

Consumer Perceptions of Produce Safety

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ABSTRACT

In recent years, food safety has been an extremely controversial and complex issue to tackle. Foodborne illnesses and outbreaks persist, leaving uncertainty about the effectiveness of food regulation.. Consumers are influential in shaping food safety governance as both industry and government always cite consumer demand as a reason to take action. The objective of this study is to understand consumer perceptions of the safety issues associated with produce. I administered a survey on produce safety issues to college students. Responses showed that most students felt that organic produce is safer than inorganic, farmers markets sell safer produce, and government agencies need more enforcement in assuring food safety in produce. Furthermore, respondents identified pest infestation, bacterial contamination, and expiration dates as most concerning when purchasing produce, implying that there is an ongoing tension between perceptions of produce safety and their purchasing behavior.

KEYWORDS

Food Safety Modernization Act, pesticides, perception, consumers, farmer's market, organic produce, food safety, government regulations

INTRODUCTION

Food safety is a dimension of quality, in which the absence of foodborne pathogens, outbreaks, and pesticide residues means that food is safe to eat (Fontes et al. 2013). Food safety issues are controversial and complex. The federal government first addressed food safety in the Pure Food and Drug Act of 1906, which was intended to protect the public from food contamination and products that were marketed as healthy without scientific support (FDA 2009). To specifically address produce, the Food and Drug Administration (FDA) published the *Good Agricultural Practices* in 1998, which offers voluntary audits that focus on the best agricultural practices to verify fruits and vegetables are produced, packed, handled, and stored in the safest manner to avoid microbial risks (USDA 1998). In 2011 President Obama signed the Food Safety Modernization Act (FSMA), which established safety standards that emphasizes on prevention as key to produce safety (FDA 2014). However, the provisions of this law have not been adequately funded by Congress, and are not being effectively enforced, while food producers are lobbying their way out of paying for this enforcement (Nixon 2015). Despite decades of trying to address food safety issues in the United States, government agencies such as the FDA and USDA, still have not developed a means of truly assuring food safety. Foodborne illnesses and outbreaks persist, consumer uncertain about the safety of produce and other foods.

The FSMA and other measures have not been entirely effective due in part to a lack of funding and research, and the political power wielded by major industry groups (Stuart 2010). Food safety regulation operates under a quasi public-private partnership (Martinez et al. 2006), with producers charged with ensuring food safety. In the fresh produce sector, large retail consortiums have set standards for on-farm practices with which growers must comply with (Stuart 2010). For example, the Leafy Greens Marketing Agreement (LGMA) establishes a set of standards on leafy greens crafted by industry, and is a true quasi-public regulatory mechanism that is enforced by government (LGMA 2014). Efforts by both government and industry to regulate food safety focus on protecting public health and consumer satisfaction. However, there is sparse research on perceptions of food safety. This is particularly important because consumer opinion can influence industry and government, which may respond to consumer demand.

The American public expects food to be safe and nutritious (Verbeke et al. 2006), and consumer concerns about food safety have historically driven both industry and government to take action. Media and government reporting has led to increasing awareness of the risk of

foodborne illness, and has shaped consumer perceptions of food safety issues. This has been particularly true in terms of safety concerns associated with fresh eggs, meat, and produce. However, the lack of knowledge on the long-term and short-term risks from pesticide residues or food illnesses can also affect consumers' perceptions on produce safety. Consumers may misperceive the risks of unsafe food, leading to a misunderstanding of the true safety of their food (Verbeke et al. 2006).

