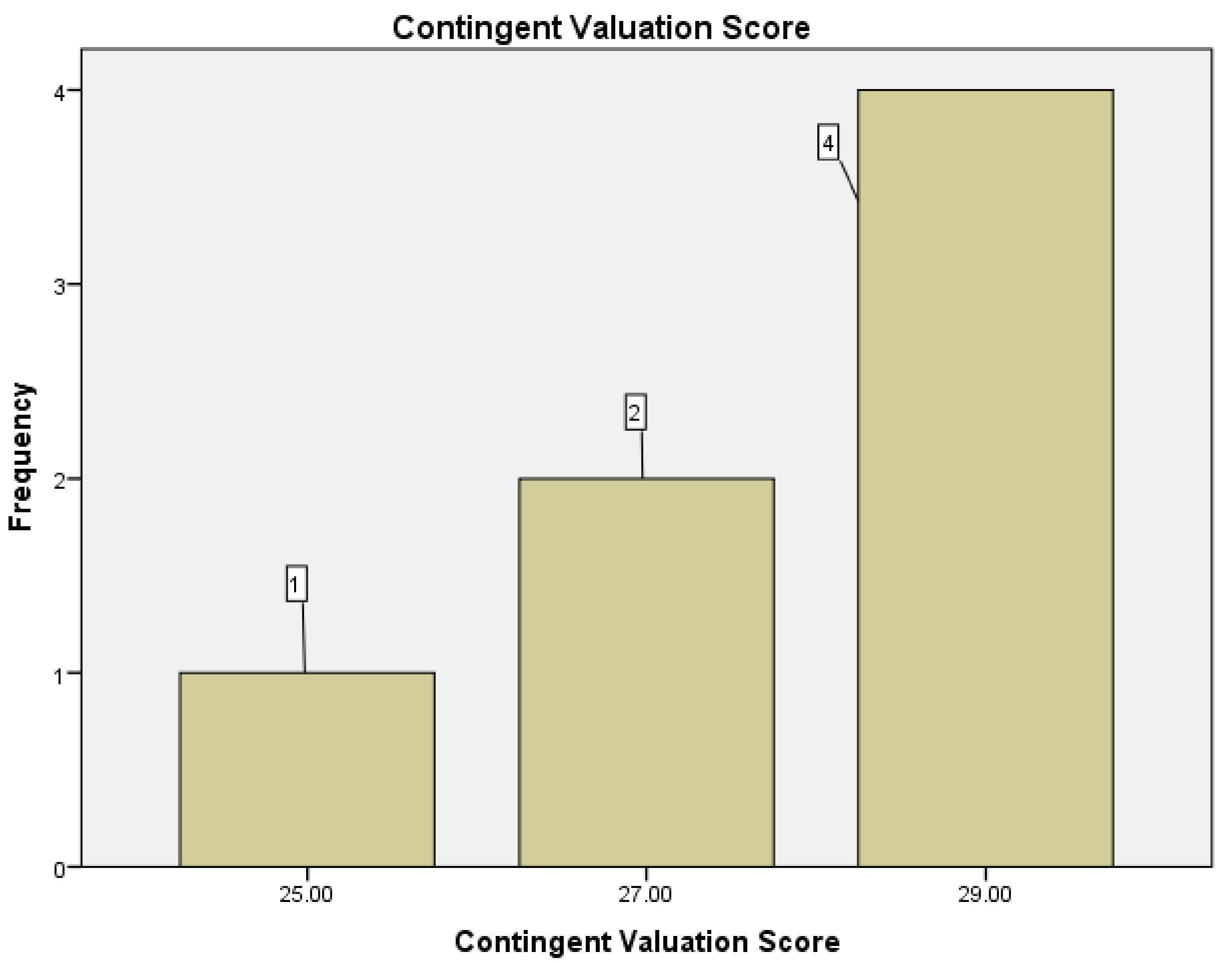

Figure 5. Bar graph indicating frequency of CV scores in the Lead User section of the study of the market viability of native Texas Persimmon as a food source.

Demographic Comparisons Among Lead Users

There were no strong indicators when an ordered logit model was applied to the CV score of the restaurateurs, and compared to their age, gender, income, education, or ethnicity. This is most likely due to the small sample size.

Findings related to Objective Three

The third objective of this study was to test for the existence of a relationship between preference and WTP for locally grown food and environmental opinions among the Intercept method respondents.

Instrument Scoring

Environmental Attitude score

Respondents were asked five questions relating to their environmental attitude (Environmental Attitude score). Examples of questions included, “I believe that I behave in an environmentally-conscious way,” “When I buy a product, I take ecological considerations into account,” and “All plants and animals play an important role in the environment.” Possible answers were “Strongly Agree,” “Agree,” “Undecided,” “Disagree,” and “Strongly Disagree.” Responses of “Strongly Agree” received five points, while responses of “Agree” received four points, responses of “Undecided” received three points, responses of “Disagree” received two points, and responses of “Strongly Disagree” received one point. Non-responses to questions were left uncoded.

Respondents were classified as having poor, mediocre, and positive environmental attitudes based on their Environmental Attitude scores. Possible scores ranged from zero to 25 points. Individuals with scores of ten or fewer points (indicating most responses were two or fewer points) were classified as having “poor environmental attitudes,” while those with scores from eleven to 20 (indicating most responses were four or fewer points) were classified as having “mediocre environmental attitudes,” and those with scores of 21 to 25 (indicating at least one of their responses scored five points, and the other responses either four or five points) were classified as having “positive environmental attitudes.” Respondents included no participants with poor environmental attitudes (0%), 64 participants with mediocre environmental attitudes (16%), and 336 participants with positive environmental attitudes (84%). The mean overall score for all respondents on the Environmental Attitude score was 21.80, indicating, on average, respondents had positive environmental attitudes (Fig. 6) (Table 9).

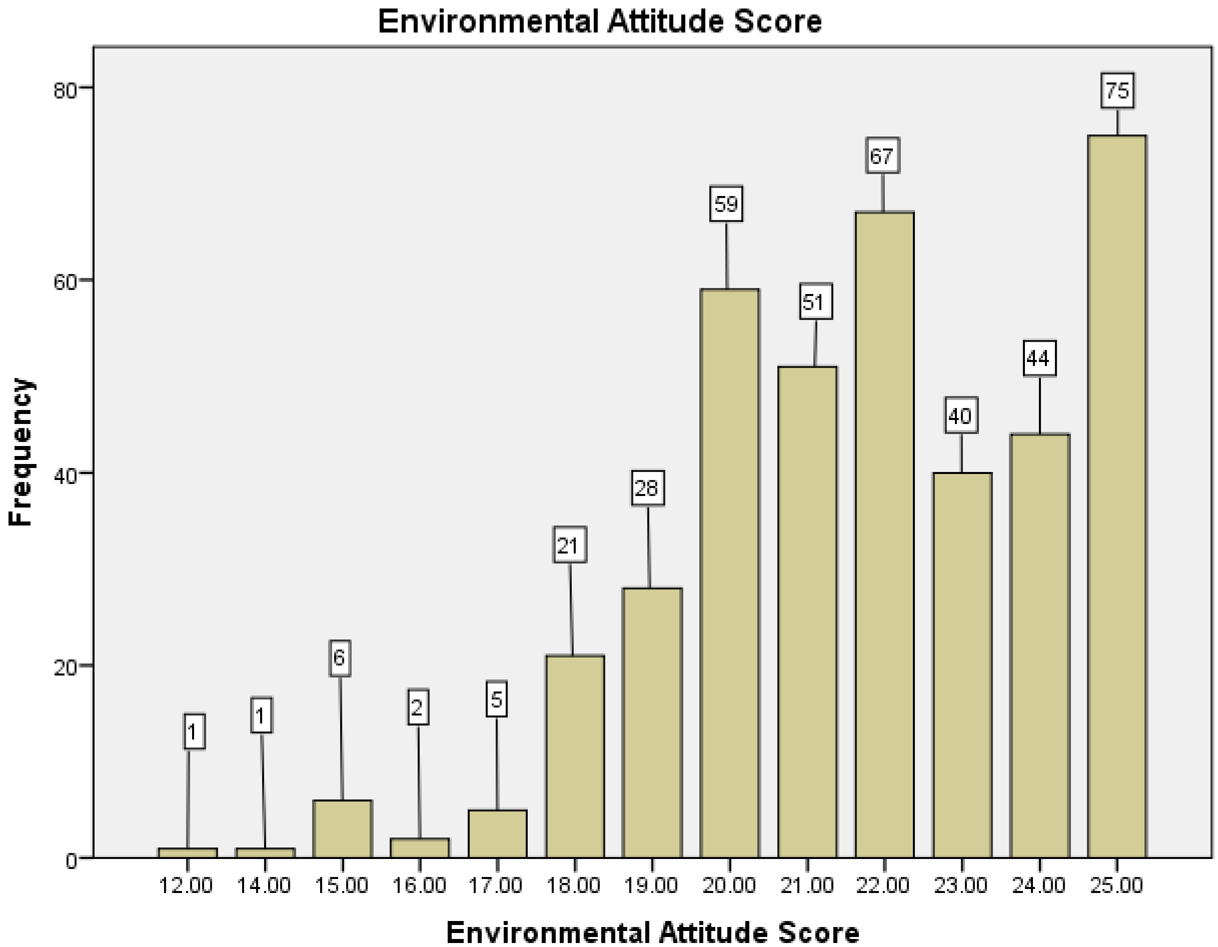

Figure 6. Bar graph indicating frequency of Environmental Attitude scores in the study of the market viability of native Texas Persimmon as a food source.

