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Imperfect Produce Pricing: Relationships between Price Percent Discount and Demographic Traits of Customers

April Foster

University of Arkansas, Fayetteville

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Imperfect Produce Pricing: Relationships between Price Percent
Discount and Demographic Traits of Customers

A thesis submitted in partial fulfillment
of the requirements for the degree of
Master of Science in Agriculture and Extension Education

by

April Foster
University of Arkansas
Bachelor of Science in Food Technology, 2007

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University of Arkansas

This thesis is approved for recommendation to the Graduate Council.

Kate Shoulders, Ph.D.
Thesis Director

Jefferson Miller, Ph.D.
Committee Member

Donald Johnson, Ph.D.
Committee Member

Curt Rom, Ph.D.
Committee Member

Abstract

This research sought to understand the impact of price reductions on consumer spending behaviors related to the purchase of imperfect produce. Additionally, the correlation between consumers' demographics and their willingness to purchase imperfect produce at various price points was evaluated. The data was viewed with mindfulness toward reducing food loss as a function of the world food crisis. More specifically, the purpose of this study was to describe the relationship between Washington County, Arkansas consumers' demographic traits and the percent discount at which they are willing to alter their behavior to purchase specific imperfect produce items. Using the Theory of Planned Behavior as a framework, this study achieved its purpose via a direct consumer survey which collected pricing information and demographic information. The data revealed an expected mean percent discount of 21%, with a range of seven percent to 32% dependent on the type of produce queried. Linear regressions were used to determine if demographics could be used to statistically predict expected price points. The largest explanation of variability occurred between store type and tomatoes with a calculated value of 3.2%. This study has shown that demographics play a very small role in consumer expectations for price of imperfect produce. This study has also shown that consumers expect a wide range of discount dependent on type of produce.

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Finally and most importantly, I want to acknowledge my God, who has provided me shelter and guidance throughout my life. Here's to an eternity together.

Dedication

This research is dedicated to my children, Korbin and Inari. I hope you learn that it's not what's on the outside but rather what's on the inside that matters the most. After all, imperfect produce still offers nutritional benefits. Your imperfections offer benefits as well.

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CHAPTER I. INTRODUCTION

Background of the Study

Imperfect produce currently lacks a standard definition. For the purposes of this study, imperfect produce refers to fruits or vegetables safe for human consumption but having some defect that has conventionally prevented them from being offered for sale or purchased and consumed by the average American consumer. It includes items such as red delicious apples with too little red on the skin, hollow-hearted potatoes, and oversized strawberries. Imperfect produce is a natural result of farming the conventionally accepted produce items Americans eat every day (Leschin-Hoar, 2014). Imperfect produce is often either unharvested or unpurchased, contributing to the nearly 40% of food produced in the United States each year that goes uneaten (Leschin-Hoar, 2014).

Historical food loss. As far back as 1977, the United States government has been aware of the implications associated with the growing world population as they relate to agriculture. The United States General Accounting Office (GAO) published a study predicting the issues the global community is now facing and stated the following:

In the context of rising population, uncertain weather, and concern with the availability of resources, every opportunity should be taken to improve food system management in this country. (GAO, 1977, cover page)

In relation to the necessity of preparing for the burgeoning population's increasing food demand, studies were performed to find areas and costs associated with food loss. Studies estimated that by the 1970s, 20% of crops produced and available for harvest, i.e., approximately 137 million tons of crops per year, were lost in some way. Furthermore, those crops were valued at \$31 billion per annum. Within the food system, 44% of that loss occurred during the harvest portion of the food cycle. In 1974, there was an estimated four percent loss rate at wholesale and

retail levels. Additionally, data from the same year revealed that only 10% to 20% of vegetables and 0% to 30% of fruit lost at the farm level was utilized in a secondary application such as canning (GAO, 1977).

The GAO study ultimately determined the financial cost of food loss was paid out by the consumer. This resulted from pricing structures that accounted for expected loss of products throughout the supply chain (GAO, 1977). In addition to financial loss, the end consumer suffers the nutritional loss that results when producers sell imperfect produce items to further processors such as canners or juicers. This loss occurs because processing techniques like heating, caustic cleaning and peeling destroy certain nutrients (GAO, 1977).

The General Accounting Office did note some loss is unavoidable because of issues, such as damage from harvesting techniques, which result in unsafe food, for example, a squash that is punctured allowing for bacteria to be introduced into the vegetable. Additionally, some losses were reported as being justifiably economical with reasons such as the slowness of technology transfer impeding loss-reducing technique implementation (GAO, 1977).

Recent food loss. Studies relating to food loss have been reemerging in recent years. For example, a 2013 *Food Logistics* article found that, as a result of quality or freshness issues, plate waste or overbuying, up to 40% of food grown in the United States is never eaten. Financially speaking, this is equivalent to approximately \$43 billion-worth of produce items per year (Grant, 2013).

In other terms, data collected by the United States Environmental Protection Agency (EPA) from the same year (2013) revealed that an estimated 35 million tons of food waste was disposed of in landfills in the United States alone (EPA, n.d.). Additionally, per day in 2010, 387

billion calories were not available for consumption because of food loss (Buzby, Wells, & Hyman, 2014).

Future food loss. As the global community continues forward, reducing food loss remains vital for a variety of reasons. Reducing food waste could not only reduce food costs worldwide but could improve human nutrition on a global scale as well. According to a formative research study published by the USDA in 2014, a better understanding of food waste, from physical amount wasted to value of amount wasted, can be used to drive changes to legislation and policies (Buzby, Wells, & Hyman, 2014). In addition to financial savings, the EPA reported that curtailing food waste can reduce methane emissions produced by food decomposing in landfills and can conserve energy and resources throughout the farm to fork cycle (EPA, n.d.).

Utilizing Ajzen's Theory of Planned Behavior, this study sought to determine the price reduction at which consumers in Washington County, Arkansas would alter their buying behavior of imperfect produce items (Ajzen, 1991). Furthermore, the study sought to describe correlations between willingness to purchase imperfect produce and consumer demographics, including socioeconomic status.

Statement of the Problem

Knowledge regarding the impact of price reductions on consumer spending behaviors related to the purchase of imperfect produce can assist in the reduction of food loss, thereby contributing to the solving of the world food crisis (Institute of Food Technologists, n.d.; USDA Office of the Chief Economist, n.d.). Additionally, understanding the correlation between consumers' demographics and their willingness to purchase imperfect produce at various price points may provide retailers, educators and legislators with a source of useful information for selling imperfect produce.

Purpose and Objectives

Work needs to be done to solve the problem of food loss as it relates to imperfect produce. The purpose of this study was to describe the relationship between Washington County, Arkansas consumers' demographic traits and the percent discount at which they are willing to alter their behavior to purchase specific imperfect produce items. Using the Theory of Planned Behavior as a framework, this study achieved this purpose via the methodology as laid out in Chapter 3 of this study and the following objectives:

1. Describe the demographic traits, including socioeconomic status, ethnicity, age and shopping role, of selected Washington County, Arkansas consumers.
2. Describe the price reduction, compared to the price point of conventionally accepted produce, at which selected Washington County, Arkansas consumers would be willing to purchase specific imperfect produce.
3. Describe the relationship between selected Washington County, Arkansas consumers' demographic traits and the percent discount at which they would be willing to purchase specific imperfect produce items.

Significance of the Study

Imperfect produce and its uses have recently been gaining societal attention (IFT, n.d.). This study supplies a starting point for future studies regarding imperfect produce because it can be applied to address global issues of food loss and food security. The study seeks to understand the price reduction at which consumers would alter their behaviors and purchase imperfect produce items. Knowledge regarding consumer willingness to purchase imperfect produce items gained from this study could be used to impact both government and retailer policies regarding

the disposition and use of produce that is imperfect or flawed in some form but is otherwise safe for human consumption.

The study of price reductions for imperfect produce is of interest to a variety of members of the agricultural business sector. United States legislators could potentially use information gathered about consumer willingness to purchase imperfect produce items to enact legislation similar to that passed by the French parliament in 2015, which essentially made it illegal for large grocery stores to discard food that is safe for human consumption (White, 2015). The next chapter reviews literature related to the topics discussed in this study in additional detail and further presents the need for the study.

Definition of Terms

Attitude toward a Behavior

Attitude toward a behavior is a term used in the Theory of Planned Behavior referring to the “degree to which a person has a favorable or unfavorable evaluation or appraisal of the behavior in question” (Ajzen, 1991, p. 188). For this study, attitude toward a behavior refers to a consumer’s appraisal of the act of purchasing imperfect produce.

Conventionally Accepted Produce

For the purposes of this study, conventionally accepted produce refers to produce, including both fruits and vegetables, sold directly to consumers that is without major blemishes or imperfections, meeting cosmetic standards for color, size, shape, and weight (Mugica, 2017).

Food Insecure

For the purposes of this study, food insecure describes households that either are unable to acquire or are uncertain of having enough food to meet the nutritional needs of all their household members as a result of insufficient money or resources. Food insecurity can occur at

any point during the year and does not imply a continual state of need for the entirety of the year (USDA ERS, 2016).

Food Loss

For the purposes of this study, food loss refers to the decrease of edible food that was originally planned to be available for human consumption that occurs during the production, post-harvest or processing stages of the food supply chain (Gustavsson, Cederberb, & Sonesson, 2011, p. 2).

Food Waste

For the purposes of this study, food waste refers to the decrease of edible food that was originally planned to be available for human consumption that occurs during retailing or during the food supply chain, including plate waste (Gustavsson, Cederberb, & Sonesson, 2011, p. 2).

Food Security

Food security was defined as “when all people have at all times access to sufficient, safe, nutritious food to maintain a healthy and active life” during the World Food Summit of 1996 (World Health Organization, n.d.).