Consumer interest in organic and locally grown produce and the expansion of farmers' markets may reflect an effort by consumers to take food safety into their own hands. Organic produce is commonly understood to preclude the use of pesticides and other harmful chemicals, have fewer environmental impacts than conventional agriculture, and posing less risk to agricultural workers and the public health (Wolf et al. 2005), and consumers associate organic food with natural process, care for the environment and animal welfare, and the non-use of pesticides and fertilizers (Shafie and Rennie 2009). Grocery stores have added organic products and the number of farmers' markets have dramatically increased since 1994 (USDA 2014). Labeling organic products is voluntary, and is administered by USDA, which provides a list of practices and products that are necessary to legally use the organic label. Both labeling and certifying organic are intended to assure consumers of the safety and quality of the product, yet lack of transparency and government enforcement can mislead consumers to perceiving the product as safe or 100% organic (Casewell 1998). Consumers are more likely attend farmers' markets for the following reasons: high quality products, good value for their money, specialty items, buying directly from farmers, socializing and entertainment, and to purchase organic produce, most of which are not related to food safety (Wolf et al 2005). However, a great deal of uncertainty remains regarding consumer perceptions of produce safety at conventional and farmers markets.

I examined consumers' perceptions of produce safety at the point of purchase, in terms of: organic versus inorganic produce, produce sold at farmers markets versus conventional grocery stores, and the government's role in ensuring food safety. I hypothesized that consumers would perceive that: (1). Organic produce is safer than inorganic produce, (2) farmers' markets sell safer produce than conventional grocery stores, and lastly, (3) government agencies do effectively assure food safety.

METHODS

Study System

The population of study for this project was college students in Berkeley, Ca most of whom were 18-22 year old. Many of these students are freshmen or transfer students who are experiencing living away from home and grocery shopping for the first time. The University of California Berkeley is a suitable location to sample college students on their perception of food safety issues. Surrounding the campus, there are a variety of grocery stores and farmers markets where students can purchase produce.

Data collection

I constructed and optional online survey given to three versions of Environmental Science, Policy and Management 50AC, Introduction to Culture and Natural Resource Management, which together are composed of over 450 student. Surveys were taken voluntarily, but to receive more responses from the survey, extra credit was awarded to those who took the survey as an incentive. I collected a total of 307 online survey responses through SurveyMonkey.com.

Survey questions explored respondents' perceptions of produce safety issues and purchasing behavior. To determine perceived difference between inorganic and organic produce, I asked whether and why respondents felt that organic produce is or is not safer than inorganic produce. To determine how consumers felt about purchasing their produce at different markets, I asked a series of questions on perceptions of produce safety and frequency of visits to farmer's markets and conventional grocery stores. To examine how consumers felt about government assurance of produce safety through regulation, I asked a series of questions about perceptions of government oversight of produce safety. I asked consumers their level of concern about different food safety attributes when purchasing produce and what institutions or players they felt were most responsible for food and health issues in produce. The last section of my survey included a series of demographic questions: age, education, race/ethnicity, income, and primary shopper of household.

Data Analysis

To analyze the responses of my survey questions, I gathered and counted the total number of responses and generated percentages and graphs/charts for each section of the questions. For my short answer questions I used a coding method to simply responses in certain categories.

RESULTS

Demographic profile

Survey respondents were 62% Asian American, 31% White, 10% Latino, and less than 1% were either African American, Pacific Islander, Native American, and Middle Eastern. Most students were in their freshman 52% or sophomore 29% year, while only a small percentage were juniors 10% or senior 8%. The family income level of 45% of respondents was greater than \$100,000, that of 26% was between \$60,000-\$99,000, that of 18% was between \$25,000- \$59,000, and 12% of respondents' families earned less than \$25,000 per year. The majority of respondents were the primary shoppers of the household.

