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The Bacteria Content of Bagged, Pre-Washed Greens as Related to the Best if Used by Date

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Abstract

The sale of ready-to-eat salads has increased over the past years, yet little is known about consumer usage and the related safety of these products. This study evaluated the changes of microbiological quality of pre-washed spinach and mixed leafy vegetables during refrigeration storage. Microbial loads were determined by aerobic plate count (APC) and Enterobacteriaceae count (EC). The microbiological quality of pre-washed greens varied widely and deteriorated rapidly in a refrigerator. At "best if used by" date, twenty percent of samples had APC of more than 7.0 Log CFU/g and all samples had EC of more than 5.0 Log CFU/g. It is recommended that consumers purchase and eat pre-washed greens in their entirety as far in advance of the "best if used by" date as possible.

Keywords: Best if used by, Food product dating, Pre-washed green, Refrigeration, Vegetables

Introduction

Bagged, pre-washed salad greens are gaining popularity in the market place as a healthy and convenient choice. Pre-washed greens are minimally processed with no heating procedure to inactivate the microorganisms; therefore, they are subject to rapid deterioration and can support the growth of large populations of bacteria. Consumers worry about the microbiological quality of pre-washed greens, as there have been numerous recalls associated with pre-washed greens; several have involved foodborne pathogens including *Salmonella, E. coli* O157:H7, and *Listeria monocytogenes* (FDA 2011). Some pathogenic bacteria, such as Listeria *monocytogenes,* can continue to grow during refrigeration storage. According to Food Marketing Institute, consumers often assume that the dates placed on the packages are an indication that the product is safe to consume at least until that date (FMI 2010). In a survey conducted in 2002, FMI reported that 54% of consumers believed that eating food past its sell-by/use-by date constituted a health risk (FMI 2002). However, consumers are often confused by the different food dating. A survey conducted by Research Triangle Institute and Tennessee State University revealed many consumers did not understand the meanings of the different types of open dates (Kosa et al. 2007). Only 18% of respondents correctly defined the ‘‘use-by’’ date, and more than half of respondents had the misconception that it indicates the last date recommended for safe consumption of a product. Most bagged, pre-washed greens carry an open date labeling, such as “use by” and “best if used by”, although it is not required by federal regulation. “Use-by” dates usually refer to best quality and are not safety dates. But even if the date expires during home storage, a product should be safe, wholesome and of good quality - if handled properly and kept at 40 °F or below (USDA-FSIS 2011). The purpose of this study was to evaluate the changes of microbiological quality of bagged pre-washed greens stored in the refrigerator after opening.

Materials and Methods

Fifteen bags of prewashed, precut lettuce, spinach or mixed greens (5 bags of precut lettuce, 5 bags of spinach and 5 bags of mixed greens) with different “best if used by” dates (BIUBD) were purchased from a local grocery store at three different times during two-month period. The prewashed greens were stored in the original bags at 40 °F in a home-style refrigerator. Samples were taken from the bags and analyzed on the first day of purchasing and were tested continuously every two days until the tenth day past the BIUBD labeled on the bags. Microbiological quality of the bagged vegetables was determined by aerobic plate count (APC) and Enterobacteriaceae count (EC). In brief, a portion of the vegetable (about 25g) was placed in a sterile stomacher bag and 5 volumes (v/w) of Butterfield’s phosphate buffer (pH 7.2) were added to each bag. The contents of the sample bags were blended using a Stomacher R 400 Circulator (Seward Limited, UK) at 230 rpm for 2 minutes. The liquid contents were serially diluted in Butterfield’s phosphate buffer from 10-1 to 10-8 folds for subsequent plating. Petrifilm plates (3M Microbiology, St. Paul, MN) for Aerobic Count, and Enterobacteriaceae Count were inoculated with 1 mL of the serially diluted samples. The Petrifilm plates were incubated at 35° C for 24-48 hours per the manufacturer’s instructions. The colonies were enumerated manually and recorded after incubation. APC and EC were converted to Log CFU/g of sample. Microbiological data were analyzed using Statistical Package for Social Sciences (SPSS) software, Version 15.0 for Windows. Means and standard deviations were calculated and significant differences were tested using

General Linear Model. Significance thresholds for all tests were set at P = 0.05. Pearson correlation was used to correlate APC and EC with storage time.

Results and Discussion

There was no significant difference between microbiological quality and types/brands of the products. The microbiological quality of pre-washed greens varied widely among samples when the packages were first tested on the day of purchasing. The APC levels, commonly known as total bacterial count, ranged from 3.8 to 5.9 Log CFU/g, with an average of 5.4 Log CFU/g. The EC levels, commonly known as an indicator for poor sanitation and fecal contamination, ranged from 2.8 to 5.8 Log CFU/g, with an average of 5.2 Log CFU/g. Samples with one to four days from their BIUBD had significant higher bacteria levels, APC more than 5.7 Log CFU/g and EC more than 5.6 Log CFU/g, than samples with eight to ten days from their BIUBD, APC less than 4.0 Log CFU/g and EC less than 3.8 Log CFU/g (Figure 1). When tested at their BIUBD, 3 of the 15 samples had APC of more than 7.0 Log CFU/g; the average APC of all samples was 6.2 Log CFU/g. All 15 samples had EC of more than 5.0 Log CFU/g; the average EC of all samples was 5.9 Log CFU/g. There were positive correlations between storage time and APC, as well as EC. The results indicated a constant deterioration of microbial quality of bagged salad vegetables during refrigerated storage. The estimated initial microbiological quality at the tenth day before BIUBD was 4.1 Log CFU/g for APC (Figure 2) and 3.7 Log CFU/g for EC (Figure 3), respectively. The average increase of APC in every two days was 2.5 times (0.40-log); and the average increase of EC in every two days was 2.7 times (0.43-log). Average APC and EC reached more than 8 Log CFU/g at the tenth day after BIUBD. Our results indicated the pre-washed greens can support the rapid growth of microorganisms during refrigeration storage. Pre-washed greens, unlike other processed food, have no heating procedure during processing; therefore, good sanitation and temperature controls during processing and distribution are the key to ensuring the quality of pre-washed greens. The National Advisory Committee on Microbiological Criteria for Foods (NACMCF) recommends that retail and consumer packages carry a uniform standardized label (NACMCF 2005). The National Institute of Standards and Technology has published a model ‘‘Uniform Open Dating Regulation’’ for consideration as a means of assisting state regulatory agencies in addressing date labeling issues (NIST 2001). Consumers should benefit from an “Uniform Open Dating’ that is easy to understand when judging food qualities.

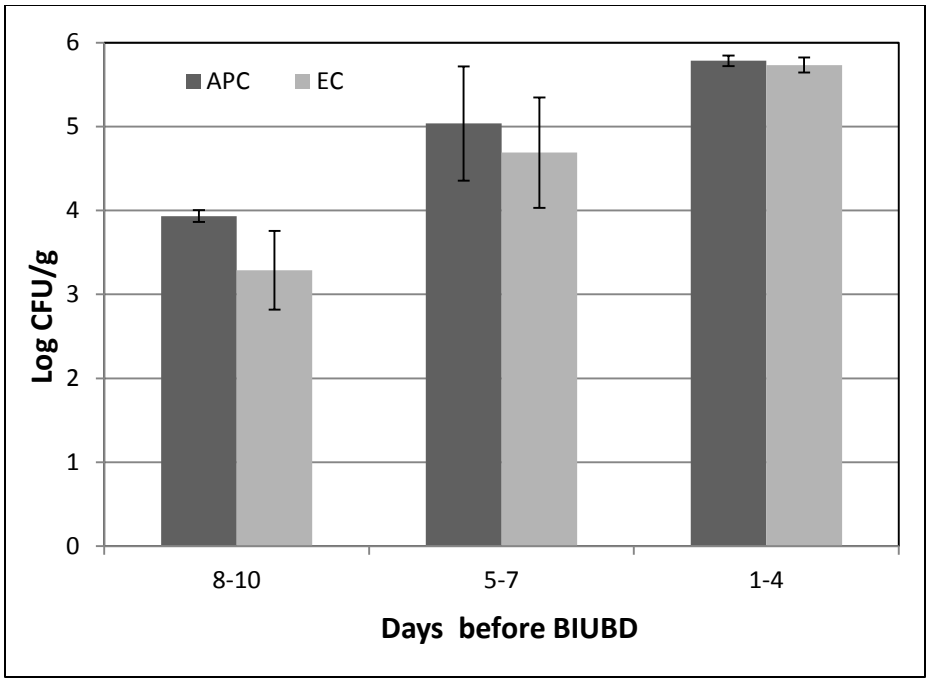

Figure 1. APC and EC of bagged pre-washed greens on the day of purchasing

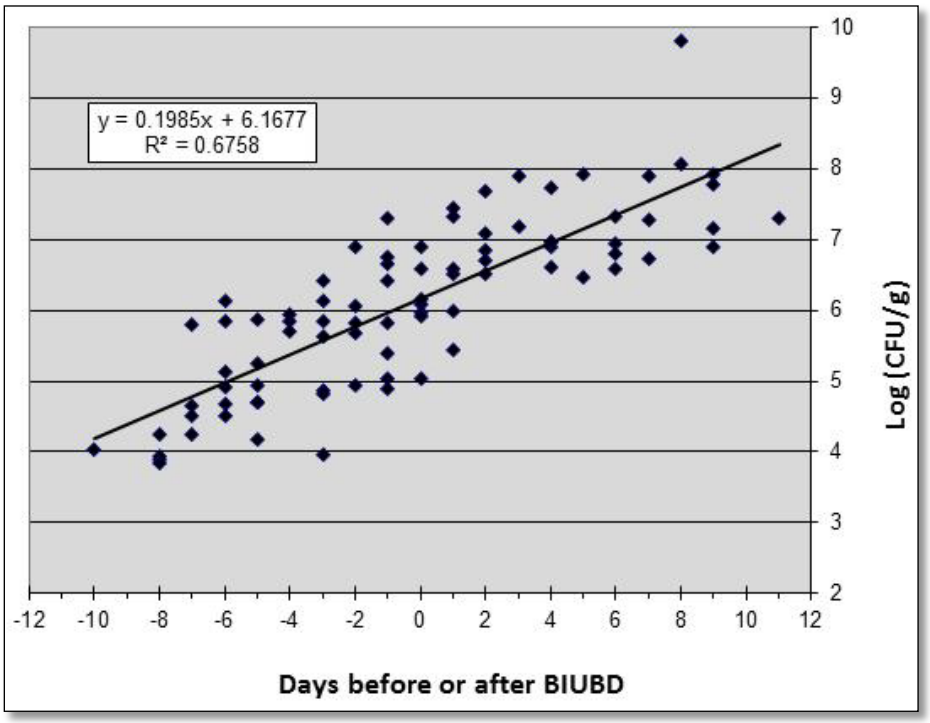

Figure 2. Correlation of APC to BIUBD

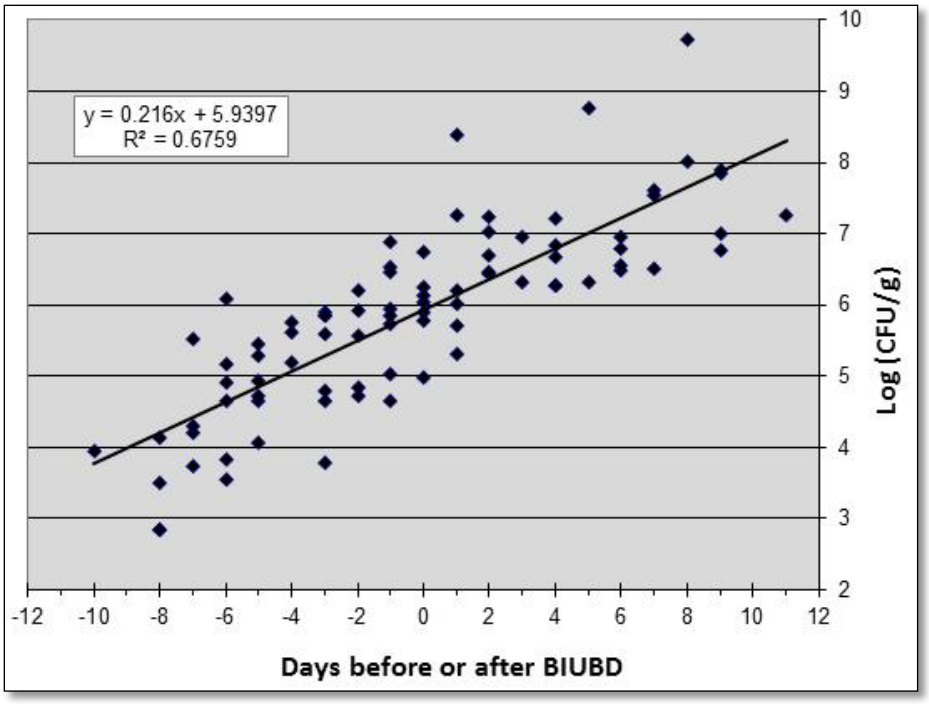

Figure 3. Correlation of EC to BIUBD

Conclusions

Our results showed that the microbiological quality of bagged pre-washed greens is highly variable and complex and showed relevant storage problems. For consumers who choose to purchase pre-washed, bagged greens it is recommended that they purchase and eat them in their entirety as far in advance of the "best if used by" date as possible.

Acknowledgements

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Assessing Food Safety Training Needs: Findings from TN Focus Groups

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Abstract

Although food safety training is important for the food services industry, there is limited information on the needs for hard-to-reach food service workers. The objectives of this paper are to: (1) identify food safety training issues facing hard-to-reach food service workers, and (2) analyze the opinions collected of participants in food safety focus groups. Data reported in this paper were collected using focus group meetings from selected counties in TN. Qualitative methodology was applied to data collected. Findings showed that food safety training should be offered on a continuous basis using materials that are easy to read, understand and implement. An effective food safety training program is needed to monitor employees to ensure compliance with established guidelines and procedures.

Keywords: food safety, training needs, communications, focus groups, eating places, hard-to-reach audiences, food service workers

Introduction

According to the 2007 U. S. Census Bureau, there were approximately 566,020 food services and drinking places, 217,282 full service restaurants, 266,534 limited service eating places, and 209,819 limited service restaurants. In 2008, Tennessee had 8,937 eating and drinking places. Restaurants employed approximately 271,400 people in Tennessee, contributing 10 percent of jobs in the state. Between 2010 and 2020, it is projected that the number of jobs created by restaurants will increase from 270,200 to 271,400. This represents 24,600 new jobs, **a** 9.1% growth in restaurant and food service employment in Tennessee. In 2010, Tennessee's restaurants were expected to generate about $8.7 billion in sales. Every extra $1 million spent in Tennessee's eating and drinking places creates 29.3 additional jobs in the state.

Food safety training is an important component of the American food system. Millions of Americans are at risk of being sick, hospitalized or dying from eating unsafe food. Limited information exist on food safety training needs for limited resource and hard-to-reach food service workers. In a recent study, Ekanem et. al. 2011 noted that food safety training was very important in the food service industry in Tennessee. That study, however neither examine specific training needs nor examine these needs for hard-to-reach food service workers. The present study will attempt to fill that gap.

The objectives of this paper are to identify food safety training issues and analyze the opinions of participants in food safety focus groups. The objectives of this paper are to: (1) identify food safety training issues facing limited resource and hard-to-reach food service workers (2) analyze the opinions collected of participants in food safety focus groups.

Related Literature Review

In 2009, it was estimated that 130 million individuals visited restaurants daily where 70 billion meals or snacks were served. United States restaurants generated a total of $566 billion in sales. A preview of the 2008 US Census data showed that 34.4 percent of the estimated population was ethnically or racially diverse. Hepatitis A and Norwalk-like virus, accounted for most (60 percent) of the foodborne outbreaks. Eighty-nine percent of these outbreaks occurred in food service establishments/restaurants (Kwon, J. et. al. 2010, 2011). Using a modified Dillman mailed self-administered questionnaire, Walter et. al. (1997) surveyed 132 homes for people with developmental disabilities in western Massachusetts. The study found training needs exist in many areas including: food safety training and storage, handling procedures, attitudes, practices and critical control points in safe food preparation. Cody, M. et. al. (2008) used data collected from 1,174 participants from 121 districts in 33 states, highlighted food safety training issues. Among the food safety training issues raised were the need for better training materials, compensation for time to attain training, the lack of expert trainers and follow-up.

Methodology

The project reported in this paper was part of a two state food safety training needs assessment study in Arkansas and Tennessee. Focus group questions were developed by a team of agricultural economists, food scientists, agricultural educators, health specialists and others. The

questionnaire was tested and modified for clarity and readability prior to administration with hard-to-reach audiences. Organizers targeted workers, managers or assistant managers, owners, trainers, certified nutritionists, environmental specialists and food inspectors for participation. The targeted audiences were current or previous workers of family owned eating places, fast food restaurants, delis, nursing home cafeterias, hospital dinners, child care eating facilities, correction center canteens and schools eateries.

Data was collected using focus group discussions with food services workers in three selected counties in Tennessee. Shelby, Davidson and Montgomery counties were conveniently selected based on availability and interest of the county extension agents in food safety. Each meeting was 90 to 120 minutes. Collaborating extension specialists and county agents recruited seven to 13 local food service workers per location to participate in the meetings. Participants input were taped, hand-recorded, transcribed, checked for accuracy and computerized. Qualitative methods were used in analyzing opinions expressed by participants. Findings provide insights for discussions, recommendations and policies implications for addressing food safety training needs of limited-resource and hard-to-reach audiences.

Findings

A profile of the focus group members showed that while 30 percent were males, 70% were females. Thirty-three percent of the participants resided in a city of less than 20,000 populations, 19 percent lived in a city 20,000 to 50,000 people while 48 percent live in a city of more than 50,000 inhabitants. In terms of ethnic background, 44 percent were Black or African Americans while 44 percent were Whites or Caucasians and 12 percent identified themselves as belonging to other ethnic groups (American Indians, Alaskan Natives, Asians or Hawaiian). While 52 percent of the focus group participants held positions as Managers, Assistant Managers, Trainers or Owners, 26 percent were food inspectors or environmental specialists and 23 percent held the positions of food service workers or others. When asked to provide information regarding their educational background, participants with High School education or less constituted 19 percent, some college 32 percent, bachelor's degree 16 percent, graduate degree 20 percent and other (30 percent). The following income groups and percentage of the participants were recorded: Four percent of the participants earned less than $10,000, 16 percent generated $10,001 to $25,000, 20 percent were paid $25,001 to $40,000, eight percent earned $40,001 to $55,000, 28 percent made $55,001 to $70,000 and 24 percent received more than $70,000 in gross annual household income. In terms of language, 90 percent of the participants revealed that English was their primary language of communication. As many as 67 percent of the focus group participants provided their contact information to received information about the project, technical assistance, educational programs or future collaborations.

This section presents discussions generated from the focus group meetings on the important issues in food safety training of hard-to-reach workers in food service. In response to this question, participants acknowledged the importance of food safety training for Tennessee food service workers. Participants agreed that certification should be required for all Tennessee food service workers. Experts in food safety should offer training to top-managers, middle managers and other workers in establishments that serve food. The participants recommended specific training on cooking, chilling temperature and personal hygiene. Involvement of everyone in the

food establishment would allow all employees to benefit from a structure training program. Managers' commitment would strengthen any food safety plan that the establishment intends to implement.

According to the responses shared by the participants, offering specific training that emphasize the basic concepts of food safety will allow workers to learn the principles that explain actions they take to keep food safe. Participants also agreed that there was an issue with training material being displayed in a language that the workers are not well-versed in. Therefore, assistance should be provided to food service workers in translating and interpreting information. Additionally, participants also stressed the need for printed materials to be user-friendly, easy and simple to understand. Furthermore, effective food safety training must be offered on an on-going basis. Managers should be well-informed on the incidence of foodborne issues. The cost of food safety training was an issue. To be cost effective, participants suggested that training-the-trainer ought to be provided by city or county government. Continuous monitoring of employees is necessary to ensure that they follow guidelines. Responses to these questions showed the needs identified for food safety training in Tennessee.

Recommendations and Conclusions

The purpose of this paper was to report on findings of focus group discussions on food safety training needs for food service workers in Tennessee. Using eight questions developed for a structured focus group meeting, opinions were gathered from three groups seated in Shelby, Montgomery and Davidson counties during the months of May through June 2011. A total of 31 participants drawn from previous and current food service workers took part in the study. Food safety training is very important in order to maintain the relatively safe position that the United States has enjoyed over the years. In whatever form it is offered, food safety training should provide positive impacts that change behaviors important for safe food storage and handling. With increasing diversity of the U.S. population and workforce, the importance of research like the one conducted here cannot be over emphasized. Focus group meetings can provide useful insights into development of essential content of a good food safety training manual or curriculum. This study shows that good food safety training should acknowledge diversity (the differences in educational, social, cultural and religious backgrounds) of trainees in addition to how the training material is communicated.

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Microbiological Quality of Packaged Lunchmeat as Related to the Sell-by-Date

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Abstract

Consumers are often confused by the product dating systems used by the food manufacturers. However, they have reported that they consider these dates when purchasing lunchmeats and other ready-to-eat foods. A study was conducted to evaluate changes of microbiological quality of packaged lunchmeat during refrigerated storage as related to the sell-by-date (SBD). Thirty packages of lunchmeat with the same lot number were tested over an extended period. The microbiological quality was satisfactory at the time of purchase. It deteriorated steadily during refrigerated storage regardless of whether the packages were opened or not, and was unsatisfactory at SBD. Food manufacturers should strive to meet the microbiological quality standards and consider the usefulness of the information to consumers when setting a product date.

Keywords: Bacteria in lunchmeat, Package labeling, Sell-by-dates

Introduction

Packaged lunchmeats are a popularly consumed product in homes in the United States. In a study by Godwin and Coppings (2005) the majority of consumers (71%) reported having lunchmeat in their refrigerator for varying lengths of time, some for over one month. Product dating information, e.g. sell-by dates (SBD), is often found on food packages. However, consumers are confused by the different open dating systems, such as sell-by, use-by, and best-if-used-by. A survey conducted by Food Marketing Institute found that consumers' perceptions vary regarding interpreting the dating statements used (Food Marketing Institute 2002). Similar findings were found in a consumer survey conducted by RTI International and Tennessee State University (Kosa et al. 2007). They also found that the majority of participants said they read the dates before purchasing a product. Although the SBD is intended for inventory control and traceability, consumers believe that it indicates a date related to the safety of the product, i.e. how long it is safe to use and store the product after purchasing. USDA-FSIS has published guidelines for consumers' understanding and proper use of the dating information (USDA-FSIS 2011). According to this consumer guideline, lunchmeat, assumedly if purchased before SBD, may be kept in a refrigerator for up to 14 days unopened and 3-5 days after opening. Yet upon inspecting the contents of refrigerators in several states, more than almost one-fourth of them had lunchmeat stored in packages with no dates at all (Godwin and Coppings 2005). Wide variations in microbiological quality may be seen in stored lunchmeat since the product may be purchased up to the SBD, and stored for lengthy times thereafter. Scientific data is needed for developing educational materials regarding storage times and handling practices of refrigerated RTE foods. In order to assess various scenarios of the length of storage, this study was conducted to evaluate changes of microbiological quality of packaged lunchmeat during refrigerated storage as related to the SBD.

Materials and Methods

Thirty packages of thin sliced oven roasted turkey breast with the same lot number and SBD were purchased from a local grocery store. Packages were randomly divided into ten batches (three in each batch) and stored in the original resealable bags at 40 °F in a home-style refrigerator. A testing schedule was arranged so that a new batch was opened every two to four days. The exterior of the packages were sampled the day the packages were opened. A slice of the meat from within was analyzed on the first day the bags were opened, and continuously every two-days, for a total of fourteen days. Microbiological quality of the lunchmeats was determined by aerobic plate count (APC) and Enterobacteriaceae count (EC). In brief, a slice of lunchmeat (about 28g) was place in a sterile stomacher bag and 5 volumes (v/w) of Butterfield's phosphate buffer (pH 7.2) were added to the bag. The contents of the sample bags were blended using a Stomacher R 400 Circulator (Seward Limited, UK) at 230 rpm for 2 minutes. The liquid contents were serially diluted in Butterfield's phosphate buffer from 10-1 to 10-7 folds for subsequent plating. Total Plate Count Agar and Violet Red Bile Glucose Agar were inoculated with 1 mL of the serially diluted samples using the pour plate method (Maturin and Peeler 2001; Szabo 1997). The plates were incubated at 35° C for 48 hours and the colonies were enumerated manually and recorded after incubation. APC and EC were converted to log CFU/g of sample. Microbiological data were analyzed using Statistical Package for Social Sciences (SPSS) software, Version 15.0 for Windows. Descriptive statistics including means and standard deviations were calculated for

all microbial data. Significant differences were tested using General Linear Model. Significance thresholds for all tests were set at P = 0.05.

Results and Discussions

According to industry standards (i.e. less than 1,000 CFU/package for APC and EC), the exterior surfaces were found to be clean for all the packages (n=30) except one. Since any unacceptable count is potentially harmful, this result suggests that the exterior of the package may be contaminated during display or handling at stores or after purchasing. Consumers are advised to clean the surface of package before opening it, and to keep the unused portion of the lunchmeat sealed and stored in the original package. Transfer of lunchmeat from the original package to a container is not recommended as this could increase the potential for contamination.

The average microbial load of the lunchmeats was less than 100 CFU/g at the beginning of the experiment (twenty-first day before SBD). According to the guidelines for the microbiological quality established by PHLS Advisory Committee for Food and Dairy Products, sliced meat should have less than 106 CFU/g of APC and less than 104 CFU/g of EC at the point of sale to be considered acceptable (Gilbert et al. 2000). The lunchmeat used in our study met this microbiological quality standard at the time of purchase. There was a steady increase of APC and EC during refrigerated storage regardless of whether the packages were opened or not. The average increase over a one week period was 11.7 times (1.07-log) for APC and 11.2 times (1.05-log) for EC (Figure1). The data suggested both APC and EC increased more than 10 times in a period of about 7 days under proper refrigerated storage. It is advisable to consumers that the packaged lunchmeat be consumed as soon as possible after purchase since the freshness of the product deteriorated even if they are unopened. The microbiological quality of the product may deteriorate at much faster rate if handled inappropriately, such as being left at room temperature for extended times, stored at incorrect refrigeration temperatures, or unsanitary handling. The average APC was 4.2 x 104 CFU/g and average EC was 2.8 x 104 CFU/g at SBD; the microbiological quality would be considered satisfactory for APC but unsatisfactory for EC if purchased on the SBD. Our data suggested that the packages of lunchmeat in our study would reach the unsatisfactory level of EC at least 1-2 days before SBD. Food manufacturers need to consider reevaluating the SBD labeling based on these guidelines. There were no significant differences among the packages that were been opened at different days before the SBD (Figure 2). The opening of the package is not considered a major factor in the deterioration of the microbiological quality if handled and stored properly. Therefore, educational efforts should be focused on the importance of refrigeration temperature control. Both APC and EC reached more than 107 CFU/g at the fourteenth day after SBD. These exceed the satisfactory level for APC and EC. Thus it is a concern, in the worst scenario, if consumers purchase a product just before SBD and store it unopened in the refrigerator for 14 days before eating. It is advisable that consumers eat lunchmeats purchased close to the SBD immediately.

Conclusion

The results suggest that SBD, in addition to being used for inventory purposes, can be useful information for consumers as a criterion in judging microbiological quality of the packaged

lunchmeats. Food manufacturers should reevaluate the SBD considering the usefulness of the information to consumers and meeting the microbiological quality standards. Education programs are needed in order for consumers to use the product dating information effectively.