Imperfect Produce

Imperfect produce does not yet have a standard definition. Some common terms other than “imperfect produce” are “ugly produce” and “blemished produce.” For this study, we will use the term “imperfect produce” to refer to fruits or vegetables safe for human consumption but having some defect that has conventionally prevented them from being offered for sale or purchased and consumed by the average American consumer.

Perceived Behavioral Control

Perceived behavioral control is a term used in the Theory of Planned Behavior referring to the “perceived ease or difficulty of performing the behavior and it is assumed to reflect past experience as well as anticipated impediments and obstacles” (Ajzen, 1991, p. 188). For this study, perceived behavioral control refers to a consumer’s perceived ability to purchase imperfect produce.

Plate Waste

For the purposes of this study, plate waste is a measurement of edible food originally planned for human consumption that is discarded by consumers after purchasing and serving for consumption. This includes both the home setting, where the consumers prepare their own plated food, and foodservice settings. It can be defined as the amount of edible food served that is ultimately uneaten prior to discarding (Buzby & Guthrie, 2002). By the definitions in this study, it is included in measurements of food waste.

Price Point

For the purposes of this study, a price point is the suggested retail price of a specific product. Price points are set such that they can compete with other like products and can be adjusted or altered as demand and competition require (Business Dictionary, n.d.).

Social Norm

Social norm is a term used in the Theory of Planned Behavior referring to “the perceived social pressure to perform or not to perform” the specific behavior being studied (Ajzen, 1991, p. 188). For this study, a social norm refers to the perceived social pressure to utilize imperfect produce.

Theory of Planned Behavior

The Theory of Planned Behavior is an extension of Icek Ajzen's previous theory, Reasoned Actions, and suggests that intentions to perform a behavior can be accurately predicted based on personal attitude toward a behavior, subjective norms and perceived behavioral control (Ajzen & Madden, 1985; Ajzen, 1991). The Theory of Planned Behavior is used in this study as part of the theoretical framework.

Limitations

The study had the following limitations:

1. The sample was drawn from a single county in the state of Arkansas, and the frame was somewhat limited by those areas with populations that responded to the survey.

Therefore, results may not be generalizable to other counties or states.

2. The data collected in this study were all self-reported and relied on the respondents providing truthful answers to all questions.
3. Only specific produce items and specific defects were shown in the survey. Thus, these results may not be generalized to all produce items and all defects.
4. Extraneous variables outside the control of the researcher could impact willingness to purchase items. Such variables include personal preference and participant unfamiliarity with market prices.

Assumptions

This study included the following assumptions: (a) the participants responded truthfully; (b) the participants were familiar with the produce items even if they did not purchase them on a regular basis; (c) the participants understood the general statements at the beginning of the

questionnaire; and (d) the data collected measured participant willingness to purchase produce items.

Organization of the Thesis

This research study is described in five chapters. Chapter I includes the background of the study, statement of the problem, purpose and objectives of the study, significance of the study, definition of terms, limitations and assumptions of the study.

Chapter II presents the literature review. It begins with an introduction and is then divided based on the divisions of the Theory of Planned Behavior: personal attitude toward a behavior, subjective norms and perceived behavioral control. Chapter II then offers a conclusion of the theory followed by a summary. Chapter III describes the methodology used for the research study. It is organized into four main sections: selection of participants, instrumentation, data collection and data analysis.

Chapter IV presents the study's findings and is divided up by the three research objectives. Chapter V delivers a summary of the entire study, findings discussion, implications resulting from the study, recommendations for further research and conclusions.

CHAPTER II. LITERATURE REVIEW

Introduction

This study seeks to understand the price reduction at which consumers will alter their behavior to be willing to purchase imperfect produce. The study's design was informed by the Theory of Planned Behavior. This chapter discusses the Theory of Planned Behavior as well as literature related to the relationship between consumers' socioeconomic status and the price reduction at which they would be willing to purchase imperfect produce.

Previous researchers and organizations, including the United States Office of the Chief Economist and the Institute of Food Technologists (IFT), have studied the issues of food waste and food loss as they relate to the economy and consumers for decades (IFT, n.d.; USDA Office of the Chief Economist, n.d.). Recent trends move toward finding ways to sell and market imperfect produce to consumers as a function of avoiding food waste (IFT, n.d.). Additionally, studies have been completed regarding price discounts for commodities other than produce (Cooke, 2016; Coughlan & Soberman, 2004; Harfmann, 2016; Peterson, 2015). Price reduction and demographic studies have been completed with regard to imperfect items sold at outlet malls (Coughlan & Soberman, 2004) and at discount retailers (Cooke, 2016; Harfmann, 2016; Peterson, 2015).

Feeding a growing world population requires utilizing all available food sources. Governments and other prestigious organizations, such as the Institute of Food Technologists, are placing critical importance on food sources to meet this demand. The task of developing markets for imperfect produce has recently become a major focus of producers and retailers both within the United States and internationally, especially in European markets. Thus, this study sought to examine the relationship between consumers and the price reduction at which those

consumers would be willing to purchase imperfect produce as a way of determining the market for imperfect produce as a food source.

The following review of literature represents that literature which is pertinent to this research study, namely the issues related to food waste and food loss, the recent inclination toward selling imperfect produce, the percent price reduction at which other commodities are sold and the socioeconomic and descriptive characteristics that define consumers who purchase imperfect items. More specifically, this chapter is divided into the following sections based on the three main tenants of the Theory of Planned Behavior: an overview of the Theory of Planned Behavior, personal attitude toward a behavior, subjective norms, perceived behavioral control and a conclusion of the theory.

Theory of Planned Behavior

The Theory of Planned Behavior is commonly credited as having been developed in largest part by Icek Ajzen in the mid-1980s (Ajzen, 1991). Planned behavior is an extension of Ajzen's previous theory, reasoned actions, which held that personal attitudes combined with subjective norms could predict intentions and behaviors (Ajzen & Madden, 1985). The Theory of Planned Behavior further postured that perceived behavioral control, in conjunction with the items specified in the theory of reasoned actions, acts as an accurate predictor of intentions and resulting behaviors (Ajzen & Madden, 1985). Ajzen summarized the underlying belief of the theory of planned behavior as follows:

As a general rule, the more favorable the attitude and subjective norm with respect to a behavior, and the greater the perceived behavioral control, the stronger should be an individual's intention to perform the behavior under consideration (Ajzen, 1991, p. 188).

The theory of planned behavior was further explained by Munro, Lewin, Swart, and Volmink (2007) (see Figure 1).

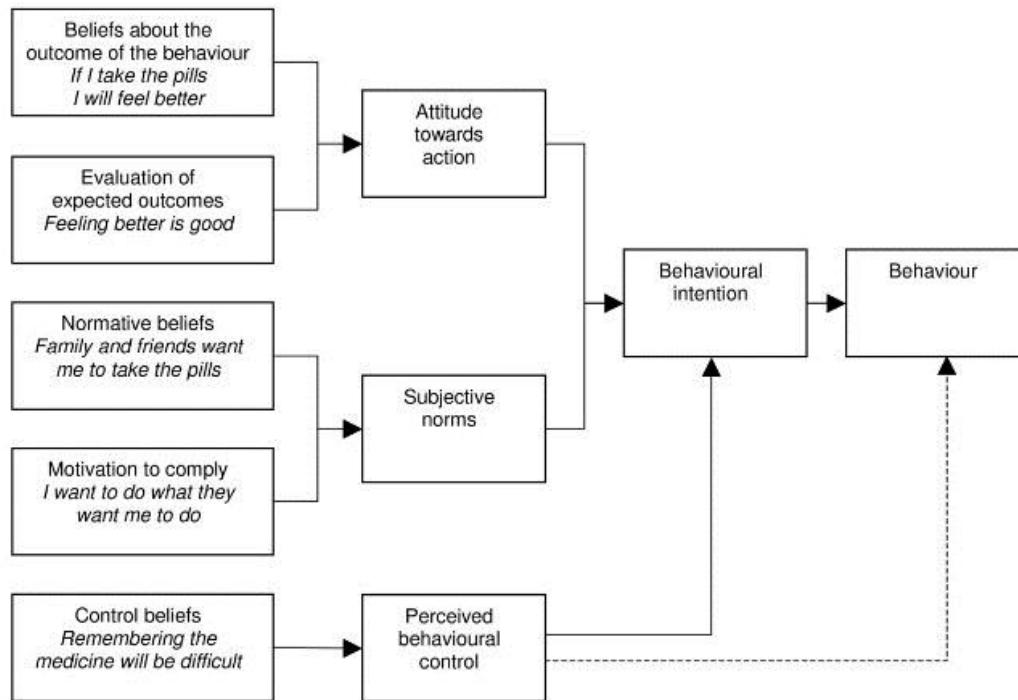


Figure 1. A model of the theory of Planned Behaviour. Adapted from “A Review of Health Behaviour Theories: How Useful are these for Developing Interventions to Promote Long-Term Medication Adherence for TB and HIV/AIDS?” by S. Munro, S. Lewin, T. Swart, and J. Volmink, 2007. *BMC Public Health*, 7(1), p. 104.

Personal Attitude toward a Behavior

Personal attitude toward a behavior deals with the level at which a person has a positive or negative valuation of the behavior in question (Ajzen & Madden, 1985). This valuation is largely based on two subcategories. The first is the person’s beliefs about the outcome of the behavior. This can be written out as: If I do *Behavior A*, *Outcome B* will occur. The second subcategory is an evaluation of the expected outcomes, written such that *Outcome B* is *Positive/Negative*. Combined, these two subcategories create a person’s personal attitude toward the behavior (Munro, Lewin, Swart, & Volmink, 2007).

With regard to this study, *Behavior A* would be purchasing an imperfect produce item at a reduced price; *Outcome B* would be saving money by purchasing and owning imperfect produce. The expected outcome of someone making the purchase would be positive if the person were to view the saved money, *Outcome B*, as having more personal worth than having a perfect product. The expected outcome would be negative if the individual personally found buying an imperfect product not to be worth the tradeoff no matter what the price reduction. If the person finds the outcome negative, he or she will not perform the behavior. These outcomes would be indicated in the survey.