[z]Environmental Attitude questions were adapted from Cornelissen, Pandelaere, Warlop, and Dewitte's study of consumer behavior (2008).
[y]Environmental Attitude score ranged from zero points to 25 points. Greater Environmental Attitude score indicated a greater sensitivity to issues concerning the environment and a lower Environmental Attitude score indicated a lesser sensitivity to issues concerning the environment.

Table 9. Descriptive statistics indicating frequency of responses to statements to the Environmental Attitude score in the study of the market viability of native Texas Persimmon as a food source.

Environmental Attitude statement[z]	Strongly Disagree (1)		Disagree (2)		Undecided/ Neutral (3)		Agree (4)		Strongly Agree (5)		Mean[y] (Out of viable range)	SD
	(no.)	(%)	(no.)	(%)	(no.)	(%)	(no.)	(%)	(no.)	(%)		
Environmental Attitude score											21.80	2.45
I think of myself as an environmentally responsible shopper.	0	0	10	2.5	34	8.5	213	53.3	143	35.8	4.22	0.70
I believe that I behave in an environmentally conscious way.	1	0.3	8	2.0	24	6.0	233	58.4	133	33.3	4.22	0.67
When I buy a product, I take ecological considerations into account.	0	0	15	3.8	59	14.8	196	49.1	129	32.3	4.10	0.78
It is important that each individual be aware of environmental concerns.	0	0	3	0.8	7	1.8	152	38.1	237	59.4	4.56	0.57
All plants and animals play an important role in the environment.	1	0.3	3	0.8	8	2.0	83	20.8	305	76.3	4.72	0.56

[z]Environmental Attitude questions were adapted from Cornelissen, Pandelaere, Warlop, and Dewitte's study of consumer behavior (2008).
[y]Environmental Attitude score ranged from zero points to 25 points. Greater Environmental Attitude score indicated a greater sensitivity to issues concerning the environment and a lower Environmental Attitude score indicated a lesser sensitivity to issues concerning the environment.

Local Food-User score

Respondents of the Intercept method survey were asked 11 questions relating to their purchase of local foods (Local Food-User score). The Local Food-User score required respondents to answer questions regarding their attitude towards local food, and their purchasing habits therein. Examples of questions included, “I prefer to buy locally,” “I typically buy food at a local farmer's market,” and a question on how often the respondent bought “Local fresh produce.” The possible answers were “Strongly Agree,” “Agree,” “Undecided,” “Disagree,” and “Strongly Disagree.” Responses of “Strongly Agree” scored five points, while responses of “Agree” scored four points, responses of “Undecided” scored three points, responses of “Disagree” scored two points, and responses of “Strongly Disagree” scored one point. Non-responses to questions were left uncoded.

Respondents were classified on a scale of low, medium, and high local food-use based on their Local Food-User score. Possible points for scores ranged from zero to 55 points. Individuals with a score of 34 or fewer points (indicating most responses were three or fewer points) were classified as having “low local food-use,” while those with a score from 35 to 44 (indicating most responses were four or fewer points) were classified as having “medium local food-use,” and those with a score of 45 to 55 (indicating at least one of their responses scored five points, and the other responses either four or five points) were classified as having “high local food-use.” Respondents included 49 participants with low local food-use (12.4%), 229 participants with medium local food-use (57.4%), and 120 participants with high local food-use (30.3%). The mean score for the Local Food-User score was 41.22, indicating, on average, respondents were classified as medium local food-users (Fig. 7) (Table 10).

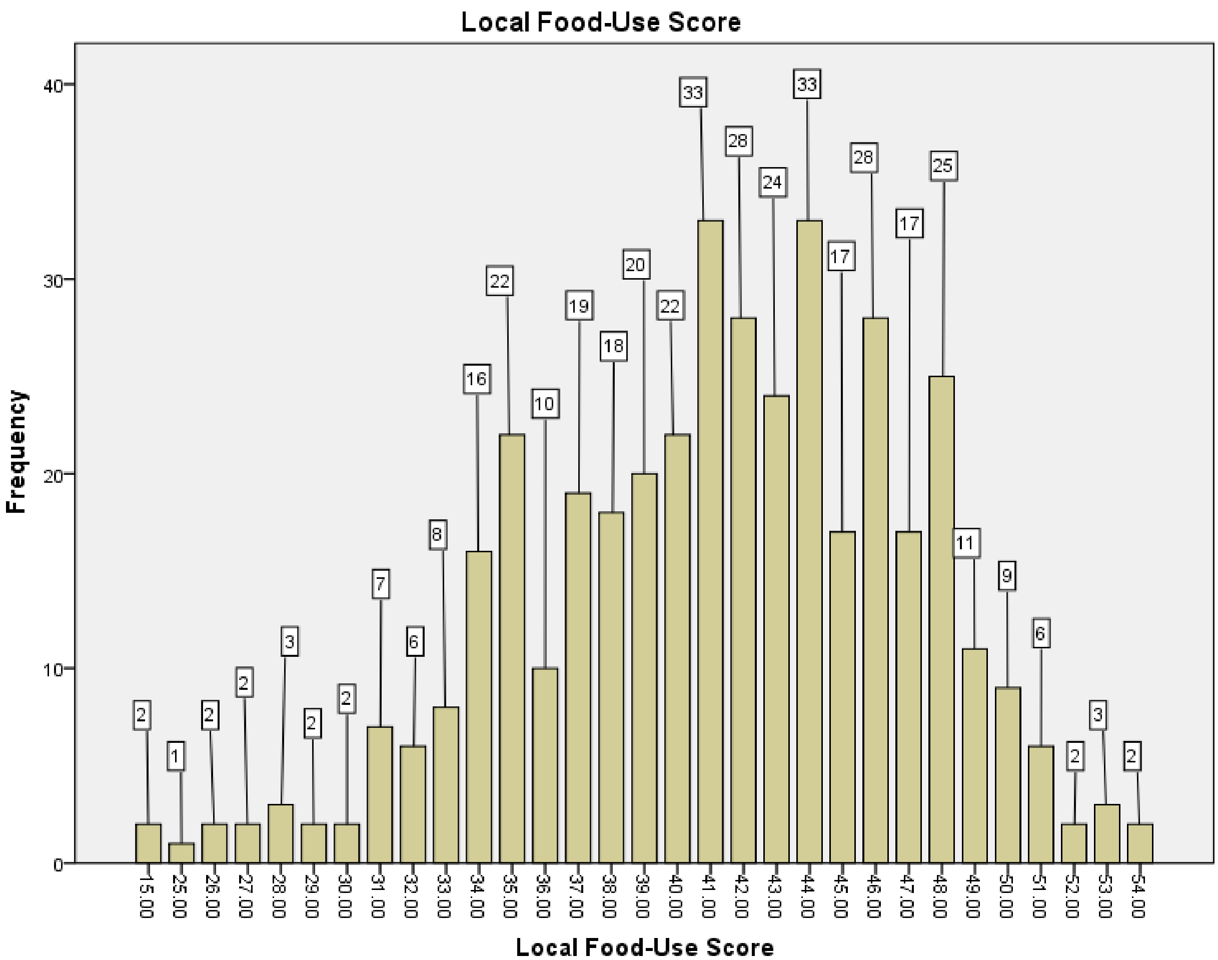

Figure 7. Bar graph indicating frequency of Local Food-Use score in the study of the market viability of native Texas Persimmon as a food source.

[z]Local Food-Use questions were adapted from Cornelissen, Pandelaere, Warlop, and Dewitte's study of consumer behavior (2008).
[y]Local Food-User score ranged from zero points to 55 points. Higher Local Food-User score indicated a greater amount of locally produced products purchased by the participant, and a lower Local Food-User score indicated less locally produced products were purchased by the participant.

Table 10. Descriptive statistics indicating frequency of responses to statements to the Local Food-User score in the study of the market viability of native Texas Persimmon as a food source.

Local Food-User statement[z]	Strongly Disagree (1)		Disagree (2)		Undecided/ Neutral (3)		Agree (4)		Strongly Agree (5)		Mean[y] (Out of viable range)	SD
	(no.)	(%)	(no.)	(%)	(no.)	(%)	(no.)	(%)	(no.)	(%)		
Local Food-User score											41.22	5.88
I prefer to buy locally.	0	0	4	1.0	17	4.3	121	30.3	258	64.5	4.58	0.62
Definition of Local												
Home County	1	0.3	24	6.0	16	4.0	132	33.1	226	56.6	4.40	0.84
Capital Region	3	0.8	8	2.0	27	6.8	174	43.8	185	46.6	4.33	0.76
Texas	1	0.3	22	5.7	54	13.9	208	53.5	104	26.7	4.01	0.81
United States of America	23	5.9	114	29.5	81	20.9	105	27.1	64	16.5	3.19	1.20
(The following questions used a different response set)	**Rarely (1)**		**Occasionally (2)**		**I Don't Know (3)**		**Often (4)**		**Very Often (5)**		**Mean**	**SD**
Local Food Product Purchasing Habits	**(no.)**	**(%)**	**(no.)**	**(%)**	**(no.)**	**(%)**	**(no.)**	**(%)**	**(no.)**	**(%)**		
Fresh Produce	3	0.8	16	4.0	59	14.9	109	27.5	210	52.9	4.28	0.91
Dairy Products	9	2.3	146	37.0	108	27.3	65	16.5	67	17.0	3.09	1.14
Meats	13	3.4	109	28.8	91	24.0	76	20.1	90	23.7	3.32	1.21
Processed Foods	6	1.5	108	27.2	126	31.7	105	26.4	52	13.1	3.22	1.04

Table 10 Continued												
Eggs	8	2.1	76	19.7	55	14.3	82	21.3	164	42.6	3.82	1.23

[z]Local Food-Use questions were adapted from Hustvedt and Dickinson (2009).
[y]Local Food-User score ranged from zero points to 55 points. Higher Local Food-User score indicated a greater amount of locally produced products purchased by the participant, and a lower Local Food-User score indicated less locally produced products were purchased by the participant.