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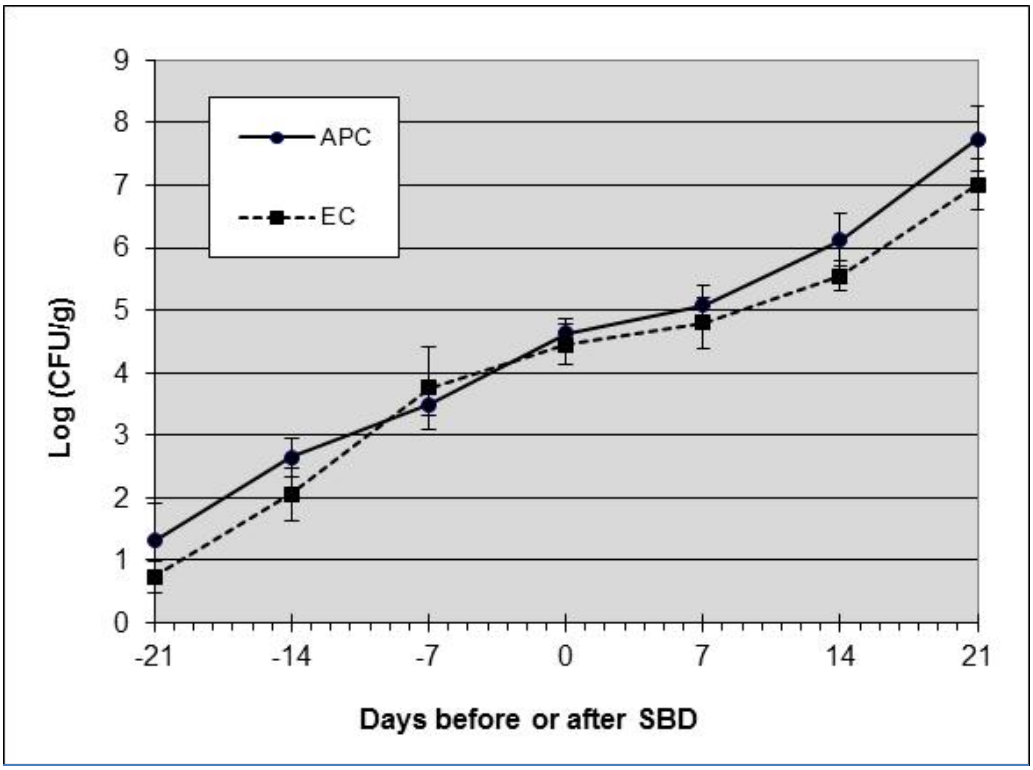

Figure 1. Average APC and EC of lunchmeat related to SBD.

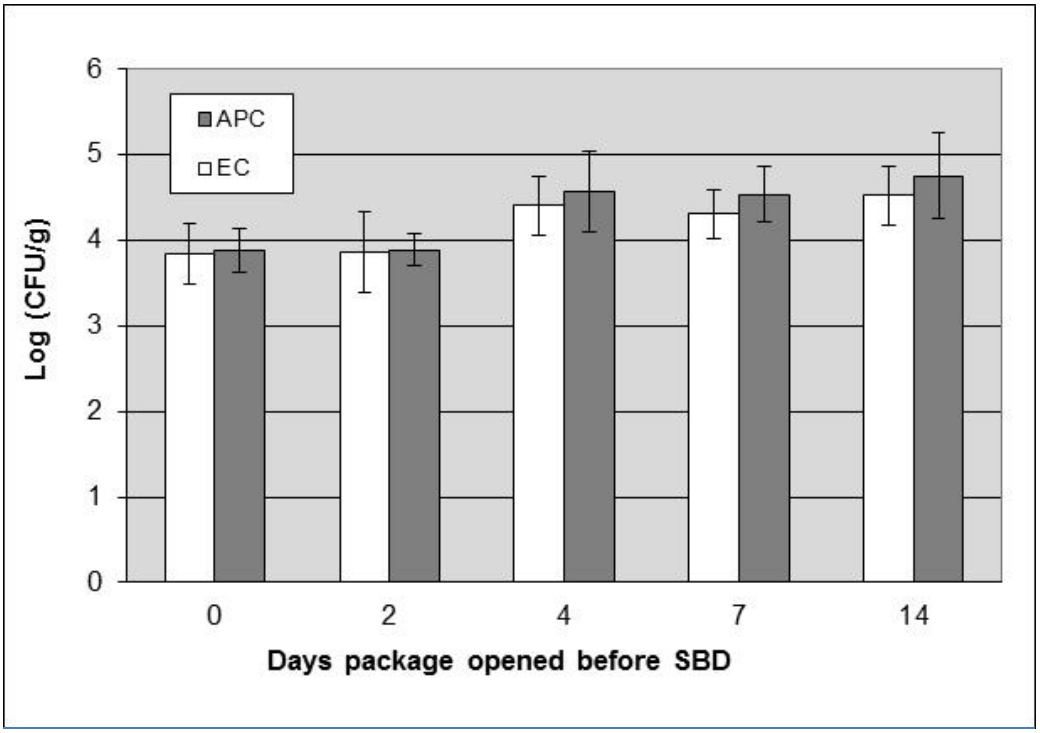

Figure 2. Average APC and EC of lunchmeat at SBD.

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Consumer Response to Food Contamination and Recalls: Findings from a National Survey

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Abstract

Food tampering is a great concern to many in the food safety industry. Deliberate contamination of food in the United States has occurred and could happen again. Upon discovery, the company may voluntary recall the unsafe product or it may be recalled by the government. Food recalls are announced on television and radio, in newspapers, and on the internet at www.foodsafety.gov among others. Indeed thousands of recalls occur each year, often resulting in millions of dollars in cost to the food industry. Since 9/11, the U.S. government has worked with the food industry to anticipate and prevent threats to the food supply. Consumers, however, also have a part to keep food safe before, during, and after possible acts of foodborne bioterrorism. We conducted a national survey of 1,011 adults, which asked respondents how likely they would be to follow specific government recommendations regarding foodborne illness, recalls, and intentional acts of contamination. Forty-two percent of respondents reported they thought it was very likely or likely that there would be a possible terrorist attack on the U.S. food supply in the next 10 years, and 62% reported they would not be very prepared or not at all prepared for one. In the event of a possible terrorist attack, 28% of respondents stated they would stock more food and water in their homes. Additionally, in our study, most (86%) of the respondents reported they would be very likely or likely to contact their local health department or law enforcement agency if they suspected a food product had been intentionally tampered with, and 96% reported they would be very likely or likely to return a recalled food product to the place of purchase or discard it. It is important for consumers to do their part to be prepared in the event of an intentional attack on the U.S. food supply, and to be aware of possible deliberate contamination and food recalls should they occur.

Keywords: food recalls, food tampering, consumer response to recalls

Introduction

Since 9/11 and the subsequent anthrax incidents, concerns about intentional acts of food contamination, or foodborne bioterrorism, in the United States have been heightened. Although most foodborne disease outbreaks are unintentional, deliberate contamination of food in the United States has occurred and could happen again (Ryan et al., 1987; Totok et al., 1997). For example, an intentional contamination of pasteurized liquid ice cream in tanker trucks caused an estimated 244,000 people to become infected with Salmonella enteritidis in 1994 (Hennessy et al. 1996). A deliberate contamination of a commercial food product could cause a widespread outbreak of foodborne illness geographically dispersed across the United States (Sobel, Khan, & Swerdlow, 2002). The Centers for Disease Control and Prevention (CDC) therefore produced a list of possible biological agents that could be used to contaminate food and water sources (Khan, Morse, & Lillibridge, 2000). Although these biological agents, namely foodborne pathogens, rarely result in death with proper treatment, a sudden large increase in the number of foodborne illness cases could overwhelm medical resources, and appropriate treatment might not be available to all victims (Sobel et al. 2002). Since 9/11, the U.S. government has worked with U.S. food processors and food producers to anticipate, prevent, and deter threats to the food supply (Cliché, 2006). In addition to food intentional food contamination or bioterrorism, the frequency of food recalls has increased in recent years (Zootecnica 2011) due to a variety of factors including improved methods for detecting microbial or chemical contaminants in foods and changes in government inspection and surveillance methods. The majority of food recalls are the result of operational mistakes or the inadvertent but undisclosed contamination of a food product by a known allergen.

Food producers and processors and government agencies have roles to play in ensuring the safety of the food supply. Consumers, however, also have a part in the farm-to-fork continuum to keep food safe including before, during, and after emergencies and possible acts of foodborne bioterrorism. Several government agencies, such as the U.S. Department of Agriculture (USDA). Food and Drug Administration (FDA) and the U.S. Department of Homeland Security, and other organizations, such as the American Red Cross, have developed various Web sites and print materials to educate consumers about recommended food safety practices to respond to food recalls and prepare for emergency situations, including food tampering and bioterrorism. In focus groups conducted by Godwin, Coppings, Kosa, Cates, & Speller-Henderson (2010), it was found that consumers trust these agencies for information on handling food-related emergencies. However, limited research, especially at the national level, has been conducted to measure consumers' knowledge and use of these recommended food safety practices.

A national survey was conducted to understand consumers' food safety attitudes, knowledge, and practices with regard to emergency preparedness and response (Kosa, Cates, Godwin, Coppings, & Speller-Henderson, 2011). Study findings could be used by educators to identify gaps in consumers' food safety knowledge and practices, develop new or improve existing educational approaches, and thereby help reduce the risk of foodborne illness.

Methodology

A national survey of U.S. household grocery shoppers aged 18 years and older was conducted using a Web-enabled panel survey approach. The survey administration and analysis procedures are described below and in a paper published on power outages published by Kosa et al (2011).
Sample. The sample was selected from a Web-enabled panel developed and maintained by Knowledge Networks (Menlo Park, CA), a survey research firm. The Web-enabled panel was designed to be representative of the U.S. population (Couper, 2000). The Web-enabled panel was based on a list-assisted, random-digit-dial (RDD) sample drawn from all 10-digit telephone numbers in the United States. Households that do not have telephones (approximately 2.4% of U.S. households) are not covered in the sample (US Census Bureau, 2010). As part of a household's agreement to participate in the panel, they were provided with a free computer and free Internet access. All new panel members were sent an initial survey that collects information on a wide variety of demographic characteristics to create member profiles.

At the time of sample selection, approximately 45,000 panel members were actively participating in the Web-enabled panel. A sample of 1,619 panel members who had primary or shared responsibility for the grocery shopping in their households was randomly selected to receive the survey.
Questionnaire. The questionnaire collected information on consumers' food safety attitudes, knowledge, and practices regarding emergency preparedness and response. Respondents were asked whether they had read or heard about specific food safety recommendations and how likely they would be to follow the recommendations during a future emergency. Respondents were also asked whether they had read or heard about other specific government recommendations regarding food recalls, and intentional acts of contamination, including a terrorist attack on the U.S. food supply, and how likely they would be to follow these recommendations in the future.
Prior to survey administration, the survey instrument was evaluated with 10 adults who had recently experienced extended power outages using cognitive interviewing techniques (Willis, 1994). Subsequently, the survey instrument was refined based on the results from the cognitive interviews.

Survey Procedures and Response. The survey was e mailed to a random sample of panel members aged 18 years old and older who had primary or shared responsibility for the grocery shopping in their household. To maximize response rate, two e-mail reminders were sent and one telephone call was made to nonrespondents. Data were collected over a 14-day field period. Of the 1,619 sampled panelists, 49 individuals were not eligible and 559 individuals did not respond. The total sample size was 1,011, which yielded a 64% completion rate.

Weighting Procedures. The data were weighted to reflect the selection probabilities of sampled units and to compensate for differential nonresponses and undercoverage (Lohr, 1999). The weights were based on the inverses of their overall selection probabilities with adjustments for undersampling of telephone numbers for which an address was not available during panel recruiting; households with multiple telephone lines; oversampling of certain geographic areas, African American and Hispanic households, and households with computer and Internet access; and undersampling of households not covered by MSN TV. Using a raking, or iterative proportional fitting technique, data on age, gender, race/ethnicity, geographic region, education, Internet access, and metropolitan status were used in a poststratification weighting adjustment to

make the sample reflect the most current population benchmarks (US Census Bureau, 2007). The final weights were trimmed and scaled to sum to the total U.S. population aged 18 years and older; hence, the weighted survey results are representative of the U.S. adult population.

Analysis. Weighted frequencies were calculated for each survey question. For selected questions, analyses were conducted to assess whether responses varied by respondent characteristics. The following sociodemographic and other variables were included in this analysis: gender, age (18 to 44 years old versus 45 years old and older), education level (high school or less versus some college or more), marital status (married versus not married), household size (single versus two or more individuals), race/ethnicity (white, non-Hispanic versus other), household income (less than $35,000 versus $35,000 or more), U.S. region (Northeast, Midwest, South, and West), and metropolitan status (metropolitan versus nonmetropolitan) based on the metropolitan statistical area (MSA) for the household. A chi-square test was performed for the relationships between the variables of interest and the sociodemographic and other variables. The analysis was conducted with the Stata release 8.2 software package (Stata Corporation, 2005).

Results

Of the 1,011 respondents, 72% were women; 73% were white, non-Hispanic; and 61% were between the ages of 30 and 59 years old. Approximately 61% of respondents had some college education or a college degree, and 61% of respondents had annual household incomes of $35,000 or more. Twenty-seven percent of respondents had children living in their households at the time of the survey. Detailed demographic information for the respondents is provided in Table 1 (see Appendix).

Data regarding the likelihood that respondents would follow USDA recommendations is summarized in Table 2 (see Appendix). Nearly ninety-six percent of respondents indicated that they would be very likely (79.4 %) or likely (16.4 %) to follow the USDA recommendation to discard or return a recalled food product (Table 2). A slightly lower proportion, 85.6 %, of respondents were very likely (62.0 %) or likely (23.6 %) to contact their local health department or law enforcement agency if they suspected that a food item had been tampered with as recommended by USDA. Respondents from household that included a high risk person were more likely to follow the recommendation. The percentage of respondents who felt that a terrorist attack on the U.S. food supply is very likely or likely was over twice that of respondents who felt that such a terrorist attack is unlikely or very unlikely (42.1 % vs. 18.6 %, respectively). Thirty nine percent of respondents indicated that a terrorist attack on the food supply was neither likely nor unlikely.

Discussion and Conclusions

Proper handling of food and food products in the home is a vital step in protecting consumers from foodborne illness or injury from foods that have been tampered with or contaminated. A large majority of consumers in our survey indicated that they would properly respond to notification that they possessed a recalled food item by discarding it or retuning it to the point of purchase. This high degree of compliance would help to reduce the adverse health impact of recalled foods. While again a large majority of respondents expressed a willingness to comply with the recommendation to contact local law enforcement or health department when confronted with a

food product that had apparently been tampered with, the percentage of persons very likely to follow this recommendation was less the proportion that were very likely to follow the recommendation regarding a recalled food (62.0 vs. 79.4 %, respectively. Unfortunately, his may reflect hesitancy to follow through with the recommendation. Moreover, consumers would need to be aware of the proper authority to contact and have appropriate contact information. It may be that some consumers would lack this information and fail to inform local authorities in a timely manner. While over twice the percentage of survey respondents thought a bioterrorist attack involving the food supply was likely in the near future, this represented less than half the respondents. This result is surprising given the high vulnerability of our food supply to persons with malicious intern (Rasco & Bledsoe, 2005).

Continued efforts are needed to promptly inform consumers of food related problems and instruct them in how to respond to food recalls or food emergencies. Several websites are available, such as www.foodsafety.gov and www.recalls.gov/food, to notify consumers of food safety issues including food product recalls. The Food Safety Modernization Act (FSMA) includes enhanced efforts by the FDA to provide consumers with accurate information on these issues (U.S. Food and Drug Administration [FDA], 2011). We have assembled educational curricula to train county extension agents in how to assist consumers confronted with emergencies that impact food safety (Godwin & Stone, 2011). These and related efforts should enable consumers to be better prepared to properly respond to a variety of food safety issues.

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Appendix

Table 1. Demographic characteristics of survey respondents (n=1011).

			%
Region			
	Northwest		17.9
	Midwest	22.7	
	South		36.0
	West		23.5
Age			
	18 - 29	15.4	
	30 - 44	28.3	
	45 - 59	32.3	23.9
	60 +		
Race/Ethnicity			
	White non Hispanic		73.0
	Black non-Hispanic		9.8
	Hispanic	11.2	
	Other		6.0
Gender			
	Male		28
	Female		72
Household size			
	Single		33.6
	Two or more		66.4
Children in home			
	Yes		27
	No		73

Table 2. Respondent's likelihood to follow USDA recommendations (%).

	Likelihood to follow recommendation				
Recommendation	*Very likely*	*Likely*	*Neither*	*Unlikely*	*Very unlikely*
Discard or return recalled food item	79.4	16.4	2.0	1.5	0.4
Contact local health department regarding tampered food item	62.0	23.6	7.6	5.1	1.6

n=1011

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What is the New Version of Scale Efficient: A Values-Based Supply Chain Approach

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Abstract

Although the growth in direct markets suggests a significant jump in local food purchasing by households, direct marketing still only accounts for a small percentage of total food sales because conventional food supply chains account for the great majority of food dollars. Since these traditional outlets are often unable to integrate local products from small and mid-size producers, new opportunities have arisen for farmers to reach wholesale markets. But the economic question is whether these innovations can compete in terms of efficiency, since the transaction costs associated with product distribution are likely to rise if new systems do not achieve scale economies. The goal of this study is to determine what scale would be needed for a local food distributor located in Northern Colorado to be financially feasible. Since the mission of the distributor is to increase local food access for wholesale buyers and provide a market outlet for small and mid-size producers; financial feasibility is a necessity but profit is not the primary goal.

Keywords: farm to school, feasibility study, value chain, local, food distribution

Introduction

In the United States, 99.2% of all food is purchased through traditional wholesale channels such as grocery stores, restaurants, and institutions (Martinez, et al. 2010). Due to the large volume and centralized purchasing of most wholesale food channels, the majority of the producers that supply these outlets are large, wholesale producers. While this type of supply chain provides a consistent supply of affordable products that are available to consumers year round, it provides little opportunity for small and mid-size growers, who often can provide less consistent volumes, to reach the wholesale market.

There are emerging opportunities, however, and recently some consumers have begun to demand products that are often difficult for the traditional wholesale channels to provide. Specifically, increasing demand for source verified and locally produced foods appear to play a role in the significant growth in direct markets. Therefore, the small and mid-size farmers have partially addressed the barriers excluding them from wholesale markets through their willingness to develop strategies that allow them to sell directly to the consumer. As evidence, the number of farmers' markets across the country has increased by almost 250% since 1994 and, from 2009 to 2010 alone they showed a 16% increase (Farmers Market Growth: 1994-2011, 2011). Moreover an online registry estimates the number of farms engaged in community supported agriculture (CSA) to be 4,401 (Local Harvest 2011), a huge growth since CSAs were first recognized in the US in 1986 (Adam 2006).

On the supply side, from 2002 to 2007, the number of U.S. farms selling directly to consumers through farmers' markets, roadside stands, and pick-your-own operations grew by 104.7% while the value of farm products sold directly to the consumer increased by 47.6% 2.

(Vogel & Low 2010). The smaller increase in the value of farm products could be, in part, because many of those selling through direct markets were small farms with limited volumes.

Although the growth in direct markets suggests a significant jump in local food purchasing by households, direct marketing still only accounts for a small percentage of total food sales. This very small share of local food sales can be partially attributed to supply chain constraints and the relatively limited product absorption capacity of direct markets. In addition, producers face limitations in supplying more conventional wholesale channels in terms of providing consistent product supply and quality, as well as gaining assurance that their products will retain identity throughout the distribution channel. There are emerging opportunities for farmers interested in supplying wholesale markets, however but the economic question is whether these innovations can compete in terms of efficiency, since the transaction costs associated with product distribution are likely to rise if new systems do not achieve scale economies or allow for adoption of investments that may improve supply chain efficiencies.

The goal of this paper is provide insight into how new, smaller scale distributors might compete with traditional distributors. Specifically, the goal is to determine what scale would be needed for a local food distributor located in Northern Colorado to be financially feasible. This distribution facility will be located on an existing farm but will operate as a separate marketing entity. The purpose of this arrangement is to use existing infrastructure to lower costs for a collaborative of

producers who sell to the same school district in order to achieve better scale economies for each of the individual farms. The overarching mission of the distributor is to increase wholesale buyers' access to locally produced foods and provide a market outlet for small and mid-size producers. Therefore, financial feasibility is a necessity but profit is not the primary goal. 3

Previous Research

The significant growth in the demand for local foods in recent years has translated into a growing body of research devoted to the topic. A wide variety of case studies of local and regional food systems highlight best practices for building small and mid-scale supply chain infrastructure, but there are few feasibility studies of financial viability. Instead of the analyses usually included in feasibility studies, the case study literature has focused on the structure and key indicators of success among small and mid-scale distributors, typically referred to as values-based supply chains.

Feasibility Study

Haddad, Nyquist, Record, and Slama (2011) conducted a feasibility study for a fruit and vegetable packing house in Illinois. "The primary determinant of feasibility is the commitment of sufficient acreage to provide the necessary raw material for a packing house to operate profitably as an independent commercial business" (p.7). Achieving scale economies and operating at capacity given capital investments appears to be an important indicator of success. This is an important consideration for the northern Colorado project presented in this paper. The study by Haddad et al. suggests that an 18,000 square foot facility would require about 1,200 acres to break even and have the capacity to sell 3.5 million cases per year at average price of $10 per case.

Values-Based Supply Chains

Entrepreneurs, producers, and others involved in small and mid-scale supply chains have adopted a model from the business community—values-based supply chains. These value chains fall on a continuum of size and profit margins that lies somewhere between the two primary agricultural models (niche, direct markets and high volume, commodity markets) and provide an 4 avenue for both small and mid-size farmers to access wholesale markets. Value chains focus more on distributional efficiency (fair returns to all stakeholders), rather than the scale efficiency that has dominated food distribution for the past 20 to 30 years. A few key aspects of value chains which differ from the typical supply chain are that: 1) all actors are seen as partners with each receiving a price above the cost of production cost; 2) the focus is typically on long-term relationships; 3) horizontal linkages are created to provide adequate volume; and 4) partnerships are created to utilize existing infrastructure and knowledge (Stevenson & Pirog 2008).

The infrastructure of value chains varies widely across organizations, from significant infrastructure and high fixed costs (similar to a traditional food distributor), to an organization owning no infrastructure and simply acting as a marketing agent. There are many examples throughout the value chain literature describing distributors that fall along this infrastructure spectrum. Three of

these value chains are discussed here in order to inform what we learned about the potential business structures explored in the feasibility study.
La Montanita is a New Mexico retail store cooperative with a retail driven local food distributor under the co-op umbrella. The distribution arm operates much like a traditional distributor, owning a warehouse with both dry storage and cold storage, and multiple trucks. They rely on revenue from distribution, co-op membership dues, and grants to cover the costs of running the business. In 2008, the distribution arm of co-op did not break-even, even in the face of a fairly high sales volume of $2.2 million (Gunter & Thilmany-McFadden 2011). However, the broader organization was willing to support the early years of that center because of its role in developing a supply chain of values-based products for their retail stores.

High Plains Food Co-op is a Colorado-based local food distributor located somewhere in the middle of the infrastructure spectrum. They focus on minimizing costs by utilizing existing 5 infrastructure but, when necessary, they purchase and rent equipment. In 2009, High Plains had sales of $30,000 and its biggest challenge was in the acquisition of capital in order to facilitate growth (Gunter & Thilmany-McFadden, 2011). Red Tomato, a non-profit value chain in the Northeast that focuses on coordinating the supply chain and promotion and uses partnerships to provide its infrastructure needs. The business is financially feasible, both fixed and variable costs are covered by trading income, consulting fees, gifts and grants (Stevenson 2009).

Feasibility Study

In Northern Colorado, local food distribution from small and mid-size farms to wholesale buyers has two forms: 1) producers marketing and delivering their own products to buyers, and 2) producers selling their products through a new local foods aggregator and distributor. This business began operations in May, 2011 and is the first of its kind in the region. It sells all types of food products and is currently focused on servicing restaurant buyers, but their operations are growing quickly and they are looking to expand to new buyer accounts.

In the region, restaurants and K-12 schools are the main wholesale buyers that have shown a strong commitment to purchase local foods from small local growers. Currently, farmers are distributing their own produce to schools but, due to the steady growth in that market, many groups are interested in the possibility of a local food distributor in the region that will focus on providing locally sourced produce to the schools and to other wholesale buyers. An existing farm in the region was identified as a potential location for a local food distributor. This farm is centrally located, has existing infrastructure including a structure for aggregation and distribution and a walk-in cooler, and the farm operators already have experience selling to wholesale customers including K-12 schools. 6

The remainder of this paper will explore the necessary scale for several potential infrastructure investments that the farm-based local food distributor is considering. Based on previous research, three scenarios will be explored—each with a different level of upfront capital costs—to determine the breakeven sales requirements for each scenario. Scenario one is a distributor system with a high level of infrastructure which includes owning a refrigerated truck, employing a full time manager and purchasing a walk-in cooler. Scenario two is a distributor with some infrastructure (vehicles and equipment), but more focused on minimizing capital investments to re-

duce costs. In the final scenario, the distributor acts solely as a marketing agent that uses the infrastructure belonging to the existing local foods distributor in the region.

Based on the size of the infrastructure and the current level of produce marketed by farmers to wholesale buyers in the region, the highest first year sales volume reasonably assumed is $70,000. The distributor would be operational 6 months per year, based on the climatic limits of Colorado's growing season. Products will be delivered once a week for the first year, with an increase to two days and then three distribution days in the subsequent years, to keep up with the increase in sales. In terms of liability coverage, a $2 million liability insurance policy, necessary vehicle and employee insurance costs are included for all scenarios, except scenario three which assumes the insurance is held by a partner.

Based on industry averages, a 15% markup will be assumed for all K-12 school sales, a 20% markup will be assumed for all other wholesale sales, and an 8% brokerage fee is assumed for the final scenario (where marketing costs are shared with a partner). Because the main focus of the distributor is K-12 schools, it is assumed that 90% of sales in year one will be to K-12 schools, but this reliance with decline to 85% in year two, and 80% in year three. All remaining sales are assumed to be to other wholesale accounts such as restaurants and retailers. A very 7 ambitious sales growth of 80% each year is assumed, but such growth is consistent with past sales growth (of the local food distributor located in the region) and the potential demand evaluated in primary data analysis (Gunter 2011).

Scenario One Results

In scenario one, the distributor will purchase a refrigerated 14-foot truck, a used walk-in cooler, and all necessary office equipment and supplies. All capital purchases are financed over time so that marketing cash flows can cover repayment on loans. A marketing manager and one employee will work full time for 6 months out of the year and a bookkeeper will work as a 0.10 FTE equivalent (given the relatively low workload)[1]. Table 1 shows the results of this scenario. Based on year one sales of $70,000, net income goes from (-$68,000) in year one to (-$49,000) by year three. By far the largest expense in this scenario is personnel, with an annual expense of $52,400. The second highest expense is $8,000 for insurance.

Table 1. Scenario One

	Year 1	**Year 2**	**Year 3**
Total Revenue	70,000	126,000	226,800
Cost of goods sold	59,150	106,470	191,646
Gross Margin	10,850	19,530	35,154
Operating expenses	73,465	72,790	74,298
Operating Income	(62,615)	(53,260)	(39,144)
Non-operating expenses	3,641	3,193	2,709
Net Income	(68,386)	(60,287)	(48,754)

[1] Increased personnel are not assumed for future years based on the assumption that volunteer labor will be utilized, as is a common practice in food hubs (Barham, 2011).

Scenario Two Results

In scenario two, the goal is to own as little infrastructure as possible. The first version of this scenario included renting a refrigerated truck, utilizing existing walk-in cooler space and employing one full-time employee for 6 months. Renting a truck is less expensive in the first year when one delivery day per week is assumed, but in year two when there are two delivery days it becomes more expensive to rent than own. For this reason, a truck is purchased in scenario two rather than rented; but all other assumptions remain the same.

Table 2 shows results for this scenario. Year one sales of $70,000 result in a net income of (-$25,000) in year one, negative (-$19,000) in year two, and negative (-$7,800) in year three. 8 Personnel and insurance remain the two largest two expenses at $16,000 and $8,000, respectively.

Scenario Three Results

In scenario three, the only expenses for the distributor is one full time employee for six months, a cell phone, and worker's compensation insurance. The distributor will be acting as a broker with an assumed brokerage fee of 8%. Table 3 describes results from this scenario. Assuming year one sales of $70,000, net income in year one is (-$14,400), dropping to (-$10,700) in year two and (-$4,200) in year three.

It should also be noted that the three scenarios imply different risk, since the investments in scenario three are very "reversible." In short, if sales increases are not realized, personnel can be scaled back and no other investments have been made. However, in scenarios one and two, there are some investments that may need to be sold at a loss (truck) or connected to an operation (cooler) to recoup original investment costs.