Food loss. One personal attitude toward a behavior to be considered is the consumer need for cosmetically perfect produce items. Food loss must be reduced in an effort to feed the world's growing population, which is estimated to reach 9.6 billion people by the year 2050. To help collect data and facilitate discussions on these issues, the Institute of Food Technologists created a Future Food 2050 website (IFT, n.d.), which includes an article examining the stance that developed countries waste food because their consumers harbor an aspiration for cosmetic perfection in their produce (Derbyshire, 2014).

Additionally, in the interview upon which the article is based, Tristram Stuart, considered an expert in food waste, states:

I am critical of the discourse based on the premise that we will have 9 billion people on the planet by 2050, and how on earth are we going to feed them without increasing production? We already grow enough food for 12 billion. There are some regions of the world where increased production would be beneficial, but globally speaking that is not what our primary objective is. (Derbyshire, 2014, ¶9)

The article goes on to discuss Stuart's belief that to end food waste, consumer perceptions and buying habits must be changed along with government regulations. Moreover, it touches upon

the fact that retailers discard or reject large amounts of food for cosmetic flaws and producers leave crops unharvested as a result of overproduction (Derbyshire, 2014).

Subjective Norms

Subjective norms are a social factor measuring societal pressure to either perform or not perform a specific action (Ajzen & Madden, 1985). Subjective norms are controlled by two subcategories. The first is normative beliefs. This is an individual's belief about how others want the individual to behave (Munro, Lewin, Swart, & Volmink, 2007). Others could be defined as any individual or group, such as family, friends or coworkers. Others could even be other governments or the global community. This concept can be broken down to *Other(s) C* wants me to do *Behavior A* or *Other(s) C* does not want me to do *Behavior A*.

The second subcategory of subjective norms is motivation to comply (Munro, Lewin, Swart, & Volmink, 2007). Does the person care what the others want? If so, pressure is exerted on the person to adjust his or her behavior to comply with the opinions of the others. Altogether, the subjective norm could be written out as *Other(s) C* wants me to do *Behavior A* and I care what *Other(s) C* thinks, so I will do *Behavior A*.

Food loss. As defined in recent years by the United States Department of Agriculture (USDA), "food loss" is the entire amount of postharvest edible food not consumed for any reason ranging from plate waste to inadequate climate control. "Food waste" is one portion of food loss that occurs when food is discarded by retailers as a result of cosmetic imperfections such as blemishes or being off-color from conventionally accepted standards (Buzby, Wells, & Hyman, 2014). As knowledge about food loss and food waste and its impact on the world community grows, the knowledge may act as a pressuring subjective norm to make behavioral changes.

Imperfect produce. Discussions like those on the Future Food 2050 website (IFT, n.d.) are becoming more common, and discourse on food loss typically leads to dialogue regarding the prevention of such loss. Although not all food loss is avoidable, researchers continue to search for ways to significantly reduce food loss to help feed the expanding global population (GAO, 1977; IFT, n.d.). The following sections reference efforts to reduce food loss as it specifically relates to imperfect produce. These sections help to show that attitudes, and therefore subjective norms, toward using imperfect produce are changing.

International imperfect produce. Some of the international steps taken by retailers to sell imperfect produce and thereby reduce food loss have recently been studied. One example of this includes a study finding that, after the European Union relaxed its strict produce guidelines, Tesco successfully began selling “Monster Bunch” boxes with oversized produce items (Grill-Goodman, 2014). It is important to note this change was only possible after governmental regulations were relaxed and, as shown by the success of the program, consumers were willing to purchase the oversized items when given the opportunity.

Another international example of selling imperfect produce occurred recently in France. France’s Intermarché retailer began marketing imperfect produce in a campaign titled “the inglorious fruits and vegetables” (English translation) which included a short film and posters resembling those for theatrical films. Intermarché sold imperfect produce items at a 30% price reduction. Within two days of the campaign going live, Intermarché stores were reported to have a 24% traffic increase with a 1.2-ton sale of imperfect produce (Grill-Goodman, 2014).

Additional marketing strategies for naming imperfect produce have been used throughout Europe, Australia and Canada. Some of the names chosen to market imperfect produce include wonky fresh produce, odd bunch, naturally imperfect range, imperfect picks and nobody is

perfect. Additionally, only imperfect produce is used for cooking by the similarly-named German catering company Culinary Misfits (Calvo-Porrall, Medin, & Losada-Lopez, 2017).

Perceived Behavioral Control

The third and final factor regarding intent to perform a behavior in the Theory of Planned Behavior is perceived behavioral control. This factor considers the ability to perform a behavior. It measures the actual ability to control a behavior. There are both internal and external limitations to performing behaviors that must be considered (Ajzen & Madden, 1985).

For this study, an example of an internal limitation might be the person's knowledge regarding produce. A consumer who is not knowledgeable about red bell pepper blemishes might not believe he or she has the ability to judge whether an imperfect red bell pepper is worth purchasing, and this could prevent the person from buying a red bell pepper altogether. An example of an external limitation might be a lack of availability of imperfect produce to purchase. In both of these cases, the person perceives that he or she does not have control over purchasing the produce items.

Domestic imperfect produce. Also emerging in the United States is a trend to purchase and use imperfect produce, as both consumers and entrepreneurs become more educated regarding food loss, thereby removing limitations (Begun, 2016; Taylor, 2015). For instance, some local programs have been developed to allow regional growers to sell their imperfect produce items to restaurant operators, who in turn use the imperfect produce the same way they would use produce conventionally considered cosmetically acceptable to the general public (Begun, 2016; Taylor, 2015).

As recently as 2015, restaurant chefs have found imperfect produce generally has the same flavor profile as "perfect" produce when cooked in recipes (Taylor, 2015). Some examples

of successful imperfect produce uses include using spinach with broken leaves that might have been left unharvested, and therefore wasted as a food source, in dishes such as salad or using potatoes with a small blemish for roasting. Reportedly chefs discovered that using imperfect produce can offer a cost savings of up to 15% and help save produce preparation time in their businesses as well (Taylor, 2015).

Another example of imperfect produce use in the United States is Daily Table, a business created in part by Doug Rauch, former president of retailer Trader Joe's. Daily Table's approach to imperfect produce and the reduction of food waste is innovative by today's standards. Located in Boston, Massachusetts, Daily Table uses food that is safe for human consumption but which would typically be discarded by retailers either because of cosmetic blemishes or because it was unsold inventory. Daily Table sells the food either "as-is" or prepared as ready-to-eat meals, with both options priced at a reduced rate. However, Daily Table does face some significant obstacles, ranging from public relations issues to worries about being socioeconomically insensitive to low-income residents to convincing shoppers it is safe to buy out of date food (Leschin-Hoar, 2014).

As a further illustration, this study looked to the increasing foodservice trend of using imperfect produce. Compass Group started a program titled Imperfectly Delicious Produce in 2014. The program claims to have increased yields of some produce items by up to 40% (Begun, 2014). Imperfect produce items such as potatoes with hollow heart, a condition that does not impact the safety of the potato as far as human consumption is concerned but does leave a cavity in its center, were previously rejected. With programs like Imperfectly Delicious Produce emerging, those imperfect produce items are now being both purchased and consumed (Godoy, 2014). Furthermore, farmers have found the sale of these items to have significant

economic benefit, although the benefit is currently small because the market is still small (Godoy, 2014).

Price reductions. Although a recent *Progressive Grocer* article found the market for produce items in the United States has seen market category growth, it also noted most of the growth was from an increase in organic produce sales (Strailey, 2015). The question now facing produce retailers, ranging from grocery super centers to local farmers with stands at farmers' markets, is at what percent price reduction they should expect consumers to purchase imperfect produce. Additionally, those same produce retailers must wonder when they can continue to grow their markets in economically satisfying ways through the sale of imperfect produce. Data regarding pricing based on produce grades is available from the USDA. For additional insight into the historical sale of imperfect items, the researcher must look at non-produce imperfect items that can habitually be purchased for reduced prices.

Grades. One method of understanding the potential for imperfect produce sales is to look at current USDA grades. Currently, the USDA maintains grades for certain produce items. Prices for produce may vary based on assigned grade. An example of this is apples. Apples can be one of four government regulated grades: U.S. Extra Fancy, U.S. Fancy, U.S. No. 1, or U.S. Utility. A major key in grading is color. For Red Delicious apples, U.S. Extra Fancy apples must be at least 66 percent red, U.S. Fancy apples must be at least 40 percent red, and U.S. No. 1 apples must be at least 25 percent red. Other grading factors include damage, deformity, diameter, and maturity (USDA AMS, 2002). Red Delicious apples sized 64s sold in Atlanta, Georgia, at the terminal market level on May 30th, 2018, are valued at \$25.00 per cartons tray pack for grade U.S. Extra Fancy, while U.S. Fancy are valued at \$23.00 to \$25.00 per cartons

tray pack, showing a possible difference of up to \$2.00 per cartons tray pack (USDA AMS, 2018).

A Canadian price and grade study found that Canada Extra Fancy grade apples were worth approximately \$1.50 more per tray over Canada Fancy grade apples. The same study found that Canada Commercial grade apples were discounted at \$4.03 per tray (Carew & Smith, 2004). Finally, a 1992 study by Tronstad, Huthoefer & Monke found that the price reduction for U.S. Fancy apples was a discount of \$1.05 per box from the Extra Fancy price.

Outlet malls. With regard to the sale of non-produce imperfect items, one of the most common markets in the United States is that of retail outlet malls. These retail outlet malls historically sell excess, damaged or otherwise less desirable or lower quality goods from factories directly to consumers. A 2004 study found outlet malls have been successful in recent decades due to consumers' increasing desire to find products of sufficient quality for less financial cost. The study found that by 2003, outlet malls were generating \$15 billion in revenue (Coughlan & Soberman, 2004).