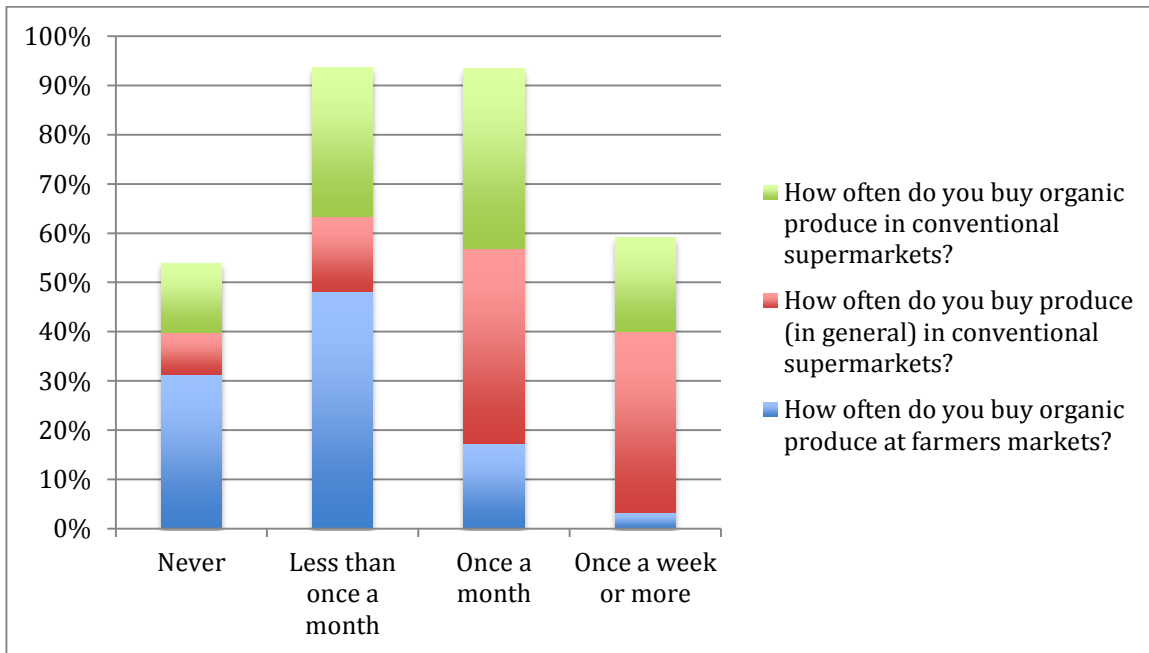
Behavior toward farmers' markets

Most students never shopped at farmers' markets or shopped at them less than once a month, and mainly purchased their produce at conventional supermarkets (Figure 1). Thirty seven percent of respondents bought produce in conventional supermarkets once a week or more. And 28% of respondents bought organic produce at farmer's markets less than once a month, while 37% bought organic produce at conventional supermarkets at least once a month (Table 1).

Table 1. Summary of student responses by market type.

Category	Never	Less than once a month	Once a month	Once a week or more	Total
How often do you buy organic produce at farmers market?	31.27%	28.21%	17.26%	3.26%	307
How often do you buy produce (in general) in conventional supermarket?	8.52%	15.08%	39.67%	36.72%	305
How often do you buy organic produce in conventional supermarkets?	14.14%	30.26%	36.51%	19.08%	304

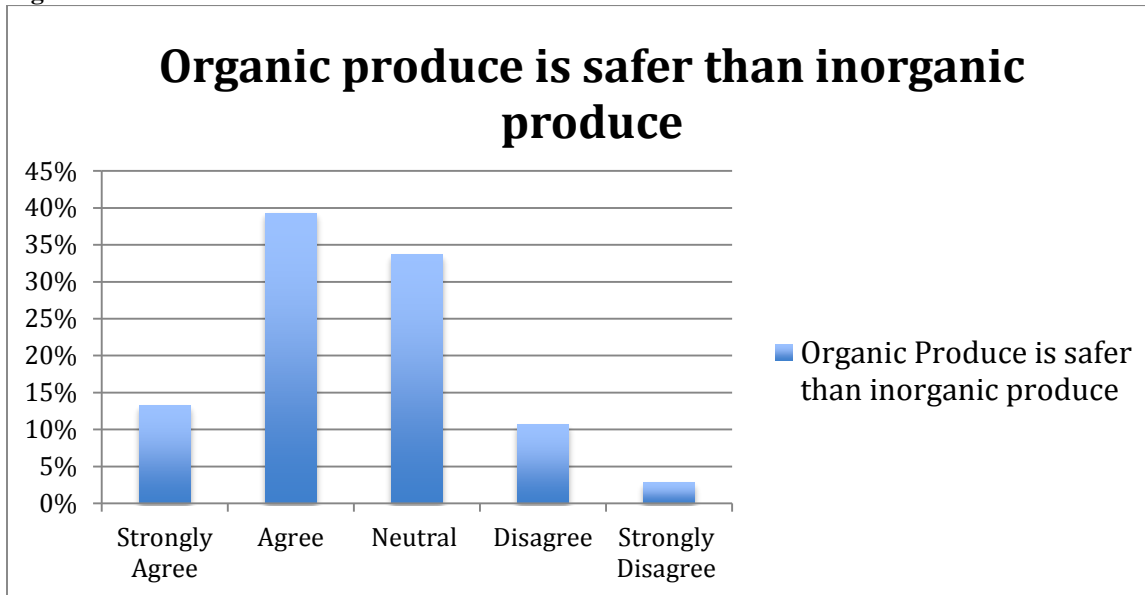
Figure 1: Frequency of purchasing produce at different markets.