Conclusion

Historically, food distribution is a business characterized by small margins, which suggests efficiency, but may have unintended implications. Traditional distributors rely on a combination of large volume and efficient use of infrastructure to remain profitable, so their models may not provide market access for small and mid-size food producers. Moreover, if investments in high quality, fresh produce are made by producers, it is hard to capture the premium buyers would pay through wholesale distributors, who are more concerned about volume than the needs of a particular niche of buyers (like schools and institutions who want to use local, fresh produce, meats and dairy). How can smaller scale distributors compete, when faced with same small margins? Although there is no one answer to this question, results from 9 this feasibility study provide insight into three potential infrastructure investment/sales volume combinations that can be analyzed for financial feasibility.

Breakeven sales requirements are dependent on the assumed growth rate and capital cost requirements. In all scenarios, with an assumed growth rate of 80% and a scaling back of capital cost requirements in each scenario, the distributor will not breakeven in its first three years of business. As the infrastructure needs decrease in each scenario, net income becomes less

negative and closer to breaking even; but the question then becomes (for scenario two) whether a facility with limited infrastructure can reasonably facilitate the increased sales in years two and three, and this seems unlikely. In scenario three, on the other hand, we do not rely on owning infrastructure and our constraints are tied more to investments that the partner distributor may be willing to make to expand and serve the producers.

Utilizing existing infrastructure helps to lower fixed costs, but it also places a limitation on the volume that can reasonably be assumed to flow through a distributor. Even with the cost savings, the facility is not likely to breakeven in its first three years of operations because it cannot reach the necessary scale. But when some essential aspects of a value chain are integrated into the model, such as a partnership to utilize existing infrastructure, we begin to see a more feasible scenario.

The inability for the distributor to breakeven in any scenario is not uncommon. In a survey of local food distributors conducted by Jim Barham (2011) with the U.S. Department of Agriculture, 60% of the food hubs surveyed received government funding to begin operations and 30% continue to receive government funding after operations have begun. It is very common for burgeoning regional food distributors to rely on grant or other donated funds/time to become established in the early years before sufficient sales accounts can be established. 10

The goal of the local food distributor in this study is to increase wholesale buyers' access to locally produced foods (in particular the K-12 schools), and to provide a market outlet for small and mid-size producers who are otherwise overlooked by traditional wholesalers (who rely on large volumes, rather than specialized product offerings) for their core business model. How this goal is accomplished is not the main concern, except that jobs creation is a goal of any current community conversation. Based on the feasibility study results, the best way to accomplish our goal is to either partner with the local food distributor in the region and act as a market coordinator (at least in the short run as sales volumes are established); or provide support for the current local food distributor in the region without creating a separate business. Perhaps support for that enterprise (through help in writing grants and establishing accounts), could earn vested organizations, school districts and producers a seat within a newly formed "Advisory Board" that guides some of the buying and pricing policies of the existing distributor. These initial numbers and discussion points are just a starting point, and meant to inform subsequent discussions of how to move forward on Farm to School and broader, regional food distribution efforts in Northern Colorado. 11

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Oilseed Trade Flows: A Gravity Model Approach to Transportation Impacts

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Abstract

Oilseeds and oilseed products are vital commodities in international trade, and production has been rapidly expanded in recent years under the yield growth and demand characteristics linked to more income-elastic products. Of the global production for major oilseeds, which reached 395.2 million metric tons in 2009, three major producers – the United States, Brazil and China – account for almost 50 percent. This paper develops a broad trade framework to estimate the impacts of transportation costs on international oilseeds trade using gravity models. We describe export and import markets of oilseeds and derived vegetable oils. A Baier and Berstrand gravity model method (2009), using a Taylor-series expansion, reveals a theoretical relationship between incomes, trade flows and trading costs through a reduced-form gravity specification. Distance between two countries and border trade barriers have significant and substantive impacts on the trade value of oilseeds and oilseeds oils.

Keywords: oilseeds trade, gravity models, transportation costs

Introduction

The international oilseeds trade sector exhibits relatively complex flows, as oilseeds can be processed to use as edible food products or crushed to produce vegetable oils and feed meals, providing multiple final uses in the food, feed and associated industries. Five major oilseeds are produced world-wide: soybeans, cottonseeds, rapeseeds/canola, peanuts and sunflower seeds. Oilseeds production has rapidly expanded in recent years under the yield growth and demand characteristics linked to the more income-elastic products, reaching 395.2 million metric tons in 2009, with three major producers: United States, Brazil and China. This study constructs a simplified but comprehensive trade framework of oilseeds and oilseeds oils. The impacts of transportation costs and border barriers on internationally traded oilseeds and derived oils are then estimated using gravity models.

World Oilseeds Production and Consumption Patterns

Production of the five major oilseeds crops rose from 159.4 million hectares (m ha) in 1996 to peak at 198.7 m ha in 2006 before declining to 192.8 m ha in 2007. The United States (USA) has long been the leader in oilseeds production (USDA/FAS). China, second before 2002, was replaced by Brazil in order of production, and is currently followed by Argentina, India, the EU-27 and Canada. The USA, Brazil and China accounted for 64% of this world production in 2008. Oilseeds consumption includes two parts: oilseed oils and oilseed meals. China is the world's largest consumer of major oilseed oils, with its total oil consumption reaching 24.55 million tons and accounting for about 19% of total world consumption in 2008. The EU-27 trailed only China in consumption of major oilseed oils, estimated to be 23.23 million tons in 2009 (USDA, 04/2009). After EU-27, the major countries of oilseed oil consumption are India, the USA, Indonesia, Malaysia, Brazil, Japan, Mexico and Argentina. The EU-27 total protein meal consumption reached 52.13 million tons and accounted for about 23% of world total consumption in 2008. China trailed only the EU-27 in consumption of major protein meals at 49.53 million tons in 2008. After China, the major countries for consumption of protein meals are the USA, Brazil, India, Japan and Mexico. S Soybean meal consumption is far the largest of the protein meals. It is generally the highest in protein quality and highest in overall nutrient content of the commonly used plant proteins. Soybean meal has become a staple in poultry diets, and in the USA, the poultry industry is the biggest user of soybean meal, consuming about 54 percent of all USA soybean meal.

World Oilseed Exports/Imports

With the increased production and consumption noted, oilseeds and oilseeds products have become one of the largest sectors in international trade. The amount of soybeans exported is the largest of the five major oilseed exports, increasing from 45.55 million tons in 1999 to 79.52 million tons in 2009. Exports of rapeseed, cottonseed, peanut and sunflower seed have been relatively stable between 1999 and 2008. The export of rapeseed was the second largest export in the world market, with lows of 4.11 million tons in 2002 and with the high export at 11.91 million tons in 2008 ("Oilseeds: World Markets and Trade", FAS, USDA).

The USA has been the premier exporter of oilseeds over the past several years, followed by Brazil, Canada and Argentina. Despite substantial production growth in the past 25 years and recent gains in export volume, the USA share of global exports has steadily decreased. The USA dominated world trade in unprocessed oilseeds in the mid to late 1970s, with a global market share of more than 70%. Recently, however, it has fallen below 50% (USDA, 2010). The main export markets for the USA are China, Mexico, Canada and Japan.

Gravity Models, Data and Specifications

Anderson (1979) first proposed and derived a gravity model by taking into account the effect of price. Helpman (1987) applied the gravity model framework and gave it an alternative characterization on the role of size of different countries, and he tested the model on several OECD countries. Bergstrand (1985) generalized the microeconomic foundations of the gravity model, and later, he extended them to introduce relative factor endowment differences and non-homothetic tastes (Bergstrand, 1989). Baier and Bergstrand (2001) estimated the effects of income convergence, income growth, transportation cost reductions and tariff declines on bilateral trade flows in OECD countries.
McCallum (1995) estimated the gravity equation:

$$(1)\quad \ln x_{ij} = a_1 + a_2 \ln y_i + a_3 \ln y_j + a_4 \ln d_{ij} + a_5 \delta_{ij} + \varepsilon_{ij}$$

where are exports from country i to country j; and are gross domestic production in country i and j; is the distance between country i and j; and is a dummy variable equal to one for inter-provincial trade and zero for state-province trade. The significant implication of this theoretical gravity model is that trade between countries is determined by relative trade barriers. Three general-equilibrium comparative implications found include: trade barriers reduce trade volume between large countries more than between small countries; trade barriers increase trade volume within small countries more than within large countries; and, trade barriers increase the ratio of trade within country 1 relative to size-adjusted trade volume between countries 1 and 2 by more the smaller is country 1 and the larger is country 2 (McCallum, 1995).

A second approach uses estimated border effects to measure price effects. Anderson and van Wincoop (2003) found that estimated gravity models do not have a sound theoretical foundation, suffering from omitted variables bias and comparative statics analysis. In order to resolve such problems, they developed a method that efficiently and consistently estimated a theoretical gravity equation, and they used an estimated general equilibrium gravity model to conduct comparative statics and to resolve the border puzzle. The drawback of using the method of Anderson and van Wincoop (A-vW) is the custom programming requirement to obtain standard errors. Their strategy used fixed effects to take account of the unobserved price indexes.

Baier and Bergstrand (2009) suggest a method for "approximating" the Multiple Resistance (MR) terms based on theoretically approximating international trade-cost effects. Using a Taylor-series expansion, they reveal a relationship between income, trade flows and trade cost by a reduced-form gravity equation, which is based on the model of A-vW (2009). While the A-vW model solves the demand for trade from country i to country j by maximizing the utility function subject to budget constraint, Baier and Berstrand (B-B) apply a first-order, log-linear Taylor-

series expansion to equations of and to obtain a reduced-form gravity equation. They then use OLS to estimate the reduced-form equation. To confirm their theory, coefficient estimates for lnDIS and MRDIS are restricted to have identical but oppositely-signed coefficient values (Baier and Bergstrand, 2009).

Trade value data on oilseeds for 2009 were obtained from United Nations Commodity Trade Statistics Database (UN comtrade) http://comtrade.un.org/db/. Standard International Trade Classification (SITC) continues to be used by many countries and organizations, and for this study, we used SITC Revision 3 in the category oilseeds.

To compare the different specifications, we focus on trade patterns for a set of 22 countries for 2009. There are potentially 22*21=462 individual trade flows between the 22 countries of origin (exporters) and the 22 countries of destination (importers). We use oilseed trade value expressed in USA dollars as an indicator of the bilateral trade volume, such that each pair of countries yields two observations, each country being both an exporter and an importer. We use reported exports rather than reported imports, as the former provides a better coverage (Burger et al., 2009). The primary trade countries are USA, Canada, China, Argentina, Brazil, the EU-27, India, Japan, Mexico Australia, Colombia, Egypt, Indonesia, Malaysia, New Zealand, Pakistan, Russian Federation, Singapore, South Africa, Spain, Thailand and Turkey.

Despite the rapid growth in world trade of oilseeds, barriers of physical distance, institutional frameworks, culture and economic policy still generate considerable costs to international trade (Anderson and van Wincoop, 2004). Gross Domestic Product (GDP) data were obtained from the IMF 2010 List of Countries. Since transportation costs include shipping price, packing prices for international trade are almost impossible to obtain consistently. We use the distance between two countries to estimate the transportation cost. Data on distance directly to destination (minimum distance between two ports) were obtained from the website http://www.freemaptools.com/how-far-is-it-between.htm.

We specified five gravity model systems to estimate coefficients and compare the results, three of which we discuss here. First, we used a McCallum Gravity Equation proposed in 1995. According to our trade patterns, we revised this model and removed the dummy variable term that equals to one for interprovincial trade and zero for state-province trade, such that:

$$(2)\quad \ln X_{ij} = a_1 + a_2 \ln GDP_i + a_3 \ln GDP_j + a_4 DIS_{ij} + \varepsilon_{ij}$$

The following gravity model specifications, proposed by Baier and Bergstrand (B-B models) in 2009, are used for comparison:

$$(3)\quad \ln x_{ij} = \beta_0^{'} - \rho(\sigma-1)\ln DIS_{ij} - \alpha(\sigma-1)BORDER_{ij} + \rho(\sigma-1)MRDIS_{ij} + \alpha(\sigma-1)MRBORDER_{ij} + \varepsilon_{ij}$$

where,

$$MRDIS_{ij} = \left[\left(\sum_{k=1}^{N} \theta_k \ln DIS_{ik}\right) + \left(\sum_{m=1}^{N} \theta_m \ln DIS_{mj}\right) - \left(\sum_{k=1}^{N}\sum_{m=1}^{N} \theta_k \theta_m \ln DIS_{km}\right) \right]$$

$$MRBORDER_{ij} = \left[(\sum_{k=1}^{N} \theta_k BORDER_{ik}) + (\sum_{m=1}^{N} \theta_m BORDER_{mj}) - (\sum_{k=1}^{N} \sum_{m=1}^{N} \theta_k \theta_m BORDER_{km}) \right]$$

$$x_{ij} = X_{ij} / GDP_i GDP_j \quad \text{or} \quad \ln x_{ij} = \ln X_{ij} - \ln GDP_i - \ln GDP_j$$

In this gravity model specification, coefficient estimates for and MRDIS, BORDER and MRBORDER are first restricted to have identical but oppositely signed coefficient values. For comparing among alternative gravity models, we estimated this equation with and without MRDIS and MRBORDER terms; then we estimated this equation with and without restrictions.

Results and Conclusions

In this section, we discuss a McCallum model without a dummy variable term. Estimated coefficients of the McCallum model are presented in Table 1. The coefficient estimate of Geographical Distance (ln) in the McCallum model is -2.501. All variables for the McCallum Model specification have the expected signs and the estimated coefficients are significant. The results of coefficient estimates of the McCallum model are also very close to those of a naive model in which we replaced zero-valued oilseed trades by one (a small, non-negative amount).

Table 1. Estimated McCallum Gravity Model for Oilseeds Trade (2009).

Variable	Parameter Estimate	Standard Error	t-Value	Pr> |t|
Intercept	-11.544	5.657	-2.040	0.0419*
Geographical Distance (ln)	-2.501	0.450	-5.560	<.0001**
GDP for Export Country (ln)	1.762	0.211	8.370	.0001**
GDP for Import Country (ln)	1.315	0.211	6.250	<.0001**

*p<0.05, **p<0.01; N=462

Next, we show results for the Baier and Bergstrand model with and without MR terms or restrictions in Table 2. The coefficient estimate of Geographical Distance (ln) for column of the first B-B gravity model without MR terms, ignoring multilateral resistance terms, is significantly different from zero at the 1% level. However, the coefficient estimate of the Border dummy variable is not significant. Column (2) of Table 2 represents the results of B-B gravity model with MR terms and without restrictions that lnDIS and MRDIS, BORDER and MRBORDER are constrained to have identical but oppositely signed coefficient values. The coefficient estimate of Geographical Distance (ln) is significant at the 1% level, but the coefficient of the border dummy variable has no statistical significance. The coefficient estimates of MRDIS and MRBORDER are significantly different from zero at the 1% level, indicating their contribution to explain trade in terms of transportation costs and/or relationships with neighbors. Column (3) represents the estimated B-B gravity model with restrictions. The coefficient estimate of the border dummy is statistically significant at the 1% level in this specification.

Table 2. Estimated Baier and Bergstrand Gravity Models for Oilseeds Trade (2009)

	(1)	(2)	(3)
Parameter	**B-Bw/o MR terms**	**B-B w/o restrictions**	**B-B with MR terms**
Geographical Distance (ln)	-2.521 (<.0001)**	-2.638 (<.0001)**	-0.009 (0.968)
Border dummy	-0.081 (0.954)	-0.381 (0.791)	4.180 (0.0003)**
MRDIS		-0.786 (0.002)**	0.009 (0.968)
MRBORDER		-6.212 (0.0007)**	-4.180 (0.0003)**

*p<0.05, **p<0.01

The application of various specifications of previously used gravity models exhibit considerable differences in coefficient estimates. Without MRDIS and MRBORDER terms, our B-B model finds only one term of geographical distance has the expected sign and is significant. After we added both MR terms, but no restriction that and MRDIS, BORDER and MRBORDER be limited to have identical but oppositely-signed coefficient values and examined the B-B model with MR terms and restrictions, coefficient estimates of both the geographical distance and border sharing have the expected signs. An increase in geographical distance by 1% leads to a decrease in the volume of trade in oilseeds by 0.9%, which is much smaller than in other gravity model specifications. Contingent countries have greater trade volumes of oilseeds than non-contingent countries.

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Social Media Opportunities for Value-Added Businesses

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Abstract

An Internet survey was administered (14-17 May 2010) to 1210 consumers who had active Facebook, Twitter, or blog accounts to investigate their use of social networks and their attitudes towards direct marketers who utilize these tools. Overall, 94% of participants have an active Facebook account with 33.1% believing Facebook is a "good fit" for on-farm markets and farmers' markets pertaining to the food they sell. Relating to other advertising and promotions participants believe are a "good fit," responses ranged from 61.7% for print advertisements (newspaper, store circulars, mail) to 15.3% for MySpace. Differences were explored between groups based on fresh fruit and vegetable and value-added processed product consumption. Participants who responded that they consumed 3 or more servings of fresh fruits and vegetables during an average day were more likely to believe that print advertising (66.0%), email (41.8%), Facebook (36.9%), and blogs (22.4%) were a "good fit" for these direct marketers compared to participants who responded that they consumed 1 to 2 servings. Based on number of servings of value-added processed products participants reported consuming, those who consumed 3 or more servings in an average day were more likely to believe Facebook (42.9%) was a good fit compared to those who consumed 1 to 2 servings (22.4%). Results can assist direct marketers and other agricultural businesses to identify social networking tools that best appeal to their target markets, components consumers feel are mandatory for a direct marketers, and what advertising and promotions these retailers should consider to disseminate farm market and on-farm market information.

Keywords: Direct market, Facebook, produce, survey, Twitter

Introduction

A question most businesses frequently consider is how to best advertise and promote to their customers. Traditional sources such as newspaper, television, and radio are still recognized as valuable outlets but with 79% of U.S. adults having Internet access and 65% of online adults using social networks (Sterling 2011) it is only prudent to consider non-traditional outlets as a way to product products and build relationships with clientele.

Conducting an Internet search to learn about demographics of social network users (Finn 2011), how they currently use and would prefer to use the tools, and suggestions as to how businesses could best use the tools (Meister 2001) reveals an abundant number of resources. Research has been conducted to learn how consumers use business social networking sites; however, data pertaining to how they use sites specific to fruit and vegetable direct marketers is not readily available.

With Facebook recognized as the a popular social network with "nearly one-sixth of the world's population" using it (Estes 2011), it would be prudent to not only learn how direct marketers could use Facebook to connect with clientele but how to encourage them to respond to posts, event invitations, and other communications.

Questions that deserve investigation include what social networks consumers use when they want to learn about food products and brands and whether or not tools used differ from social networks they use when learning about other interests. By identifying the outlets most widely used and developing best practices as to how to use the networks retailers may increase customer counts, interaction, and hopefully revenue.

Materials and Methods

Data were collected through a 15 min Internet survey (14-17 May 2010) administered to 1210 consumers residing in five metropolitan areas in the mid-Atlantic U.S. region (Richmond, Baltimore, Philadelphia, Washington, D.C., and New York City). Participants were randomly selected from a panel of participants managed by Survey Sampling International, LLC (Shelton, CT) a provider of sampling solutions for survey research. Panelists received an electronic consent statement along with a link to the survey developed by researchers and approved by the Office of Research Protections at The Pennsylvania State University (University Park, PA). Panelists were screened for having an active Facebook, Twitter, or blog account, being at least 18 years old, if they resided in one of the targeted metropolitan areas, and also if they were the primary food shopper for their household.

Survey questions were pre-tested and administered to a sample of randomly selected 100 Survey Sampling International, LLC panelists. Question topics focused on consumers' use of non-traditional advertising and promotional strategies with emphasis on how tools are used pertaining to fresh fruit and vegetables and value-added produce products and associated retailers who sell these products.

Statistical Analysis

Data retrieved from the surveys were analyzed with SPSS (versions 18 and 19; SPSS, Chicago, IL). To assess differences between responses segmented by demographic groups Pearson's Chi Square and Phi and Cramer's V tests were used for categorical and/or multiple-choice questions, and Kruskal-Wallis and Mann-Whitney tests for Likert-Scale questions.

Results

Participant Demographics

Most common responses to demographic questions were female (71.4%), a member of a two-adult household (47.1%), living in a household with no children (62.7%), were age 49 to 64 (35.6%) and 37 to 48 (25.3%) years, had either obtained some level of high school to obtaining some level of college/technical school education but had not graduated (57.2%), with a household income of $49,999 or lower (64.7%).

With the number of methods retailers could use to reach customers it is necessary to determine which one(s) clientele are most likely to access. Of the 1210 participants, all respondents actively used at least one of the following social networking accounts: Facebook (94.0%), Twitter (22.0%) and/or blog (12.3%). When asked to indicate whether or not these tools were a "good fit" for five different direct marketing outlets approximately one-third of participants responded that Facebook was a "good fit" for on-farm markets and farmers' markets, Pick-your-own operations, local wineries, and local grocers (range of 22.2 to 35.4%), with 28.6% responding that Facebook is appropriate for road side fruit and/or vegetable stands (Table 1). Fewer participants, a range of 16.4 to 21.3%, responded that Twitter and blogs were a "good fit" for these businesses.

Table 1. Proportion (%) of survey participants who responded that certain social networks (e.g. Facebook, Twitter) were a "good fit" for select direct marketing outlets (e.g. pick-your-own, local grocer) pertaining to food they sell[z]

Variable	On-farm markets and farmers' markets	Pick-your-own operation	Road side fruit and/or veg. stand	Local winery	Local grocer
Facebook page (%)	36.5	34.0	28.6	33.3	34.7
Twitter (%)	18.1	20.3	15.3	18.5	19.0
Blogs (%)	18.2	21.3	16.4	18.1	17.1

[z]Internet survey conducted 14-17 May 2010 involving 1201 consumers who have active Facebook, Twitter, or blog accounts and reside in five metropolitan areas in the mid-Atlantic U.S. region (Richmond, Baltimore, Philadelphia, Washington, D.C., and New York City).

To understand attitudes and behaviors regarding electronic resources used to promote food items, participants were asked to indicate the types of on-line and social networking sites they found useful pertaining to fresh fruits and vegetables. Overall, "website for promoting food products" received the most responses with 31.0% of participants selecting the tool. Fewer participants selected other electronic resources that ranged from MySpace pages (4.0%) to "website for selling food products" (23.4%).

Data were further analyzed to detect differences in using these tools based on the number of fresh fruit and vegetables and value-added produce products participants consumed in an average day. Even though a majority of participants indicated that they consumed 1 to 2 servings of fresh fruits and vegetables or value-added produce products during an average day, more participants who consumed 3 or more of the fresh and processed products indicated that they found the on-line and social networking sites presented as being useful. Of the differences, 40.2% of those who consumed 3 or more servings of value-added products found Facebook pages useful compared to those who consumed 1 to 2 servings (17.9%; Table 2).

Table 2. On-line and social networking sites survey participants have found useful pertaining to fresh fruits and vegetables segmented by behavior characteristic (number of servings of fresh fruit and vegetables and value-added produce products consumed during an average day)[z]

	Average response	Servings of fruits and vegetables consumed during an average day[y]		Servings of value-added produce products consumed during an average day	
Variable		1 to 2	3 or more	1 to 2	3 more
Responses (no.)	1201	701	447	749	112
Proportion within each segment (%)		61.1	38.9	87.0	13.0
Which of the following types of on-line and social networking sites have you found useful pertaining to fresh fruits and vegetables?					
Facebook page (%)	17.5	14.1b	22.8a	17.9b	40.2a
Twitter (%)	5.5	4.4b	7.8a	5.3b	15.2a
MySpace page (%)	4.0	1.7b	8.1a	2.5b	20.5a
Blogs (%)	7.9	6.0b	11.2a	8.0b	22.3a
Email sent by a business and/or company (%)	19.1	14.6b	25.1a	20.3b	29.5a
Email newsletter (%)	22.0	19.0b	27.7a	23.1b	33.0a
Website for promoting food products (%)	31.0	29.1b	35.1a	33.2b	43.8a
Website for selling food products (%)	23.4	21.5b	27.3a	25.6	26.8

[z]Internet survey conducted 14-17 May 2010 involving 1201 consumers who have active Facebook, Twitter, or blog accounts and reside in five metropolitan areas in the mid-Atlantic U.S. region (Richmond, Baltimore, Philadelphia, Washington, D.C., and New York City).

[y]Percents with different letters within rows and behavioral segments (number of servings of fresh fruit and vegetables and value-added produce products consumed during an average day) are significantly different $P \leq 0.05$ based on Pearson chi-square statistic. Analysis conducted using SPSS (version18 and 19; SPSS, Chicago).

Comparing traditional and non-traditional advertising and promotions allows retailers to determine the best mix for their business. Responses were collected for a number of retailer outlet types (e.g. local winery, local grocery, supermarkets and grocery store, warehouse club) as to whether or not a particular avenue was a "good fit." Data specific to on-farm markets and farmers' markets is presented in Table 3. Based on responses, "print advertisements (newspaper, store circulars, mail)" was selected the most by participants (61.7%) as being a "good fit," with websites (company's website, third-party websites), television and/or radio, email, and Facebook selected by 39.8% to 33.1% of participants. Twitter, MySpace, and Blogs were selected by even fewer participants, range of 15.3 to 18.2%.

Table 3. Responses to survey questions pertaining to traditional and non-traditional advertising and promotional strategies that are a "good fit" for direct market outlets segmented by behavior characteristic (number of servings of fresh fruit and vegetables and value-added produce products consumed during an average day)[z]

	Average response	**Servings of fruits and vegetables consumed during an average day[y]**		**Servings of value-added produce products consumed during an average day**	
Variable		1 to 2	3 or more	1 to 2	3 more
Responses (no.)	1201	701	447	749	112
Proportion within each segment (%)		61.1	38.9	87.0	13.0
Believes that the following types of advertising and promotions would be a "good fit" for on-farm markets and farmers' markets pertaining to food they sell					
Print advertisements (newspaper, store circulars, mail) (%)	61.7	59.5b	66.0a	63.0	59.8
Television and/or radio (%)	37.4	37.5	37.6	39.4	39.3
Websites (company's website, third-party websites) (%)	39.8	38.1	42.1	41.4	37.5
Email (%)	36.5	34.1b	41.8a	37.9	39.3
Facebook (%)	33.1	30.7b	36.9a	33.4b	42.9a
Twitter (%)	18.1	16.4	20.6	18.8	23.2
MySpace (%)	15.3	14.3	16.6	15.9	21.4
Blogs (%)	18.2	15.4b	22.4a	19.4	23.2

[z]Internet survey conducted 14-17 May 2010 involving 1201 consumers who have active Facebook, Twitter, or blog accounts and reside in five metropolitan areas in the mid-Atlantic U.S. region (Richmond, Baltimore, Philadelphia, Washington, D.C., and New York City).

[y]Percentages with different letters within rows and behavioral segments (number of servings of fresh fruit and vegetables and value-added produce products consumed during an average day) are significantly different $P \leq 0.05$ based on Pearson chi-square statistic. Analysis conducted using SPSS (version18 and 19; SPSS, Chicago).

Significant differences were evident between those who consumed 1 to 2 servings of fresh fruits and vegetables and value-added produce products and those who consumed 3 or more. Again, those who consumed 3 or more servings of fresh fruits and vegetables and/or value-added products were more likely to select certain advertising and promotions than those who consumed less. Specifically, those who consumed 3 or more servings of fresh fruit and vegetables were slightly more likely to select print advertisements (66.0%), email (41.8%), Facebook (36.9%), and blogs (22.4%) than their counterparts. Those who consumed 3 or more servings of value-added produce products were slightly more likely to select Facebook (42.9%) than those who consumed 1 to 2 servings (33.4%).

Conclusion

Selecting appropriate advertising and promotion tools and using them effectively is a must for small businesses. With the number of options available, retailers may feel overwhelmed as to what methods will reach their target audience. Data collected from participants indicated which social media tools they found useful regarding produce retailers. Results indicate that only about one-third believe these are a "good fit" for these direct marketers. Reasons as to how participants use social networks (e.g. "liking" a business's Facebook page, write blog entries) and components they expect a social network to include (e.g. ability to respond to an event invitation posted by a business) have also been collected and may assist in determining how to design efforts so that they provide the greatest return on investment.