Additionally, the average price percent discount for clothing outlet stores was 24%. On the other hand, the study also revealed a price percent discount ranging from negative 15% to positive 47%. The researchers attribute this phenomenon to different marketing and pricing strategies as well as other underlying reasons that items were available in the outlet stores. Furthermore, only 15% of merchandise for sale in clothing outlet stores was reported as consisting of imperfect items (Coughlan & Soberman, 2004).

Discount retailers. In addition to retail outlet malls, United States consumers shop at discount general retailers such as Aldi and Dollar General. Their low-cost pricing strategies can offer insight into pricing strategies that can be utilized when selling imperfect produce items to

consumers. However, it is important to note discount retailers are still a niche market within the United States (Harfmann, 2016). Nonetheless, at the end of 2015, Lidl and Aldi, two large discount retailers in the United Kingdom, both saw double-digit sale growth compared to the previous fiscal year (Cooke, 2016).

A recent study conducted for popular news source and website *Business Insider* found that prices at Aldi stores were, on average, approximately 30% cheaper when compared with similar items at retail giant Walmart. While the study did not necessarily compare brand to brand, it did compare produce to produce. For example, three pounds of gala apples at Walmart were found to cost \$4.41 and to cost \$2.99 at Aldi, which represents a 32% price difference (Peterson, 2015).

Socioeconomics. Retailers and producers must also seek to understand who buys price-reduced items. Various studies on this issue have been completed (Coughlan & Soberman, 2004; Harfmann, 2016; Karande & Ganesh, 2000). Unfortunately, the data from the studies are inconclusive and often show differing findings from one study to another.

Outlet malls. A review of collected socioeconomic data related to the socioeconomic and descriptive characteristics associated with who is shopping for price-reduced items at outlet malls reveals some pertinent information and differing findings. For example, one study noted that a high percentage of shoppers at outlet malls consisted of individuals who were under 50 years of age and who had college degrees. These factors may indicate shoppers interested in price-reduced items include those well above the poverty line (Coughlan & Soberman, 2004). On the other hand, one study found that the age of shoppers was not concentrated into any specific age group (Karande & Ganesh, 2000).

In multiple studies, the majority of shoppers were noted to be women (Coughlan & Soberman, 2004; Karande & Ganesh, 2000). Additionally, reported in multiple studies, the median income reported by shoppers at outlet malls was higher than the previous researchers had expected (Coughlan & Soberman, 2004; Karande & Ganesh, 2000). In fact, the median income of the shoppers in the 2004 Coughlan and Soberman study was noted at \$57,000 in 2002. Finally, the average distance in minutes travelled to get to a retail outlet mall was 54 minutes (Coughlan & Soberman, 2004).

Discount retailers. In contrast to the findings related to socioeconomic and descriptive statistics of consumers who shop at outlet malls, a 2016 *Beverage Industry* article found consumers who shop at discount retailers tend to have a lower income. In fact, consumers were reported as being 93% more likely to shop at and purchase items from a discount retailer if they make less than \$35,000 per annum. Additionally, the largest demographic of consumers who purchase beverages at discount retailers was reported to be millennials with positive skewness toward African Americans and Hispanics (Harfmann, 2016).

Conclusion of Theory

With regard to this study, it is hoped to determine what price reduction results in a shift in a planned behavior to purchase imperfect produce. First, buying imperfect produce must be perceived as a personal positive decision by determining at what price reduction a consumer would purchase imperfect produce. Second, the review of literature discusses the manner in which governments and other organizations are building up subjective norms that can impact other governments' and individuals' behaviors toward the use of imperfect produce. Finally, the study is removing internal limitations by showing pictures of imperfect produce items that are safe to consume.

Summary

Using the ideas presented in this literature review as a guiding context, the purpose of this study is to examine and explore (a) the price percent discount at which consumers would be willing to purchase imperfect produce and (b) what characteristics define those consumers. The issues of food loss and food waste continue to be of central importance as the world population continues to grow (Derbyshire, 2014). Although gaining popularity among businesses, studies regarding the sale of imperfect produce directly to consumers in the United States are currently limited. Therefore, utilizing studies that deal with other commodities, this study will begin filling the gap associated with the emergent topic of the imperfect produce market, the socioeconomic factors at work and price reductions at which such produce can be sold directly to consumers.

Chapter III. Methodology

Introduction

The purpose of this research study was to describe the price points at which Washington County, Arkansas consumers were willing to purchase imperfect produce as well as to describe the correlation between Washington County, Arkansas consumers' willingness to purchase imperfect produce items and their demographic traits. The methodology used to test the research objectives is presented in this chapter. The research objectives guiding this study were:

1. Describe the demographic traits, including socioeconomic status, ethnicity, age and shopping role, of selected Washington County, Arkansas consumers.
2. Describe the price reduction, compared to the price point of conventionally accepted produce, at which selected Washington County, Arkansas consumers would be willing to purchase specific imperfect produce.
3. Describe the relationship between selected Washington County, Arkansas consumers' demographic traits and the percent discount at which they would be willing to purchase specific imperfect produce items.

The chapter is organized into four main sections: selection of participants, instrumentation, data collection and data analysis.

Selection of Participants

The population for this study was all persons aged 18 and above living in Washington County, Arkansas. The threshold for significance based on a population size of 168,431 persons (U.S. Census Bureau, n.d.) was determined to be 400 respondents. There were 174 respondents resulting in a calculated response rate of only 4.73% as discussed later in this chapter. The 174 respondents were selected through convenience sampling in Washington County, Arkansas.

Electronic mail addresses were obtained through the Washington County, Arkansas County Clerk's Office. The electronic mail addresses were all those registered voters who had provided an electronic mail address when registering to vote (n = 3,677). These voters comprised the sampling frame. Respondents' socioeconomic statuses were broken down into lower-income, middle-income, and upper-income based on family income as reported by each respondent. Additional demographics and descriptive statistics regarding the respondents are further broken down in Chapter IV.

Median income. As reported by the United States Census Bureau, the median household income of Washington County residents, as measured by the 2014 U.S. dollar, for the years 2010 through 2014 was \$41,983. The per capita income for Washington County residents for the same time frame was reported as \$24,018 (U.S. Census Bureau, n.d.). Income level classifications were based on definitions by the Pew Research Center (2015).

Lower-income. Lower-income households in Washington County are those that had income levels of less than two-thirds the median income level, or less than \$27,989. The per capita equivalent was an income level of less than \$16,072 annually (U.S. Census Bureau, n.d.).

Middle-income. Middle-income households in Washington County are those that had income levels of more than one-third the median income level but less than double the median income level, or income between \$27,989 and \$83,966. The per capita equivalent was an income level between \$16,072 and \$48,216 annually (U.S. Census Bureau, n.d.).

Upper-income. Upper-income households in Washington County are those that had income levels of more than double the median income level, or more than \$83,966. The per capita equivalent was an income level of more than \$48,216 annually (U.S. Census Bureau, n.d.).

Selection of participants. The target population of this study was all adults the age of 18 years and above currently residing in Washington County, Arkansas. According to the U.S. Census Bureau, as of July 2015, that population estimate was equivalent to 168,431 persons (U.S. Census Bureau, n.d.). With a 95% confidence interval, a calculated probability of 0.05 and a precision level of 5%, the sample size required to generalize findings to the population would be 400 respondents (Israel, 1992).

Instrumentation

Direct consumer survey. A contingent valuation questionnaire was constructed to measure consumers' willingness to purchase with regard to various imperfect produce items (Appendix A). The questionnaire began with a series of explanatory statements. Following the outline prescribed by RAND Europe (2010), a not-for-profit research institute focused on policy and decision-making, the questionnaire began with a brief description of the produce items' similarities to help prohibit unreliable observations resulting from unfamiliarity of items among participants. The statements informed respondents that all produce items presented were safe to eat and that similar fruits and vegetables contained the same nutritional values.

Secondly, the questionnaire asked respondents to state the highest price point at which they would have a willingness to purchase each individual item. The items were presented to each consumer via photograph. All pictures for each variety of produce were accessible together to simulate a grocery store buying experience. Each set of pictures contained one conventionally accepted piece of produce photo, labeled A, beside a single imperfect produce photo, labeled B. Each set of pictures was accompanied by the same set of questions and the same information. Average prices for each conventionally accepted produce item were provided based on the

researcher's in-store observations and data from the USDA ERS Fruit and Vegetable Prices listings (2017).

Finally, the questionnaire asked respondents questions regarding their demographics. Skip logic was used in the questionnaire to exclude respondent responses regarding specific produce items they would not purchase at any price point. Collected consumer demographic information included sex, age, education level, income level, number of income earners in the household, residency and race. All demographic questions and responses were based on U.S. Census Bureau wording (n.d.). Additionally, questions were asked to determine whether the respondent was a primary grocery shopper and in what type of store fresh produce is most frequently purchased by each respondent.

Reliability and validity. The questionnaire was approved for use by the University of Arkansas Institutional Review Board. Three cognitive interviews were completed to ensure the questionnaire was clear and understandable in its wording. A pilot test was completed utilizing the graduate students and faculty of the University of Arkansas Department of Agricultural Education, Communications and Technology. Test-retest reliability was calculated, yielding a Pearson's correlation of 0.899. This score was accepted as it indicated a strong positive correlation (Cohen, 1988).

Data Collection

The study employed quantitative data collection through the use of the questionnaire described in the immediately preceding Direct Consumer Survey section (Appendix A). The data collection included gathering of open-ended and multiple-choice responses by 174 respondents to the questionnaire. Questionnaires were administered electronically. Electronic questionnaires were sent out through e-mail and contained the universal resource locator (URL)

address of the online survey form (Appendix B). Each respondent received a unique, anonymous URL address. A follow-up request was sent to each electronic mail address two weeks after the initial request for participation. A total of 3,677 electronic mail questionnaires were sent out, and 174 responses were received. This method had a calculated response rate of 4.73%. Because no further efforts were made to address nonresponse error, findings herein should not be generalized beyond the respondents.