Organic vs. Inorganic Produce

Most students felt neutral or agreed that organic produce is safer than inorganic produce (Figure 2). About 53% indicated that they strongly agree or agree that organic produce is safer, while only 14% disagreed or strongly disagreed with that statement, and the rest 33% of respondents felt neutral (Figure 2). The frequent responses for why organic produce is not safer than inorganic produce were: not educated enough to make judgments or inorganic is tested thoroughly and regulated. The most frequent responses for why organic produce is safer than inorganic produce were: less pesticides use and harmful chemicals.

Figure 2



Perceptions of government regulation and food safety issues

The majority of students are felt neutral or feel positive about government assurance and oversight of produce safety (Figure 3). Sixty six percent of the respondents strongly agreed or agreed that government regulations and inspections assure food safety, while 12% strongly disagreed or disagreed with that statement, and 22% felt neutral. Fifty seven percent strongly agreed or agreed that there should be more government oversight in food safety issues, while 5% disagreed or strongly disagreed with that statement and 38% felt neutral (Figure 3). The top reasons that respondents frequently indicated as to why they felt government regulations and inspections are not effective in assuring produce safety were: too many loopholes, too much to inspect, not enough funding, only want profit, corrupt, pesticides, GMOs, chemicals, and E.Coli/Salmonella. The top reasons that respondents frequently indicated on why government regulations and inspections are effective in assuring food safety were: government’s job to protect consumers, set standards and regulations, and experiences in not getting food poisoning. A majority of the respondents identified the USDA or FDA when asked to name any specific federal or state agencies, laws or regulations governing food safety. The most common responses regarding how

to improve food safety regulations and inspections that respondents claimed could make produce safer were: lessen pesticides use, chemicals, and contamination and more inspections/ oversight /transparency.

Figure 3: Thoughts on government regulation in produce.