Correlation Analyses

The demographics garnered from the Intercept method participants (including age, education, household income, gender, and ethnicity) were compared to each individuals' various scores (including WTP rate, Local Food-Use score, Environmental Attitude score, and Native Plant Use score) using a series of Pearson's Product-Moment tests. Analysis of variance (ANOVA) tests were used to look for differences between variables.

Willingness-to-pay

Age Comparisons

A Pearson's Product-Moment correlation indicated a significant negative relationship between age and WTP (r=-0.138, *P*=0.007). This showed that as participants' age increased, WTP decreased (Table 11). This conclusion can be assumed as there are statistically significant differences between age groups when a post-hoc least common denominator test was performed, discussed below.

Table 11. Correlation matrix indicating the Pearson's Product-Moment correlation between WTP rate and age in the study of the market viability of native Texas Persimmon as a food source.

		Age Group[y]
WTP Rate[z]	Pearson Correlation	-0.138
	P	0.007*
	N	381

*Statistically significant at the 0.05 level.
[z]WTP rate ranged from zero points to 16 points. Higher WTP rates indicated a greater price in Willingness-To-Pay for the Texas Persimmon. Lower WTP indicated a lesser price in Willingness-To-Pay.
[y]Age groups included Under 25, which were coded as "one," 25-34, which were coded as "two," 35-49, which were coded as "three," 50-64, which were coded as "four," and 65+ which were coded as "five."

An analysis of variance test further compared the age groups to WTP. Significant differences (*P*=0.033) were found indicating differences in WTP rates based on age group (Table 12).

Table 12. ANOVA test comparing WTP mean scores and age group in the study of the market viability of native Texas Persimmon as a food source.

Age Group[z]	Sample Size (no.)	WTP Mean Score (0-16 scale)[y]	SD	df	F	P
Under 25	33	12.4	3.8	4	2.653	0.033*
25-34	119	13.2	3.4			
35-49	86	12.8	3.9			
50-64	113	11.5	5.2			
65+	30	11.3	5.9			

*Statistically significant at the 0.05 level.
[z]N=381
[y]WTP rate ranged from zero points to 16 points. Higher WTP rates indicated a greater price in Willingness-To-Pay for the Texas Persimmon and lower WTP indicated a lesser price in Willingness-To-Pay

Post hoc analysis (LSD) indicated that the age groups "25-34 years," "50-64 years," and "65+ years" were significantly different from each other. The age group of

"25-34" was significantly different from the age groups "50-64", and "65+" (*P*=0.005, and 0.035, respectively). All other age groups were statistically similar. Furthermore, those within the age group "25-34 years" had the highest mean WTP rates, followed by those "35-49 years", then those "Under 25" and finally those "50-64 years" and "65+ years" with the lowest WTP rate. These results verified the correlational tests in showing that the age group "25-34 years," the youngest group had a greater WTP than older groups, confirming the finding that as age increased, WTP decreased (Table 13).

Table 13. WTP mean differences of scores (LSD) based on age in the study of the market viability of native Texas Persimmon as a food source.

Age Group	Under 25[z]	25-34	35-49	50-64	65+
Under 25	-	-0.71	-0.30	0.92	1.19
25-34	0.71	-	0.40	1.63*	1.89*
35-49	0.30	-0.40	-	1.22	1.49
50-64	-0.92	-1.63*	-1.22	-	0.26
65+	-1.19	-1.89*	-1.49	-0.26	-

*Statistically significant at the 0.05 level.
[z]Mean differences were calculated as the group in the row minus the group in the column.

Local Food-Use

A Pearson's Product-Moment correlation indicated a positively correlated significant relationship (r=0.156, P=0.033) between Local Food-Use score and WTP. This correlation showed that as the local food-use score increased, WTP increased as well (Table 14).

Table 14. Correlation matrix indicating the Pearson's Product-Moment correlation between WTP rate and Local Food-User scores in the study of the market viability of native Texas Persimmon as a food source.

		Local Food-User score[z,x]
WTP Rate[y]	Pearson Correlation	0.156
	P	0.033*
	N	386

*Statistically significant at the 0.05 level.
[z]Local Food-Use questions were adapted from Hustvedt and Dickinson (2009).
[y]WTP rate ranged from zero points to 16 points. Higher WTP rates indicated a greater price in Willingness-To-Pay for the Texas Persimmon. Lower WTP indicated a lesser price in Willingness-To-Pay.
[x]Local Food-User score ranged from zero points to 55 points. Higher Local Food-User score indicated a greater amount of locally produced products purchased by the participant, and a lower Local Food-User score indicated less locally produced products were purchased by the participant.

ANOVA tests further compared the Local Food-Use score groups to WTP rates. Significant differences (*P*=0.004) were found indicating differences in WTP rates based on Local Food-Use score group. Post hoc analysis indicated that the Local Food-Use score group of "low local food-use" was significantly different from the "medium local food-use" group (*P*=0.013), and "high local food-use" group (*P*=0.001). This means that a lower Local Food-Use score would result in a lower WTP. That the "low Local Food-Use" category's mean WTP rate was a 10.5 (with a 10 being the WTP choice of "$0.20 more") compared to the approximate 12 and 13 scores of "medium Local Food-Use" and "high Local Food-Use" (12 being the choice of "$0.40 more" and 13 being "$0.50 more") would indicate that a respondent's local food-use is an important factor in determining WTP, and that a lower Local Food-Use score would mean a lower WTP rate. This backs up the findings provided in Table 14, showing a positive correlation between Local Food-User score and WTP (Tables 15 and 16). Unlike the age groups mentioned above, here the participants' Local Food-User post hoc LSD scores are not as definitive on being able to differentiate, with the most significant result being the difference between those with a High Local Food-User score and the Low Local Food-User score at 0.079

Table 15. ANOVA test comparing mean scores on the Local Food-User score category based on WTP rate in the study of the market viability of native Texas Persimmon as a food source.

Local Food-User score Classification [z]	Sample Size (no.)[y]	WTP Mean Score (0-16 scale)[x]	SD	df	F	P
Low Local Food-Use	44	10.5	5.4	2	5.624	0.004*
Medium Local Food-Use	223	12.3	4.2			
High Local Food-Use	113	13.1	4.2			

*Statistically significant at the 0.05 level.
[z]Local Food-Use questions were adapted from Hustvedt and Dickinson (2009).
[y]Local Food-User score ranged from zero points to 55 points. Higher Local Food-User score indicated a greater amount of locally produced products purchased by the participant, and a lower Local Food-User score indicated less locally produced products were purchased by the participant.
[x]WTP rate ranged from zero points to 16 points. Higher WTP rates indicated a greater price in Willingness-To-Pay for the Texas Persimmon and lower WTP indicated a lesser price in Willingness-To-Pay

Table 16. WTP mean differences of scores (LSD) based on Local Food-User score category in the study of the market viability of native Texas Persimmon as a food source.

Local Food-User score Classification[y]	Low Local Food-Use[x]	Medium Local Food-Use	High Local Food-Use
Low Local Food-Use	-	-1.80	-2.59
Medium Local Food-Use	1.80[z]	-	-0.79
High Local Food-Use	2.59	0.79	-

*Statistically significant at the 0.05 level.
[z]WTP rate ranged from zero points to 16 points. Higher WTP rates indicated a greater price in Willingness-To-Pay for the Texas Persimmon and lower WTP indicated a lesser price in Willingness-To-Pay
[y]Local Food-User score ranged from zero points to 55 points. Higher Local Food-User score indicated a greater amount of locally produced products purchased by the participant, and a lower Local Food-User score indicated less locally produced products were purchased by the participant.
[x]Mean differences were calculated as group in the row minus the group in the column.

Environmental Attitude Score Comparisons

A Pearson's Product-Moment correlation indicated a positively significant relationship (r=0.176, P=0.001) between Environmental Attitude scores and WTP. This correlation showed that as environmental attitude score increased, WTP increased as well (Table 17).

Table 17. Correlation matrix indicating the Pearson's Product-Moment correlation between WTP rate and Environmental Attitude score in the study of the market viability of native Texas Persimmon as a food source.

		Environmental Attitude score[z,x]
WTP Rate[y]	Pearson Correlation	0.176
	P	0.001*
	N	386

*Statistically significant at the 0.05 level.
[z]Environmental Attitude questions were adapted from Cornelissen, Pandelaere, Warlop, and Dewitte's study of consumer behavior (2008).
[y]WTP rate ranged from zero points to 16 points. Higher WTP rates indicated a greater price in Willingness-To-Pay for the Texas Persimmon and lower WTP indicated a less price in Willingness-To-Pay.
[x]Environmental Attitude score ranged from zero points to 25 points. Greater Environmental Attitude score indicated a greater sensitivity to issues concerning the environment and a lower Environmental Attitude score indicated a lesser sensitivity to issues concerning the environment.

ANOVA tests further compared the Environmental Attitude score groups to WTP rates. Significant differences (P=0.013) were found indicating differences in WTP rates based on Environmental Attitude score group (Table 18). This would suggest that a respondents' attitude towards the environment was an important factor in determining their WTP rate. In addition, the mean scores of the two scored groups are both positive WTP rates (a score of 11 meaning "$0.30 more" and a score of 12 meaning "$0.40 more," respectively), meaning that both the "mediocre Environmental Attitude" and "positive Environmental Attitude" groups are willing to pay more than the baseline amount proffered in the survey. These results combined would insinuate that those with anything more than a poor attitude towards environmental concerns would be willing to pay more for Texas Persimmons. This result is supported by the correlation between the Environmental Attitude score and the WTP rate.