Though significant differences were detected for data based on segmenting participants according to their consumption of fresh fruits and vegetables and value-added products these differences were not vastly different. Therefore strategies developed to reach audiences many not need to greatly change based on how many servings of these products consumers eat during an average day. By using the same advertising and promotional strategies to reach light and heavy users the amount of time and monetary resources retailers need to be expended can be greatly reduced. Data collected from survey participants provides the starting point from which retailers can begin their own investigation of what will work best for their individual businesses.

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U.S. Consumer Demand for Organic Fluid Milk by Fat Content

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Abstract

This study examined consumer demand for organic fluid milk in the current maturing organic market using a nationwide weekly retail scanner data set. An Almost Ideal Demand System in which both organic milk and conventional milk were further decomposed into products with different fat content was estimated. The demand for organic milk was shown to be price elastic. The results also revealed substitutions between organic milk and conventional milk products differing in fat content. The substitution pattern was asymmetric and there was greater movement toward organic milk than back toward conventional milk for the same relative change in price.

Keywords: demand, organic milk, fat content, elasticity

Introduction

The U.S. organic food industry expanded rapidly during the last several decades. The sales of organic food increased to $26.7 billion in 2010 from $1 billion in 1990, representing 4% of the total food sales. The annual growth rate of organic food sales from 2000 to 2008 ranged around 15 to 21%. In spite of the economic downturn, organic food sales maintained a relatively strong increasing rate of growth of 7.7% in 2010 compared to the total food growth of 0.6%. Organic dairy is regarded as a "gateway" to organic consumption, as one of the first organic products experienced by consumers. It constitutes the second largest segment of the organic food market, with its sales accounting for 14.6% of organic food sales in 2010. Organic dairy accounted for nearly 6% of all U.S. sales of dairy products in 2010 (Organic Trade Association 2011).

Consumer demand for organic milk is driven by various reasons including health and environment benefits and concerns over animal welfare (Liu et al. 2011). In early years of the rapid expansion of the organic milk market, supply could not keep pace with the fast increasing demand. In recent years, however, the growth of demand for organic milk slowed down because of the economic recession, while supply continued to expand. Supply of organic milk exceeded demand for the first time in 2007 (Westervelt 2007). In 2009, U.S. organic milk sales actually experienced a 3% decline from 2008 sales, losing $45 million (Bast 2010).

Such changes in the organic dairy market call for a timely analysis of consumer demand for organic fluid milk. Farmers continue to pursue better payoffs through producing organic milk, but their economic gains depend on consumer demand and the premium associated with organic milk. Understanding consumer demand for organic milk can provide insight into the future growth of the industry and can help make effective production and marketing strategies to promote sustainable growth of the industry.

Literature

Growth of the organic fluid milk market prompted researchers' interests on examining consumer valuation on organic milk. Some of the previous studies used consumer surveys and experiments to examine consumers' stated preference over organic milk and found that consumers were willing to pay a premium for the organic attribute and demand for organic milk was own-price elastic (Bernard and Bernard 2009; Brooks and Lusk 2010). However, this type of studies provided only a snapshot of consumer preferences towards organic milk.

A few studies attempted to study consumers' revealed preferences using retail data (Glaser and Thompson 2000; Dhar and Foltz 2005; Alviola and Capps 2010; Chang et al. 2011). The results on response of organic milk demand to price were rather diverse, ranging from -1.37 to -9.73 (Glaser and Thompson 2000; Dhar and Foltz 2005; Alviola and Capps 2010). Chang et al. (2011) found organic demand was inelastic. Demand for organic milk was shown to be more sensitive to price changes than its conventional counterpart (Glaser and Thompson 2000; Dhar and Foltz 2005). Organic and conventional milk were revealed to be substitutes with asymmetric pattern (Glaser and Thompson 2000; Dhar and Foltz 2005; Alviola and Capps 2010).

Past studies using retail data were limited in several ways. First, most of these studies examined the early development stage of the organic milk market by using data before 2005 except for Chang et al. (2011). As the organic milk market matured, consumer demand for organic milk has likely evolved. Studies using data in the early stage of the organic market development may not reflect the demand for organic milk in the current situation. Second, most of these studies focused on a regional rather than national market (Dhar and Foltz 2005; Chang et al. 2011). Dhar and Foltz (2005) used 12-city retail data, while Chang et al. (2011) used data from central Ohio. These results are likely not applicable to the national market. Furthermore, milk products are fundamentally differentiated by fat content, and relationships among products of different fat content should be understood to draw any practical implications. Most of the past studies did not differentiate organic milk by fat content (Dhar and Foltz 2005; Alviola and Capps 2010). Glaser and Thompson (2000) looked into the fat content issue but ran separate systems for each milk fat level. Hence, in this paper, we analyze consumer demand for organic milk differentiated by fat content using a nationwide data set from 2008 to 2010.

Research Methods

The analysis used AC Nielsen's national weekly scanner data from April 2008 to April 2010 (104 observations). Because the majority of organic milk is sold in half gallon (64 ounces) cartons, only the data for 64 ounces milk products were included in the study. Table 1 show the sample average market shares of organic milk and conventional milk by fat content. During the period under study, conventional milk accounted for most of the sales, representing 83.8% of the total fluid milk sales, while the organic milk accounted for the remaining 16.2%. Among various types of conventional milk, the reduced fat milk (2% milk fat) registered the highest share (27.9%) and the low-fat milk (1% milk fat) had the lowest share (13.9%). In contrast skim milk constituted the highest share (5.4%) among organic milk with different fat content probably due to higher health consciousness among organic milk consumers. The low-fat milk had the lowest share (2.8%) among organic milk similar to the conventional.

Table 1. Average Market Share of Milk by Fat Content (104 weekly observations)

Type	Skim	Low Fat (1%)	Reduced Fat (2%)	Whole
Organic	5.40%	2.78%	4.42%	3.61%
Conventional	21.67%	13.86%	27.94%	20.33%

Over the sample period, organic milk continued to enjoy significant price premium over conventional milk (Table 2). Among organic milk, reduced fat milk averaged the highest price of $3.95 per half gallon and skim milk had the lowest price of $3.61 per half gallon. In contrast, the average price of conventional skim milk was the highest among the prices of all half gallon conventional milk products. The price of the conventional reduced fat milk was the lowest at $2.16 per half gallon.

Table 2. Average Market Price of Milk by Fat Content ($/half gallon)

Type	Skim	Low Fat (1%)	Reduced Fat (2%)	Whole
Organic	3.61	3.86	3.95	3.95
Conventional	2.33	2.22	2.16	2.19

An Almost Ideal Demand System (AIDS; Deaton and Muellbauer 1980) was specified to examine the demand for organic fluid milk. In the demand system, both organic milk and conventional milk were further decomposed into products with different fat content to examine possible substitution patterns among milk with various fat contents. Hence, the demand system was specified as follows:

$$(1)\ W_{it} = \alpha_i + \sum_{j=1}^{n} \gamma_{ij}\, logP_{jt} + \beta_i \log\left(\frac{X_t}{P_t}\right) + \delta_i T_{it} + \varepsilon_{it}$$

where *i, j*= {organic skim, organic 1%, organic 2%, organic whole, conventional skim, conventional 1%, conventional 2%, conventional whole}. W_{it} is the share of subcategory *i* in total milk expenditure in week *t* and was computed by dividing the sales of subcategory *i* by the total milk expenditure X_t. *T* is the time trend and α_i is the intercept. P_{jt} is the weighted price (dollar per half gallon) of subcategory *j* and calculated as the sales divided by the corresponding quantity. In the estimation, index P_t is a linear approximation based on the Stone index and defined as

$$(2)\ \ logP_t = \sum_{j=1}^{n} W_{jt}\, logP_{jt}$$

Model Estimation and Results

The above demand system was first differenced to account for autocorrelation. The homogeneity and symmetry conditions were imposed. The model was estimated by iterative seemingly unrelated regression. The expenditure and price elasticities were calculated based on parameter estimates of the model at the sample mean.

Table 3 presents the estimated expenditure elasticities. All expenditure elasticities are statistically significant at the 1% level. The expenditure elasticities of organic milk with different fat content were lower than those of their conventional counterparts. The magnitudes of the organic expenditure elasticities were all statistically below one at the 1% significance level except for organic skim milk, indicating organic milk was not a luxury item but a necessity for an average consumer during the sample period. This result is consistent with Dhar and Foltz (2005) and some results in Chang et al. (2011). The finding suggests that the demand for organic milk may be driven by factors other than income such as beliefs about health benefits. Among organic milk, skim milk had the largest expenditure elasticity. A 1% increase in the expenditure on milk would lead to a 0.87% increase in the quantity demanded for organic skim milk, while a 1% increase in the expenditure on milk would cause the demand for organic whole milk to increase by 0.71%.

Table 3. Estimated Expenditure Elasticities

Type	Skim	Low Fat (1%)	Reduced Fat (2%)	Whole
Organic	0.871***	0.854***	0.726***	0.706***
Conventional	0.998***	1.069***	1.044***	1.061***

Note: ***, **, and * imply statistical significance at the 1, 5, and 10% levels, respectively.

The expenditure elasticities of conventional milk were around one and not statistically different from unity at the 5% significance level, which is consistent with previous studies (Glaser and Thompson 2000; Dhar and Foltz 2005; Chang et al. 2011). Among conventional milk products, demand for skim milk was the least responsive and demand for low fat milk was the most responsive to a rise in total milk expenditure.

The own price elasticities are presented in Table 4 and were all statistically significant at the 1% level. As expected, the uncompensated own price elasticities were all larger in magnitude than the compensated elasticities. The compensated and uncompensated elasticities for all four types of organic milk were not much different. Since organic milk is commonly perceived to be associated with groups of the population with higher income, a smaller income effect was expected. For conventional milk, however, the uncompensated elasticities were significantly greater in magnitude than the compensated elasticities. This result indicates income changes playing a relatively more important role in demand for conventional milk than for organic milk.

The demand for all four types of organic milk was own-price sensitive; suggesting lowering the price of organic milk would likely lead to a greater increase in the quantity demanded of organic milk. Among organic products, skim milk was the most sensitive to own-price changes. Given a 1% increase in price, the quantity demanded for organic skim milk would drop by 1.6%. The demand for organic whole milk was less responsive to price changes (1.04%). The magnitudes of organic price elasticities were notably lower than those estimated from data before 2000 (Glaser and Thompson 2000), suggesting that organic products have indeed become much more mainstream. The estimates are higher than the ones estimated using recent but regional data (Chang et al. 2011), where nation-wide demand is expected to be more elastic than demand in smaller markets.

Table 4. Estimated Own-Price Elasticities

Product Type		Compensated	Uncompensated
Organic	Skim	-1.598***	-1.645***
	1%	-1.320***	-1.344***
	2%	-1.149***	-1.181***
	Whole	-1.046***	-1.071***
Conventional	Skim	-0.585***	-0.801***
	1%	-1.319***	-1.467***
	2%	-1.022***	-1.314***
	Whole	-0.861***	-1.077***

Note: ***, **, and * imply statistical significance at the 1, 5, and 10% levels, respectively.

Comparing organic and conventional results by fat content, the compensated own-price elasticities of 1% and 2% milk were quite similar between organic and conventional counterparts, where both organic and conventional 1% and 2% milk were sensitive to their own-price changes. In contrast, demands for organic skim milk and whole milk were more own-price elastic than their conventional counterparts based on compensated terms; both conventional skim milk and whole milk demands were price inelastic. Among conventional milk products, 1% milk was the most price sensitive followed by 2% milk. In contrast to the organic milk group where skim milk demand was the most elastic, conventional skim milk was the most insensitive to its price changes compared to other conventional milk products. The demand for conventional skim milk would decrease by 0.59% if its price increases by 1%.

Table 5 shows the compensated cross price elasticities, which reveal the net relationship among products in the system by excluding income effects. Within the organic complex, skim and 2% milk were shown to be substitutes. A 1% increase in organic skim milk price would results in 0.49% increase in the demand for organic 2% milk. A smaller, 0.40% increase in the demand for skim milk would be caused by a 1% increase in the price of 2% milk, suggesting that skim milk leads the price in the organic complex.

With respect to the conventional milk complex, 1% milk was a substitute to 2% milk, skim milk, and whole milk. Conventional skim and 2% milk were also substitutes. The transmitting patterns among the above substitute pairs were asymmetric. For instance, demand for conventional 1% milk would increase by 0.51% in response to a 1% increase in conventional 2% milk price. However, if the price of conventional 1% milk rises by 1%, the increase in the quantity demanded for 2% milk would be only 0.25%, equaling half of 0.51%. Although conventional 1% milk was a substitute to all the other three conventional milk products, the substitution effect between 1% and 2% milk was the strongest and the substitution between 1% and skim milk was relatively weak.

Estimation results also revealed substitutions between organic milk and conventional milk products differing in fat content. In general, substitution effects caused by price changes of conventional milk on the demand for organic milk (the upper right quadrant of Table 5) were stronger than the effects of organic milk price changes on conventional milk demand (the lower left quadrant). Conventional 2% milk was shown to be a substitute to all four types of organic milk. An increase in the price of conventional 2% milk would cause the quantity demanded for organic 1% milk to increase the most and the quantity demanded for organic skim milk to increase the least. On the other hand, the same change in the price of one type of organic milk would result in a much smaller change in the quantity demanded for conventional 2% milk with the substitution elasticities being around 0.08. The conventional 1% milk was also a substitute to organic skim and 1% milk. A 1% increase in conventional 1% milk price would cause the demand for organic skim and 1% milk to rise by 0.45% and 0.46%, respectively. On the contrary, changes in prices of organic 1% and 2% milk would have less impact, i.e., 0.18% and 0.09% respectively, on the demand for conventional 1% milk. Conventional whole milk were shown to be a substitute to organic 2% and organic whole milk but to a lesser extent.

Table 5. Compensated Price Elasticities for Organic and Conventional Milk

		Organic				Conventional			
		Skim	*1%*	*2%*	*Whole*	*Skim*	*1%*	*2%*	*Whole*
ORGANIC	Skim	-1.598***	0.026**	0.392***	0.162	0.186	0.431***	0.393***	-0.122
	1%	0.050	-1.320***	0.085	0.274	-0.269	0.444***	0.766***	-0.176
	2%	0.471***	0.050	-1.149***	-0.346*	0.184	-0.102	0.455***	0.163
	Whole	0.233	0.207	-0.425*	-1.046***	0.141	-0.124	0.482***	0.238
CONVENTIONAL	Skim	0.053	-0.030	0.050	0.034	-0.585***	0.171***	0.172*	0.133
	1%	0.179***	0.095***	-0.017	-0.019	0.282***	-1.319***	0.526***	0.342***
	2%	0.085***	0.081***	0.086***	0.074***	0.143**	0.258***	-1.022***	0.338***
	Whole	-0.022	-0.018	0.050*	0.055*	0.156	0.232***	0.469***	-0.861***

Note: ***, **, and * imply statistical significance at the 1, 5, and 10% levels, respectively.

Conclusion and Discussion

With the expansion of the organic food industry in the U.S., the demand for organic milk has been changing. This study used a recent data set to examine the nationwide demand for organic fluid milk by fat content. The results suggested that, during the sample period of 2008 to 2010, organic milk was no longer a luxury good for consumers who chose to consume organic milk. The demand for organic milk was price elastic. Hence, lowering price is probably an effective way to increase sales of organic milk. However, the effects would be different for organic milk products with different fat content. Reducing price would be most effective to promote the demand for organic skim milk and most ineffective to increase demand for organic whole milk.

Previous research showed that organic milk and conventional milk at the aggregated level were substitutes (Dhar and Foltz 2005; Alviola and Capps 2010). This study disaggregated milk into different fat levels and found organic milk and conventional milk could be substitutes among products with certain levels of fat content but not all. Moreover, the substitution pattern is asymmetric in the sense that for the same relative change in price, there was greater movement toward organic milk than back toward conventional milk, suggesting consumption stickiness among organic consumers.

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Modeling Household Preferences for Cereals and Meats in Mexico

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Abstract

Using 2008 household data and a two-step censored model, this article analyzes separability among preferences of the major food groups in Mexico. The main objective of the present paper was to determine if beans and potatoes are not separable from meats and cereals, respectively. Results indicate that beans belong to the protein source demand system and potatoes are not separable from cereals. Another major finding is that corn income elasticity very close to one might indicate a sensitive situation for low income households that consider this cereal their major source of calories.

Keywords: separability, preferences, Mexico, demand, censored.

Introduction

There are nearly 112 million people in Mexico who make up 28.2 million households. Cereals and meats are the most important food groups consumed in Mexico. Corn is the major cereal consumed with per capita consumption exceeding 100 kilograms per year. The main meats consumed by Mexican households are chicken, pork, and beef, but about 15% of chicken, 31% of pork and 14% of beef consumed are imported. In 2010, 97% of imported chicken, 88% of imported pork and 83% of imported beef were from the United States (Secretary of Economy, SIAVI). It is very important for the Mexican Agricultural Industry, policy makers and Mexico's major trading partners to understand Mexican preferences across cereals and meats.

As household cross-sectional data are more available, interest to conduct econometric analysis of consumer demand with economic and demographic effects increases. However, the use of micro survey data presents a major estimation issue. This type of data is censored because it contains a large amount of zero expenditure on several commodities, situation that generates missing prices. Another important consideration while conducting demand analysis is the decision of what goods to include in each food group. When estimating demand systems, researchers often aggregate products by characteristics or nutritional attributes but it is not always clear how to group commodities with different characteristics. For example, should beans be included in the meat group? Should potatoes be included as a starch along with other cereals? The consumption of potatoes has grown in significant amounts during the recent years and its use as starch makes potatoes comparable with cereals. Also, beans are the major source of proteins for low income families. For these families, meats are substituted with beans. Is this sufficient support to include potatoes with cereals and beans with meats for food demand analysis? In 1936, Hicks and Leontief introduced the idea of separability among preferences through the *composite commodity theorem* to construct commodity groups for empirical analysis. In 1994, Moschini et al. provided empirical evidence to show differences in cross-elasticities when weak separability is rejected.

The data set used in this study is the 2008 National Survey of Income and Expenditure for Household (ENIGH) in Mexico. This cross-sectional data is a rich sample with demographic effects, but it is censored. To overcome this issue, this study uses a two-step estimation of a censored demand system proposed by Shonkwiler and Yen in 1999. The main objectives of this study are to estimate demand elasticities among cereals and meats in Mexico and to test the validity of weak separability regarding whether beans are part of the meat group and whether potatoes should be part of a demand system of cereals.

Model Specification

This study uses a non-linear approximation of the AIDS model as follows:

$$(1)\ w_{ih} = \rho_{i0} + \sum_{k=1}^{K} \rho_{ik}\, d_{kh} + \sum_{j=1}^{n} \gamma_{ih} \ln(p_{ih}) + \beta_i \ln[\frac{x_h}{a(p_h)}] + u_{ih}$$

where w_{ih} is the budget share of the i^{th} good purchased by household h, ρ_{i0}, ρ_{ik} ,γ_{ih} and β_i are the parameters to be estimated, d_{kh} are the k^{th} demographic variables, $\ln(p_{ih})$ is the log of the price of the i^{rh} good, x_h is the total expenditure, and $a(p_h)$ is a price index which is defined as:

$$(2)\ \ln a(p_h) = \alpha_0 + \sum_{j=1}^{n} \delta_{jh} \ln(p_{jh}) + 0.5 \sum_{i=1}^{n} \sum_{j=1}^{n} \gamma_{ij} \ln(p_{ih}) \ln(p_{jh})$$

In 1999, Blundell and Robin suggested a reduced form function for ln(x_h) to address the correlation issue between the error term u_{ih} and the log expenditure variable ln(x_h) as follows:

$$(3)\ \ln(x_h) = \sum_{k=1}^{K} \rho_{ik} d_{kh} + \sum_{j=1}^{n} \delta_{ih} \ln(p_{ih}) + \omega \ln(x_h) + v_h$$

where v_h are computed residuals to be added into the non linear AIDS model. Adding-up restriction, homogeneity and slutsky symmetry (properties of demand) can be imposed as:

$$(4)\ \sum_i^n \rho_{i0} = 1, \sum_i^n \rho_{ik} = 0, \sum_{i=1}^{n} \gamma_{ij} = 0, \sum_i^n \beta_i = 0, \text{and} \sum_i^n \lambda_i = 0$$

$$(5)\ \sum_{i=1}^{n} \gamma_{ij} = 0 \text{ for any } j$$

$$(6)\ \gamma_{ij} = \gamma_{ji} \text{ for all } i \text{ and } j$$

Weak separability imposes restrictions on the degree of substitutability between goods from different groups and allows the use of total expenditure of the goods in the system, instead of total income. Moschini, et al. (1994) defined non-homothetic asymmetric weak separability as:

$$(7)\sigma_{if} * e_m = \sigma_{im} * e_f \quad (i) \in I_g, (m, f) \in I_s, \text{and } g \neq s$$

where σ's are the Allen-Usawa elasticities, e is the expenditure elasticity, good *i* belongs to group I_g, good *m* and f belong to group I_s, and *g* and *s* are different groups of commodities.

Data and Procedure

The 2008 National Survey of Income and Expenditure for Mexican Households is a micro survey conducted by the National Institute of Statistics and Geography (INEGI) every two years. Households report quantity purchased and total expenditure on different byproducts during one week. The present study calculated a weighted average price of the each product to account for the relative importance of quantity of each byproduct on the price of a good. The number of households included in the cereals and meat models were 27,846 and 25,769, respectively. The group of cereals included corn, wheat, rice, other cereals, and potatoes, and the one for meats comprised beef, pork, chicken, processed meats, fish and beans. Data contains zero expenditure for corn, wheat, rice, other cereals and potatoes for 12%, 13%, 68%, 78%, and 53% of households, respectively. Also 44%, 75%, 44%, 34%, 87%, and 47% of households reported zero expenditure on beef, pork, chicken, processed meats, fish and beans, respectively. Missing prices, a consequence of censored data, were generated using Markov Chain Monte Carlo (MCMC) approach (MI procedure in SAS) with log of prices to avoid negative prices.

The demographic factors included were: size of the household, strata (1:more than 99,999 inhabitants; 2:from 15,000 to 99,999 inhabitants; 3:from 2,500 to 14,999 inhabitants; and 4:less than 2,499 inhabitants), regions (CR: Central Region; COR: Central Occidental Region; NWR:

Northwest Region; NER: Northeast Region; and SR: South Region), poverty levels (1:very low; 2:low; 3:medium; 4:high; and 5:very high), and age and gender of the head of the household.

The first step of Shonkwiler and Yen (1999) is a multivariate probit regression (PROC QLIM in SAS) to estimate household's probability of purchasing a commodity. In this regression, the cdf denoted by $\Phi(\boldsymbol{z}_i'\boldsymbol{\tau}_i)$ and the standard normal probability density function (pdf) represented by $\phi(\boldsymbol{z}_i'\boldsymbol{\tau}_i)$ are calculated to generate the following model in the second step using the Full Information Maximum Likelihood in Proc Model (SAS):

$$(8) w_{ih} = \Phi\left(\boldsymbol{z}_i'\boldsymbol{\tau}_i\right) \cdot \left[\alpha_{ih} + \sum_{j=1}^{n} \gamma_{ij} \ln(p_{ih}) + \beta_i \ln[\tfrac{x_h}{a(p_h)}] + \kappa_i \hat{v}_h \right] + \varphi_i \cdot \phi\left(\boldsymbol{z}_i'\boldsymbol{\tau}_i\right) + \zeta_{ih}$$

As Pudney (1989) suggested, each model used *n*-1 equations in order for adding up restriction to hold. The residual goods were rice for cereals and pork for meats. To calculate Marshallian, Hicksian, expenditure, income and demographic elasticities the following formulas were used:

$$(9) \quad e_{ij}^{m} = w_i^{-1}\{\gamma_{ij} - \beta_i[\alpha_j + \sum_k^n \gamma_{jk} \ln(p_k)]\} \cdot \Phi_{\mathrm{i}} - \delta_{\mathrm{ij}}$$

$$(10) \quad e_{ij}^{h} = e_{ij}^{m} + w_i e_i$$

$$(11) \quad e_i = 1 + w_i^{-1} \cdot \beta_i \cdot \Phi_{\mathrm{i}}$$

$$(12) \quad e_{M(i)} = e_i e_M$$

$$(13) \quad e_{im}^{d} = w_i^{-1}\{[\rho_{im} - \sum_k^n \gamma_{jk} \ln(p_k)] \cdot \beta_i \} \cdot \mathrm{d}_m \Phi_{\mathrm{i}}$$

where δ_{ij} is the Kronecker delta (1 if *i*=*j* and 0 otherwise), $w_i$is the average budget share per commodity, e_M is the estimated parameter of household income in the reduced equation, d_m is equal to one for binary variables or the mean of the variable otherwise. To avoid over rejection, a size corrected Likelihood Ratio statistic (Italianer, 1985 and Moschini, et al.,1994) was used:

$$(14) \; LR_c = \left[-2\left(\ln L(\tilde{\theta}) - \ln L(\hat{\theta})\right)\right]\left[MN - \tfrac{1}{2}(P_{\hat{\theta}} + P_{\tilde{\theta}}) - \tfrac{1}{2}N(N+1)\right] \xrightarrow{d} X_J^2$$

where $\ln L(\tilde{\theta})$ is the restricted log likelihood value, $\ln L(\hat{\theta})$ is the unrestricted log likelihood, *M* is the number of equations, *N* is the total number of observations, $P_{\hat{\theta}}$ and $P_{\tilde{\theta}}$ are the number of parameters of the unrestricted and restricted model respectively, and *J* are the restrictions to test.

Results and Conclusions

Multivariate probit results in Table 1 and Table 2 (see Appendix) show consumers' view of corn, rice, other cereals, and potatoes as having a lower nutritional value than wheat. But, consumers give the same nutritional value to all protein source products. Parameter estimates for the pdf (φ) in Table 3 (see Appendix) show the importance of censoring treatment in these models. Non linear AIDS model's outcome (Table 3) shows that overall both demographic and economic factors have significant effect on the quantity demanded for all the goods included in each system. Ho-

mogeneity and symmetry restrictions (Table 4, see Appendix) from the neoclassical demand theory show that these properties do not hold for the demand system of cereals which encompasses some theoretical implications for smaller data sets. The major objective was to test whether beans and potatoes belong to the demand systems of meats and cereals, respectively. Empirical evidence suggests the inclusion of these two commodities in their respective food group. This major result entails that further research in Mexico on food demand systems for cereals and meats might not ignore the effect of potatoes and beans on demand for cereals and meats, respectively.

Table 5 and 6 (see Appendix) show own and cross price elasticities for both models. Own price elasticities from the two models indicate that all commodities are price elastic implying that an increase on its own price will reduce the demand for each good. Income elasticities show that all goods are normal in the two models, but beef and fish are considered normal luxury commodities. This finding is consistent to the situation in Mexico. As households move to a higher level of income, they purchase more beef. Additionally, Mexican households do not consider fish as a part of their essential diet. Compensated price elasticities show that all commodities in the model for cereals are net substitutes, except for rice, which shows a net complementary relationship with corn. Consequently, demand for most of the cereals is positively related to an increase of other commodities price. On the other hand, uncompensated cross price elasticities for meats demonstrate that Mexicans substitute beef, pork and chicken with beans, which was the main driving force to include beans into the analysis of food demand for animal protein source products. Income effect offsets most of substitution effect among commodities in both models.

Demographic variable effects on the demand for cereals and meats show the impact of hetereogeneity across households in the demand for these food groups. These results are very important for the Mexican Industry and major trading partners of Mexico, because it shows how quantity demanded will change across regions and type of households. For instance, rural areas consume more corn, wheat, other cereals, beans and pork than urban areas. COR, NER and SR have a higher propensity to consume corn than CR, while NWR consumes less corn than CR. CR consumes more rice and chicken but less beans and fish than the rest of the country. Moreover, the lower the poverty level, the greater consumption of corn, beef, chicken and processed meats. However, low income families consume less wheat, rice, other cereals, potatoes, beans and fish than high income families. Another major finding is that corn income elasticity (very close to one) suggests that this commodity is very close to becoming a luxury good for Mexican households. Corn in Mexico is principally a food grain rather than a feed grain. Corn plays a central role among Mexican population as a critical component of the cultural heritage and identity of the Mexicans and as a food staple. Do results imply a major food security issue? Mexico has already lost its self-sufficiency in white corn because its domestic use has steadily outpaced its production. If corn becomes a luxury good in Mexico, low income families will not be able to afford their main source of calories, leaving a country in a cultural and political sensitive situation.