Data Analysis

The study employed quantitative methodology of data collection and data analysis. Data were divided into two sections for initial analysis: demographics and willingness to purchase. Then, the data was aggregated for analysis.

Demographics. Demographic data were collected in items 20 through 29 of the questionnaire (Appendix A). Collected demographic data were entered into Microsoft Excel[®] 2013. The data were then sorted by income level to allow socioeconomic status to be the independent variable once aggregated. The frequency and percentage of responses to items 20 through 29 were displayed using descriptive statistics and tables. A table showing the demographic breakdown of respondents, anchored by socioeconomic status, was obtained from the Excel[®] program (Table 1).

Willingness to purchase. Data regarding willingness to purchase various produce items were evaluated for price reduction utilizing an Excel[®] program. Data were collected in items 1 through 19 of the questionnaire (Appendix A). An average of the willingness-to-purchase price point for each produce item grade was calculated. Then, those averages were compared across each produce item's grade to determine price point change. The data collected in this analysis are represented in Table 2.

Aggregation. Data from the demographics section and the willingness-to-purchase section were combined to determine the relationship between the two areas (Table 3). Data were coded and analyzed in SPSS version 22. Linear regressions were performed to establish if demographic traits could predict expected price point of imperfect produce.

Summary

This chapter restated the purpose and objectives of the research. The participants were chosen through convenience sampling of Washington County, Arkansas residents. The selection process for the sample from the population was discussed. Reliability and validity of the test instrument was presented. Data collection methods and response rates were conferred. Finally, the methods of data analysis for each of the research objectives were presented. Results of the data analysis are presented in the next chapter.

CHAPTER IV. RESULTS

Introduction

This study intended to describe the relationship between Washington County, Arkansas consumers' demographic traits and the percent discount at which they are willing to alter their behavior to purchase specific imperfect produce items. The purpose of this study was achieved by examining the relationship between respondents' demographic traits and the percent discount at which they would be willing to purchase specific imperfect produce items. This chapter presents the results of data analysis for the three stated research objectives.

The presentation of the results is arranged by the three research objectives. Research objective one, to “describe the demographic traits, including socioeconomic status, ethnicity, age and shopping role, of Washington County, Arkansas consumers,” was answered using Table 1. Table 2 was used to answer research objective two, “describe the percent discount, compared to the price point of conventionally accepted produce, at which respondents would be willing to purchase specific imperfect produce.” Table 3 was used to answer research objective three, “describe the relationship between respondents' demographic traits and the percent discount at which they would be willing to purchase specific imperfect produce items.” Finally, a summary of the results is presented.

RO1: Describe the demographic traits, including socioeconomic status, ethnicity, age and shopping role, of Washington County, Arkansas consumers.

Table 1 displays the demographic characteristics of the 174 participants. Each demographic is measured by the number of positive responses and the percent of the total responses to contain that response.

The data revealed that 67% of respondents were female as opposed to 32% male and 1% other. All respondents were 18 years or above with the majority being between 18 and 30 years of age. It should be noted that each age group was represented by more than 10% of respondents. Eighty-four percent of respondents self-identified as white. All respondents reported having a minimum of a high school diploma with 41% reporting having a bachelor's degree and 27% reporting having an advanced degree.

As reported by the US Census Bureau, the median household income of Washington County residents, as measured by the 2014 U.S. dollar, for the years 2010 through 2014 was \$41,983. The per capita income for Washington County residents for the same time frame was reported as \$24,018 (U.S. Census Bureau, n.d.). Lower-income respondents, those respondents reporting a household income level of less than \$28,000, accounted for 26% of responses. Middle-income respondents, those reporting a household income between \$28,000 and \$84,000, accounted for 42% of responses and upper-income respondents, those reporting household income above \$84,000, accounted for 30% of responses.

Forty-three percent of respondents indicated they lived in a household with two income earners, and 51% indicated living in a household with three income earners. Only seven percent of respondents reported having less than equal amount of shopping responsibility in their household. Finally, 59% of respondents indicated they do the majority of their produce shopping in supermarket type stores. Seventeen percent produce shop in smaller chain stores, and 16% produce shop in local stores.

Table 1
Demographic Characteristics of Participants (N = 174)

Characteristic	<i>n</i>	%
Sex		
Female	117	67
Male	56	32
Other	1	1
Age at time of survey (years)		
18 – 30	61	35
31 – 40	39	22
41 – 50	26	15
51 – 64	27	16
65 or above	21	12
Race		
American Indian or Alaska Native alone	2	1
Asian alone	2	1
Black or African American alone	5	3
Hispanic or Latino	11	6
Native Hawaiian or Pacific Islander alone	0	0
White alone	146	84
Two or more races	8	5
Highest education level completed		
Less than High School diploma	0	0
High School diploma or GED	21	12
Technical degree	7	4
Associate's degree	28	16
Bachelor's degree	71	41
Master's degree or higher	47	27
Annual household income (\$)		
Less than \$28,000 per year	46	26
Between \$28,000 and \$84,000 per year	73	42
More than \$84,000 per year	53	30

Table 1 (Cont.)

Characteristic	<i>n</i>	%
No response	2	1
Income earners per household		
0	0	0
1	8	5
2	74	43
3	88	51
4 or more	4	2
Primary grocery shopping responsibilities		
Participant does all	72	41
Participant does most	36	21
Shared equally	53	30
Participant rarely does	11	6
Participant does none	2	1
Type of store from which fresh produce is purchased		
Farmers' markets	5	3
Supermarkets	103	59
Club stores	8	5
Smaller chain stores	30	17
Local stores	27	16
Other	0	0
Does not typically purchase fresh produce	1	1

RO2: Describe the percent discount, compared to the price point of conventionally accepted produce, at which respondents would be willing to purchase specific imperfect produce.

Table 2 displays the mean and number of responses received for each variety of produce with regard to price, difference in prices, and percent change. All imperfect produce varieties studied showed a decrease in price point when compared to the corresponding conventionally accepted produce. Change in price point ranged from a mean decrease of seven percent for imperfect potatoes to a mean decrease of 32% for imperfect tomatoes. The mean percent discount for all produce varieties studied was 21%.

Table 2

Mean Price and Differences between and Percent Change of Conventionally Accepted as Perfect and Imperfect Produce Items

Species	Conventionally Accepted as Perfect (a)	Imperfect (b)	Difference (a-b)	Percent Change (b-a)/a*100
Red apples				
<i>M</i> (n=164)	\$1.50	\$1.12	\$0.38	-25
Red bell peppers				
<i>M</i> (n=160)	\$1.25	\$1.04	\$0.21	-17
Carrots				
<i>M</i> (n=167)	\$1.00	\$0.86	\$0.14	-14
Russet potatoes				
<i>M</i> (n=166)	\$0.60	\$0.56	\$0.04	-7
Navel oranges				
<i>M</i> (n=168)	\$1.25	\$ 0.86	\$0.39	-31
Tomatoes				
<i>M</i> (n=153)	\$3.25	\$ 2.20	\$1.05	-32

RO3: Describe the relationship between respondents' demographic traits and the percent discount at which they would be willing to purchase specific imperfect produce items.

Table 3 displays the R square values as percentages obtained through performing linear regressions to determine if demographic traits could be used to statistically predict expected price point to purchase specific imperfect produce items. Results revealed that in 10 instances, demographic traits were determined to account for zero percent of variability in price point. The largest explanation of variability occurred between store type and tomatoes with a calculated value of 3.2%.

With regards to red apples, a linear regression established that age, education level, household income, shopping role and inspection method accounted for zero percent of the explained variability in price point while race accounted for 0.2% and type of store from which produce is most frequently purchased accounted for 1.7%. For red bell peppers, a linear regression established that age and education level accounted for zero percent of the explained variability in price point. Race, household income and shopping role each accounted for 0.1% of variability. Store type accounted for 0.2% of variability, and inspection method accounted for 0.4%.

For carrots, a linear regression established that variability in price point was explained by age at 1.6%, race and household income at 1.0%, education level at 2.1%, shopping role at 0.2%, inspection method at 0.1% and type of store from which produce is most frequently purchased accounted for 0.7%. For russet potatoes, a linear regression established that store type accounted for zero percent of the explained variability in price point. Household income and inspection method each accounted for 0.1% of variability. Age accounted for two percent of variability,

race accounted for 0.8%, education level accounted for 0.4% and shopping role accounted for 0.7%.

With regards to navel oranges, a linear regression established that variability in price point was explained by age at zero percent, household income at 0.5%, education level and inspection method at 0.1%, shopping role at 0.4% and type of store from which produce is most frequently purchased and race accounted for 0.8%. For tomatoes, a linear regression established that store type accounted for 3.2% of the explained variability in price point. Education level and inspection method each accounted for 0.5% of variability. Age and shopping role accounted for 0.4% of variability, and race accounted for 0.1%.

Table 3

R Square Values as Percentages for Demographic Traits and Price Percent Discount of Produce

Measure	Age	Race	Education Level	Household Income	Shopping Role	Inspection Method	Store Type
Red Apples	0.0	0.2	0.0	0.0	0.0	0.0	1.7
Red Bell Peppers	0.0	0.1	0.0	0.1	0.1	0.4	0.2
Carrots	1.6	1.0	2.1	1.0	0.2	0.1	0.7
Russet Potatoes	2.0	0.8	0.4	0.1	0.7	0.1	0.0
Navel Oranges	0.0	0.8	0.1	0.5	0.4	0.1	0.8
Tomatoes	0.4	0.1	0.5	0.0	0.4	0.5	3.2

Summary

This chapter began with an introduction regarding the purpose of the study and a restatement of the research objectives in the order in which they would be addressed. This was followed by the demographic analysis of the sample as displayed in Table 1. Next, Table 2 displayed the results of the pricing questions as mean prices and offered percent change data. Finally, Table 3 showed the results of linear regressions between the demographic traits and the pricing data through use of R square values.