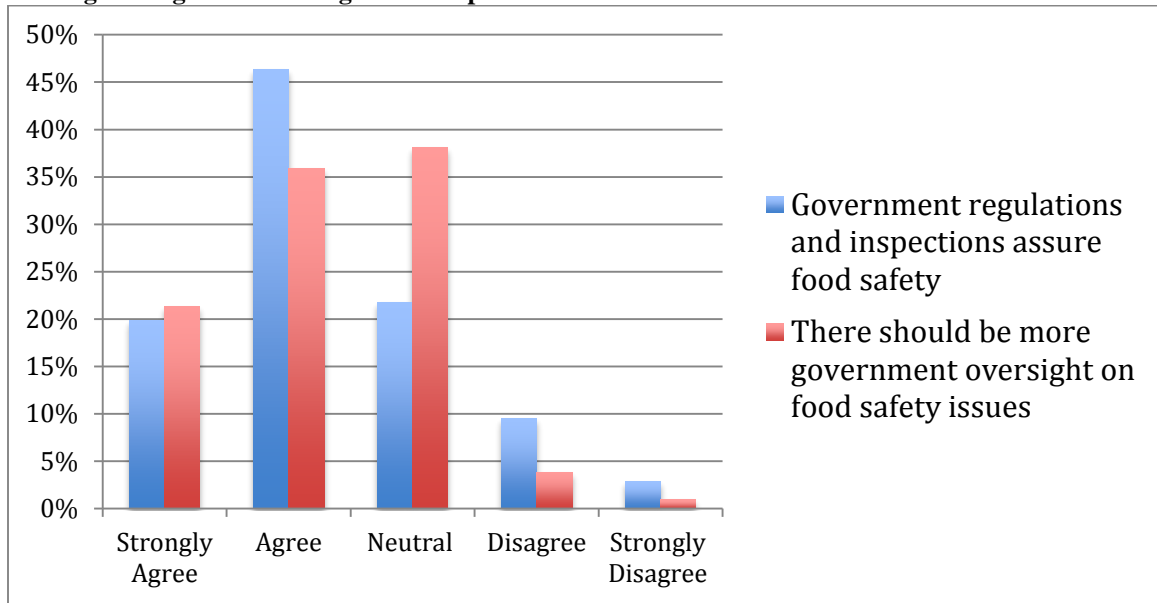


Table 2: Coding procedures for responses to the question “why do you feel that government regulation and inspection is or is not effective in assuring food safety in produce?”

Categories	Coding
Unsure/ Not Enough Knowledge	➤ Not enough information to answer- 12%
Not Effective	<ul style="list-style-type: none"> ➤ Many loopholes, too much to inspect or cannot regulate every single food ➤ Not enough funding, only want profit, corrupt ➤ Pesticides, GMOs, chemicals, E.Coli/Salmonella
Effective	<ul style="list-style-type: none"> ➤ Government’s job to protect us from harmful substances ➤ Set standards and regulation ➤ Experience of not getting sick

Table 3: Can you name any specific federal/ state agencies, laws, or regulation?

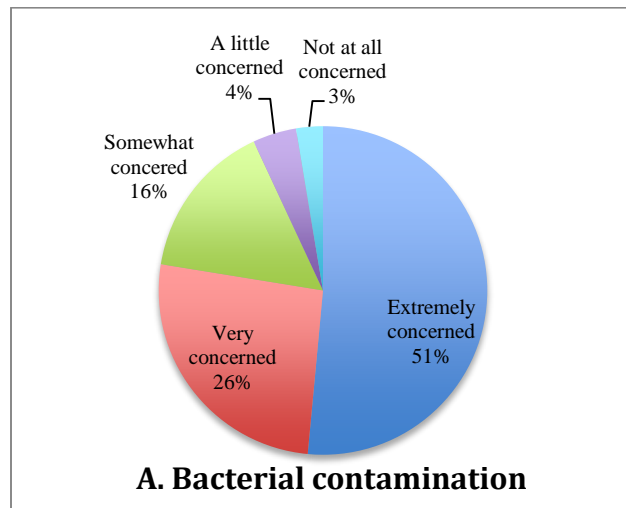
Categories	Coding
Yes	USDA/ FDA
No	31%

Table 4: What, if any, changes in food safety regulations and inspections could make produce safer?

Categories	Coding
Yes	Pesticide, Chemicals, Contamination. More inspections/ Oversight /More transparency
No	No/Idk/N.A – 31%

The top three attributes of food safety that respondents are most concerned with when purchasing produce were: bacterial contamination, pest infestation, and expiration date. Respondents thought that packagers/processors, farmers/growers, and government agencies were most responsible for food health and safety issues such as foodborne illnesses and outbreaks. While consumers, supermarkets, and restaurants as least responsible for food safety issues such as foodborne illnesses and outbreaks.