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Appendix

Table 1. Parameter Estimates of the Multivariate Probit Model of Cereals, Mexico, 2008[a]

	Corn		Wheat		Rice		Other Cereals		Potatoes	
	Parameter	SE	Parameter	SE	Parameter	SE	Parameter	SE	Parameter	SE
Intercept	-0.016	0.203	0.828***	0.195	0.877***	0.167	-3.035***	0.183	-0.468***	0.159
Household size	0.034***[b]	0.005	0.034***	0.005	0.095***	0.004	0.013***	0.004	0.087***	0.004
Strata 2	0.173***	0.037	-0.073**	0.031	0.089***	0.026	-0.087***	0.028	0.012	0.025
Strata 3	-0.013	0.042	-0.057	0.038	0.135***	0.032	-0.110***	0.036	0.078**	0.031
Strata 4	-0.440***	0.037	-0.127***	0.035	0.087***	0.030	-0.011	0.033	0.052*	0.029
COR	0.116***	0.029	0.014	0.028	-0.010	0.023	0.262***	0.026	-0.091***	0.022
NWR	-0.079**	0.037	-0.271***	0.034	-0.274***	0.031	0.551***	0.032	-0.029	0.028
NER	0.289***	0.043	-0.264***	0.036	-0.309***	0.033	0.425***	0.034	-0.132***	0.030
SR	-0.012	0.031	-0.114***	0.031	0.009	0.026	0.269***	0.029	-0.393***	0.025
Poverty Level 2	0.717***	0.044	-0.002	0.051	-0.078*	0.042	0.147***	0.051	0.151***	0.042
Poverty Level 3	0.991***	0.047	-0.034	0.053	0.035	0.044	0.078	0.052	0.223***	0.043
Poverty Level 4	1.147***	0.050	-0.164***	0.053	-0.046	0.045	0.066	0.052	0.148***	0.044
Poverty Level 5	1.098***	0.052	-0.041	0.056	0.016	0.047	0.097***	0.054	0.191***	0.046
Female	-0.063***	0.024	-0.011	0.022	-0.023	0.019	0.066***	0.021	0.013	0.018
Age	0.001**	0.001	-0.005***	0.001	0.000	0.001	-0.011***	0.001	-0.001	0.001
Log of price of corn	0.415***	0.042	-0.061	0.044	-0.129***	0.037	0.044	0.041	-0.066**	0.036
Log of price of wheat	-0.115**	0.024	0.200***	0.021	-0.137***	0.019	0.061***	0.020	-0.058***	0.018
Log of price of rice	-0.033	0.033	-0.015	0.031	0.082***	0.027	-0.029	0.028	0.006	0.025
Log of price of other cereals	0.002	0.014	-0.020	0.013	-0.029***	0.011	-0.002	0.012	-0.013	0.011
Log of price of potatoes	0.006	0.026	0.052**	0.025	-0.013	0.021	0.045**	0.023	0.036*	0.020
Log of household income	-0.042**	0.015	0.002	0.015	-0.108***	0.013	0.200***	0.014	0.028**	0.012

[a] Data is from 2008 National Survey of Income and Expenditure for Mexican Households (ENIGH), National Institute of Statistics and Geography (INEGI).
[b] Asterisks (*, **, ***) indicate significance at the 10% , 5% and 1% levels, respectively.

Table 2. Parameter Estimates of the Multivariate Probit Model of Meats, Mexico, 2008[a]

	Beef		Beans		Fish		Pork		Chicken		Processed Meats	
	Parameter	SE	Parameter	SE	Parameter	SE	Parameter	SE	Parameter	SE	Parameter	SE
Intercept	-3.488***[b]	0.193	3.235***	0.194	-3.988***	0.247	-1.764***	0.213	-1.324***	0.191	-1.167***	0.198
Size	0.023***	0.004	0.105***	0.004	-0.027***	0.005	0.049***	0.005	0.030***	0.004	0.042***	0.004
Strata 2	0.010	0.026	0.090***	0.026	0.050	0.033	0.153***	0.029	0.015	0.026	-0.045*	0.027
Strata 3	-0.013	0.032	0.142***	0.032	0.005	0.041	0.232***	0.035	0.050	0.032	-0.064*	0.033
Strata 4	-0.274***	0.030	0.034	0.030	-0.183***	0.041	0.007	0.034	-0.068**	0.030	-0.179***	0.031
COR	0.151***	0.023	0.361***	0.023	0.043	0.029	-0.151***	0.024	-0.550***	0.023	-0.102***	0.023
NWR	0.066**	0.029	0.131***	0.029	0.118***	0.037	-0.673***	0.036	-0.824***	0.029	0.061***	0.031
NER	0.254***	0.033	0.055*	0.032	-0.356***	0.049	-0.732***	0.043	-0.820***	0.033	-0.224***	0.033
SR	-0.138***	0.025	0.239***	0.026	0.198***	0.033	0.451***	0.027	-0.213***	0.026	-0.273***	0.026
Poverty Level 2	0.009	0.045	-0.011	0.046	-0.290***	0.056	0.428***	0.050	0.232***	0.044	0.371***	0.044
Poverty Level 3	0.169***	0.046	-0.115**	0.046	-0.276***	0.057	0.436***	0.051	0.433***	0.045	0.460***	0.046
Poverty Level 4	0.149***	0.047	-0.096*	0.047	-0.399***	0.059	0.506***	0.052	0.361***	0.046	0.560***	0.046
Poverty Level 5	0.278***	0.048	-0.147***	0.049	-0.408***	0.061	0.616***	0.054	0.387***	0.047	0.584***	0.048
Female	-0.040***	0.019	-0.060***	0.019	-0.129***	0.025	-0.063***	0.021	-0.017	0.019	0.020	0.020
Age	0.002***	0.001	0.001**	0.001	0.005***	0.001	-0.002***	0.001	0.002***	0.001	-0.012***	0.001
Log of price of beef	0.107***	0.027	-0.098***	0.027	0.019	0.035	-0.108***	0.030	0.023	0.027	-0.026	0.028
Log of price of beans	0.084***	0.026	0.034	0.026	0.053	0.034	-0.059**	0.029	-0.019	0.026	0.069***	0.027
Log of price of fish	-0.011	0.016	0.003	0.016	0.002	0.020	-0.005	0.017	-0.017	0.016	0.004	0.016
Log of price of pork	0.015	0.027	-0.011	0.027	-0.070***	0.034	0.013	0.030	-0.022	0.027	0.006	0.028
Log of price of chicken	0.114***	0.022	-0.051**	0.022	0.068**	0.028	-0.048**	0.024	0.096***	0.022	-0.006	0.022
Log of processed meats	0.008	0.019	-0.060***	0.019	0.040	0.025	-0.014	0.021	0.001	0.019	0.058***	0.020
Log of household income	0.211***	0.013	-0.299***	0.013	0.263***	0.016	0.118***	0.014	0.103***	0.013	0.127***	0.013

[a] Data is from 2008 National Survey of Income and Expenditure for Mexican Households (ENIGH), National Institute of Statistics and Geography (INEGI).
[b] Asterisks (*, **, ***) indicate significance at the 10% , 5% and 1% levels, respectively.

Table 3. P-values of the Homogeneity and Symmetry and the Separability Tests for Cereals

Case	Model for Cereals					Model for Meats				
	LR Statistic	LR_c Statistic	Number of restrictions	$\chi^2_{0.05}$	P-value	*LR* Statistic	LR_c Statistic	Number of restrictions	$\chi^2_{0.05}$	P-value
I. Homogeneity and Symmetry Test	220.00	219.80	10	18.31	<0.001	20.00	19.98	15	25.00	0.172
II. Separability Test	240.00	239.79	12	21.03	<0.001	1060.00	1058.93	18	28.87	<0.001
III.Separability Test	20.00	19.98	2	5.99	<0.001	52.00	51.94	3	7.81	<0.001

Case I: H_0: Homogeneity and Symmetry Imposed, H_1: Unrestricted Model
Case II. H_0: Homogeneity, Symmetry and Separability Imposed, H_1: Unrestricted Model
Case III. H_0: Separability Imposed, H_1: Unrestricted Model

Table 4. Parameter Estimates for the non linear AIDS Model for Cereals and Meats, Mexico, 2008[a]

	Cereals					Meats					
	Quantity of					Quantity of					
	Ln(m)	Corn	Wheat	Other Cereals	Potatoes	Ln(m)	Beef	Beans	Fish	Chicken	Processed Meats
Intercept	-0.450***[b]	0.274***	0.510***	0.236***	0.064	0.204***	0.617***	0.071***	0.884***	0.410***	-0.118***
Household size	0.013***	0.001	-0.012***	-0.013***	0.006***	0.020***	-0.022***	0.010***	-0.036***	-0.012***	0.006***
Strata 2	0.066***	0.058***	-0.044***	-0.016**	-0.002	0.000	-0.008	0.002	0.001	-0.008	-0.026***
Strata 3	0.073***	0.046***	-0.046***	-0.022**	0.008	0.025***	-0.034***	0.048***	-0.045***	-0.017	-0.036***
Strata 4	0.018**	-0.045***	-0.002	-0.005***	0.053***	0.071***	-0.044***	0.123***	0.011	0.007	-0.019*
COR	-0.026***	0.022***	-0.002	0.004	-0.027***	-0.001	0.081***	0.084***	0.021***	-0.156***	-0.024***
NWR	-0.065***	-0.049***	0.044***	0.000	0.033***	-0.027***	0.108***	0.106***	0.128***	-0.222***	0.076***
NER	0.044***	0.076***	-0.036***	-0.013	-0.003	0.003	0.193***	0.130***	0.121	-0.154***	-0.003***
SR	-0.031***	0.031***	0.016***	0.014	-0.091***	0.025	-0.049***	0.030***	0.015	-0.056***	-0.064***
Poverty Level 2	0.120***	0.187***	-0.108***	-0.026*	-0.050***	-0.089***	-0.037*	-0.125***	-0.002	0.026	0.044***
Poverty Level 3	0.169***	0.243***	-0.149***	-0.043***	-0.068***	-0.126***	0.006	-0.192***	-0.038	0.065***	0.052***
Poverty Level 4	0.174***	0.281***	-0.160***	-0.028**	-0.087***	-0.150***	0.010	-0.212***	-0.040	0.050***	0.096***
Poverty Level 5	0.105***	0.231***	-0.127***	-0.008	-0.087***	-0.186***	0.034	-0.254***	-0.045	0.035	0.091***
Female	-0.001	-0.004	-0.011***	0.012***	0.013***	0.001	0.006	0.011***	0.035***	0.014***	0.011***
Age	0.002***	0.001***	0.001***	0.001**	0.001***	0.001***	0.001***	0.002***	0.000	0.001***	-0.003
Log of price of corn	-0.397***	0.006	0.005**	-0.003***	0.005***	-	-	-	-	-	-
Log of price of wheat	-0.335***	0.005**	-0.038***	0.012***	0.013***	-	-	-	-	-	-
Log of price of rice	-0.051***	-0.014***	0.008***	0.023***	0.022***	-	-	-	-	-	-
Log of price of other cereals	-0.031***	-0.003*	0.012***	-0.037***	0.005***	-	-	-	-	-	-
Log of price of potatoes	-0.084***	0.005***	0.013***	0.005***	-0.044***	-	-	-	-	-	-
Log of price of beef	-	-	-	-	-	-0.203***	-0.065***	-0.012***	0.003	0.038***	0.016***
Log of price of beans	-	-	-	-	-	-0.149***	-0.012***	0.035***	-0.008***	-0.012***	0.008***
Log of price of fish	-	-	-	-	-	-0.038***	0.003	-0.008***	-0.073***	0.011***	0.010***
Log of price of pork	-	-	-	-	-	-0.072***	0.020***	-0.011***	0.058***	0.018***	0.000
Log of price of chicken	-	-	-	-	-	-0.198***	0.038***	-0.012***	0.011***	-0.066***	0.012***
Log of processed meats	-	-	-	-	-	-0.221***	0.016***	0.008***	0.010***	0.012***	-0.045***
Ln(m)	-	0.041***	-0.018***	0.001	-0.030***	-	0.125***	-0.113***	0.138***	0.059***	-0.123***
φ[c]	-	0.543***	-0.581***	-0.425	0.111***	-	-0.636***	0.945***	-0.427***	0.252***	-0.271***
Ln(y)	0.987***	-	-	-	-	0.865***	-	-	-	-	-

[a] Data is from 2008 National Survey of Income and Expenditure for Mexican Households (ENIGH), National Institute of Statistics and Geography (INEGI).
[b] Asterisks (*, **, ***) indicate significance at the 10% , 5% and 1% levels, respectively.

Table 5. Uncompensated and Compensated Price, Expenditure, and Income Elasticities for Cereals, Mexico, 2008

	Marshallian Price Elasticities					Hicksian Price Elasticities					Expenditure and Income Elasticities	
	Corn	Wheat	Rice	Other Cereals	Potatoes	Corn	Wheat	Rice	Other Cereals	Potatoes	Expenditure	Income
Corn	-1.0243	-0.0259	-0.0550	-0.0397	-0.0262	-0.4157	0.2565	-0.0059	0.0549	0.0014	1.0625	0.9190
Wheat	0.0358	-1.1267	0.0898	0.0611	0.0652	0.5759	-0.8761	0.1334	0.1451	0.0897	0.9429	0.8156
Rice	-0.2837	0.1826	-1.2118	0.5071	0.4771	0.2630	0.4364	-1.1677	0.5922	0.5019	0.9545	0.8256
Other Cereals	-0.0309	0.1332	-0.0241	-1.4154	0.0541	0.5427	0.3995	0.0222	-1.3261	0.0802	1.0016	0.8664
Potatoes	0.2253	0.5320	0.2000	0.2192	-2.6747	0.4920	0.6558	0.2215	0.2607	-2.6626	0.4655	0.4027

Table 6. Uncompensated and Compensated Price, Expenditure, and Income Elasticities for Meats, Mexico, 2008

	Marshallian Price Elasticities						Hicksian Price Elasticities						Expenditure and Income Elasticities	
	Beef	Beans	Fish	Pork	Chicken	Processed Meats	Beef	Beans	Fish	Pork	Chicken	Processed Meats	Expenditure	Income
Beef	-1.516	-0.072	-0.226	-0.100	0.059	0.142	-1.2439	0.2294	-0.1745	0.0023	0.3762	0.4311	1.3336	1.1536
Beans	0.102	-0.834	0.154	0.076	0.046	-0.015	0.2525	-0.6670	0.1828	0.1327	0.2215	0.1450	0.7364	0.6370
Fish	-0.181	-0.228	-3.194	-0.210	0.113	0.332	0.1119	0.0971	-3.1383	-0.1003	0.4546	0.6441	1.4372	1.2432
Pork	0.215	-0.141	0.700	-1.317	0.203	0.011	0.4344	0.1023	0.7422	-1.2354	0.4578	0.2437	1.0739	0.9290
Chicken	0.080	-0.057	-0.052	-0.008	-1.329	0.074	0.3118	0.1996	-0.0078	0.0785	-1.0594	0.3207	1.1353	0.9820
Processed Meats	0.293	0.051	0.312	0.208	0.195	-1.277	0.4216	0.1929	0.3369	0.2557	0.3452	-1.1406	0.6296	0.5446

Table 7. Demographic Elasticities for Cereals and Meats, Mexico, 2008

	Cereals					Meats					
	Corn	Wheat	Rice	Other Cereal	Potatoes	Beef	Beans	Fish	Pork	Chicken	Processed Meats
Household size	-0.0015	-0.0367	0.2082	-0.1483	-0.0047	-0.2003	0.0811	-0.9890	0.1793	-0.0769	-0.2561
Strata 2	0.1011	-0.1631	-0.1809	-0.1742	-0.1417	-0.0629	0.0149	0.0023	0.3252	-0.0410	-0.1839
Strata 3	0.0800	-0.1714	0.0136	-0.2457	0.2470	-0.1901	0.2189	-1.1753	0.4162	-0.0790	-0.2312
Strata 4	-0.0795	-0.0072	0.3723	-0.0517	1.9862	-0.2390	0.5539	0.2563	-0.4444	0.0228	-0.1525
COR	0.0368	-0.0061	-0.1009	0.0418	-1.1098	0.3783	0.3801	0.5279	0.1130	-0.6614	-0.1782
NWR	-0.0866	0.1684	-0.2379	-0.0007	1.2231	0.5076	0.4779	3.2843	-0.7849	-0.9401	0.2824
NER	0.1313	-0.1334	-0.6569	-0.1418	-0.1694	0.9243	0.5836	3.0923	-1.3565	-0.6522	-0.0811
SR	0.0541	0.0638	-0.0348	0.1582	-3.5544	-0.2598	0.1421	0.3721	1.0538	-0.2424	-0.3597
Poverty Level 2	0.3263	-0.4036	-0.8753	-0.2862	-1.9774	-0.2049	-0.5453	-0.0587	0.5717	0.1043	0.1382
Poverty Level 3	0.4242	-0.5595	-0.8848	-0.4861	-2.6855	0.0064	-0.8399	-1.0005	0.4463	0.2681	0.1722
Poverty Level 4	0.4904	-0.6005	-1.2743	-0.3112	-3.4071	0.0280	-0.9310	-1.0378	0.2949	0.2030	0.3746
Poverty Level 5	0.4017	-0.4772	-1.0264	-0.0926	-3.3941	0.1435	-1.1164	-1.1779	0.5681	0.1414	0.3538
Female	-0.0072	-0.0378	0.0738	0.1355	0.4590	0.0089	0.0574	0.8939	-0.3727	0.0546	-0.0166
Age	-0.0354	0.0861	0.1033	-0.0059	-2.7884	-1.0279	0.4002	-0.8219	0.0063	-0.2984	-3.2091

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A Comparative Analysis of Alabama Restaurants: Local vs. Non-local Food Purchase

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Abstract

Restaurants/chefs are increasing their demand for locally produced foods to respond to increasing consumer preferences for these products. Data from a survey of independently owned restaurants in Alabama show that there is tremendous opportunity for local producers to market to restaurants. Fifty-one percent of the restaurants surveyed currently purchase local foods, and over 80 percent of the remaining restaurants would purchase local products if barriers were addressed. To take advantage of this opportunity, producers must be able to consistently supply high quality, fresh products. Farmers must also be aware of and abide by food safety standards to sell to these restaurants.

Keywords: local, restaurants, Alabama, marketing, preferences

Background

Direct marketing to restaurants is becoming increasingly popular as chefs desire high quality, fresh foods to meet the demand of their more health conscious customers. Data from a 2008 National Restaurant Association (NRA) survey showed that 89% of fine dining restaurants served locally produced food and approximately 90% of these restaurants believed that severing local food would become more popular in the near future. Buying directly from farmers allows restaurants to obtain a wide variety of food, while building relationships with farmers, which provides chefs the opportunity to know and influence how the food used in their restaurant is grown. Buying locally also provides chefs fresher food with which to prepare dishes.

According to USDA/ERS statistics, restaurants account for more than 70% of total food away from home expenditures. Food away from home expenditures increased from $388 billion to $594 billion for the period 2000 to 2010 (USDA/ERS 2011) signifying the restaurant market represents tremendous potential for developing a sustainable network with local growers. Local growers selling directly to restaurants receive benefits including having a reliable market throughout the season and receiving premium prices. Local growers keep a higher percentage of the food dollar when using direct marketing channels. While there is potential for selling directly to restaurants, understanding restaurants'/chefs' desires and concerns are key to successfully capitalizing on this opportunity. The objectives of the study are to; 1) identify restaurants'/chefs' knowledge of food safety standards required for producers and other vendors from whom they purchase food, 2) identify challenges/barriers preventing restaurants from purchasing locally, and 3) identify and compare (restaurants that purchase locally versus those that do not) different product attributes important to restaurant/chefs in Alabama.

Previous studies provide local farmers information regarding necessary steps to take when approaching a restaurant with a marketing proposal (Pepinsky and Thilmany 2004; Food Processing Center 2003), while others provide information on restaurants'/chefs' preferences and demand for different product attributes (Curtis and Cowee 2009; Starr et al. 2003; Kelley et al. 2001). There is no known study that considers Alabama restaurants as it relates to local food purchases, and therefore, this paper will primarily address this topic. The paper provides important information to local producers, in Alabama, desiring to sell their products to restaurants. It also provides those involved with food marketing with information on what restaurants prefer.

Data and Methods

The data for this study was collected by surveying 747 independently owned restaurants in Alabama. Independently owned restaurants were chosen as survey participants particularly because previous studies showed that these are the restaurants that typically have interest in purchasing local food (Curtis et al. 2008; Kirby 2006). These restaurants are broadly distributed across the state and were randomly chosen from Alabama Restaurant and Food-service Association. The survey was administered through a combination of mail, internet and telephone. There were a total of 148 responses gathered by combining all three methods which is approximately 20% response rate. The survey was segmented into different sections. Section 1 requested general background information about the restaurants, section 2 addressed restaurants that do not pur-

chase locally while section 3 targeted restaurants that purchase locally. Responses from these three sections were used to compare restaurants that purchase locally to those that do not. This gives a clear indication of what restaurants desire as it relates to local food purchases.

Results

Descriptive statistics were done on data from survey responses using statistical analysis software (SAS). All participants were asked background information of their restaurants. Table 1 presents the averages on background information of all restaurants. Responses show restaurants that purchase locally have been in business on average 2 years more than those that do not purchase locally. Meal prices were also found to be higher on average for restaurants that purchase locally. Breakfast prices are on average about 14% higher for restaurants buying locally and dinner prices approximately 13% higher. Lunch prices were found to be only approximately 3% different between the two types of restaurants. These higher prices for restaurants that purchase locally could be an indication of the higher premium consumers are willing to pay to get local food. Contrary to what was expected; restaurants that purchased locally on average spent 13% less on weekly food expenses. Since local foods typically cost more, it was expected that food costs for restaurants purchasing locally, on average, would be higher than restaurants that do not. This may be partially explained by decreased shipping and transportation costs as well as the reduction of some middleman expenses.

Table 1. Background Information on Local and Non-Local Restaurants

Factor	Mean	Std. dev
Years in Business		
Non Local	12.00	16.10
Local	14.00	16.24
Meal Prices		
Breakfast	6.65	3.95
Non Local	7.59	1.80
Local		
Lunch		
Non Local	8.59	2.34
Local	8.87	2.37
Dinner		
Non Local	13.22	6.48
Local	14.98	7.92
Average Weekly Food Expense ($)		
Non Local	6550.40	6306.95
Local	5774.11	5499.01

One key question asked to the participants was whether they purchase locally or not. Results from responses showed approximately 51% (n=75) of respondents purchases locally while the remaining 49% (n=73) do not. Respondents who do not purchase locally were asked their primary reason for not doing so. Inadequate availability was the major barrier to restaurants not purchasing locally, reported by 38% of respondents. Other barriers noted were inconvenience, uncertain of where to buy, lack of knowledge as to what is available locally, cost, and some restaurants purchase only from food distributors. Non-local buyers were also asked their level of interest in promoting locally grown food on their menu or other promotional material. Only 20% reported they were extremely interested, while 61% were interested and the remaining 19% had

no interest. All participants were asked how familiar they were with food safety standards required for producers and other vendors from whom they purchase food. As shown in figure 1, approximately 83% of respondents who purchase locally and 80% who do not purchase locally reported they were familiar with food safety standards, of which 46% and 42% were extremely familiar, respectively. Only a small number of respondents reported they were not familiar with these standards. Farmers are cautioned to take due diligence in abiding by food safety standards if they expect to sell to these restaurants.

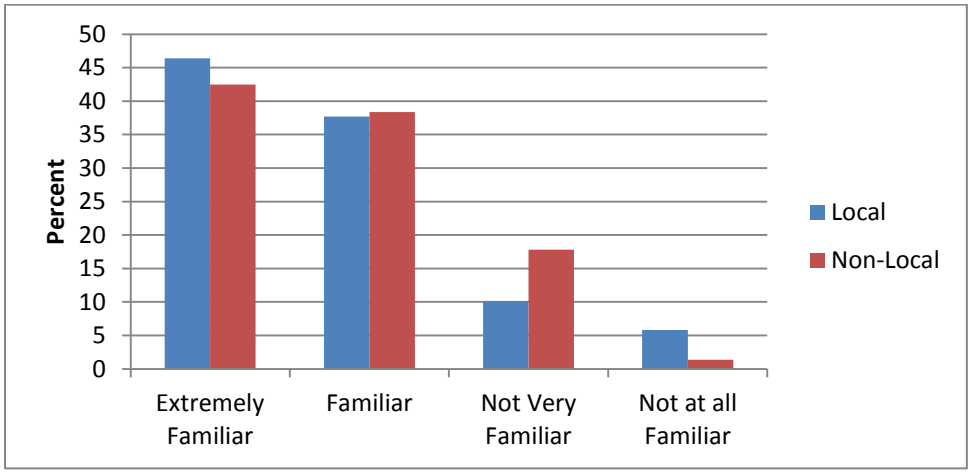

Figure 1: Familiarity with Food Safety Standards

All participants were asked to rank four different payment methods in terms of preferences for purchasing locally grown products. The four payments methods include paying with cash, paying by check, paying with a credit/debit card or invoice to be paid within 30 days. Paying with check was found to be the most preferred payment option by both local (38%) and non-local (52%) buyers, shown in figure 2. Invoice to be paid within 30 days was second most preferred while paying with a credit or debit card was least preferred.

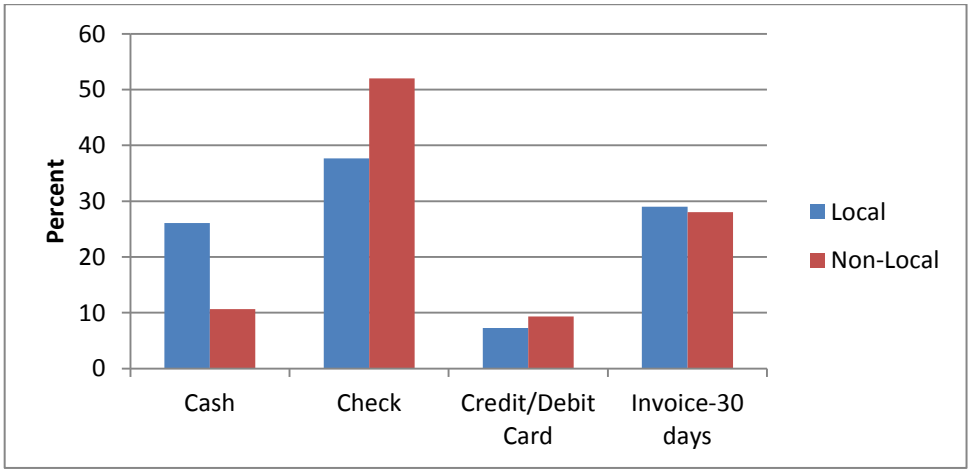

Figure 2: Payment Methods

Knowing the level of importance restaurants place on different food attributes is vital to a producer who wants to utilize this marketing channel. Participants were asked to rate (1 not important & 11 very important) the importance of different factors (food attributes and logistics) when making a decision to purchase locally grown food. Figures 3a-3c shows the importance of different attributes that influences local food purchase decision. On average, all attributes are considerably more important to non-local buyers. Non-local buyers rated consistent supply (CS), consistent quality (CQ), year-round availability (Avail), food safety (FS) and product freshness (Fresh) as very important indicated by the mean of 10 or above. Similar to non-local buyers, local buyers indicated consistent quality, food safety and product freshness are the attributes most desired. How the product is delivered (How Del) and product packaging and labeling (P&L) were least important to both non-local and local buyers.