Results from the second research objective revealed that for each produce variety queried, a price discount was expected by consumers for imperfect options. Percent change ranged from a desired mean seven percent discount for imperfect russet potatoes to a desired mean 32% discount for imperfect tomatoes. The mean percent discount for all produce varieties studied was 21%.

Results from the third research objective found that a demographic traits accounted for zero percent of variability in price point 10 times. Meanwhile, the largest explanation of variability occurred between store type and tomatoes with a calculated value of 3.2%.

Chapter V will present conclusions from the study, implications for practice arising from the findings of the study and recommendations for further research.

CHAPTER V. CONCLUSIONS AND IMPLICATIONS

Introduction

In Chapter IV the data resulting from the study were reported and displayed. Chapter V consists of a summary of the study, discussion of the findings, implications for practice, recommendations for further research and conclusions.

Summary of the Study

The purpose of this study was to advance the understanding of the impact of price reductions on spending behaviors as related to the purchase of imperfect produce. This was done to help address the issue of food loss as part of the world food crisis as laid out by the USDA Office of the Chief Economist (n.d.) and the Institute of Food Technologists (n.d.). The study sought to understand the percent discount at which Washington County, Arkansas consumers would be willing to alter their buying behaviors and purchase visually imperfect produce. Furthermore, relationships between consumer demographics and desired percent discount were sought.

The study utilized the Theory of Planned Behavior as a framework to respond to the three research objectives. The first research objective dealt with describing the demographic traits of Washington County, Arkansas consumers. The second research objective sought to describe the price reduction at which respondents would be willing to purchase specific visually imperfect produce items. The third research object focused on the relationship between respondents' demographic traits and the percent discount they required to purchase the imperfect produce items.

Data were collected through a direct consumer survey (Appendix A) consisting of two main question types that were sent out via electronic mail. The first set of questions presented photographs of produce items and asked the respondents to indicate what price they would

expect to pay for pictured items. The second section of questions asked respondents questions regarding their demographics. One hundred and seventy-four responses were received.

Collected data were analyzed utilizing two main methods. Demographics were analyzed using the Excel© program to determine percent of responses per response type for each question and results were reported in Table 1. The Excel© program was also used to compare the price of conventionally accepted as perfect produce items to the data collected regarding the expected price of imperfect produce items and to find the percent change between the prices. Data from this analysis is located in Table 2. Finally, linear regression was performed on collected data through use of SPSS version 22. Data from this final analysis is presented in Table 3.

Discussion of the findings is presented in the next section of this chapter.

Discussion of the Findings

Chapters IIV and IV of this study presented the methods used and the data gained in this research study. This section provides a summary and discussion of the results presented in Chapter IV as they are used to address the three research objectives of this study. The results are summarized and discussed after each of the listed research objectives below.

It is important to note the threshold for significance based on the population size for Washington County, Arkansas of 168,431 persons (U.S. Census Bureau, n.d.) was determined to be 400 respondents. However, only 174 respondents participated in the survey used to collect data for this study. As discussed in Chapter III of this study, convenience sampling was used to collect responses. Convenience sampling offered a simple way to recruit respondents that was quick and inexpensive. However, due to the number of respondents being less than the number of respondents needed to achieve significance, the data cannot be generalized to represent Washington County, Arkansas consumers. The demographic traits reported by the respondents

is compared to the available demographic information of the Washington County, Arkansas population in the next section of this chapter.

RO1: Describe the demographic traits, including socioeconomic status, ethnicity, age and shopping role, of Washington County, Arkansas consumers.

All respondents were 18 years or above. The majority of respondents were between 18 and 30 years of age, representing 35% of responses. Additionally, 22% of respondents reported being between 31 years of age and 40 years of age. Michael Dimock of Pew Research Center (2018) defined millennials as having birth years between 1981 and 1996, being between 22 and 37 years of age at the time of this study. This indicates that the largest part of the data collected from this research study was from millennials. Coincidentally, a previous study found that the largest demographic of consumers who purchase beverages at discount retailers was reported to be millennials (Harfmann, 2016).

Additionally, the data revealed that 67% of respondents were female as opposed to 32% male and 1% other. Eighty-four percent of respondents self-identified as white. The US Census Bureau (n.d.) reported that Washington County, Arkansas was comprised of 50% female and 50% male citizens and that 87% of citizens reported being white alone. The racial makeup of Washington County, Arkansas was very close to the racial makeup of the respondents of this survey with only a three percent difference in white alone respondents.

All respondents reported having a minimum of a high school diploma with 41% reporting having a bachelor's degree and 27% reporting having an advanced degree. For the years 2012-2016, the US Census Bureau (n.d.) reported that Washington County, Arkansas respondents had a minimum of a high school diploma at a rate of 84.2% and 31.2% were reported as having a bachelor's degree or higher. This indicates that the study missed out on data from the 15.8% of

the population not having attained a high school diploma. Additionally, the data collected comprised responses from a significantly higher rate of respondents having bachelor's degrees or higher than is in the general population of Washington County, Arkansas.

RO2: Describe the percent discount, compared to the price point of conventionally accepted produce, at which respondents would be willing to purchase specific imperfect produce.

All imperfect produce varieties studied showed a decrease in price point when compared to the corresponding conventionally accepted as perfect produce. The mean percent discount for all produce varieties studied was 21%. This is a discount of nine percent less than what France's Intermarché retailer sold imperfect produce for during their Inglorious Fruits and Vegetables campaign (Grill-Goodman, 2014). This implies that retailers could successfully market imperfect produce in the United States for a profit as was done by Intermarché, as Intermarché's imperfect produce campaign resulted in a 24% traffic increase in stores and a 1.2-ton sale of imperfect produce within two days while offering a larger discount than was found needed by this study (Grill-Goodman, 2014).

The maximum percent discount between U.S. Extra Fancy Red Delicious Apples and U.S. Fancy Red Delicious Apples in Atlanta, Georgia when sold by the carton was determined to be only eight percent (USDA AMS, 2018). Respondents in this study reported an expected mean discount of 25% for imperfect red apples. This could indicate a disparity of 17% between the discount retailers would receive when purchasing apples from a producer by the carton and what consumers would expect to pay per pound. This could lead to a roadblock for retailers being willing to sell imperfect produce in their stores as it could indicate a loss as opposed to a profit.

However, this is not a direct comparison as the imperfect produce items presented in this study would most likely not receive a grade of U.S. Fancy or higher.

The largest percent difference occurred for tomatoes. Respondents revealed a mean price of \$2.20 per pound of imperfect tomato. This represented a price decrease of \$1.05 per pound when compared to the conventionally accepted as perfect price of \$3.25 per tomato, indicating an expected percent change of negative 32%. Conversely, the smallest percent difference occurred for russet potatoes. Respondents revealed a mean price of \$0.56 per pound of imperfect potatoes. This represented a price decrease of only \$0.04 when compared to the conventionally accepted as perfect price of \$0.60 per pound of potatoes, indicating an expected percent change of negative seven percent.

This expected percent change ranged from negative seven percent to negative 32% covers a range of 25%. This large of a range can indicate that consumers' expectations for amount of discount required to change their purchasing behavior to buy imperfect produce is highly dependent on type of produce. This is in line with Coughlan and Soberman's (2004) findings that clothing sold in outlet stores required price percent discounts ranging from 15% to 47% for successful sale.

It should be noted that of the six produce items included in this research study, russet potatoes, carrots and red bell peppers all indicated a price change of less than 20%. These three items are all often cooked and/or included as an ingredient in a dish before consuming. The remaining three produce items, red apples, navel oranges and tomatoes, all indicated a price change of 25% or more would be required to change buying behaviors. These three items are frequently eaten with little to no at home processing. Therefore, the difference in price

expectations may be reflective of how much processing the consumer plans to do to the item before consuming it.

RO3: Describe the relationship between respondents' demographic traits and the percent discount at which they would be willing to purchase specific imperfect produce items.

Whereas Harfmann (2016) reported that the largest demographic of consumers who purchase beverages at discount retailers was millennials with positive skewness toward African Americans and Hispanics, the data from this study indicated that neither age nor race accounted for variability in consumer expectations of price percent discount of imperfect produce by more than two percent. In fact, results from this study showed that age accounted for price variability zero percent when considering red apples, red bell peppers and navel oranges. These findings on age are in line with the Karande and Ganesh (2000) study that found that the age of outlet mall shoppers was not concentrated into any specific age group.

The Harfmann study (2016) reported that consumers were 93% more likely to shop at and purchase items from a discount retailer if they make less than \$35,000 per annum. In contrast, the Coughlan and Soberman study (2004) reported that the median income of shoppers at outlet malls was \$57,000. However, this study found that household income accounted for a maximum variability of only one percent for imperfect produce price expectations, implying that income level does not have a large impact on the expected price of imperfect produce.

With regards to education level, produce shopping role, method of produce inspection and type of store from which produce is most commonly purchased, this study found that expected discount required to alter buying behaviors to purchase imperfect produce items was impacted a maximum of 3.2%. None of the descriptive statistics measured accounted for a large

portion of variability indicating they should not be used to statistically predict expected price point to purchase specific imperfect produce items.

Implications for Practice

Produce vendors and producers should utilize the data collected in this research study to make informed decisions regarding price points at which to sell imperfect produce. By discounting imperfect produce to a price at which consumers are willing to change their buying behavior, less imperfect produce would be discarded. Vendors and producers need to consider the monetary price of discarding or leaving unharvested imperfect produce when compared to the price they could receive from consumers for imperfect produce.

Furthermore, legislators could view this data as proof that imperfect produce can be sold when discounted instead of being discarded and work toward enacting legislation to prevent produce that is nutritious and safe for human consumption from ultimately ending up in landfills.