Figure 4: Top three most concerning attributes



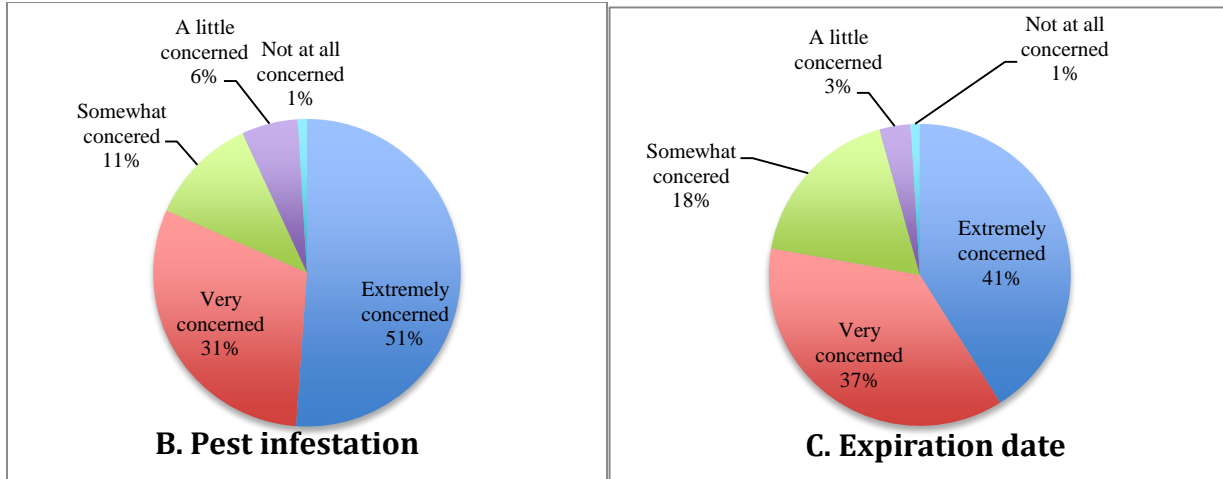
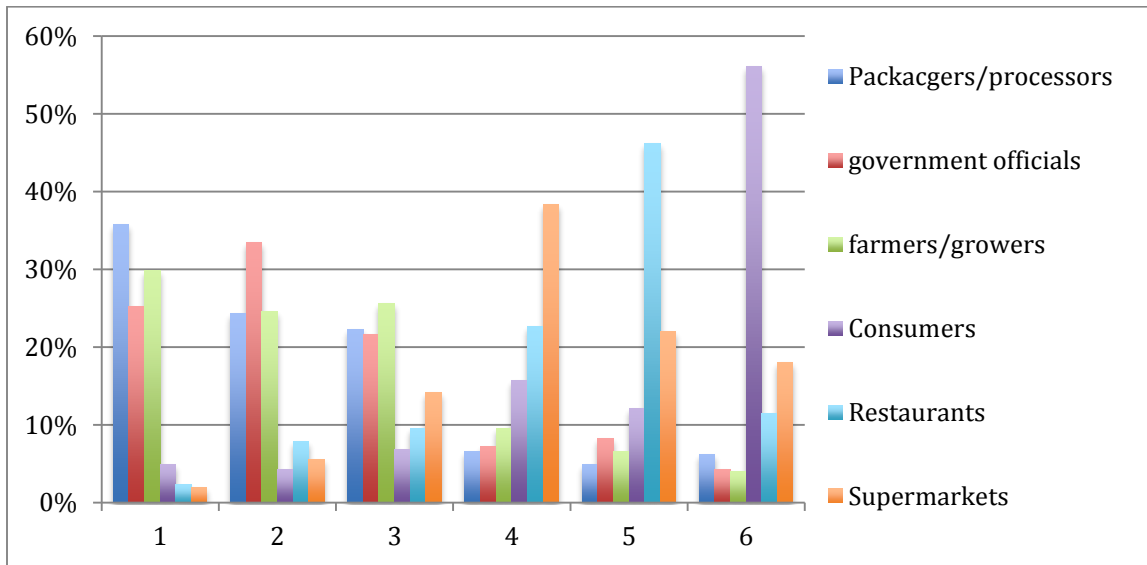


Figure 4: Most responsible for foodborne illnesses and outbreaks



DISCUSSION

Consumer perceptions of produce safety issues are highly subjective, and attitudes toward these issues do not translate into actual behavior. Most students believe that organic produce is safer than inorganic produce, and that produce sold at farmer's markets is safer than produce sold at conventional grocery stores. Yet, most students never or rarely shop for produce at farmers' markets and mostly purchase produce at conventional grocery stores. Students also feel relatively positive about government's role in regulating food safety, however most students want to see changes in government oversight of produce safety. Consumers may influence produce safety policy and practices, and understanding consumer perceptions and behavior regarding produce safety can help us see the gaps and the inconsistencies from the reality of food safety today.