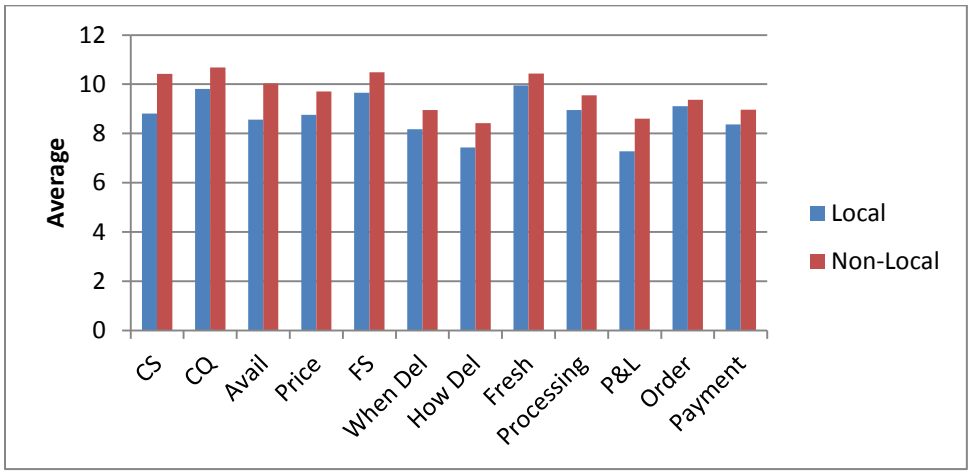

Figure 3a: Importance of factors when making decision to purchase locally

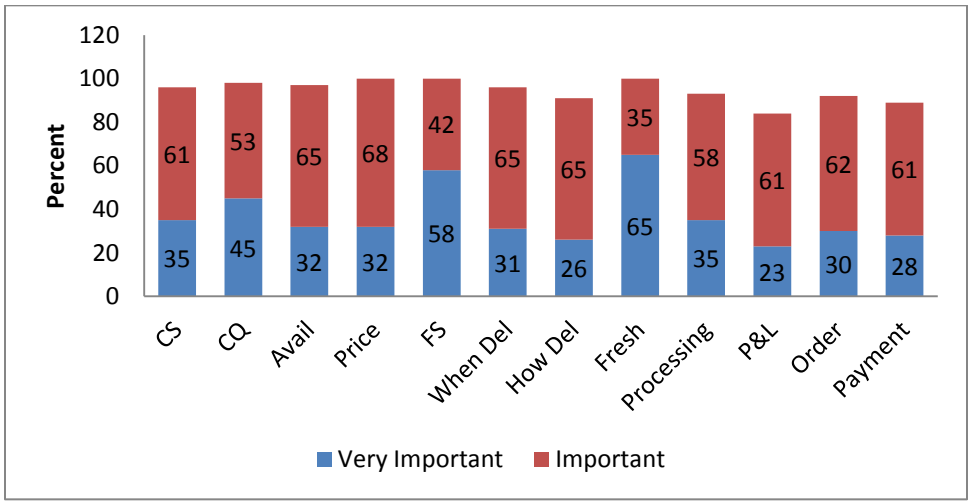

Figure 3b: Importance of factors when making decision to purchase locally (Local Buyers)

Figures 3b&c show percentages of respondents rating attributes as very important or important. Percentage of respondents rating attributes as not important can be obtained by subtracting that of very important and important from 100%. Consistent supply was rated very important by 72% of non-local buyers, consistent quality by 80%, availability by 53%, food safety by 77% and product freshness by 73%. For local buyers only food safety and product freshness were rated very important by more than 50% of respondents, 58% and 65% respectively.

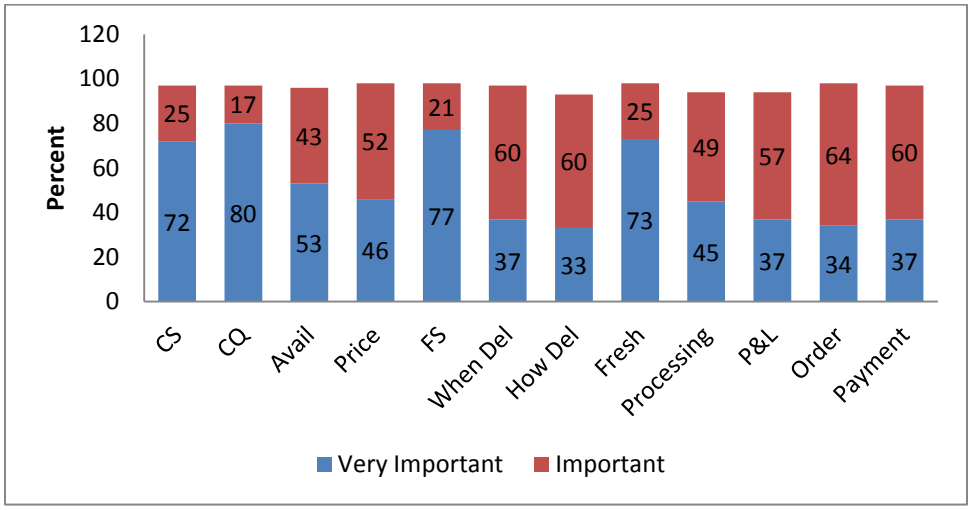

Figure 3c: Importance of factors on making decision to purchase locally (Non-Local)

Figure 4 presents data on the percentages of weekly food purchases that are locally grown. Interestingly, only 10% of respondents (n=62) reported that 50% or more of their weekly food purchases are locally grown. Almost three-fourth (71%) of respondents purchases less than 25% of locally grown food on a weekly basis. This information should put into perspective for local producers the opportunity available to them to capitalize on.

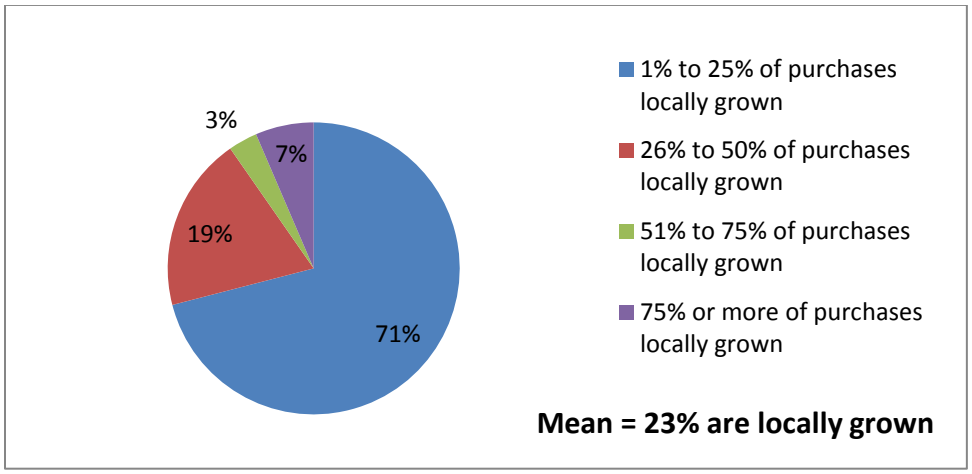

Figure 4: Percentage of weekly food purchases locally grown

Respondents who purchase locally grown food were also asked how much of their local food is obtained from different marketing channels. Results are presented in Figure 5. Approximately 70% of restaurants (n=67) purchase from food service suppliers. This is about 27% more than

those who purchase from a direct marketing channel; farmers' market or directly from a farmer (not including farmers' market). This suggests there is great opportunity for producers to approach these restaurants purchasing from food service suppliers about direct local buying. About 55% and 40% of restaurants purchase from farmers' market or directly from a farmer, respectively. Only about 12% purchase from other sources including food broker and local processor. Data also shows (not shown in figure) only 6% of restaurants purchase 100% of their locally grown food directly from a farmer. Most restaurants (24%) purchase all locally grown food from a food service supplier while 9% from a farmers' market. There is therefore tremendous opportunity available to local producers in Alabama to sell to local restaurants.

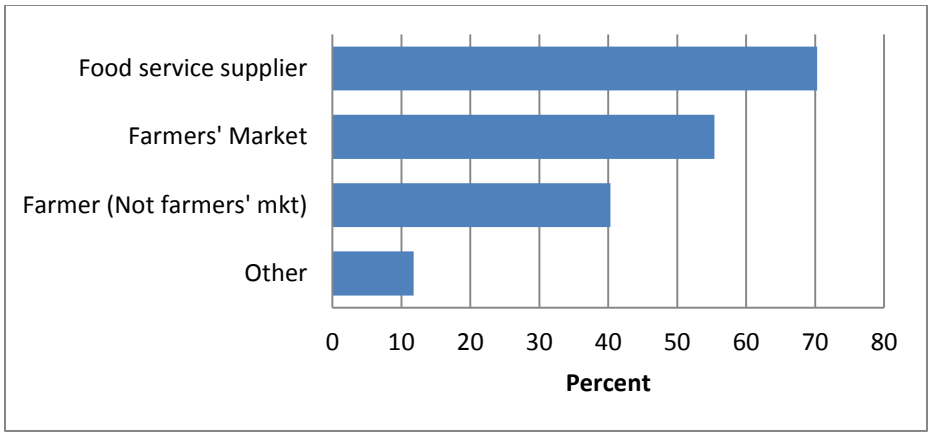

Figure 5: Source of locally grown food

Respondents who purchase locally grown food were asked the percentage of local food delivered to restaurant versus percentage picked up by restaurant staff. As shown in Figure 6, 69% of respondents have the food delivered while 31% is picked up. This data will help to make producers aware of the added cost associated with selling directly to these restaurants. Having to deliver the products will not only result in transportation cost but also the time away from farm associated with driving to and from restaurants. Cost and time are the two major challenges to producers selling directly to restaurants. There is also the responsibility of ensuring the right products and right quantity are delivered on time. Producers can include this estimated cost into their marketing plan which should help decide if the profit margin from selling to local restaurants would be favorable.

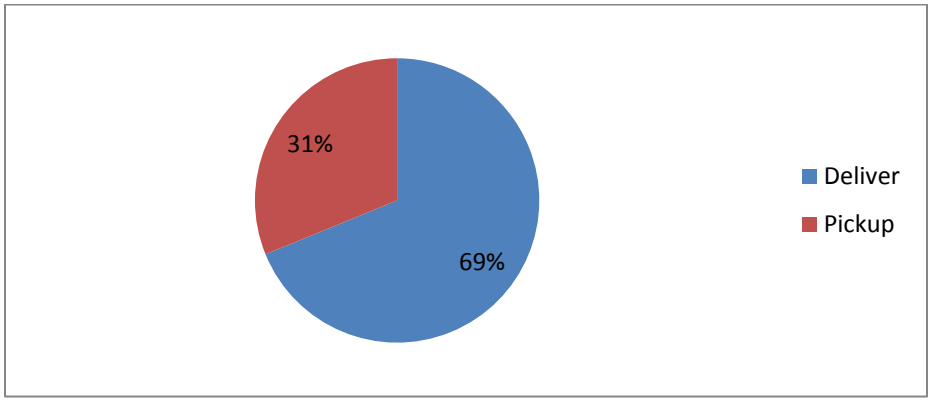

Figure 6: Percentage of locally purchased food delivered vs. picked up

Local buyers were asked whether purchasing locally has had a positive impact on their restaurants' profit. Approximately 62% or respondent agreed or strongly agreed with this statement, where 26% strongly agreed. None of the respondents strongly disagreed however almost 10% disagreed and the rest of the respondent were indifferent to the statement (see Figure 7). This indicates that selling locally grown food is "profitable" for almost two-thirds of respondents (n=72). This information is essential to producers as they can use this data as a selling point when contacting restaurants about marketing their products. This could be an effective way of convincing potential restaurant owners/chefs who are skeptical about buying locally. Non-local respondents were asked whether they think buying locally grown food would have a positive impact on their restaurant's profit. Only 44% (n=75) of the respondents strongly agreed or agreed with this statement, of which 20% strongly agreed. Twenty one percent strongly disagreed or disagreed while 35% were indifferent.

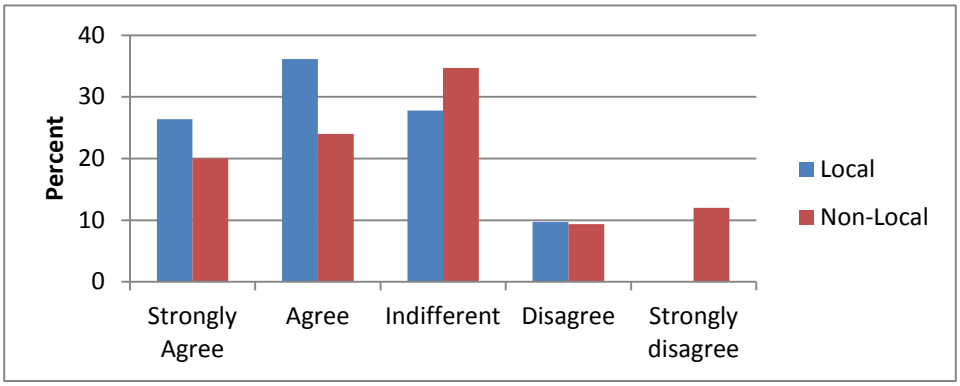

Figure 7: Impact of purchasing locally grown food on restaurant's profit

Conclusion

With consumers demanding more locally produced foods, restaurants/chefs, in order to meet customers demand, are also increasing demand for locally grown products. This increase in demand creates an opportunities for local producers. Approximately half the respondents in this study do not purchase locally, mainly attributable to inadequate availability. This is an indication to producers that the demand is available; they can approach these restaurants with a plan in place to work with them to provide these products. It is clear from responses that preferences differ for restaurants that purchase locally grown products and those that do not. Product attributes in general are more important to restaurants that do not purchase locally than to those that do. However, product freshness is a very important attribute to all restaurants. Food safety is also very important to all restaurants and therefore producers must adhere to these standards if they want to market to these restaurants.

Finally, majority of restaurants are demanding produce (vegetables) and meat, therefore local farmers producing these particular products have a higher chance of being successful in this industry. The bottom line for producers is; there is tremendous opportunity available to local producers to connect with restaurants in Alabama, which once capitalized on should significantly increase their profit margin.

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Providing the Local Story of Produce to Consumers at Institutions in Vermont: Implications for Supply Chain Members

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Abstract

Farm to institution (FTI) is a movement which aims to increase procurement of locally grown foods by institutions such as schools, colleges, hospitals, senior meal sites, and correctional facilities. FTI provides an opportunity for farmers by expanding their markets, for buyers by meeting demand for fresh, locally grown food, and for distributors by meeting buyers' demands and expanding their network of suppliers. Previous research has discussed the importance of the story of the food in creating connections between farmers and consumers, yet it becomes difficult to communicate this story as supply chains lengthen. This study focuses on institutional procurement of fresh fruits and vegetables in Vermont. Face to face, semi-structured interviews were conducted with 19 supply chain actors (farmers, distributors, food hubs and buyers). We find that providing the story has both value and cost, with costs often being borne with those least able to afford them.

Keywords: procurement, fresh produce, relationships, promotion,

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Introduction

Farm to Institution (FTI) is a movement that aims to provide an increased amount of locally grown fruits and vegetables to institutions such as schools, colleges, hospitals, senior meal sites, and correctional facilities. FTI has the potential to benefit local farmers by providing new markets for their produce. Similarly, institutions can combine local produce with experiential education opportunities to increase consumption of healthful food products and address the national obesity crisis (Briefel & Johnson 2004; Siega-Riz, Popkin, & Carson 2000).

Research suggests that maintaining the story of the food through supply chains creates connections between farmers and consumers, potentially increasing the consumption of fresh produce (Izumi, Alaimo, & Hamm 2010). However, advocates have questioned the ability of the FTI supply chain to retain farmers' identity and the farmers' connection to consumers at the institutions when the supply chain is long and indirect in nature (Ohmart & Markley 2007). The research questions at hand are: How is the local story of produce currently being provided at Vermont's institutions and what are the types of costs for the farmer, distributor, and institutional buyer to convey this local story to the consumer through a long and indirect supply chain? The following paragraphs address the recent literature on local story of food.
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Selected Literature

Our analysis is motivated by a recent study (Izumi, et al. 2010) which found that where there is more local story or local identity, there is an increased consumption of fruits and vegetables. Their study suggests that if the students know the farmer,-i.e., the story of the food is presented - students consider the food to be "cool" and consume more of it (Izumi, et al. 2010, 87). The FTI literature shows that this "local story" is provided in a variety of forms including school field trips to farms, visits to the institution by the farmers, and visuals such as posters, plaquards, photos, and signs. The personal interactions and visuals raise the awareness of the benefits of local produce and makes the local story of produce more visible for the consumer, therefore increasing its value (Berkenkamp, 2006; Izumi, Wright, & Hamm, 2009; Kloppenburg, Wubben, & Grunes, 2008; Strohbehn & Gregoire 2008; Vogt & Kaiser 2008).

In long commodity supply chains, the identity is usually lost, as maintaining the story of food may incur high transaction costs for one or more supply chain actors. Other common barriers identified in the literature include relationship maintenance, infrastructure, seasonality and limited budgets all of which contribute to institutions sourcing from intermediaries rather than directly from farmers (Allen & Guthman 2006; Bagdonis, Hinrichs, & Schafft, 2009; Berkenkamp, 2006; Gregoire & Strohbehn 2002; Hobbs, 1996; Izumi et al. 2009; Joshi & Beery 2007; Kloppenburg, Wubben, & Grunes 2008).

Produce often travels through a large distributor, because of the transaction costs associated with multiple farmers and multiple invoices (Berkenkamp 2006). Large distributors offer a standardized, stream-lined procurement environment that is well-suited for school budgets (Berkenkamp 2006). The issue of a deepening fiscal crisis in public education is also a major barrier when it

comes to purchasing local produce, causing many schools to have no choice but to choose produce that isn't local (Murray 2005).

Few if any studies have researched costs of providing local story or a longer supply chain, such as FTI; this paper addresses the gap. The next section of this paper addresses the methods, followed by a discussion of the nature and costs of "local story" currently being provided at institutions in Vermont.

Methods

Face to face, semi-structured interviews were conducted with nineteen supply chain actors (farmers, distributors, and buyers) in order to evaluate and inform efforts to increase the efficacy of FTI. Interviews were between 25 and 60 minutes. Participants were asked about their experiences in FTI, including motivations, agreements, communication, relationships, costs, and perceived needs. Vermont Food Education Every Day (VT FEED), a local stakeholder, helped establish an original interview list which was further developed through snowball sampling. Interviews were audio recorded and then transcribed to text. Transcripts were read multiple times to understand the situation of FTI as a whole. Data was then coded by hand, and by a secondary coder.

Results

For Institutional Buyers

Some schools K-12 are invested heavily in providing the local story of food. These schools provide educational trips in the form of farm visits in order to create a connection between student and farmer. One school system has photography of local farmers displayed around the high school cafeteria, created by the photography class. This institution is passionate about providing the local story of produce, and also offers a locavore day (where 90% of the lunch is local) once a month. The food service director of another K-12 school system comments on the success of providing local story:

"We try to bring our farmers into the school to have face time with kids as often as possible. One of my favorite stories is a mom calling me up, because her kid took off from her at the farmer's market and she said "Wow, who are you talking to?", and he said, "Oh this is Thomas he grows our carrots for school." And that's so cute, right? For me it's like, cha-ching, customer forever, this mom loves our program. And the connection was made with that farmer and that student. And that's great."

A large hospital finds it difficult to provide local signage to the patients, although there is plenty of signage denoting local in the cafeteria. The nutritional director of the hospital comments on linking the farmer with the consumer:

"We have reached out to farmers, (once those relationships are established) for other things. Like, a couple of those farmers had been invited to be speakers at different events that we've

hosted. One of them has been on our calendar that has gone out to ten thousand people. We try not to make the relationship about buying; it's about developing a community tie."

Some institutions have a low budget for "local story". Other institutions do not see the value in providing the local story of produce. A senior meal site in the Northeast Kingdom relies on word of mouth to get the message out about the fresh produce they are serving. Even for a well-endowed college, the budget for local story of produce isn't there. There is no marketing department and a college food service director comments that in terms of marketing they are "*always scrambling at the end of the day*." He sees no need to provide local story of ingredients because there is "*nothing sexy about a local carrot.*" The food service director only finds it necessary to identify a particular farm if there is a hard knock story or some kind of ethnic minority involved. It has to be "*a success story*," in order to be worth the effort of telling.

For Distributor

The type of local story provided by distributors depends on the type of distributor. Non-profit distributors tend to provide an extensive amount of local story, which is costly in terms of time and preparation. Larger for-profit distributors tend to be more focused on providing posters and advertisements to institutional buyers. This type of local story does have a cost for the distributor, but it is not a great one.

All of the non-profit distributors interviewed provided education to the consumers and/or faculty at the institutions. They see their work as "alternative" and as "creating awareness and community." The non-profits provide recipes to institution staff, coordinate farmer visits and educational farm trips, and prepare lessons involving produce for students. The work of the non-profits is costly. They rely heavily on grants which cannot last forever, and they would need a larger budget for further promotion.

For Producers

Producers are passionate about providing "local story", although the costs sit on the farmers' shoulders. One organic fruit and vegetable farmer talks about the importance of local story:
"*People have a hard time walking past you when they see your name. They see me all day on my tractor in the field growing their food, and then they see a picture of me. When they see a picture of the farmer, they humanize where that food comes from. Every time you humanize where the food comes from there is a connection. That person wants to feel part of that movement. It's empowerment. The humanistic approach is really important. So, giving a name, giving an address behind it is always good. When they see you, they shake your hand, they hear your story, they hear how much you work for it, it's like "Oh I never realized this piece of equipment is only used for a week, and that's why it's more expensive." Every piece of information gives people empowerment."*

The local connection is costly for farmers. It takes time and money for school trips, farmer demonstrations, and delivering produce directly. One farmer speaks about delivering produce:
"I mean, that's my local school, I take care of them. I'll deliver it even though it's not worth my time delivering it."

Conclusion

Providing local story to consumers at institutions is vital for experiential learning purposes, and can potentially increase consumption of healthy foods (Izumi, et al., 2010) as well as create a connection to the farmer, and create value for the consumer. This paper discusses the implications of providing local story of produce to consumers in a longer and indirect supply chain of FTI, by interviewing supply chain actors (institutional buyers, distributors, and farmers) in Vermont. We find that providing more of the farmers' "story" is a double edged sword. It is both valuable, and costly. Creating the connection between consumer and farmer is valuable, although the creation of this connection requires time, effort and money. Future research could provide a quantitative analysis of the "local story" costs of FTI supply chain members, building on our purely qualitative approach. It may be beneficial to know consumers' perspective on "local story", and how it affects what they eat. Researching behaviors, infrastructure and technology that seek to maintain the local story of produce throughout the FTI supply chain, while relieving the costs of "local story" from the farmer, could also prove useful.

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The Food Processing Industry in India: Challenges and Opportunities

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Abstract

India's agricultural base is quite strong but wastage is very high and processing of food products is very low. The country's processing sector is small and processing of food to consumable standards in India has reached only 10% recently. India's share in exports of processed food in World trade has remained at about 1.5 percent or $3.2 billion. This paper examines trends and status of the food processing industry, identifies and discusses constraints/problems slowing down its growth. Though there are many promising dynamics which support the potential for growth of this industry, there are still some significant constraints which, if not addressed sooner, can impede the growth prospects of the Food Processing Industry in India.

Keywords: India, Food processing, Industry, Constraints, Commodities.

Introduction

India is the world's second largest producer of food next to China and has the potential of being the biggest in the World. Food and food products are the biggest consumption category in India, with spending on food accounting for nearly 21% of India's GDP and with a market size of $181 billion. The Indian domestic food market is expected to grow by nearly 40% of the current market size to $258 billion by 2015 and $344 billion by 2025 (World of Food India, 2011; Merchant, 2008). India's agricultural base is quite strong but wastage is very high and processing of food products is very low. While processing of food to consumable standards are at levels of up to 80% in some developed countries, the overall processing level in India has recently reached 10%. Therefore, India's food processing sector comparatively is small and its share in exports of processed food in world trade has remained at about 1.5 percent or $3.2 billion (Bhuyan 2010).

Generally, in developing country markets, higher incomes result in diet upgrades, with increased demand for meats, dairy products, and other high value products. In India also sustained economic growth and increasing urbanization are fueling rapid growth in demand for high value food commodities like fruits, vegetables, milk, meat, eggs and fish (Rao et al 2004; Ali et al 2007). In the affluent and middle class (estimated to be around 350-375 million), the percentage share of food expenditure vis-à-vis other products has dropped, the total expenditure on foods has increased across all classes. There is an increasing trend of a shift from food security to nutritional security and convenience shopping. Increased mobility, exposure, increased aspiration and availability of a wide range and products have also contributed to shifts in spending (World of Food India, 2011).

The agro food processing industry is one of the largest in India, employs around 18% of the country's industrial work force and is ranked fifth in terms of production, consumption, export and expected growth (Merchant 2008). India also produces a variety of temperate to tropical fruits, vegetables and other food products. Processing of food products plays an important role in the conservation and effective utilization of fruits and vegetables. India's strong agricultural base, variety of climatic zones and accelerating economic growth holds significant potential for food processing industry that provides a strong link between agriculture and consumers. The purpose of this paper is to examine trends and status of food processing industry in India. The paper also identifies the constraints/problems encountered and discusses challenges slowing down the growth of this sector. At the end, the paper examines opportunities and offers some feasible suggestions for continuous growth of the industry. Strength, Weakness, Opportunities and Threats analysis is used to highlight opportunities and threats facing the food processing industry and consider strategies to develop markets worldwide for processed food products.

Food Production and Processing – The Indian Scenario

In recent decades, there have been substantial changes in the patterns of production, consumption, and trade in Indian agriculture. One change is the shift in production and consumption from food grains to high value agricultural commodities such as fruits and vegetables, milk and milk products, meat, eggs, fish and processed food products. Trade in high value products is increasingly displacing exports of traditional commodities such as rice, sugar, tea, coffee, tobacco, etc. Thus, during the 2000s, the growth rate in value of exports of rice, sugar, marine products, tea,

etc. declined while high value exports(fruits and vegetables, floriculture, meat, processed fruit juices) grew by about 18 percent annually (Sharma and Jain 2011; Ali, Singh and Muhammad 2007). Given the declining share of traditional commodities in production, consumption and trade, horticulture and other nontraditional, high value, agricultural crops represent an important area of potential income growth in rural areas.

Trends in Area and Production of Major Crops /crops Groups:

During the last three decades net area sown under major crops declined from 142 million hectares during 1983-84 to 140.8 million hectares in 2008-09, whereas total cropped area increased from 176.4 million hectares to 194 million hectares during the same period. The area under food grains declined by about 6 million hectares between 1983-84 and 2008-09 and this decline reduced the share of food grains in total cropped area from about 73 percent in 1983-84 to about 63.8 percent in 2007-08 (Sharma and Jain, 2011).During the last two decades, food grain production increased from 177.4 million tones in1993-94 to 227.8 million tons in 2009-10 by over 28 percent (Table1). However, the highest increase was observed in case of cotton (>200% increase), followed by fruits and vegetables (97%), condiments and spices (66%) and wheat (39%). Pulses recorded the lowest increase in production, from 12.7, million tons in 1993-94to 14.6 million tons in 2009-10.

Table 1: Trends in area production of major crops/crop groups: 1983-84 to 2008-09

	Area (Million ha)			**Production (Million tons)**		
Crops	1983-84	1993-94	2008-09	1983-84	1993-94	2009-10
Rice	40.1	42.3	43.8	53.5	75.9	95.0
Wheat	23.5	24.3	28.1	41.9	57.6	80.0
Coarse cereals	41.5	33.6	27.9	30.9	31.1	38.2
Pulses	23.4	22.4	23.0	12.1	12.7	14.6
Food grains	128.5	122.6	122.8	138.4	177.4	227.8
Oilseeds	18.5	26.0	26.8	11.6	20.1	27.5
Sugarcane	3.2	3.6	4.6	183.3	237.2	303.7
Fruits & vegetables	5.1	8.3	13.6	-	95.6	188.7
Condiments & spices	2.2	2.3	2.6	-	2.5	4.15
Cotton	7.9	7.5	9.7	7.3	10.6	24.1
Net area sown	142.0	142.2	140.8	-	-	-
Total cropped area	176.4	184.8	194.0	-	-	-

Source: Agricultural Statistics at a Glance 2010 and previous issues, Directorate of Economics and Statistics, Ministry of Agriculture, Govt.of India, New Delhi.