Table 18. ANOVA test comparing mean scores on the Environmental Attitude score categories based on WTP rate in the study of the market viability of native Texas Persimmon as a food source.

Environmental Attitude score Classification [z]	Sample Size (no.)	WTP Mean Score (0-16 scale)[y]	SD	df	F	P
Mediocre Environmental Attitude	119	11.5	4.7	1	6.213	0.013*
Positive Environmental Attitude	267	12.7	4.3			

*Statistically significant at the 0.05 level.
[z]Environmental Attitude questions were adapted from Cornelissen, Pandelaere, Warlop, and Dewitte's study of consumer behavior (2008).

[y] Environmental Attitude score ranged from zero points to 25 points. Greater Environmental Attitude score indicated a greater sensitivity to issues concerning the environment and a lower Environmental Attitude score indicated a lesser sensitivity to issues concerning the environment.

CHAPTER V

Summary, Conclusions, And Recommendations

Purpose of the Study

The main purpose of this study was to test the consumer willingness to pay (WTP) rate of a native Texas plant fruit product for the restaurant industry as well as for the consumer market. The specific objectives of the study were to:

1) Determine if the native plant selected for study had potential for marketing to consumers and restaurants in Central Texas by:

- Conducting an analysis of restaurant owner perspectives of food concepts based in the Lead User concept.
- Conducting an analysis of local farmers' markets customers' perspectives based on the Intercept Model.

2) Evaluate the consumer and restaurant owners' WTP for the plant product of interest.

3) Test for the existence of a relationship between preference and WTP for native grown food and environmental opinions.

Summary of the Literature Review

Ethnobotany of Plants – Digestible, Medicinal, and Industrial

Human interactions with plants are essential for the survival of the species. This is because plants provide carbohydrates which make it easier for larger populations of people to be sustained (Finucane, 2009). Without plants to sustain them, there would be many fewer, if any, people in the world. The key to human utilization of plants has been the ability to manipulate the crops grown, and how they are grown. What is chosen to grow has changed over time, with staple grains forming the core of the diets of prosperous nations around the world (FAO, 1995), but starchy roots and leaves being essential too (D'Altroy and Hastorf, 1984; Fullager et al., 2006). Environmental pressures have always had a stark influence on how humans have sustained themselves from the land around them (O'Brien and Laland, 2012).

In addition to plants being used for food, other characteristics of a region's flora have been greatly utilized by humans. Studies have revealed compounds in plants that can relieve pain (Warner and Mitchell, 2002), treat diseases like diabetes, cancer, and intestinal disorders (Kulkarni and Dhir, 2008; Li et al., 2010; Tang et al., 2009), and be used as antiseptics (Barnett et al., 2006). Other plants can be used for industrial purposes, such as dyes (Turner, 2009). There are thousands of plants with useful components, characteristics, and edible parts, and modern humans only use a handful (Turner et al., 2011).

Historically Useful Texas Plants

Texas is particularly blessed with edible and useful plants. With its exceptionally large size, and wide range of ecologies, there are useful plants all across the state that are underutilized today, but have been used in the past to varying extents (Tull, 1987). From the tall pecan tree, *Carya illinoinsses*, with its nutritious nuts, to the lowly herb amaranth, *Amaranthus spp.*, with its super-food seeds and leaves, to the spicy chile pepper, *Capsicum annum*, bringing heat to any meal, the plants of Texas are varied in their habit and habitat, and are ripe for utilization.

A Comparison of Traditional Food Production Methods versus Industrial Production Methods

To fully utilize these plants efficiently, however, requires agriculture rather than just gathering or gardening, as more food leads to larger populations, which leads to requiring a greater intensification of land use (O'Brien and Laland, 2012). When deciding to grow a crop, the farmer has several choices for the methods they utilize to grow crops, most commonly between traditional methods and industrial methods. Traditional methods harken to the time before the Industrial Revolution, when fossil fuels came into use (Overton, 2011), and came at a price of higher day to day work by those using them. Still, studies have shown that traditional agriculture can produce similar sized crops, compared to its more industrial version (Horwith, 1985; Pimentel 2005; Puente et al., 2011).

Industrial agriculture is not some sort of boogey man, though. Half of the population of the world today is here because of industrial agriculture's use of fossil fuels and fertilizers (Erisman et al., 2008). In addition, there are new versions of staple crops coming out of scientific experiments all the time that offer more disease resistant bountiful harvests than previous centuries could produce (Engelen, et al., 2004).

Current Status of Agriculture and Horticulture in the United States and Texas

The agriculture industry comprises a very large portion of the United States economy, with an estimated value of $279 billion in 2007 (USDA Census of Agriculture, 2008). This seems appropriate considering that food is essential for human survival. Within this broader concept of agriculture lies organic agriculture. The total United States organic agriculture output for 2007 was $3.16 billion (USDA Census of Agriculture, 2008). This is a small portion of the grand total, but as has been established, organic agriculture is still a niche market. Of these totals, Texas produced a $21 billion output of agricultural products in 2007 and within that total was $51 million of organic output (USDA Census of Agriculture, 2008). This shows that, while the use of native plants as a food source could have potential in Texas or the United States as a whole, it will only contribute a small portion of the market, if the organic industry is any indicator.

Current Areas of Food Production

In the United States, fruit, nut, grain, and vegetable production in 2007 equaled $110.5 billion (USDA, 2008). Compare the American production of grain in 2008 with that of the other largest grain producers (with 333 million metric tons of corn and 9.7 million metric tons of sorghum produced in 2008 versus the next biggest producer, China with 197 million metric tons of rice and 112 million metric tons of wheat in 2008), and it becomes clear that farms in the United States can produce vast quantities of food (USDA, 2008). In Texas, specifically, our warmer winters contribute to large amounts of vegetables and fruit produced when much of the country is covered with snow. In 2010, Texas produced 10.5 million tons of broccoli, and 681,000 tons of grapefruit, to name but two crops (USDA, 2010). This huge output is reflective of the vast natural resources available to American farmers.

Niche Markets in Texas

To take advantage of these natural resources, niche markets like the organic or local food concepts can specialize and create new opportunities. Niche markets need to create a devoted consumer base (Niche Market, 2003). The actual research on how to do so in Texas, though, is sparse (Hanagriff et al., 2004). The Go Texan program is one example of an effective niche sales program, averaging a 9% increase in sales (Hanagriff et al., 2004). This program prompts potential consumers to consider buying their products from a Texas-based company rather than products from another state or country. When combined with the perceived value and concern over quality of organic food production (Curtis, 2011), this program could have great potential in promoting native plants as a food source.

Marketing

Concerns over the quality of food have led many consumers to seek out alternative sources for their produce, beyond the grocery store. Amongst these sources, farmers' markets stand out. Here, the added value food labels of organic and local abound. These terms can be hard for customers or the farmers to define (DeWeerdt, 2009; Durham, 2003; USDA, 1990; FDA, 2006), and so many consumers at farmers' markets often try to establish relationships with each producer from whom they buy their produce (Hunt, 2006). They also seek quality produce above all else (Curtis, 2011; Hunt, 2006; Wolf et al., 2005), and how they define quality is dependent on producer.

Finally, the youth of the United States seem to be leading the charge on alternative food procurement. Three separate studies showed that younger people (under 35) tended to make up larger sections of the attendees of the farmers' markets (Detre et al., 2010; Hunt, 2006; Wolf et al., 2005). This trend illustrates how these niche markets could still have growth potential in the future.

Methodology

- *Sample Group*

Two groups were sampled in this study. One was a group of 7 restaurateurs in the Central Texas area. These restaurateurs were frequently chef-owners of restaurants who used either organic food, local food, or both. They were selected as Lead Users of niche food markets. The other group sampled was attendees of farmers' markets in the cities of Austin, Wimberley, Bastrop, San Marcos, and New Braunfels, in the Central Texas area. The total number surveyed was 400, and these surveys were obtained through the use of the Intercept Method.

Instrumentation

Participants in the Lead User portion of the study responded to open-ended qualitative interview questions about their attitudes of concepts like organic, local, and native food, in addition to questions regarding their years of experience in the restaurant industry, and details about their restaurant, as well as demographic questions. These questions were regarded by other researchers as valid questions.

Participants the Intercept method portion of the study answered quantitative survey questions regarding concepts related to their environmental attitude, their purchasing habits regarding locally-produced food, and their use of native plants. These totaled 15 in number. These questions were adapted from Cornelissen, Pandelaere, Warlop, and Dewitte's study of consumer behavior (2008) which generated a Cronbach's alpha of 0.84. They consisted of six Likert scale (1932) questions with five possible responses ranging from 5= "Strongly Agree" to 4= "Agree" to 3= "Undecided" to 2= "Disagree" to 1= "Strongly Disagree", and the participant marked the answer which corresponded to their feelings. Another seven used an alternative Likert scale ranging from 5= "Very Often," 4= "Often," 3= "Occasionally," 2= "Rarely," to 1= "I don't know". Finally, two questions regarding native plants used a third Likert scale, ranging from 4= "Yes," 3= "No," 2= "I don't know," to 1= "Does not apply to me".