Demographics and socioeconomic factors did not correlate with consumer attitudes, or behavior regarding produce safety, suggesting that other factors such as willingness to pay, taste, appearance, or past experiences play significant role in attitudes and behavior regarding produce safety. These results differ from those of Wilcock et al (2005), who found that demographic and socioeconomic factors were important in shaping consumer perceptions of produce safety.

The top three food safety attributes that students found most concerning when purchasing produce were bacterial contamination, pest infestation, and expiration date. This was particularly interesting since the majority of students felt that organic produce was safer than inorganic produce, yet their top three choice of most concerning food safety attributes were issues that are commonly associated with organic produce. This suggests that there is disconnection between consumers perceptions and the reality of safety in organic produce. Food worker welfare and source of produce were the least concerning to students when purchasing produce. Respondents believed that 'consumers' were least responsible for food safety outbreaks and 'farmers/growers/ and packagers/processors' were most responsible for food outbreaks, suggesting that most consumers of produce underestimate their own personal risk from food. This is similar to a study done where relationship between perception of risk and perception of control is very insignificant (Redmond and Griffith 2005).

Perceptions of Organic vs. Inorganic Produce

Most students agreed or felt neutral that organic produce is safer than inorganic produce. Student's often felt that organic produce was safer than inorganic because of the non-use of

pesticide or chemical fertilizers. This suggests that most students are aware of the general differences between organic and inorganic produce confirming with studies that found the non-use of pesticide and fertilizers as one of the most common association with organic (Shafie and Rennie, 2009). The fact that many respondents felt neutral about whether organic produce is safer than inorganic, this also suggests that an information gap still exists in communicating to the public the differences between organic and inorganic produce, or simply that some students may not care about safety of produce.

One way to address this is by making information on characteristic of organic produce more available to the public. Information should not only emphasize chemical or pesticide use, but also food worker welfare and environmental protection in organic versus inorganic farming practices, because these are also important aspects of produce safety that should be recognized.

Farmers' Markets vs. Conventional Markets

Students rarely shop at farmers' markets when purchasing organic produce, and the majority of students purchase produce (organic or inorganic) at conventional grocery stores. Although student feel more positively toward food safety in farmers' markets than at conventional grocery stores, they are likely to purchase produce at conventional grocery stores, suggesting that consumer attitudes may not translate into consumer behavior (Wilcock et al. 2004). Some reasons why more students purchase produce at conventional grocery stores than farmers' markets are convenience, location, and price (McGarry et al. 2005). Farmers' markets may not be accessible to student seven days a week, while grocery stores like Safeway are open all week during convenient hours. Furthermore, prices of produce also vary among different markets and that farmers' markets typically sell produce at a higher price than conventional markets (Warnert 2014). Students may also feel obliged to purchase their produce at conventional grocery stores. If, for example, one were shopping not only for produce, but for household items and other goods, then a grocery store would be preferable because of the variety of goods, compared to making multiple trips to different markets.

Government Regulations

Most students felt either positive or neutral about government regulation of produce safety. Although more than half of the students saw government regulation as ineffective, feeling that

there are too many loopholes, too much to regulate, and not enough funding. On the other hand, students cited their own experiences with food safety issues and believed that it is the government's job to assure food safety. Most students suggested that there should be more oversight and transparency, as well as the non-use of chemicals and pesticides to make produce safer for consumers. These findings suggest that many students are aware of the lack of funding in government oversight of food safety, which is a realistic trend today in food safety governance. Private companies are now setting the standards on food safety because government does not have adequate funding (Stuart 2010). As expected, respondents were unaware of this.