The decline in area under food grains resulted in increase in area under other crops. The largest beneficiary of this decline were oil seeds during the decade of the 1980's, when area under oilseeds increased from 18.5 million hectares in 1983-84 to 26 million hectares in 1993-94 but area under oilseeds remained stable between 1993-94 and 2008-09. The share of oilseeds in total cropped area increased significantly from less than 10 % in early eighties to 14.8% in early nineties, which marginally declined to about 14.3% in 2007-08. The area under cotton, which declined by about half a million hectares between 1983-84 and 1993-94, increased by more than 2 million hectares between 1993-94 and 2008-09. Another beneficiary of decline in area under food grains was high value crops mainly fruits and vegetables. The area under fruits and vegetables increased by about 8.5 million hectares between 1983-94 and 2007-08. This indicates that

crop pattern in India shifted towards oilseeds, sugarcane, and fruits and vegetables during the 1980s, whereas in the 1900's and 2000s the shift was more towards fruits and vegetables and other nonfood crops (Sharma and Jain, 2011).India is a major producer of many fruits and vegetables with share in world production: 41% of mango; 23% of banana; 24% of cashew nut; 10% of onion; 30% of cauliflower; and 36% of green peas. The share of area under fruits and vegetables in total cropped area, which was less than 3 percent in 1983-84 increased to over 5% in 2007-08 (Sharma and Jain, 2011). The trends in production of fruits and vegetables are presented in Table 2. The production of fruits in India averaged about 55.05 million tons over a period of six years (2002-03 to 2007-08), a total increase of about 14 million tons.. There was also a slight increase in acreage under fruits. During the same period the production of vegetables increased by almost 33 percent and area also increased by almost 3 million ha.

Table 2: Production of Fruits and Vegetables in India

Year	Fruits			Vegetables		
	Area (Million Ha)	Production (Million tons)	Growth rate	Area (Million Ha)	Production (Million tons)	Growth rate
2002-03	4.8	49.2	-	5.9	84.8	-
2003-04	5.1	49.8	1.22	6.7	101.4	19.57
2004-05	5.3	52.8	6.02	7.1	108.2	6.71
2005-06	5.3	55.4	4.92	7.2	111.4	2.96
2006-07	5.6	59.6	7.58	7.5	115.0	3.23
2007-08	5.8	63.5	6.54	7.8	125.9	9.48

Source: National Horticultural Board, data base 2007-08)

Structure and Composition of Indian Food Processing Industry

The food processing or food manufacturing industry includes companies that transform livestock and agricultural products into products used for intermediate or final consumption. Processed foods are products in which a raw commodity is transformed into a processed product regardless of whether the amount of processing is minor, such as canned fruit, or more complex, such as snack foods (U.S. Census Bureau 2004, Industry Outlook for Processed Foods). Through food processing value is added to the agricultural or horticultural produce by using various techniques including grading, sorting, packaging etc., which enhance the shelf life of food products. A strong and dynamic food processing sector plays significant role in the overall economic setup of a country. The sector provides vital linkages and synergies between industry and agriculture and has been identified as a sector having immediate potential for growth of the economy. Processing also helps in generating rural employment, additionally processed fruits and vegetables are a source of earning foreign exchange (Murthy and Dasaraju, 2011).

The extent of processing in India can be categorized as follows:

- Primary Processing; cleaning, grading, powdering and refining of agricultural produce, e.g., grinding wheat into flour.

- Secondary Processing: basic value addition, e.g., tomato-puree, ground coffee, processing of meat products.
- Tertiary Processing: high value addition products like jams, sauces, biscuits and other bakery products ready for consumption.

Food processing is a large sector in India that covers activities such as agriculture, horticulture, plantation, animal husbandry and fisheries. It also includes other industries that use agricultural inputs for manufacturing of edible products. The Ministry of Food Processing, Government of India divides the industry into six segments: Dairy, fruits & vegetable processing; Grain processing; Meat & poultry processing; Fisheries; and Consumer foods including packaged foods, beverages and packaged drinking water. In Table 3 various segments of India's food processing industry and examples of products produced in these sectors are presented.

Table 3: Segments of Food Processing Industry and Products Produced in India.

Sectors	Products
Dairy	Whole milk powder, skimmed milk powder, condensed milk, ice cream, butter and ghee, cheese
Fruits & Vegetables	Beverages, juices, concentrates, pulps, slices, frozen & dehydrated products, potato wafers/chips, etc
Grains & Cereals	Flour, bakeries, starch glucose, cornflakes, malted foods, vermicelli, beer and malt extracts, grain based alcohol
Fisheries	Frozen canned products mainly in fresh form
Meat & Poultry	Frozen and packed –mainly in fresh from egg powder
Consumer Foods	Snack food, namkeens, biscuits, ready to eat food, alcoholic and non-alcoholic beverages

Source: Ministry of food processing India, Annual report, 2004

Though the Indian food processing industry is large in size, it is still at a nascent stage in terms of development. Of the country's total agriculture and food produce, only 2 percent is processed. The industry size has been estimated at US$ 70 billion by the Ministry of Food Processing, Government of India. The food processing industry contributed 9 percent to India's GDP and had share of 6 percent in the total industrial production. The industry employs 1.6 million workers directly (Merchant, 2008). The industry grew at an estimated rate of 9.12 percent during the period 2002 to 2007. Value addition of food products is expected to increase from the current 8 percent to 35 percent by the end of 2025. Fruit & vegetable processing, which is currently around 2 percent of total production is expected to increase to 25 percent by 2025 (Food Processing, 2006).

India's processing industry is highly fragmented and is dominated by the unorganized sector. A number of players in this industry are small. About 42% of the output comes from the unorganized sector, 25% from the organized sector and the rest from small scale players. Though the unorganized segment varies across categories but approximately 75 percent of the market is still in this segment. The organized sector is relatively bigger in the secondary processing segment than the primary processing segment. The primary processing segment is also highly fragmented. Primary food processing is a major industry with a highly fragmented structure that includes hundreds of thousands of rice mills and hullers, flour mills and oil seeds mills, several thousands of traditional bakeries; food units and fruits, vegetable and spice processing units in

the unorganized sector (Food Processing, 2006). The most common type of food processing units that form the organized sector are flour mills, fish processing units, fruits and vegetables processing units, meat processing units, non-alcoholic and aerated drinks units, sugar units (mills) and modernized rice mills. While India's agricultural production base is quite strong, the food processing industry is still under developed. The highest share of the processed food is in the dairy sector, where 37 percent of total produce is processed, of which only 15% is processed by the organized sector. The processing level is around 2.2 percent in fruits and vegetables, 21% in meat and 6% in poultry products. Of the 2.2% processing in fruits and vegetables only 48% is in organized sector remaining in unorganized sector (Merchant, 2008).

Factors Affecting Food Processing Industry in India

The vision -2015 prepared by the Ministry of Food Processing Industries, Government of India, envisages to increase processing level of perishables from 6 to 20 percent , increase value addition from 20 to 34 percent and increase share in global trade from 1.6 percent to 3 percent, thus tripling the size of processing food industry by 2015. (Report of the Task Force, 2008). However, before this can be achieved a number of constraints must be removed. In Table 4 (See Appendix), major factors affecting beginning from production to distribution in the value chain are presented. These factors directly/ indirectly affect the Indian processing industry.

Constraints in Indian Food Processing Activities

Major constraints for the growth of the Indian food processing industry include the absence of adequate infrastructure, particularly rural road connectivity, inadequacy of information and marketing linkages, lack of electricity supply, and the absence of cold chain systems. The cold chain capacity caters to less than 10 percent of the produce and within that facilities are so rudimentary that over 80 percent are only capable of handling potatoes. Maintaining the standards of quality is another major constraint and there are two aspects to it. First, there is poor infrastructure for storing raw food materials. The two main types of storages – the warehouses and the cold storages, lag in storage standards. The pests infest the grains sometimes due to lack of monitoring, proper use of pesticides and proper ventilation. Similarly, the power outages result in suboptimal function of the cold-storages and the quality of food material in the cold storages becomes questionable. The second important aspect is having poor quality standards and control methods for implementing the quality standards for processing and packaging the processed foods. For example, vegetables may not be washed properly and processed into either 'ready to eat food' or packaged as 'cut and ready to cook' vegetables. High costs and low availability of credit remain a problem because even within the priority sector, lending by banks for agriculture, food processing receives only 4.5 per cent of the ear marked credit. The regulatory framework preventing farmers from directly marketing their produce, except through designated agricultural markets adds to cost and impairs flexibility. Packaging is usually poor but its cost is high and become unbearable for small producers. Another important constraint is the legal framework-currently; food laws span nine ministries, comprising 13 central orders alone. In addition, states have their own control orders. In Table 5, SWOT analysis of Indian food processing industry is presented.

Table 5: SWOT Analysis of Agro-Processing Industry Infrastructure in India

Strengths	Weaknesses	Opportunities	Threats
Round the year availability of raw materials. Social acceptability of agro-processing as important area and support from the central government. Vast network of manufacturing facilities all over the country. Vast domestic market.	High requirement of working capital Low availability of new reliable and better accuracy instruments and equipments Inadequate automation w.r.t. information management. Remuneration less attractive for talent in comparison to contemporary disciplines. Inadequately developed linkages between R&D labs and industry.	Large crop and material base in the country due to agro-ecological variability offers vast potential for agro processing activities. Integration of developments in contemporary technologies such as electronics, material science, computer, bio-technology etc. offer vast scope for rapid improvement and progress. Opening of global markets may lead to export of our developed technologies and facilitate generation of additional income and employment opportunities.	Competition from global players Loss of trained manpower to other industries and other professions due to better working conditions prevailing there may lead to further shortage of manpower. Rapid developments in contemporary and requirements of the industry may lead to fast obsolescence.

Conclusions

Though there are many promising dynamics which support good growth of this industry, there are still some significant constraints which, if not addressed sooner, can impede the growth prospects of the Food Processing Industry in India. One of the biggest constraints is that this industry is capital intensive. It creates a strong entry barrier and allows limited number of players to enter the market. Players mean competition which reduces efforts to improve quality standards. Major challenges faced by the Indian food processing industry include: educating consumers that processed foods can be more nutritious; dealing with low price elasticity for processed food products; need for distribution network; development of marketing channels; streamlining of food laws; improving food quality standards and strengthening food testing network; strengthening institutional framework to develop manpower for improving R&D capabilities to address global challenges. These challenges must be addressed to achieve full potential of the Indian food processing industry.

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Appendix

Table 4: Factors Affecting Production, Processing, and Distribution in India

	Production	Output Trading	Processing	Distribution/Retailing
Skill	Traditional methods of farming	Trading by adthiyas whose skills sets are traditional.	Exposure to low scale operations. Limitations in Retail Management purchase skill and management of large operations.	Skills required for modern retail formats relatively unknown.
Technology	No/low use of technology Low levels of mechanization. Low use of hybrids, biotechnology.	Very low investment in storage & handling technology Few upcoming commodity exchanges	Outdated technology due to small scale operations Low capacity units	Use of technology is low Bar coding, supply chain linkages and use of IT is low
Regulations	Corporates not allowed in non-plantation farming No enforceability in contract farming	Procurement intervention by Govt. agencies MSP policy Restriction on storage and movement	Favorable to small scale investments Scope for large processors limited	Foreign Direct Investment not allowed Land cost high due to inaction on land development
Capital	Funds availability to farmers is poor 80% borrow from adthiyas at very high rates	Controlled by small trader financiers	High cost finance	Flow of capital is restricted due to ban on FDI
Structure	Subscale farm sizes Farmer indebtness 70 % rainfall dependent	Large number of small trader-financiers Upcoming exchanges High wastage and transaction costs	Predominant small scale sector Low efficiency	Dominance of informal sector Small traditional family owned stores are the norms No/limited backwards linkages Large MNCs have good distribution channels

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Pigeonpea as a Niche Crop for Small Farmers

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Abstract

Pigeonpea is a nutritious legume crop that has the ability to fix nitrogen, grow on marginal lands and has multipurpose use for human consumption, animal feed and fuel. India is the largest producer and consumer of the crop. However, there is growing interest to produce the crop by other countries including the United States. The focus of this study was to examine the role of row spacing on yield. Using Analysis of Variance (ANOVA) it was found that spacing affects yield. That is, the more the spacing the more the yield.

Keywords: Pigeonpea, Niche crop, Small Farmers, Tennessee, Analysis of Variance.

Introduction

Small Farms, which make up approximately 91% of all farms in the United States, are diverse (Hoppe 2010; USDA 2007). They control a significant share of farm assets and are important for the vitality of rural communities (USDA 1998; Steele 1997). They also participate in government programs such as the Conservation Reserve Program (CRP) and the Wetlands Reserve Program (WRP). Despite their number and importance, small farmers continue to face a number of challenges arising from domestic policy changes, globalization, concentrated and vertically integrated large farm operations that dominate national and international markets (Ebodaghe 2009; Tegegne et al. 2004).

Small farmers can use different strategies to deal with the above challenges including diversification of their farm operations, introducing on farm value adding activities, as well as strengthening farmers' networks to improve market access using different marketing channels (Mishra et al. 2004; Tubene and Hanson 2002).

One possible niche crop is Pigeonpea (Cajanus cajan L. Millsp), a low input, and warm season grain legume. It is tolerant of dry weather and poor soil conditions (Metz et al. 2007; Phatak et al. (1993). It grows well on marginal lands and being a deep-rooted crop, is drought tolerant and capable of growing in semi-arid conditions with less than 635 mm of rainfall (Baryeh and Mangope, 2002). Its deep tap root and abundance of organic matter is known to improve soil and soil water storage. It has capability to fix nitrogen and is noted for its great soil adaptability than other legumes. Pigeonpea seeds are nutritious, have high-protein (21%) with high protein digestibility (68%), low in fat, sodium, have zero cholesterol, and high dietary fibers (Morton, 1976; Salunkhe et al. 1986; Sinha et al. 1977). The crop ranks sixth in the World in dry land legume production (Arnold, 2002). It provides healthy food for humans; animal feed and fuel (Whiteman et al., 1981). India is the largest producer and consumer of the crop.

Work by Metz et al. 2007; Phatak et al. (1993) have underscored the potential of pigeonpea production in the Southeastern United States. Studies by Rao et al. (2002; 2003) have focused on production and use of the crop for forage. Currently there is work underway at Tennessee State University, Alabama A and M University and Virginia State University with funding support from the United States Department of Agriculture (USDA). Similar work is also being done at Texas A and M University and USDA, ARS laboratory in Oklahoma.

The pigeonpea market is highly globalized, very competitive and dominated by India: the major producer and consumer. However, the market for it has been increasing outside Asian and Africa countries into Europe, the United States and Canada due to migration and increase in ethnic populations, especially in large cities. However, the Indian market still remains the largest (Rusike and Dimes 2004). Work by Lucier et al. (2000), shows increase in per capita bean consumption in the United States due to interest in ethnic foods cooked with dry beans and change in America's dietary awareness. The objective of this study is to assess the impact of spacing on yield and make exploratory evaluation of the market for the crop in the Nashville area.

Materials and Method

This study was carried out on Tennessee State University Agricultural Research and Demonstration farm in 2006. A Complete Randomized Block Design (CRBD) with four replications. The four pigeonpea cultivars used were (Georgia 1, Georgia 2, W-1 and W-2). The first two cultivars are developed at University of Georgia and hence named accordingly while the latter two are merely designated as White seeded varieties. The seeds were planted using two types of row spacing (10ft x 10ft and 40ft x 40 inch). Land preparation was done and pre-emergence herbicide was applied for weed control. The soil type on the plot where the crop is planted is armour with its texture being armour silt loam. Soil test was done to determine the appropriate application rate of fertilizer and other inputs. During planting inoculant was used to enhance seed germination. The crop was manually harvested at different time intervals and shelled. Yield data for the different varieties was averaged. Analysis Of Variance (ANOVA) was used to assess the impact of spacing on the different pigeonpea cultivars and average yield per acre.

Results and Discussion

Table 1 below provides average yield per acre in 2006 for the four varieties. It shows the yield is higher for all varieties when spacing is large.

Table 1. Spacing and Yield Data

Spacing	Treatment Variety	Average Yield/Acre (in lbs)
10ft x 10ft	Georgia 1	2035
	Georgia 2	995
	W-1	1054
	W-2	799
40iWork inch x 40ft x 4 rows by 3 replications	Georgia 1	2764
	Georgia 2	2253
	W-1	2216
	W-2	2834

Table 2 shows the results of analysis of the Data on the average yield per acre for each pigeonpea variety and spacing. It indicates that there is no significant difference between average yield per acre for pigeonpea varieties overall. The results also show that there is a significant difference between spacing. Finally, there is no significant interaction between varieties and spacing.

Table 2. Result of Data Analysis

ANOVA: Two-Factor With Replication						
SUMMARY	**Georgia 1**	**Georgia 2**	**W-1**	**W-2**	**Total**	
10						
Count	3	3	3	3	12	
Sum	6104	2986	3161	2398	14649	
Average	2034.666667	995.333333	1053.667	799.3333	1220.75	
Variance	253461.3333	11529.3333	360390.3	51484.33	373643.3	
40						
Count	3	3	3	3	12	
Sum	8293	6758	6649	8502	30202	
Average	2764.333333	2252.66667	2216.333	2834	2516.833	
Variance	1436356.333	1287108.33	241580.3	368311	693865.2	
Total						
Count	6	6	6	6		
Sum	14397	9744	9810	10900		
Average	2399.5	1624	1635	1816.667		
Variance	835651.1	993721.2	646326.4	1409879		
ANOVA						
Source of Variation	***SS***	***df***	***MS***	***F***	***P-value***	***F crit***
Sample	10078992.04	1	10078992	20.10661	0.000376	4.493998
Columns	2393699.125	3	797899.7	1.591732	0.230531	3.238872
Interaction	1328452.125	3	442817.4	0.883377	0.470619	3.238872
Within	8020442.667	16	501277.7			
Total	21821585.96	23				

Work by others support our finding that there is link between yield and spacing (for instance, see Faroda and Johri, 1981).

Summary and Conclusions

Pigeonpea is a nutritious crop that has a number of other desirable qualities. These include its ability to fix nitrogen, grow on marginal lands and multipurpose use for human consumption, animal feed and fuel. The focus of this study was to examine the role of row spacing on yield and explore market potential of the crop. This study found that spacing affects yield. That is, the more the spacing the more the yield. India is the largest producer and consumer of the crop. However, there is growing interest to produce the crop by other countries including the United States. Some universities in the Southern region are engaged in studies involving the crop with funding support from various agencies including the United States Department of Agriculture. Market assessment for the crop was done by holding face to face meetings with managers of ethnic and other food stores as well as vendors at farmers market in the metro Nashville area. All expressed their willingness to buy large quantities of the crop at competitive price. Thus, growing pigeonpea can provide opportunity for small farmers to earn addition income and supply healthy nutritious food for consumers.

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A Case Study Examination of Social Norms Marketing Campaign to Improve Responsible Drinking

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Abstract

This research discusses the use of social norms marketing to improve responsible drinking among college students. It was observed in each year of research that students studied overestimated their peers' drinking practices. During the social norms marketing campaign decreases were observed in both students' self-reported number of drinks consumed and perceived number of drinks consumed by peers at bars or parties, indicating that the social norms marketing efforts were somewhat successful. In addition, students reported drinking less alcohol over a shorter period of time. However, some negative behaviors related to drinking did not improve.

Keywords: Social norms marketing, responsible drinking

Background

Irresponsible alcohol consumption among young adults has been a problem in society for many years. Social norms marketing is an approach used to encourage responsible drinking among college students. Social norms are people's beliefs about the attitudes and behaviors that are considered normal within a particular social context. Most people tend to adopt group attitudes and act in accordance with perceived group behaviors for needs of affiliation and acceptance (Festinger 1954). These perceived norms greatly influence their own behavior. However, if people misperceive this norm, and think that it is more or less common than is actually the case, they may choose to engage in behaviors that are in-sync with the false norm. Social norms theory predicts that many people, both young adults and adults, will overestimate their peers' drinking practices, and that this overestimation will directly affect their own drinking behavior. If educated of the true norm and expected alcohol consumption patterns, then individual consumption will likely decrease (Berkowitz 2004).

While social norms are the perceptions of the attitudes and behaviors prevalent among the members of a community or society, social marketing is the application of commercial marketing technologies and techniques to the analysis, planning, execution, and evaluation of programs designed to influence the behavior of a target group (Armstrong and Kotler 2010).

The application of social norms theory to college drinking practices was first suggested by Dr. H. Wesley Perkins and Dr. Alan Berkowitz in 1986 (Berkowitz et al., 1986). Findings from the Berkowitz and Perkins college-based studies revealed a pattern of misperceptions held by students in regards to the drinking behavior of their peers. Most students perceived the norms for frequency and quantity of alcohol consumption of their peers to be much higher than was actually the case. The reduction and decline of college-based, alcohol related abuse and harm can be done by correcting negative misperceptions (Berkowitz et al. 1987). Using a sample of 76,000 students attending 130 different universities across the country, the correlation between student's misperceptions and students drinking behavior was shown. The majority of the students surveyed overestimated the amount of alcohol consumed by their peers. Additionally, the overestimation was the predictor for the amount of alcohol personally consumed by the same students (Perkins et al. 2005).

Case Study Research Design

In order to examine the social norms theory and the impact of a social marketing campaign at a Cal State University campus, a simulated before and after experimental marketing research design was used to eliminate the impact of pre-measurement error during the later phases of the studies (Churchill 1987). During the spring quarters of 2004, 2005 and 2007, a total 1,451 questionnaires were conducted through personal interviews and 1,230 respondents were drinkers of alcoholic beverages, Table 1. The simulated before and after design dictated that different students were interviewed during each phase of the research. Each phase of the research interviewed a representative sample of the Cal State University Student body. Questions in the survey addressed students' own alcohol related behavior and the perceived behavior of their peers.

Table 1. Questionnaires collected

	2004	2005	2007	Total
Drinkers	438	406	386	1230
Total Sample	534	471	446	1451

Impact of Social Norma Campaign on Student Attitudes and Behavior

Data obtained from the first phase of the survey in 2004 was used as the baseline data and provided the rationale for the Under Four social norms marketing campaign developed by a group of business students at Cal State University in a senior project class. Social norms theory states that students typically overestimate their peers' drinking behavior and believe that their peers consume more alcohol than is actually the case. The results from the baseline data agreed with this theory. In 2004, Cal State University students' reported that they on average consumed 3.9 drinks in at bars or parties; however, they perceived that their peers, the typical Cal State University student, consumed on average 4.9 drinks at bars or parties. The average of 3.9 and 4.9 included the responses of non-drinkers. The average number of drinks consumed at bars or parties among drinkers was self-reported to be 4.62 and perceived to be 5.04 for the typical Cal State University student on the campus examined in this research.

Since students self-reported (including non-drinkers) that they drank less than four drinks at bars or parties, but they perceived their peers to drink 4.9, a creative and informative marketing campaign developed by the students used the slogan "Under Four" to communicate the norm to students. The marketing campaign included print advertisements in the campus newspaper, full-color posters at many campus locations, banners, promotional gifts, and events. The campaign was launched in 2004 and continued through 2007. It achieved 78% aided awareness in 2006 based on additional survey research. Therefore, a majority of the students were aware of the campaign and its message.

After the first year of the research period and implementation of the social norms marketing campaign which was executed commencing in the Fall of 2004 and continued through the Spring of 2007, the proportion of students who had been exposed to messages about what other students were thinking and doing regarding alcohol use increased significantly (Table 2). This indicates that the campaign and study was having an impact on the students, and students were able to remember seeing the messages.

Table 2. Exposure to information or messages about what Cal Poly students think and do regarding alcohol use (among drinkers)

	2004 N=422	2005 N=400	2007 N=376	Total N=1198	P-Value
Never	28.4%	9.8%	12.0%	17.0%	
Once	18.7%	8.5%	11.7%	13.1%	
Twice	21.1%	18.0%	14.4%	17.9%	
3 Times	12.8%	15.5%	18.9%	15.6%	
4 Times	5.0%	11.5%	7.4%	7.9%	
5 or more Times	14.0%	36.8%	35.6%	28.4%	.000**

**Significant at the .05 level
*Significant at the .10 level

Self, Compared to Typical Cal State University Student

As discussed, in 2004, the baseline year of the study, there was a significant difference between students' self-reported average number of drinks consumed typically at parties and bars students' and perceived average number of drinks consumed among their fellow Cal State University students consumed typically at parties and bars. Cal State University students were reminded through the marketing campaign that their peers actually drink less alcohol than they may perceive them to drink. After exposure to the social norms marketing campaign in 2005 and 2007, a significant difference was still observed between students' self-reported average drinks consumed typically at parties and bars and the perceived consumption among their peers. In each year of the study, students consistently overestimated their peers' typical drinking practices at parties and bars, which is consistent with the social norms theory (Table 3). Although students continued to overestimate the alcohol consumptions of their peers, the self-reported alcohol consumption consumed typically at parties and bars experienced a decrease of 5%, from 4.62 drinks in 2004 to 4.39 drinks in 2007, another finding that is consistent with the social norms theory.

Table 3. Number of alcoholic drinks consumed by Cal Poly students at parties or bars (among drinkers)

	Students' Self-Reported (Yourself) N=434	**Students' Perceived (Cal Poly Students) N= 434**	**P-Value**
Year 1: 2004	4.62	5.04	.000**
	N=406	N=406	
Year 2: 2005	4.58	4.79	.034**
	N=385	N=385	
Year 3: 2007	4.39	4.99	.000**

**Significant at the .05 level
*Significant at the .10 level

Self-Reported Greatest Number, Last Time Number of Drinks and Hours Drinking

When students were asked to identify the greatest number of drinks consumed in one sitting and the hours it took to consume those drinks, no significant difference was found during the research period (Table 4). However, there was a significant difference between students' self-reported last time drank number of drinks over the research period. In 2004, students indicated on average that the last time they consumed alcohol they were consuming almost four and a half drinks in one sitting. In 2007, the average number of last time drank number of drinks decreased significantly to slightly over four drinks in one sitting and was considerably lower than the average reported for both 2004 and 2005 (Table 4).

During the research period there was a significant difference in the length of time students drank during their last time drinking. The first year of the study, students' drinking was spanning a time period of over three and half hours. Between 2004 and 2007, that length of time decreased significantly to a little over three hours, indicating that students were drinking a lower number of alcoholic beverages in a shorter length of time (Tables 4 and 5). Although the extreme behavior,

most drinks, remained the same, the typical behavior at parties and bars and last time improved during the period of the marketing campaign. This data is consistent with the finding that irresponsible drinking behavior was becoming less acceptable. And, although students were consuming alcohol over a shorter period of time (in one sitting) they were in fact drinking less alcohol in that shorter period of time.

Table 4. Greatest number of drinks, last time drank number of drinks and length of time (among drinkers)

	2004 N=438	**2005 N=405**	**2007 N=386**	**Total N=1229**	**Sig. One-Way ANOVA**
Greatest Number of Drinks (Mean)	5.43	5.34	5.32	5.36	.856
	N= 436	N=405	N=386	N=1229	
Hours (Mean)	3.46	3.53	3.60	3.53	.590
	N=435	N=405	N=385	N=1225	
Last Time Drank Number of Drinks (Mean)	4.49	4.62	4.12	4.42	.017**
	N=437	N=405	N=384	N=1226	
Hours (Mean)	3.40	3.36	3.10	3.30	.033**

**Significant at the .05 level
*Significant at the .10 level

Table 5. Multiple comparisons between last time drank number of drinks and length of time (among drinkers)

Last Time Drank Number of Drinks Consumed in One Sitting	**Year**	**Comparison Years**	**Mean Difference**	**Sig Tukey Test**
	2004	2005	-.12452	.758
		2007	.37303	.091 *
	2005	2004	.12452	.758
		2007	.49755	.017**
	2007	2004	-.37303	.091*
		2005	-.49755	.017**
Spanning How Many Hours	Year	Comparison Years	Mean Difference	Sig
	2004	2005	.04171	.938
		2007	.30284	.038**
	2005	2004	-.04171	.938
		2007	.26113	.096*
	2007	2004	-.30284	.038**
		2005	-.26113	.096*

**Significant at the .05 level
*Significant at the .10 level

Negative Behaviors

Although the number of self-reported drinks declined during the study, twenty percent of students reported that they were hurt or injured due to their drinking two or more times in a year. The proportion fluctuated over the course of the study, increasing between 2004 and 2005. The

majority of the student population (almost 80%) never to rarely experienced injury due to drinking (Table 6). This result is similar to the data observed by the National Social Norms Resource Center, that three-quarters of students employ at least one protective behavior to help lessen the chances of them causing harm to themselves or to others (NSNRC 2008). However, it is alarming that almost one-fifth of the Cal State University students on the campus studied did get hurt from drinking more than once.