The Environmental Attitude score measured how the respondent felt regarding questions concerning environmentally sensitive concepts. Examples of questions included "I believe that I behave in an environmentally-conscious way," "When I buy a product, I take ecological considerations into account," and "All plants and animals play an important role in the environment." Possible answers were "Strongly Agree," "Agree," "Undecided," "Disagree," and "Strongly Disagree." Responses of "Strongly Agree" received five points, while responses of "Agree" received four points, responses of "Undecided" received three points, responses of "Disagree" received two points, and responses of "Strongly Disagree" received one point. Non-responses to questions were left uncoded. Respondents were classified as having poor, mediocre, and positive environmental attitudes based on their Environmental Attitude scores. Possible scores ranged from zero to 25 points. Individuals with scores of ten or fewer points (indicating most responses were two or fewer points) were classified as having "poor environmental attitudes," while those with scores from eleven to 20 (indicating most responses were four or fewer points) were classified as having "mediocre environmental attitudes," and those with scores of 21 to 25 (indicating at least one of their responses scored five points, and the other responses either four or five points) were classified as having "positive environmental attitudes." This categorization of possible scores was divided by the points possible with each response. Essentially, the responses "Disagree" and "Agree" were the dividing responses determining which of the three groups the respondent fit in. These were chosen as they could imply a vague opinion on the statement, but not an impassioned opinion. Therefore, they made good standards by which to measure the participants' Environmental Attitude. Environmental Attitude questions were adapted from Cornelissen, Pandelaere, Warlop, and Dewitte's study of consumer behavior (2008).

The Local Food-User score measured how often respondents purchased products that were produced locally. It also measured how they felt about locally produced products, and how they defined the term "local." Examples of questions included, "I prefer to buy locally," "I typically buy food at a local farmer's market," and a question on how often the respondent bought "Local fresh produce." The possible answers were "Strongly Agree," "Agree," "Undecided," "Disagree," and "Strongly Disagree." Responses of "Strongly Agree" scored five points, while responses of "Agree" scored four points, responses of "Undecided" scored three points, responses of "Disagree" scored two points, and responses of "Strongly Disagree" scored one point. Non-responses to questions were left uncoded. Respondents were classified on a scale of low, medium, and high local food-use based on their Local Food-User score. Possible points for scores ranged from zero to 55 points. Individuals with a score of 34 or fewer points (indicating most responses were three or fewer points) were classified as having “low local food-use,” while those with a score from 35 to 44 (indicating most responses were four or fewer points) were classified as having “medium local food-use,” and those with a score of 45 to 55 (indicating at least one of their responses scored five points, and the other responses either four or five points) were classified as having “high local food-use.” Local Food-User questions were adapted from Hustvedt and Dickinson’s study of consumer likelihood of purchasing organic cotton apparel (2009).

The Native Plant Use score measured how often the respondent used native plant-based products. The two questions measuring this were, “I bought a product made from a native Texas plant in the last year,” and “My family and I have planted native Texas plants in the last year.” The possible responses were, “Yes,” “No,” “I Don’t Know,” and “Not Applicable.” Responses of “Yes” received four points. Responses of “I Don’t Know” received three points. Responses of “No” received two points, and responses of “Not Applicable” received one point. Non-responses to questions were left uncoded. The response “I don’t know” received more points than the responses of “No” and “Not Applicable” because while the respondent is not answering positively, they are also not giving a negative response. Since the Native Plant score measured whether or not they made use of native plants, a response of “I don’t know” denoted that the respondent acknowledged that they may have used a native plant, but are not sure.

Descriptive statistics were used to tabulate overall results including mean scores on the Native Plant score for the overall sample. Respondents were classified on a scale of low, medium, and high native plant use, based on their Native Plant score with this scale ranging from zero points to 8 points. Individuals with a score of zero to two points (indicating most responses scored one point or less) were classified as having a "null native plant use" because respondents' answers for questions were the response "not applicable," or no response at all. Those with a score of three to four points (indicating most responses scored one or two points) were classified as having "low native plant use." Those with a score from five to six (indicating most responses scored three or fewer points) were classified as having "medium native plant use," and those with a score of seven to eight (indicating at least one of their responses scored four points, and the other either three or four points) were classified as having "high native plant use." Native Plant Use questions were adapted from Hustvedt and Dickinson's study of Consumer likelihood of purchasing organic cotton apparel: Influence of attitudes and self-identity (2009).

Both the Lead User survey, as well as the Intercept method survey, asked participants to answer questions regarding WTP, as well as demographic questions. The WTP questions were based off a study by Krystallis and Chryssochoidis (2005), as well as one by Helfand et al. (2006). Both studies, and the questions developed, used Contingent Valuation (CV) to measure WTP. This method presents the participant with a set of price premiums in association with the products, and has the respondent select the price they would pay for the product. For this study, there were two willingness-to-pay sections set up for the participants. Creating a WTP score involved two questions, from which the respondents reported how much more or less (depending on the question) they were willing to pay for a 12 oz. container of Texas Persimmons compared to a base price of $2.99. This was put on a scale from lowest price to highest price, and was the respondent's WTP score. The second section presented the participants with four fruit choices at four dependent price points, and they were asked to rank the four choices in order of preference. This ranking was turned into an aggregate score, thus creating the respondents' CV score.

Demographic questions inquired as to the respondents' age, education level, household income and gender. Statements were modeled on those from a previous study (Hustvedt and Dickson, 2009) and were known to be reliable and valid.

Data Analysis

Data collected from the restaurateurs was tallied, as it was qualitative in nature. Data were entered into and analyzed using the Statistical Package for the Social Sciences (SPSS) Version 20.0 (Chicago, IL). Statistical analysis included descriptive statistics, frequencies, logit models, correlations, and analysis of variance.

Results & Discussions

The use of native plants as a food source in the same market as local and/or organically produced foods would benefit if said plants were to be marketed in the same niche market manner as those food options. This is because the customers of those niche markets have already adopted similar marketing systems as valid by their purchasing of the products. The potential success of native plant foods would most likely follow the paths of these food alternatives, were the native plant foods to be received positively by a target niche market. As there has been to date no studies investigating the use of native plants as a food source, the importance of this study is that it would provide a starting point in creating a new niche market based on Texas Persimmons as a food source. When introducing a novel product, it is important to establish whether the potential consumers are actually interested in the product (van Kleef et al. 2005), and part of that is discovering who the potential consumers are.

The survey results were divided between two groups, the Lead Users group and the Intercept group. The Lead User group was made of either chefs, owners, or other related positions at restaurants of the Central Texas area. The demographics of the restaurateurs indicated a spread of levels of experience through the participants, with all participants having been in the restaurant industry for at least eight years, and having worked their way up through the chain of management. This illustrated the restaurateurs' experience and familiarity with different levels of the restaurant industry and, therefore, reinforced their influence in this study. However, all but one participant was between the ages of 25-34, and all but one participant was male, and so the survey results could be influenced by these trends.

The Intercept method group included those who attended farmers' markets in the Central Texas region. This group fit the demographics of similar surveys conducted at farmers' markets: most of the participants were women between the ages of 25-60, with an income between $30,000 and $64,999, with either a bachelor's degree or a graduate level degree (Wolf et al., 2005). This would seem to be a very specific demographic group, but it is consistent with other surveys on farmers' markets, and so the group would make for a reliable source of information when comparing the niche market of native foods with the established niche markets of local and organic foods.

Results from the Lead User survey of restaurateurs revealed an overall support of the Texas Persimmon, when concerning taste and whether or not the participants would purchase the product. In addition, a majority supported both the food term “local” as well as “native.” These results indicated that there is support for both native plants as a food source as well as the possible connotation between native foods and niche food markets amongst chefs and chef-owners. All participants responded positively when asked how much more they would pay for the Texas Persimmon (“$0.30 more” to “Other” on the positive range of values, the highest of the responses of which was $1.50 more than the base price of $2.99). The mean WTP rate indicated the Lead Users would be willing to pay between $3.59 and $3.69 for one pound of Texas Persimmon. There is a dearth of studies investigating the introduction of Texas Persimmons into the market, and so further studies would put these results into perspective.

The Intercept method survey revealed the broad attitudes of those who participated in farmers’ markets. Survey results indicated that the majority of participants had a high Native Plant Use score, a positive Environmental Attitude score, and a medium Local Food-Use score. In addition to these aggregate scores, the great majority of participants were willing-to-pay more than the suggested base price of $2.99, based on their WTP rate (with a total mean WTP rate of 12.36, with a rate of 12 meaning “$0.40 more”). Finally, a majority of participants earned a CV score of less than 25, meaning that the majority were less likely to rank the proposed niche terms of “native” and “local” higher than the terms of “organic” or “conventional”. In summation, the average customer at the farmers’ markets used (and was aware they were using) native plants, had a positive attitude towards issues concerning the environment, was moderately supportive of local foods, was willing to pay about $3.39 for 12 oz. of the Texas Persimmons, and were less likely support niche markets like “local” or “native”, when compared with the “organic” and “conventional” markets. The average customer was concerned with environmental issues and was supportive of local foods, which is supported by previous studies of farmers’ market attendees (Curtis, 2011; Hunt, 2006; Wolf et al., 2005). When concerning the Texas Persimmon market, there have been no studies, and so further investigations are recommended to place these results into context.

Finally, when correlational analyses were applied to the WTP rate, three correlations were found. When compared with age groups, WTP had a negative correlation. This indicated that older participants were less likely to pay more for the Texas Persimmon. The group with the highest mean WTP rate was those between the ages of 25-34, indicating that the younger participants in the farmers' market were more likely to be supportive if Texas Persimmons were to be offered in the market. This result is empowered by previous research, which has indicated that farmer’s markets tend to attract a younger population (Detre et al., 2010; Hunt, 2006; Wolf et al., 2005).

When WTP was compared to the Local Food-Use scores of respondents, a positive correlation was found. This would indicate that those with a higher Local Food-Use score were more likely to pay more for Texas Persimmons. The group of participants with the highest mean WTP rate was those with the highest Local Food-Use score, indicating that there is a connection between the desire to use locally-produced foods and the desire to use Texas Persimmons.