Recommendations for Further Research

Using techniques similar to those utilized in this study, further research could be performed in other geographical regions to overcome the limitation of being unable to generalize to other populations. Additionally, the techniques could be used to study additional produce varieties and different imperfection types. Opportunities also exist to determine if providing educational materials about the uses of imperfect produce and/or about the consequences of discarding imperfect produce impact consumers' willingness to purchase imperfect produce items. This could be done by surveying consumers before and after educational materials are made available and analyzing the results to see if a significant change occurred.

Furthermore, studies could be completed comparing the cost to the vendors of discarding imperfect produce versus the profit received from selling imperfect produce to determine if money could be made by selling imperfect produce at the indicated prices. Finally, a study could

be completed in which imperfect produce is placed for sell at discounted prices next to conventionally perfect produce at regular prices to see if consumers actually alter their buying behaviors.

Conclusions

In conclusion, this study was meant to determine if there was a price percent discount at which safe to consume produce items could be sold to consumers instead of being discarded in one way or another by vendors or producers and in what way demographics impact that discount point. This study has shown that demographics play a very small role in consumer expectations for price of imperfect produce. This study has also shown that consumers expect a wide range of discount dependent on type of produce. This study has given a starting point for future studies regarding the sale of imperfect produce in the United States of America.

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Appendix A: Questionnaire

Start of Block: Default Question Block

Q1

Welcome and thank you for coming to the produce survey!

My name is April Foster, and I'm a graduate student at the University of Arkansas. I'm performing research about produce prices for my graduate thesis. The questionnaire will take between 5 and 10 minutes to complete. Participation is voluntary, and refusing to participate will not adversely affect any other relationship with the University or the researchers.

By clicking the 'next' arrow, you indicate your consent to participate. Should you wish to refuse participation, please exit the survey at this time. You will have the option to exit the survey at any time, should you choose to refuse participation at any time during the survey.

You can reach me at afelkins@uark.edu or my graduate advisor, Dr. Shoulders, at cshoulde@uark.edu with any questions/comments/concerns. If you have any questions about your rights as a research participant, you can contact the Institutional Review Board (IRB) at irb@uark.edu.

Page Break

Q2 You will be asked questions regarding different fruit and vegetables in the next pages. Please assume the following about each fruit and vegetable seen:

All fruits and vegetables shown would be safe to eat. Similar fruits and vegetables have the same nutritional values. For example, if you see two different bananas, each banana would have the same nutritional values. Likewise, when comparing apples to apples, each would be the same nutritionally. **Please click the arrow to begin the survey!**

Page Break

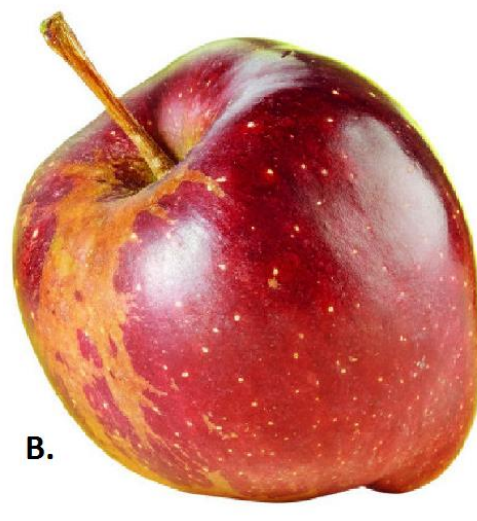
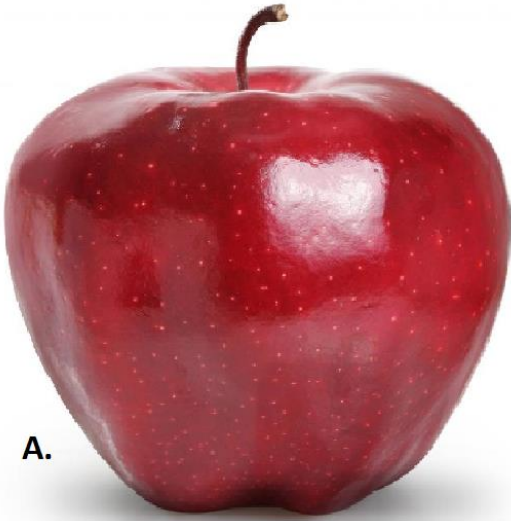
Q3 Would you consider purchasing red apples?

Yes (1)

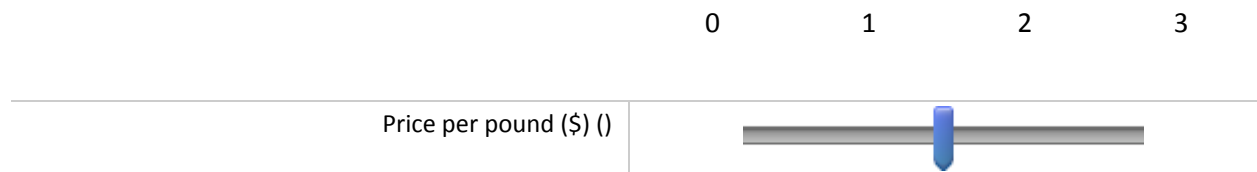
No (2)

Skip To: Q6 If Would you consider purchasing red apples? = No

Q4



Q5 The price of apple A is \$1.50 per pound. How much would you pay for a pound of apple B? Remember, these are safe to consume and are nutritionally the same. Please slide the scale below to indicate your response.



Page Break

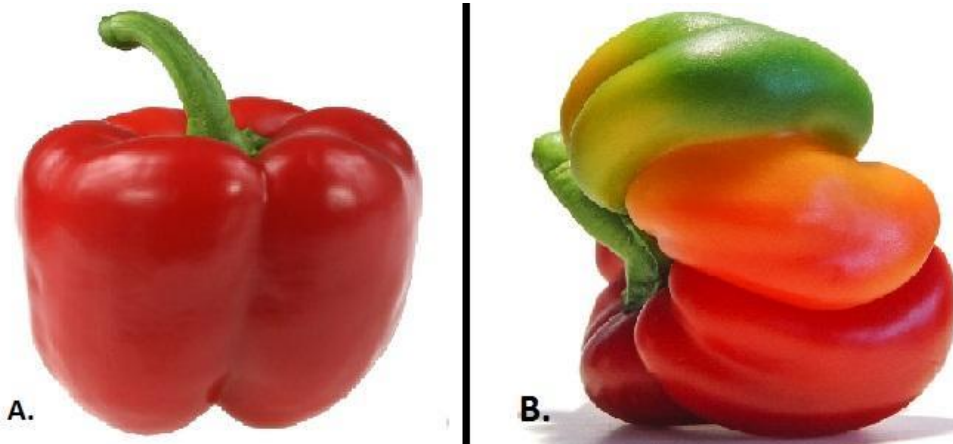
Q6 Would you consider purchasing red bell peppers?

Yes (1)

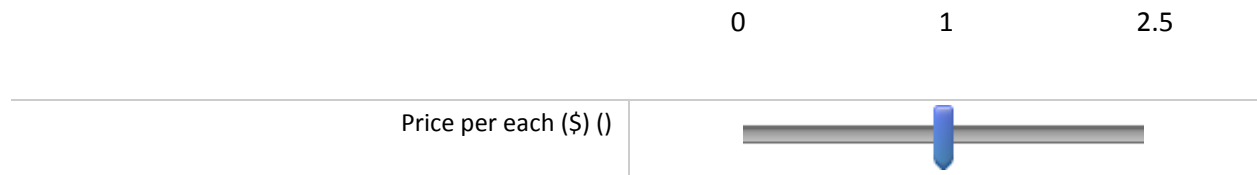
No (2)

Skip To: Q9 If Would you consider purchasing red bell peppers? = No

Q7



Q8 The price of pepper A is \$1.25 each. How much would you pay for pepper B? Remember, these are safe to consume and are nutritionally the same. Please slide the scale below to indicate your response.



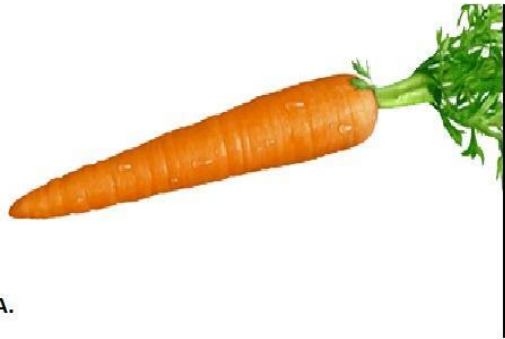
Page Break

Q9 Would you consider purchasing carrots?

- Yes (1)
- No (2)

Skip To: Q12 If Would you consider purchasing carrots? = No

Q10



Q11 The price of carrot A is \$1.00 per pound. How much would you pay for a pound of carrot B? Remember, these are safe to consume and are nutritionally the same. Please slide the scale below to indicate your response.



Page Break

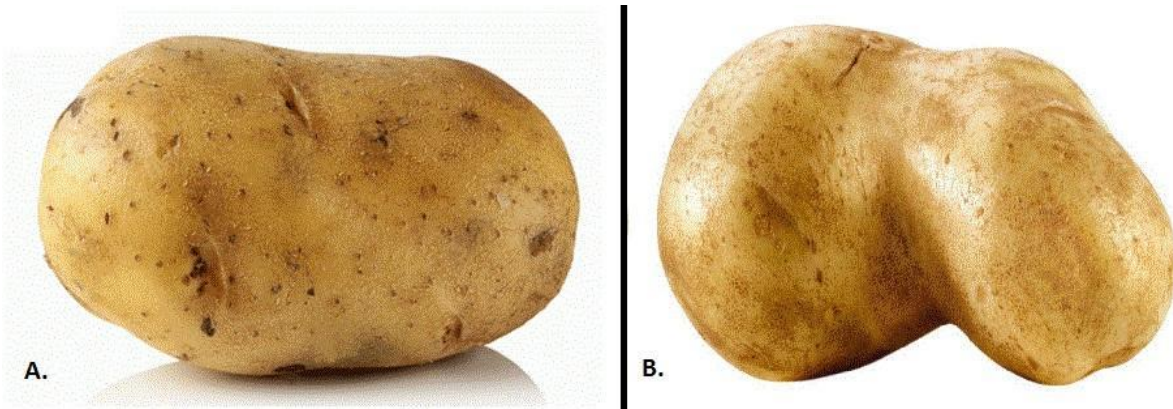
Q12 Would you consider purchasing russet (brown) potatoes?