Limitations and Further Direction

Given that I only sampled a small group of college students from one class, there may be room to expand my sample size to look at how demographic and socio-economic factors can affect food safety perceptions. Also, because I sampled from an introductory environmental science class, many students may already have been well informed or have had an interest in issues regarding food safety and sustainability. Demographics within this population group did not seem to be significant because many groups of people were underrepresented in this class. To further address consumer attitudes and behaviors, a study focused on consumer willingness to pay can address this particular challenge. Furthermore, transparency on produce food safety can give consumer assurance and trust on government's role.

Broader Implications

Understanding consumer perceptions of produce safety allows both government and produce industry to have a clearer picture on what needs to be improved in terms of satisfying the consumer. It is important that consumers are informed and educated on produce safety, and having transparency in produce safety can help build that trust between consumers, industry groups, and government agencies.

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REFERENCES

- Baker, G. A. and P.J. Crosbie. December 1993. Measuring Food Safety Preferences: Identifying Consumer Segments. *Journal of Agricultural and Resource Economics*, 18(2): 277-287.
- Casewell, J. October 1998. How Labeling of Safety and Process Attributes Affect Markets for Food. *Agricultural and Resource Economics Review*. 151-158.
- Grunert, K.G. 2005. Food quality and safety: consumer perception and demand. *European Review of Agricultural Economics* Vol 32(3) (205) pp. 369-391.
- Guthman, J. July 2004. The Trouble with 'Organic Lite' in California: A Rejoinder to the 'Conventionalisation' Debate. *Sociologia*, Vol 44, Number 3: 301-316
- Mcgarry, M. W., A. Splitter, and J. Ahern. March 2005. A Profile of Farmers' Market Consumers and the Perceived Advantages of Produce Sold at Farmers Markets. *Journal of Food Distribution Research*. 36(1).
- Maria Aguiar Fontes, Eric Giraud-Heraud, Alexandra Seabra Pinto. Consumers' behavior towards food safety: A literature review. *Cahier de recherche* 2013-26. 2013. <hal-00912476>.
- Nixon, Ron. "Funding Gap Hinders Law for Ensuring Food Safety." *New York Times* Apr. 2015. Web.
- Redmond, E.C and Griffith C.J. May 2004. Consumer perceptions of food safety risk, control, and responsibility. *Appetite*. 43 (2004). 309-313.
- Rohr, A., K. Luddecke, S. Drusch, M.J. Muller, and E.c. Alvensleben. 2004. *Food Control*. 16 (2005). 645-655.

Shafie, F.A. and Rennie, D. Nov. 2009. Consumer Perceptions towards Organic Food. *Social and Behavioral Sciences* 49 (2012) 360-367.

Wim Verbeke, Lynn J. Frewe, Joachin Scholderer, and Hubert F. De Brabander. August 2006. Why Consumers Behave as they do With Respect to Food Safety and Risk Information. *Analytica Chimica Acta* 586 (2007) 2-7.

Wilcock, A., Maria Pun, Joesph Khanona, and May Aung. 2004. Consumer attitudes, knowledge and behavior: a review of food safety issues. *Trends n Food Science & Technology*. 15 (2004). 56-66.

FDA [Food and Drug Association]. 2014. Produce Safety Standards. Food Safety Modernization Act (FSMA). FDA, Washington, D.C., USA.

FDA [Food and Drug Association]. 2009. Federal Food and Drugs Act of 1906. Regulatory Information. Public Law Number 59-384. FDA, Washington D.C., USA.

LGMA [Leafy Greens Marketing Agreement]. 2014. About Us. California Leafy Green Handler Marketing Board. <http://www.lgma.ca.gov/about-us/>.

USDA [United States Department of Agriculture].1998. Guide to Minimize Microbial Food Safety Hazards for Fresh Fruits Vegetables. Guidance for Industry. Food Safety Initiative Staff, HFS-32 USDA, Washington, D.C., USA.

USDA [United States Department of Agriculture]. 2014. National Count of Farmers Market Directory Listing Graph: 1994-2014. Farmers Market and Local Food Marketing. USDA, Washington, D.C., USA.