When WTP was compared with the Environmental Attitude scores of the respondents, a positive correlation was found. This indicated those with a more positive Environmental Attitude were more likely to pay more for Texas Persimmons. The group of participants with the highest mean WTP rate was those with the highest Environmental Attitude score, indicating there is a connection between those who have more positive attitudes about the environment and those interested in using Texas Persimmons.

The correlations found between WTP and Environmental Attitude, age, and Local Food-Use found would indicate the prime audience for the Texas Persimmon would be those who attend the farmers' market in the age group of 25-34 who value locally-produced foods and are concerned about the environment. Therefore, for any future Texas Persimmon endeavors, this particular demographic group would be the best choice to target as future consumers. Again, due to the shortage of studies investigating native plants in the market, further studies should be conducted to put these results into perspective. This includes further studies on both native plants, as well as novel food products in general.

These findings indicated several conclusions: first, the restaurateurs' approval of both native and local foods, as found from their qualitative responses, and the Texas Persimmon in particular indicated any potential market for the fruit should include restaurants as a dependable consumer of the native niche market. The primary concerns spoken to by the restaurateurs were those of freshness and reliability. This would mean that any enterprise to take advantage of this market would need to consider that native plants are highly seasonal, and thusly, any relations with restaurants would be seasonal as well. Second, the vast majority of farmers' market respondents had a high WTP rate, but low CV score. This would indicate that if the Texas Persimmon were to be offered in a farmer's market (or other potential native foods), prices would need to be competitive compared to other similar, non-native produce.

Further studies on native crops are recommended.

APPENDIX A

	Estimate^z	Std. Error	Wald	df	*P*
Bought Product with Native Plants in it					
Doesn't Apply	-0.696	0.506	1.896	1	0.168
I don't know	-0.185	0.458	.163	1	0.686
No	-0.236	0.311	.573	1	0.449
Yes	0			0	
Planted Native Plants					
Doesn't Apply	3.303	1.840	3.222	1	0.073
I don't Know	2.383	1.819	1.717	1	0.190
No	3.033	1.848	2.694	1	0.101
Yes	0			0	
Box Store Frequency					
Rarely (≤24%)	0.711	0.274	6.714	1	0.010*
Occasionally (25-49%)	0.577	0.309	3.487	1	0.062
Often (50-74%)	0.272	0.244	1.235	1	0.266
Very Often (≥75%)	0			0	
Farmers' Market Frequency					
Doesn't Know	-1.878	1.324	2.011	1	0.156
Rarely (≤24%)	-0.620	0.319	3.783	1	0.052
Occasionally (25-49%)	-0.257	0.270	0.907	1	0.341
Often (50-74%)	0.482	0.249	3.763	1	0.052
Very Often (>75%)	0			0	
Plants and Animals are important to the environment					
Strongly Disagree	0.401	1.826	0.048	1	0.826
Disagree	-1.842	1.063	3.005	1	0.083
Undecided	-0.082	0.663	0.015	1	0.902

Agree	0.061	0.239	0.065	1	0.799
Strongly Agree	0			0	
Local Home County				1	
Strongly Disagree	1.113	1.826	0.372	1	0.542
Disagree	0.195	0.439	0.198	1	0.657
Undecided	-1.333	0.504	7.007	1	0.008*
Agree	-0.871	0.217	16.127	1	0.000*
Strongly Agree	0			0	
Local Capital Region					
Strongly Disagree	0.080	1.282	0.004	1	0.950
Disagree	-2.248	0.727	9.556	1	0.002*
Undecided	-1.017	0.426	5.706	1	0.017*
Agree	-0.216	0.216	0.997	1	0.318
Strongly Agree	0			0	
Local Texas					
Strongly Disagree	-22.569	0.000		1	
Disagree	0.211	0.546	0.149	1	0.700
Undecided	0.633	0.378	2.796	1	0.094
Agree	0.531	0.262	4.095	1	0.043*
Strongly Agree	0			0	
Local USA					
Strongly Disagree	0.272	0.546	0.248	1	0.618
Disagree	0.273	0.336	0.659	1	0.417
Undecided	0.116	0.337	0.118	1	0.731
Agree	-0.066	0.303	0.047	1	0.828
Strongly Agree	0			0	
Ecological Considerations into Account					
Disagree	-1.313	0.531	6.124	1	0.013*
Undecided	-1.307	0.340	14.805	1	0.000*
Agree	-0.634	0.228	7.735	1	0.005*

Strongly Agree	0			0	
Buy Local when I can					
Disagree	-1.800	0.966	3.474	1	0.062
Undecided	-0.800	0.479	2.792	1	0.095
Agree	-0.685	0.223	9.424	1	0.002*
Strongly Agree	0			0	
Individuals should take environmental considerations into account when making purchases					
Disagree	1.010	1.093	0.854	1	0.355
Undecided	-0.659	0.698	0.890	1	0.346
Agree	0.269	0.215	1.566	1	0.211
Strongly Agree	0			0	
USDA Organic Agriculture					
Strongly Disagree	1.343	1.816	0.547	1	0.459
Disagree	0.730	0.588	1.540	1	0.215
Undecided	-0.772	0.382	4.090	1	0.043*
Agree	0.014	0.231	0.004	1	0.951
Strongly Agree	0			0	
Shop Environmentally Responsible way					
Disagree	-1.294	0.830	0.249	1	0.119
Undecided	-1.191	0.420	8.047	1	0.005*
Agree	-.0705	0.270	6.800	1	0.009*
Strongly Agree	0			0	
Behave Environmentally Conscious Way					
Strongly Disagree	1.645	1.988	0.684	1	0.408
Disagree	0.282	0.833	0.114	1	0.735
Undecided	-0.177	0.442	0.159	1	0.690

Agree	-0.273	0.248	1.213	1	0.271
Strongly Agree	0			0	
Local Fresh Produce					
I don't know	-0.869	1.292	0.453	1	0.501
Rarely (≤24%)	-1.260	0.521	5.863	1	0.015*
Occasionally (25-49%)	-1.023	0.302	11.485	1	0.001*
Often (50 – 74%)	-0.384	0.204	2.552	1	0.110
Very Often (≥75%)	0			0	
Local Dairy					
I don't know	0.473	0.780	0.369	1	0.544
Rarely (≤24%)	-0.209	0.310	0.452	1	0.501
Occasionally (25-49%)	-0.044	0.305	0.021	1	0.886
Often (50 – 74%)	-0.259	0.354	0.537	1	0.464
Very Often (≥75%)	0			0	
Local Meat					
I don't know	-0.032	0.616	0.003	1	0.959
Rarely (≤24%)	0.205	0.306	0.450	1	0.502
Occasionally (25-49%)	-0.236	0.293	0.648	1	0.421
Often (50 – 74%)	0.033	0.317	0.011	1	0.916
Very Often (≥75%)	0			0	
Local Processed					
I don't know	-0.117	0.893	0.017	1	0.896
Rarely (≤24%)	0.499	0.337	2.192	1	0.139
Occasionally (25-49%)	0.565	0.326	3.006	1	0.083
Often (50 – 74%)	0.463	0.332	1.947	1	0.163
Very Often (≥75%)	0			0	
Local Eggs					
I don't know	0.012	0.784	0.000	1	0.987
Rarely (≤24%)	-0.256	0.298	0.738	1	0.390

Occasionally (25-49%)	-0.413	0.319	1.677	1	0.195
Often (50 – 74%)	-0.608	0.281	4.686	1	0.030*
Very Often (≥75%)	0			0	
Demographics	**Estimate**[z]	**Std. Error**	**Wald**	**df**	***P***
Age					
Under 25 years	0.019	0.496	0.001	1	0.970
25-34 years old	0.588	0.392	2.254	1	0.133
35-49 years old	0.128	0.403	0.101	1	0.750
50-64 years old	-0.183	0.390	0.220	1	0.639
65+ years old	0			0	
Education					
Less than 9th Grade	-1.936	1.354	2.044	1	0.153
9th-12th grade, no diploma	-0.827	1.284	0.415	1	0.519
High School Graduate or Equivalent	1.096	0.948	1.335	1	0.248
Some College, no degree	0.292	0.297	0.964	1	0.326
Associate's Degree	-0.303	0.380	0.636	1	0.425
Bachelor's Degree	-0.176	0.238	0.545	1	0..461
Trade School	-0.696	0.620	1.259	1	0.262
Graduate or Professional	0			0	
Income					
Less than $14,999	-1.226	1.853	0.437	1	0.508
$15,000 to $24,999	-1.336	1.862	0.515	1	0.473
25,000 to $34,999	-1.412	1.845	0.586	1	0.444
$35,000 to $74,999	-1.404	1.830	0.589	1	0.443
75,000 to $99,999	-1.127	1.842	0.374	1	0.541
$100,000 to $149,999	-1.096	1.838	0.356	1	0.551
$150,000 and over	-0.596	1.840	0.105	1	0.746
Gender	0			0	

Female					
Male	-0.176	0.203	0.747	1	0.387
Ethnicity	0			0	
Caucasian					
African American	0.499	0.403	1.532	1	0.216
Asian/Pacific Islander	-0.457	0.706	0.419	1	0.518
Hispanic (of any race)	-0.307	0.595	0.388	1	0.534
Other	-0.532	0.489	1.182	1	0.277
	0			0	

[z]Estimates are logarithmic in value.
[*]Statistically significant at the 0.05 level.