Yes (1)

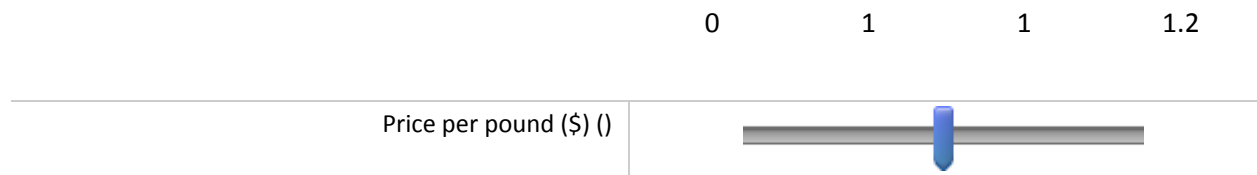
No (2)

Skip To: Q15 If Would you consider purchasing russet (brown) potatoes? = No

Q13



Q14 The price of potato A is \$0.60 per pound. How much would you pay for a pound of potato B? Remember, these are safe to consume and are nutritionally the same. Please slide the scale below to indicate your response.



Page Break

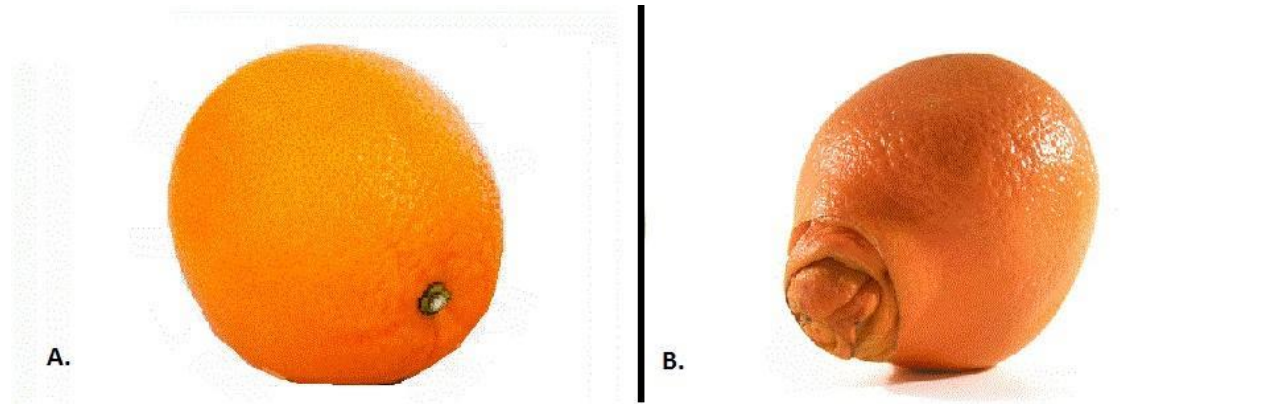
Q15 Would you consider purchasing navel oranges?

Yes (1)

No (2)

Skip To: Q18 If Would you consider purchasing navel oranges? = No

Q16



Q17 The price of orange A is \$1.25 per pound. How much would you pay for a pound of orange B? Remember, these are safe to consume and are nutritionally the same. Please slide the scale below to indicate your response.



Page Break

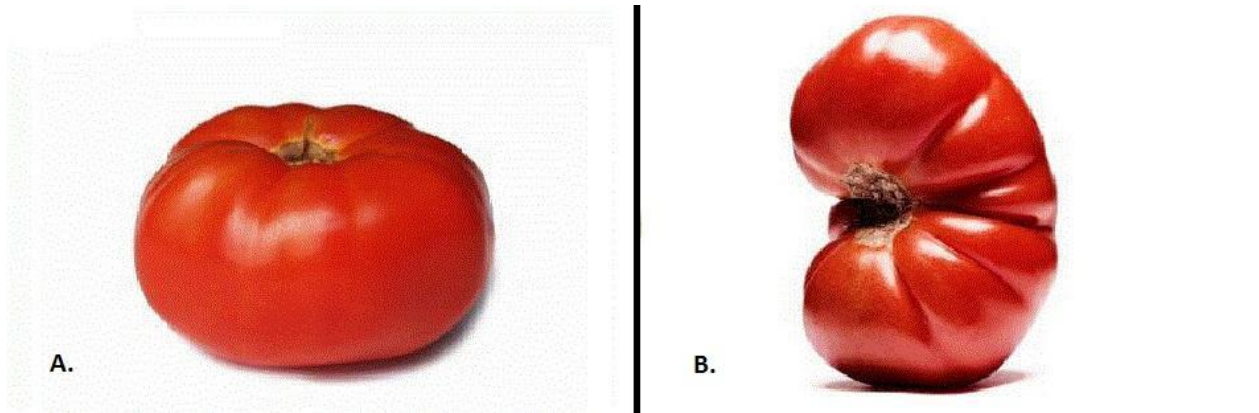
Q18 Would you consider purchasing tomatoes?

Yes (1)

No (2)

Skip To: Q21 If Would you consider purchasing tomatoes? = No

Q19



Q20 The price of tomato A is \$3.25 per pound. How much would you pay for a pound of tomato B? Remember, these are safe to consume and are nutritionally the same. Please slide the scale below to indicate your response.



Page Break

Q21 (FINAL SECTION OF SURVEY)

The following questions will ask you questions about yourself. Your responses will remain anonymous.

Q22 Do you currently reside in Washington County, AR?

Yes (1)

No (2)

Q23 What is your sex?

Q24 What is your age?

- Under 18 years of age (1)
- 18 - 30 (2)
- 31 - 40 (3)
- 41 - 50 (4)
- 51 - 64 (5)
- 65 or above (6)

Q25 What is your race?

- American Indian or Alaska Native alone (1)
- Asian alone (2)
- Black or African American alone (3)
- Hispanic or Latino (4)
- Native Hawaiian or Pacific Islander alone (5)
- White alone (6)
- Two or more races (7)
- Other (8) _____

Q26 What is the highest level of education you have **completed**?

- Less than High School diploma (1)
- High School diploma or GED (2)
- Technical degree (3)
- Associates degree (4)
- Bachelor's degree (5)
- Master's degree or higher (6)

Q27 What is your **household** income level before taxes?

- Less than \$28,000 per year (1)
 - Between \$28,000 and \$84,000 per year (2)
 - More than \$84,000 per year (3)
-

Q28 How many income earners are in your household (including you)?

- 0 (1)
- 1 (2)
- 2 (3)
- 3 (4)
- 4 or more (5)

Q29 How many people live in your household (including you)?

- 1 (1)
 - 2 (2)
 - 3 (3)
 - 4 (4)
 - 5 (5)
 - 6 or more (6)
-

Q30 How much of the primary grocery shopping do you do for your household?

- I do all of the grocery shopping. (1)
- I do most of the grocery shopping. (2)
- I share grocery shopping equally with another person(s). (3)
- I rarely do the grocery shopping. (4)
- I do none of the grocery shopping. (5)

Skip To: Q32 If How much of the primary grocery shopping do you do for your household? = I do none of the grocery shopping.

Q31 In which of the following ways do you inspect produce before purchasing it?

- I visually inspect produce. (1)
 - I physically inspect produce. (2)
 - I both visually and physically inspect produce. (3)
 - I do not inspect produce. (4)
 - I do not purchase fresh produce. (5)
-

Q32 (FINAL QUESTION) From what type of store do you typically purchase fresh fruits and vegetables?

- Farmers Markets (1)
- Supermarkets (ex: Walmart) (2)
- Club Stores (ex: Sam's Club) (3)
- Smaller Chain Stores (ex: Aldi's) (4)
- Local Stores (ex: Ozark Natural Foods) (5)
- Other (ex: Online Retailers) (6)
- I do not usually purchase fresh fruits or vegetables. (7)

End of Block: Default Question Block

Appendix B: Email

Hello,

My name is April Foster, and I'm a graduate student at the University of Arkansas. I'm performing research about produce prices for my graduate thesis. The questionnaire I've attached will take between 5 and 10 minutes to complete. Participation is voluntary, and refusing to participate will not adversely affect any other relationship with the University or the researchers.

You can reach me at afelkins@uark.edu or my graduate advisor, Dr. Shoulders, at cshoulde@uark.edu with any questions/comments/concerns. If you have any questions about your rights as a research participant, you can contact the Institutional Review Board (IRB) at irb@uark.edu.

Thank you so much for your participation. It helps me out a lot.

Thank you,

April Foster

Follow this link to the Survey:
[\\${!://SurveyLink?d=Take the Survey}](#)

Or copy and paste the URL below into your internet browser:
[\\${!://SurveyURL}](#)

Follow the link to opt out of future emails:
[\\${!://OptOutLink?d=Click here to unsubscribe}](#)

Appendix C: IRB Exemption Letter



To: April Colleen Felkins
From: Douglas James Adams, Chair
IRB Committee
Date: 01/18/2018
Action: Exemption Granted
Action Date: 01/18/2018
Protocol #: 1711081933
Study Title: Assessment of Consumers' Willingness to Purchase Imperfect Produce

The above-referenced protocol has been determined to be exempt.

If you wish to make any modifications in the approved protocol that may affect the level of risk to your participants, you must seek approval prior to implementing those changes. All modifications must provide sufficient detail to assess the impact of the change.

If you have any questions or need any assistance from the IRB, please contact the IRB Coordinator at 109 MLK/G Building, 5-2208, or irb@uark.edu.

cc: Kate Shoulders, Investigator