APPENDIX B

	Estimate[z]	Std. Error	Wald	df	*P*
Local Food Use Score					
26	0.418	1.805	0.054	1	0.817
27	-0.514	1.820	0.080	1	0.778
28	0.607	1.822	0.111	1	0.739
29	22.954	0.000		1	
30	-0.943	1.782	0.280	1	0.596
31	0.095	1.462	0.004	1	0.948
32	-0.690	1.564	0.194	1	0.659
33	0.009	1.423	0.000	1	0.995
34	-0.393	1.360	0.084	1	0.773
35	0.003	1.326	0.000	1	0.998
36	0.221	1.390	0.025	1	0.874
37	1.051	1.349	0.607	1	0.436
38	0.626	1.343	0.217	1	0.641
39	0.966	1.332	0.526	1	0.468
40	0.354	1.320	0.072	1	0.788
41	0.576	1.308	0.194	1	0.660
42	0.773	1.317	0.345	1	0.557
43	0.388	1.319	0.087	1	0.769
44	-0.082	1.301	0.004	1	0.950
45	0.738	1.346	0.301	1	0.583
46	0.899	1.312	0.470	1	0.493

47	1.475	1.339	1.213	1	0.271
48	0.731	1.310	0.311	1	0.577
49	0.457	1.375	0.110	1	0.740
50	1.979	1.406	1.981	1	0.159
51	.311	1.447	.046	1	0.830
52	.213	1.777	.014	1	0.905
53	2.902	1.766	2.700	1	0.100
54	0			0	
Environmental Attitude Score					
12	-23.768	2.189	117.848	1	0.000*
14	-1.577	1.806	0.762	1	0.383
15	-0.417	0.891	0.219	1	0.640
16	-0.089	1.309	0.005	1	0.946
17	-1.003	0.856	1.373	1	0.241
18	-1.063	0.480	4.902	1	0.027*
19	-0.931	0.445	4.369	1	0.037*
20	-0.891	0.346	6.643	1	0.010*
21	-0.730	0.368	3.933	1	0.047*
22	-0.624	0.327	3.653	1	0.056
23	-0.283	0.373	0.578	1	0.447
24	0.256	0.360	0.506	1	0.477
25	0			0	
Native Plant-Use Score					
2	2.386	1.910	1.561	1	0.211

3	2.754	2.593	1.128	1	0.288
4	2.305	1.879	1.504	1	0.220
5	3.468	1.880	3.403	1	0.065
6	2.491	1.848	1.817	1	0.178
7	2.967	1.871	2.516	1	0.113
8	0			0	

APPENDIX C

	Estimate^{z}	Std. Error	Wald	df	*P*
Bought Product with Native Plants in it					
Doesn't Apply	-0.742	0.497	2.231	1	0.135
I don't know	0.093	0.450	0.043	1	0.836
No	0.075	0.308	0.060	1	0.807
Yes	0			0	
Planted Native Plants					
Doesn't Apply	-0.782	1.810	0.187	1	0.666
I don't Know	-1.479	1.791	0.681	1	0.409
No	-1.537	1.820	0.713	1	0.399
Yes	0			0	
Box Store Frequency					
Rarely (≤24%)	-1.150	0.277	17.220	1	0.000*
Occasionally (25-49%)	-1.080	0.309	12.167	1	0.000*
Often (50-74%)	-0.732	0.244	9.017	1	0.003*
Very Often (≥75%)	0			0	
Farmers' Market Frequency					
Doesn't Know	-2.157	1.336	2.608	1	0.106
Rarely (≤24%)	0.318	0.378	0.706	1	0.401
Occasionally (25-49%)	0.266	0.286	0.865	1	0.352
Often (50-74%)	0.204	0.253	0.649	1	0.420
Very Often (>75%)	0			0	
Ecological Considerations into Account					
Disagree	0.741	0.610	1.475	1	0.225
Undecided	0.924	0.373	6.151	1	0.013*
Agree	0.266	0.265	1.005	1	0.316

Strongly Agree	0			0	
Buy Local when I can					
Disagree	0.247	1.005	0.061	1	0.806
Undecided	-0.239	0.482	0.245	1	0.620
Agree	0.180	0.224	0.646	1	0.422
Strongly Agree	0			0	
Individuals should take environmental considerations into account when making purchases					
Disagree	2.366	1.117	4.490	1	0.034*
Undecided	-1.179	0.770	2.343	1	0.126
Agree	-0.336	0.227	2.194	1	0.139
Strongly Agree	0			0	
USDA Organic Agriculture					
Strongly Disagree	0.655	1.929	0.115	1	0.734
Disagree	0.395	0.599	0.435	1	0.510
Undecided	0.119	0.372	0.103	1	0.749
Agree	-0.105	0.240	0.189	1	0.664
Strongly Agree	0			0	
Shop Environmentally Responsible way					
Disagree	-0.442	0.875	0.255	1	0.613
Undecided	0.933	0.448	4.332	1	0.037*
Agree	0.155	0.284	0.299	1	0.585
Strongly Agree	0			0	
Behave Environmentally Conscious Way					
Strongly Disagree	-0.584	1.983	0.087	1	0.768
Disagree	0.548	0.834	0.433	1	0.511
Undecided	-0.228	0.463	0.243	1	0.622

Agree	0.124	0.261	0.227	1	0.634
Strongly Agree	0			0	
Local Fresh Produce					
I don't know	3.855	1.147	11.287	1	0.001*
Rarely (≤24%)	-0.711	0.552	1.660	1	0.198
Occasionally (25-49%)	0.229	0.307	0.558	1	0.455
Often (50 – 74%)	0.074	0.231	0.101	1	0.750
Very Often (≥75%)	0			0	

[z]Estimates are logarithmic in value.
*Statistically significant at the 0.05 level.

APPENDIX D

Demographics	Estimate[z]	Std. Error	Wald	df	*P*
Age					
Under 25 years	1.318	0.499	6.963	1	0.008*
25-34 years old	0.479	0.389	1.513	1	0.219
35-49 years old	0.172	0.399	0.186	1	0.666
50-64 years old	0.759	0.391	3.775	1	0.052
65+ years old	0			0	
Education					
Less than 9th Grade	-1.111	1.311	0.719	1	0.396
9th-12th grade, no diploma	-3.340	1.188	7.898	1	0.005*
High School Graduate or Equivalent	0.488	0.917	0.283	1	0.595
Some College, no degree	-0.703	0.293	5.751	1	0.016*
Associate's Degree	0.111	0.379	0.086	1	0.769
Bachelor's Degree	0.145	0.234	0.383	1	0.536
Trade School	-0.370	0.593	0.391	1	0.532
Graduate or Professional	0			0	
Income					
Less than $14,999	0.476	1.812	0.069	1	0.793
$15,000 to $24,999	0.613	1.821	0.113	1	0.737
25,000 to $34,999	0.657	1.803	0.133	1	0.716
$35,000 to $74,999	0.855	1.789	0.228	1	0.633
75,000 to $99,999	0.444	1.800	0.061	1	0.805
$100,000 to $149,999	0.943	1.797	0.276	1	0.600
$150,000 and over	0			0	
Gender					
Female	-0.196	0.200	0.714	1	0.398
Male	0			0	

Ethnicity					
Caucasian	-0.112	0.397	0.079	1	0.778
African American	0.228	0.707	0.104	1	0.747
Asian/Pacific Islander	-0.211	0.584	0.131	1	0.718
Hispanic (of any race)	0.363	0.485	0.559	1	0.455
Other	0			0	

[z]Estimates are logarithmic in value.
[*]Statistically significant at the 0.05 level.

APPENDIX E

	Estimate[z]	Std. Error	Wald	df	*P*
Local Food Use Score					
26	0.679	1.851	0.135	1	0.714
27	1.976	1.859	1.130	1	0.288
28	2.369	1.862	1.619	1	0.203
29	1.061	2.286	0.215	1	0.643
30	1.676	1.839	0.831	1	0.362
31	0.205	1.510	0.018	1	0.892
32	-0.050	1.591	0.001	1	0.975
33	0.952	1.466	0.421	1	0.516
34	0.087	1.402	0.004	1	0.950
35	0.810	1.364	0.352	1	0.553
36	0.374	1.423	0.069	1	0.793
37	-0.073	1.376	0.003	1	0.958
38	-0.573	1.381	0.172	1	0.678
39	1.002	1.369	0.536	1	0.464
40	0.416	1.357	0.094	1	0.759
41	0.167	1.342	0.015	1	0.901
42	0.403	1.357	0.088	1	0.766
43	-0.172	1.354	0.016	1	0.899
44	0.344	1.343	0.066	1	0.798
45	0.133	1.382	0.009	1	0.924
46	-0.505	1.339	0.142	1	0.706
47	-0.370	1.367	0.073	1	0.786
48	0.046	1.349	0.001	1	0.973
49	-0.964	1.414	0.465	1	0.495
50	0.124	1.426	0.008	1	0.931
51	0.419	1.487	0.079	1	0.778
52	0.956	1.808	0.280	1	0.597
53	-1.165	1.658	0.494	1	0.482

55	0			0	
Environmental Attitude Score					
12	0.958	2.681	0.128	1	0.721
14	-21.409	0.000	-	1	-
15	2.933	0.929	9.977	1	0.002*
16	0.650	1.312	0.246	1	0.620
17	1.601	0.888	3.253	1	0.071
18	0.554	0.488	1.288	1	0.256
19	1.037	0.454	5.206	1	0.023*
20	0.562	0.352	2.555	1	0.110
21	0.428	0.372	1.323	1	0.250
22	0.414	0.331	1.566	1	0.211
23	0.285	0.377	0.572	1	0.449
24	0.643	0.364	3.117	1	0.077
25	0			0	
Native Plant-Use Score					
2	-1.280	0.557	5.275	1	0.022*
3	-1.312	1.861	0.497	1	0.481
4	0.099	0.452	0.048	1	0.826
5	0.206	0.392	0.276	1	0.600
6	-0.557	0.265	4.412	1	0.036*
7	-0.288	0.391	0.543	1	0.461
8	0			0	
WTP Rate					
I would not be willing to pay for Texas Persimmons, no matter the price.	0.616	0.452	1.864	1	0.172
Other	0.812	0.667	1.482	1	0.223
$0.70 less	2.673	1.098	5.922	1	0.015*
$0.50 less	-2.169	1.905	1.296	1	0.255
$0.40 less	2.947	1.834	2.582	1	0.108
$0.10 less	2.810	0.952	8.723	1	0.003*

$0.10 more	0.591	0.617	0.918	1	0.388
$0.20 more	-0.485	0.535	0.822	1	0.365
$0.30 more	0.700	0.478	2.146	1	0.143
$0.40 more	0.738	0.572	1.667	1	0.197
$0.50 more	0.742	0.338	4.820	1	0.028*
$0.60 more	-0.216	0.400	0.292	1	0.589
$0.70 more	0.322	0.308	1.099	1	0.295
Other	0			0	

[z]Estimates are logarithmic in value.
[*]Statistically significant at the 0.05 level.

QUANTITATIVE INSTRUMENT

Texas State University - San Marcos
Agriculture Department

Please circle the choice which best fits your answer.

1) Organic agriculture, as defined as "USDA Certified Organic," (meaning that the product was grown with no use of chemical fertilizers) is important to me.

a) Strongly Agree b) Agree c) Undecided d) Disagreee) Strongly Disagree

2) I think of myself as an environmentally responsible shopper.

a) Strongly Agree b) Agree c) Undecided d) Disagreee) Strongly Disagree

3) I believe that I behave in an environmentally-conscious way.

a) Strongly Agree b) Agree c) Undecided d) Disagreee) Strongly Disagree

4) When I buy a product, I take ecological considerations into account.

a) Strongly Agree b) Agree c) Undecided d) Disagreee) Strongly Disagree

5) I prefer to buy locally.

a) Strongly Agree b) Agree c) Undecided d) Disagreee) Strongly Disagree

6) It is important that each individual be aware of environmental concerns.

a) Strongly Agree b) Agree c) Undecided d) Disagreee) Strongly Disagree

7) All plants and animals play an important role in the environment.

a) Strongly Agree b) Agree c) Undecided d) Disagreee) Strongly Disagree

Please tell us how much you agree or disagree that the following areas fit your definition of "local," for the purposes of purchasing products.

8) Your Home County

a) Strongly Agree b) Agree c) Undecided d) Disagreee) Strongly Disagree

9) Bastrop, Hays, Blanco, Lee, Burnet, Llano, Caldwell, Travis, Fayette, Comal, and Williamson Counties

a) Strongly Agree b) Agree c) Undecided d) Disagreee) Strongly Disagree

10) Texas

a) Strongly Agree b) Agree c) Undecided d) Disagreee) Strongly Disagree

11) United States of America

a) Strongly Agree b) Agree c) Undecided d) Disagreee) Strongly Disagree

Price Premiums

Look at the bowl of fruit on the table when considering the next 3 questions. They are Texas Persimmons.

Rank the following in order of preference, as if you were purchasing the items, with 1 being the best, and 4, the worst.

Type of produce	Cherries grown using fertilizers and pesticides	Cherries grown in a USDA Certified Organic method	Cherries grown within the Central Texas Area	Native fruit Texas Persimmon (similar in sweetness to cherries, with a larger pit)
Cost of a 12 oz. container.	$2.99	$3.99	$3.49	$4.99
Rank				

12) Given a situation where conventionally grown cherries were offered at $2.99 per pound, how much more would you be willing to pay for a pound of Texas Persimmons?

a) $0.10 more b) $0.20 more c) $0.30 more d) $0.40 more

e) $0.50 more f) $0.60 more g) $0.70 more h) Other __________

j) None of the above (See question 13)

13) If you responded "None of the above" to question 12, how much less would you be willing to pay for a pound of Texas Persimmons?

a) $0.10 less b) $0.20 less c) $0.30 less d) $0.40 less

e) $0.50 less f) $0.60 less g) $0.70 less h) Other _________

j) I would not be willing to pay for Texas Persimmons, no matter the price.

Personal Purchasing Habits

14) I bought a product made from a native Texas plant in the last year.

a) Yes b) No c) I don't know d) Does not apply to me

15) My family and I have planted native Texas plants in the last year.

a) Yes b) No c) I don't know d) Does not apply to me

16) I typically buy food at a box store (Wal-Mart, H-E-B).

a) Very Often (≥75% of the time) b) Often (50 – 74% of the time)

c) Occasionally (25-49% of the time) d) Rarely (≤24% of the time) e) I don’t know

17) I typically buy food at a local farmer's market.

a) Very Often (≥75% of the time) b) Often (50 – 74% of the time)

c) Occasionally (25-49% of the time) d) Rarely (≤24% of the time) e) I don’t know

How often do you buy food in following categories?

18) Local fresh produce.

a) Very Often (≥75% of the time) b) Often (50 – 74% of the time)

c) Occasionally (25-49% of the time) d) Rarely (≤24% of the time) e) I don’t know

19) Local dairy products.

a) Very Often (≥75% of the time)   b) Often (50 – 74% of the time)

c) Occasionally (25-49% of the time)   d) Rarely (≤24% of the time)   e) I don't know

20) Local meats.

a) Very Often (≥75% of the time)   b) Often (50 – 74% of the time)

c) Occasionally (25-49% of the time)   d) Rarely (≤24% of the time)   e) I don't know

21) Local processed foods (e.g. bread, jam).

a) Very Often (≥75% of the time)   b) Often (50 – 74% of the time)

c) Occasionally (25-49% of the time)   d) Rarely (≤24% of the time)   e) I don't know

22) Local eggs.

a) Very Often (≥75% of the time)   b) Often (50 – 74% of the time)

c) Occasionally (25-49% of the time)   d) Rarely (≤24% of the time)   e) I don't know

Please circle the answer which most accurately reflects you.

23) Age

a) Under 25 Years   b) 25-34 years old   c) 35-49 years old
d) 50-64 years old   e) 65+ years old

24) Education

a) Less than 9th grade

b) 9th to 12th grade, no diploma

c) High School graduate or equivalent

d) Some college, no degree

e) Associate degree

f) Bachelor's degree

g) Trade school

h) Graduate or Professional Degree

25) Household Income

a) Less than $14,999

b) $15,000 to $24,999

c) $25,000 to $34,999

d) $35,000 to $74,999

e) $75,000 to $99,999

f) $100,000 to $149,999

g) $150, 000 and over

26) Gender

a) Female

b) Male

27) Ethnicity

a) Caucasian

b) African American

c) Asian/Pacific Islander

d) Hispanic (of any race)

e) Other ____________

QUALITATIVE INSTRUMENT

Texas State University - San Marcos

Agriculture Department

Native Food Restaurant Survey

The following questions will be asked of the participant. This survey will be conducted interview-style. All responses will be recorded by hand, and any questions the participant will have will be answered by the researcher to the best of their ability.

1) What is your general attitude towards the term “organic” as it relates to food?

2) What is your general attitude towards the “local” as it relates to food?

3) What is your general attitude towards the “native” as it relates to food?

4) What do you think of the taste of the Texas Persimmon? What do you think of the smell of the Texas Persimmon? What do you think of the color of the Texas Persimmon? If you had the opportunity to purchase the Texas Persimmon for your restaurant, would you? Why or why not?

5) Do you think incorporating a native fruit would help your menu? Why or why not?

6) What properties do you look for when buying produce for your restaurant?

7) How long have you worked at this restaurant, and what is your current title? How long have you worked in the restaurant industry? How long have you been in this position, and what are your duties therein?

8) How much food does the restaurant purchase a week, in terms of pounds? What portion of that is organic? How much is locally produced? How long has the restaurant been in operation?

Price Premiums

Look at the bowl of fruit on the table when considering the next 3 questions. They are Texas Persimmons.

Rank the following in order of preference, as if you were purchasing the items, with 1 being the best, and 4 the worst.

Type of produce	Cherries grown using fertilizers and pesticides	Cherries grown in a USDA Certified Organic method	Cherries grown within the Central Texas Area	Native fruit Texas Persimmon (similar in sweetness to cherries, with a larger pit)
Cost of a 12 oz. container.	$2.99	$3.99	$3.49	$4.99
Rank				

9) Given a situation where conventionally grown cherries were offered at $2.99 per pound, how much more would you be willing to pay for a pound of Texas Persimmons?

a) $0.10 more   b) $0.20 more   c) $0.30 more   d) $0.40 more

e) $0.50 more   f) $0.60 more   g) $0.70 more   h) Other __________

j) None of the above (See question 10)

10) If you responded "None of the above" to question 9, how much less would you be willing to pay for a pound of Texas Persimmons?

a) $0.10 less   b) $0.20 less   c) $0.30 less   d) $0.40 less

e) $0.50 less   f) $0.60 less   g) $0.70 less   h) Other __________

j) I would not be willing to pay for Texas Persimmons, no matter the price.

11) Age

a) Under 25 Years   b) 25-34 years old   c) 35-49 years old

d) 50-64 years old   e) 65+ years old

12) Education

a) Less than 9th grade

b) 9th to 12th grade, no diploma

c) High School graduate or equivalent

d) Some college, no degree

e) Associate degree

f) Bachelor's degree

g) Trade school

h) Graduate or Professional Degree

13) Household Income

a) Less than $14,999

b) $15,000 to $24,999

c) $25,000 to $34,999

d) $35,000 to $74,999

e) $75,000 to $99,999

f) $100,000 to $149,999

g) $150, 000 and over

14) Gender

a) Female

b) Male

15) Ethnicity

a) Caucasian

b) African American

c) Asian/Pacific Islander

d) Hispanic (of any race)

e) Other ____________

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