Table 6. Number of times students experienced negative behaviors due to drinking: were hurt or injured (among drinkers)

	2004 N=432	**2005 N=400**	**2007 N=377**	**Total N=1209**	**P-Value**
Never to Once	81.5%	73.3%	84.1%	79.6%	
Twice to Three +	18.5%	26.8%	15.9%	20.4%	.000**

**Significant at the .05 level
*Significant at the .10 level

Another alarming statistic observed from this research was that approximately 15% of students were taken advantage of sexually while drinking and 4% admitted taking advantage of another sexually while drinking (Tables 7 and 8). Neither of these negative behaviors improved during the social norms marketing campaign.

Table 7. Number of times students experienced negative behaviors due to drinking: were taken advantage of sexually (among drinkers)

	2004 N=435	**2005 N=397**	**2007 N=376**	**Total N=1206**	**P-Value**
Never	83.0%	86.4%	84.9%	84.7%	
Once to Three +	17.0%	13.6%	15.1%	15.3%	.704

**Significant at the .05 level
*Significant at the .10 level

Table 8. Number of times students experienced negative behaviors due to drinking: took advantage of another sexually (among drinkers)

	2004 N=432	**2005 N=398**	**2007 N=376**	**Total N=1206**	**P-Value**
Never	94.7%	96.0%	97.1%	95.9%	
Once to Three +	5.3%	4.0%	2.9%	4.1%	.335

**Significant at the .05 level
*Significant at the .10 level

Students showed an improvement during the research period when drinking in environments where they knew they would be safe. Those students who indicated they "rarely" engaged in this positive responsible behavior slowly decreased from 2004 to 2007. Similarly, the number of students who "usually to always" engaged in this behavior increased between 2004 and 2007, rising almost 10 percentage points from 61.9% to 71.1% (Table 9).

Table 9. How often students drank in environments where they knew they would be safe (among drinkers)

	2004 N=431	2005 N=395	2007 N=367	Total N=1193	P-Value
Rarely	20.4%	15.9%	14.2%	17.0%	
Sometimes	17.6%	17.7%	14.7%	16.8%	
Usually to always	61.9%	66.3%	71.1%	66.2%	.067*

**Significant at the .05 level
*Significant at the .10 level

Conclusions and Recommendations

In an effort to promote responsible drinking behavior and correct negative misperceptions about alcohol consumption at a California State University campus, social norms marketing was used by a group of senior project students. It was observed in each year of research that students at the Cal State University campus studied overestimated their peers' drinking practices. During the social norms marketing campaign decreases were observed in both students' self-reported number of drinks consumed and perceived number of drinks consumed by peers at bars or parties, indicating that the social norms marketing efforts were somewhat successful. In addition, students reported drinking less alcohol over a shorter period of time. Decreases were observed in the average number of drinks most recently consumed and the length of time used to consume those drinks.

There were no improvements in such negative behaviors as being taken advantage of sexually, taking advantage of another sexually, and binge drinking. Thus, the social norms marketing campaign appears to have some positive impacts on the student alcohol consumption behavior. However, additional outreach was needed to improve responsible drinking behavior among the students at the Cal State University observed during this research.

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A Comparison of Attitudes toward Food and Biotechnology in the U.S., Japan, and Italy

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Abstract

This research compares the attitudes of consumers in the United States, Italy and Japan toward food characteristics. The U.S. and Japanese consumers had relatively positive attitudes toward genetically modified food, while the Italian consumer had relatively negative attitudes. The Italian consumer was least likely to be familiar with genetically modified food. They rated organic higher than the U.S. consumer and they appeared to understand the meaning of the term organic better than the U.S. consumers. The U.S. and Japanese consumers were more concerned with freshness and value while the Italian consumers were concerned about the environment and local food.

Keywords: genetically modified food, organic, local, environmentally friendly

Introduction

A study by Vance Publishing in Fresh Trends 2001, found that American consumers felt it was appropriate to modify food items genetically to: be more resistant to plant disease and less reliant on pesticides, 70%; help prevent disease, 64%; improve nutritional value, 58%; improve flavor, 49%; and extend shelf life, 48%. By contrast, in the European Union (EU) the consumer generally views that genetically modified foods as unhealthy. A survey cited by the EU found that most Europeans see genetically modified food as health hazards, despite assurances from producers (Robert Wielaard, 2001). In November 1999, the European Commission passed a law requiring all European retailers to label food containing more than 1% genetically modified ingredients. The Commission also required restaurants to inform consumers if meals contained genetically modified ingredients. Similar to the EU, Japan requires the labeling of foods produced with genetically modified ingredients. According to the Ministry of Health, Labor and Welfare, the labeling of GM foods has been required in Japan since 2001 (The Ministry of Economy, Trade, and Industry, 2002)

The purpose of this research is to compare the attitudes of consumers in the United States, Italy and Japan toward food characteristics. Differences in attitudes between the U.S., Italian, and Japanese respondents concerning the following are examined in this research: organic food, genetically modified food, food labeling, locally grown food, environmentally grown, food grown in own country, food traceability, use of irradiation, and price.

Methodology

The research uses a survey instrument that was administered through the use of a personal interview during the fall of 2002 and winter of 2003 in the United States and in the winter of 2003 in Italy, and the spring of 2003 in Japan. The random sample of 550 food shoppers for the United States was collected in San Luis Obispo County, California. San Luis Obispo County was designated the best test market in the United States by Demographics Daily (Jackoway 2001). San Luis Obispo was found to be the best of 3,141 counties to represent a microcosm of the United States based on 33 statistical indicators. The random sample of 200 food shoppers for Italy was collected in Modena, Italy during the winter of 2003. The random sample of 128 food shoppers for Japan was collected in Tokyo and Chiba, Japan during the spring of 2003.

Attitudes Toward Food

Attitudes toward Genetically Modified Foods

In order to examine general attitudes concerning the purchasing of genetically modified food, consumers were asked: "How likely are you to purchase a food product that has been genetically modified where definitely = 5, probably = 4, maybe = 3, probably not = 2, and definitely not = 1. It is important to note that this question is a general attitudinal question and is not used for forecasting the purchase probability of a specific product at a specific price. Tables 1 and 2 show that consumers in the U.S. and Japan both indicated a higher purchase probability than those in Italy.

The Italian consumer indicated, probably not, while the U.S. and Japanese consumers indicated probably not to maybe (Table 1).

Table 1. Mean likelihood to purchase genetically modified food

	US N=550	Italy N=200	Japan N=128	F
Likelihood to purchase genetically modified food	2.8336 [1]	2.095 [2]	2.6797 [1]	41.048**

Table 2. Tukey Post Hoc Likelihood of purchasing genetically modified food

		Mean Difference	Sig.
US	**Italy**	0.7386**	0
	Japan	0.154	0.252
Italy	**US**	-0.7386**	0
	Japan	-0.5847**	0

Tables 3 and 4 show that the U.S. consumer was more familiar with genetically modified food than the Italian and Japanese consumers. Further, the Japanese consumer was less likely to be very or somewhat familiar with genetically modified food than the U.S. consumer (Table 3).

Table 3. Familiarity with Genetically Modified Food

	Country				Chi Square
Familiarity with Genetically Modified Food	**US**	**Italy**	**Japan**	**Total**	50.465**
Not at all familiar	21.40%	16.50%	4.00%	17.70%	
Not very familiar	37.80%	55.50%	62.70%	45.40%	
Somewhat familiar	32.70%	24.00%	31.70%	30.50%	
Very familiar	8.20%	4.00%	1.60%	6.30%	

** Significant at the .05 level

Table 4. Familiarity with GMO foods

	U.S.	Japan	Chi Square
Not at all	21.4%	4%	38.572 **
Not very familiar	37.8%	62.7%	
Somewhat familiar	32.7%	31.7%%	
Very familiar	8.2%	1.6%	

** Significant at the .05 level

Tables 5 and 6 show that consumers in Italy, where there is mandatory labeling of genetically modified foods, indicated that labeling is more important to them than to consumers in the United States and Japan. Although Japan requires labeling, it was less important to Japanese consumers than to the Italian consumer and the U.S. consumer. A survey conducted by the Japanese government indicated that other labeling issues are more important to the Japanese (Quality-of-life Policy Bureau Consumer Policy Division, 2002)

Table 5. Importance of imposing mandatory labeling by government

Mandatory Labeling of Genetically Modified Food	Country			Total	Chi Square
	US	Italy	Japan		77.601**
Not at all important	4.20%	0.50%	15.00%	4.90%	
Not very important	14.90%	6.00%	15.00%	12.90%	
Somewhat important	36.40%	23.00%	20.50%	31.10%	
Very important	44.40%	70.50%	49.60%	51.10%	

** Significant at the .05 level
* Significant at the .10 level

Table 6. Importance of imposing mandatory labeling by government

	The U.S.	Japan	Chi Square
Not at all important	4.2 %	15%	24.706**
Not very important	14.9%	15%	
Somewhat important	36.4%	20.5%	
Very important	44.4%	49.6%	

** Significant at the .05 level

Desirability Ratings of Food Characteristics

Consumers were asked to rate the desirability of nineteen characteristics of food to them when they make a decision to purchase food. They were asked the following question: "The following list shows features people may look for when they purchase food. Please indicate the desirability of each feature by giving me a number from one to five. Five means the feature is extremely desirable, three means it is somewhat desirable, and one means the feature is not desirable at all to you when you purchase food. If no single answer captures your feelings completely, please circle the closest number. Please try to use all the numbers in the scale."

Analysis of the mean ratings of the interval data in Table 7 indicates that there were many differences in the importance of individual characteristics to consumers in the U.S., Japan, and Italy. The superscripts show the ranking of the mean rating between countries for the attribute listed. The same superscript for two countries implies there is no difference in the mean rating of the attribute between the two countries. Fresh looking, fresh tasting and high quality were more important to consumers in the U.S. than to consumers in Italy and Japan. Fresh looking was equally important to consumers in Italy and Japan. Consumers in the U.S. indicated that a good value for the money was more important to them than consumers in Italy and Japan. However, U.S. and Japanese consumers rated inexpensive as a more desirable characteristic of food than consumers from Italy. The Italian consumers rated the environmental characteristics higher than consumers in the U.S. and Japan. The Italian consumers rated free of pesticides, good for the environment, grown in my local area, can be traced back to the processor and grower, and GMO free higher than consumers in the U.S. and Japan. Thus, it appears that the U.S. and Japanese consumers were more concerned with freshness and value of food products while the Italian consumers were concerned about the environment and the source of the food.

While Table 7 reports the mean ratings of the food characteristics, Table 8 generates a ranking of attributes based on the means. It is important to note that grown using biotechnology and genetically modified are the two lowest ranked characteristics for U.S. and Italian consumers. Grown using biotechnology is the second lowest characteristic for Japanese consumers and genetically modified is the eleventh characteristic. Thus, consumers in all of the countries rated the tangible characteristics of food such as those relating to freshness, quality, and price higher than the characteristics relating to the environment and biotechnology.

Table 7. Desirability characteristics of food

Food Characteristics	US[a]	Italy[a]	Japan[a]	F
fresh looking	4.6909[1]	4.26[2]	4.1484[2]	7.193**
fresh tasting	4.6909[1]	4.44[2]	4.2656[3]	23.809**
high quality	4.5428[1]	4.295[2]	3.6535[3]	59.415**
a good value for the money	4.3909[1]	3.72[3]	4.0313[2]	46.189**
high in nutrition	4.28[1]	3.93[2]	3.7559[2]	22.471**
Inexpensive	3.7527[1]	3.075[2]	3.7266[1]	30.564**
grown in my country	3.6764	3.725	3.7063	0.101
can be prepared quickly	3.6491[1]	3.405[2]	2.9681[3]	15.705**
free of pesticides	3.6436[2]	4.225[1]	3.874[2]	18.634**
good for the environment	3.5764[2]	3.89[1]	3.4016[2]	8.279**
grown in my local area	3.3418[2]	3.855[1]	3.1875[2]	17.818**
safe for the workman	3.3376	3.505	3.4766	1.543
can be traced back to the processor and grower	3.3164[2]	3.58[1]	3.0732[2]	6.496**
gourmet ingredients	2.8909[2]	3.365[1]	2.5556[3]	20.548**
irradiated to kill bacteria	2.8355[2]	1.95[3]	3.7583[1]	79.453**
organically grown	2.8309[2]	3.05[1]	3.1953[1]	5.654**
GMO free	2.7103[3]	4.065[1]	3.7344[2]	93.891**
grown using bio-technology	2.1985[2]	1.67[3]	2.8125[1]	42.376**
genetically modified	2.0348[2]	1.58[3]	3.5159[1]	127.086**

** Significant at the .05 level * Significant at the .10 level [a]Superscripts indicate differences at the .10 level based on Tukey Post Hoc test, different numbers indicate differenced. Same numbers indicate the same rating.

Table 8. Desirability ranking characteristics of food

Food Characteristics	US	Italy	Japan
fresh looking	1	3	2
fresh tasting	2	1	1
high quality	3	2	10
a good value for the money	4	10	3
high in nutrition	5	6	6
Inexpensive	6	15	8
grown in my country	7	9	9
can be prepared quickly	8	13	17
free of pesticides	9	4	4
good for the environment	10	7	13
grown in my local area	11	8	15
safe for the workman	12	12	12
can be traced back to the processor and grower	13	11	16
gourmet ingredients	14	14	19
irradiated to kill bacteria	15	17	5
organically grown	16	16	14
GMO free	17	5	7
grown using bio-technology	18	18	18
genetically modified	19	19	11

Meal and Food Purchasing Behavior

Table 9 shows whether consumers purchased organic products in the past year. In the attribute ratings, the Japanese and Italian consumers rated organic as more desirable than the U.S. consumer. A greater percentage of Japanese consumers purchased organic products in the past year. However, the U.S. and Italian consumers indicated a similar purchase incidence. Although the Japanese consumers were more likely to have purchased an organic product, Table 10 shows that the U.S. and Italian consumers purchased a greater variety of organic food products.

Table 9. Have purchased organic in the past year

	Country			Total	
	US	**Italy**	**Japan**		**Chi Square**
Have purchased organic	66.20%	63.00%	75.80%	66.90%	6.04**

** Significant at the .05 level

Table 10. Types of organic food purchased

	Country			Total	
	US	**Italy**	**Japan**		**Chi Square**
Meats	20.90%	21.50%	9.40%	19.40%	9.606**
Milk	28.20%	33.50%	21.90%	28.50%	5.241*
Other dairy products (excluding Milk)	23.80%	28.00%	6.30%	22.20%	23.576**
Fresh fruits	62.2%	44.50%	39.8	10.40%	31.426**
Fresh vegetables	62.70%	38.00%	71.10%	58.30%	46.958**
Wine	14.00%	13.00%	8.60%	13.00%	2.688
Bakery items (Including bread)	21.80%	23.50%	25.80%	22.80%	1.004
Other	16.90%	16.50%	8.60%	15.60%	5.61*

** Significant at the .05 level

In research concerning organic lettuce, Wolf has shown that there appears to be confusion in consumers' understanding of the properties of organic food in the United States. For example in the examination of organic lettuce, it was found that consumers value the organic characteristics of lettuce such as environmentally friendly as somewhat to very desirable, while they rate organically grown and certified as only slightly to somewhat desirable. Thus, Wolf hypothesized that consumers do not understand the properties of organic foods (Wolf 2002). This research has attempted to address the possible misconceptions of consumers by examining their responses to the question: "How strongly do you agree or disagree that all produce sold at a farmers' market is organic?" The farmers' markets in the research region in the United States were observed to sell primarily conventionally grown produce. Therefore, respondents that either agree or strongly agree are consumers that are likely confused about the attributes of organic produce. Since there were no farmers' markets in the areas where the research was conducted in Japan at the time, this question was excluded in the Japanese research. Almost a third of consumers in the Unites States agreed that all produce sold at farmers' market is organic. Only 18.5% of consumers in Italy agreed that all produce sold at farmers' market is organic. Therefore, it appears that the Italian consumer had a better understanding of organic food than the consumer in the United States. Perhaps the better understanding is related to why the Italian consumers rated the environmental characteristics higher than consumers in the U.S. and Japan.

Conclusions

A comparison of the U.S., Italian, and Japanese consumer indicated that there were many differences their attitudes toward food, organics, and the use of biotechnology in food production. The U.S. and Japanese consumers had relatively positive attitudes toward genetically modified food, while the Italian consumer had a relatively negative attitude toward genetically modified food. The Italian consumer was least likely to be familiar with genetically modified food. The Italian consumers rated organic higher than the U.S. consumer and they appeared to understand the meaning of the term organic better than the U.S. consumers.

The Italian consumers rated free of pesticides, good for the environment, grown in my local area, can be traced back to the processor and grower, and GMO free higher than consumers in the U.S. and Japan. The U.S. and Japanese consumers were more concerned with freshness and value of food products while the Italian consumers were concerned about the environment and the source of the food.

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Table 11. All produce products sold at farmers' markets are organic

	Country		Total	Chi Square
	US	**Italy**		12.463**
Strongly disagree	18.00%	23.00%	19.40%	
Disagree	50.60%	58.50%	52.70%	
Agree	27.30%	15.50%	24.20%	
Strongly Agree	4.00%	3.00%	3.70%	

** Significant at the .05 level

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Potential Benefits of Extended Season Sales through Direct Markets

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Abstract

Numerous studies have shown that consumers are on average willing to pay more for products at local direct markets, but tend to examine consumer preferences for goods available during the normal season. Studies which examine pricing and consumer preferences for local foods available outside of their normal season are few. One study finds that consumers would be willing to attend farmers' markets in the off-season, but does not assess their willingness to pay (WTP) for products in the off-season. A second study mentions that extending the market season may increase farmer income, but does not specifically discuss impacts to net returns resulting from price differentials. This study will assess enhanced revenue potential for out-of-season (winter, early spring, late fall) direct market sales, specifically those which can be produced through the use of season extension techniques such as high tunnels. The results of this study will provide agricultural producers with valuable information regarding potential revenue estimates which they can use to assess the financial impacts of implementing season extension techniques into their operation.

Study methods include a comparison of availability and pricing for fruit and vegetable products from May through October at farmers' markets in Utah and Colorado; a survey of farmers' market managers on the potential for extending the farmers market season; a survey of growers and Extension horticulturalists on the potential products and length of season extension for fruit and vegetable crops; and finally choice experiments designed to examine consumer WTP for local fruit and vegetable products across seasons.

Keywords: Consumer WTP, Fresh Produce, Pricing, Season Extension

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Food Quality Certification: Is the Label Rouge Program Applicable to the U.S.?

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Abstract

Label Rouge is a complementary commercial branding popular in France that guarantees high quality of products recognized by 80% of the French consumers. The label is driven by consumer preferences which are highly influenced by French culture and tradition. Label Rouge is mainly known for its association with the best quality poultry meat since 1965. This program involves all aspects of production from genetic breeders and farmers to processing plants where every part of production is controlled and must follow the Label Rouge requirements.

In the U.S., poultry production greatly increased throughout the 1980s and 1990s due to Americans' changing lifestyle (EPA, 2009). Consumers became more health conscious and sought more convenient food items. This led to the increased commercialization of poultry production which is now mostly a vertically integrated industry.

The vertically integrated nature of poultry production gives the application of the Label Rouge system a lot of potential for the U.S. poultry industry. However, the issue of consumer acceptability and overall applicability in the U.S. is still in question. Therefore, the objective of this study is to examine the Label Rouge poultry system in France and its relevance in the U.S. poultry industry.

The novel relationship of consumer preferences to the label makes it challenging for the Label Rouge program to be applicable in the U.S.; American consumers do not have as distinct tastes and preferences similar to French consumers driving the demand for this type of poultry meat. However, the system of quality assurance to consumers has great potential. Demand for traceability and food safety is intensifying; therefore configuring the poultry sector into a system similar to Label Rouge is very prospective. In France, consumers prefer it over the organic label due to cheaper prices while the difference in quality is judged insignificant. In addition, there is no industry-wide label known in the U.S. that assures product quality, thus the niche market concept for Label Rouge could be adopted after the specifications are adjusted to fit U.S. consumer tastes

and preferences. A very important consideration is the economic trade-off inherent in this level of certification. The balance between supply and demand must be sustained while the process moves towards a stable, sustainable, and a fully traceable system. This transformation faces a long progression toward market acceptance.

Keywords: product quality certification, Label Rouge, poultry industry, vertical integration, traceability

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Influence of Consumer Demographics on the Demand for Locally Grown Ethnic Greens and Herbs Because of Food Miles Concerns: A Logit Model Analysis

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Abstract

Trade in fresh fruits and vegetables has raised concerns about the distance food travels, food cost, freshness, and climate change associated with the transport. The term food mile refers to the distance or the number of miles that food travels from producer to consumer through its supply chain. Purchasing directly from local farmers may reduce these miles, thus, reducing our dependency on fossil fuels and strengthen the local economy and creating more self-sufficient communities. According to a study conducted in 1996, on average food traveled distances of 1,500 miles from source to consumer. Another study, conducted in 1997, estimated that the average pound of fresh produce travelled 1,685 miles from farm to the main wholesale market in Baltimore, Maryland. Transporting food such long distances requires a great deal of fossil fuels, increases dependency on foreign oil resources and food prices. Buying locally grown produce helps to reduce the environmental impact and cost of transportation. Locally grown fruits and vegetables can be perceived as being fresher as they are usually picked within 24 hours of purchase, may taste better, and have a higher nutritional value than produce transported from great distances.

This project was supported by the Specialty Crop Research Initiative of the National Institute of Food and Agriculture, USDA, Grant # 2009-51181-06035.

The main purpose of this paper is to highlight increased purchases of locally grown ethnic greens and herbs due to consumer interest in reducing food miles. To document ethnic consumers' behavior and their demand for greens and herbs, a telephone survey was conducted in 16 East Coast states and Washington D.C. during May through October, 2010. This survey collected information that can be used to assist small and medium farmers with better understanding consumer perceptions and factors that drive ethnic greens and herbs markets, specifically attitudes and behaviors of Asian Indian, Chinese, Mexican, and Puerto Rican consumers. A focus of the study was to predict the influence of socioeconomic and demographic variables on the purchase of locally grown ethnic greens and herbs because of food miles concerns. Respondents answered questions about whether they increased purchase of locally grown ethnic greens and herbs to reduce their impact on food miles, and based on this, a logit model was developed to predict the influence of demographic and other factors on increased purchase of locally grown ethnic greens and herbs.

Results indicate that 34% of ethnic consumers have increased purchases of locally grown ethnic greens and herbs due to food miles reason. Participants more willing to buy locally grown ethnic greens and herbs due to concerns about food miles were those who: tend to buy ethnic greens and herbs from ethnic stores; traveled greater distances to the nearest ethnic grocery store; felt that language the employees of the store spoke was very important; felt that the information on the package was very important when they purchased ethnic greens and herbs; strongly agreed in finding and purchasing ethnic greens and herbs that were the level of quality that they expect and desire; had a post-graduate or advanced degree, had an income of over $200,000; and were Asian Indians.. Purchasing locally grown ethnic greens and herbs may help reduce food miles and provide fresh produce to the local ethnic consumers while saving fuel costs. These results may be useful to the local farmers investigating the possibility of growing ethnic greens and herbs based on the demand and target markets.

Keywords: Ethnic Greens and Herbs, East-Coast United States, Locally Grown Produce, Food Miles and Logit Model

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Assessment, Development and Implementation of Training Materials for Food Defense/Safety, Biosecurity, and Traceability within the Catfish Industry

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Abstract

The objective of this research and subsequent training sessions was to assess food defense in the catfish industry, promote awareness and educate catfish farmers and processors on the principles of food defense, biosecurity and traceability of agricultural commodities and ingredients used in human food production. In the catfish processing chain, preliminary investigations have indicated that there are areas throughout production, processing and distribution that are susceptible to potential terrorism. Records for complete traceability were also found to be inadequate.

At the training sessions participants were asked a series of questions covering different areas of food defense/safety, biosecurity and traceability. Of those surveyed, 74% said they have a food defense plan; 48% had a working traceability plan; and 52% had a biosecurity plan. Pre- and post-assessments were given to evaluate the effectiveness of the training sessions. Overall 68% of participants scored equal or higher on the post-assessment as compared to pre-assessment.

While many larger catfish processors were found to be more prepared on certain principles, there is a need to advance training and knowledge further into their sector of the industry. Through effective food defense training and education, farmers and food processors are able to better assess all vulnerable points to develop food defense plan and traceability measures that are best suited for their operations. With proper training and awareness, farmers and others throughout the food distribution chain are better prepared to continue and even increase the security of our food supply.

Keywords: Catfish, Food Defense, Biosecurity, Traceability, Education

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Market Potential for Local Organic Produce in the South Atlantic Sub-Region

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Abstract

The overall purpose of this study is to conduct exploratory research on the market potential for local organic sales outlets for small-to-medium scale farmers in the South Atlantic Sub-region of the U.S. The objectives are as follow: (1) identification of the leading organic produce in each state of the South Atlantic, (2) identification of supermarket chains offering the leading organic produce of the South Atlantic, (3) identification of the leading produce with the highest premium potential in the South Atlantic, and (4) identification of local organic supply chain linkages for the leading organic produce in the South Atlantic.

Initially, this study proposed to identify established supply chains of leading organic produce within the state of North Carolina. However, the state ranked only 16th in the U.S. in the number of certified/exempt farms, with only 171 farms receiving 100 percent of the total value of sales from organic production. With limited impact to North Carolina's economy or agribusiness industry, we expanded the study to include states within the entire South Atlantic sub-region of the U.S. – Florida, Georgia, South Carolina, North Carolina, Virginia, West Virginia, Maryland, and Delaware. We used the 2007 Census of Agriculture, 2008 Organic Production Survey and Perishables Group FreshFacts® data from August of 2009 to 2010, and the 2006 National Farmers Market Manager Survey to identify patterns. Conventional and certified production, retail sales, and organic retail premiums are identified and evaluated to gain more insight of established supply chains.

The data shows potential for small scale producers with $5,000 or less by value of sales to market their goods as 'organic' due to exemption from the certification process at consumer direct sales outlets. However, small-to-medium farms (value of sales greater than $5,000 but less than $250,000) with USDA 'certification' labels may have greater opportunities to establish contracts with wholesalers as well as market their produce in multiple sales outlets. Directions for further research will include 1) evaluating market power of the contracting agent in the market for certified organic produce and 2) assessing the benefits and costs to producers and sales outlets for 'organic' produce.

Keywords: organics, local foods, and market potential

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Lessons Learned in Recruiting Minorities into Food and Agribusiness Industries

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Abstract

The purpose of the study was to assess the attitudes of high school students of the millennial generation towards academic experiences and career exploration in agribusiness using an 1890 land-grant summer residential program as a case study. The objectives were as follow: (1) to evaluate the curriculum for a summer residential food and agribusiness industries program and (2) to assess the attitudes of participants in the residential program and their plans to explore careers in food and agribusiness industries.

Data were obtained from surveys issued to participants in the Food and Agribusiness Industries Summer Program during the summers of 2009 to 2011. The Likert method was used and has been widely utilized in evaluating the 'intensity of feelings.' Objective (1) involved the development of a curriculum which focused on five major competency areas [(#1) interpersonal characteristics, (#2) communication skills, (#3) business and economics, (#4) technical skills, and (#5) computer, quantitative, and management information] sought in new hires and future agri-

business leaders as found in Litzenberg & Schneiger (1987) and Boland & Akridge (2004). In objective (2), surveys were conducted to assess the attitudes of participants in the residential program and their plans to explore careers in the food and agribusiness industries.

We summarized the findings from the survey as 'lessons learned' in utilizing a residential summer program as a recruitment strategy for prospective millennial students into the food and agribusiness industries. These lessons were as follow: (1) include multiple uses of technology in coursework, (2) train faculty on technological advances for classrooms, (3) convert traditional classroom setting into more virtual settings, (4) increase dialogue between agribusiness firms in person and in video/Internet formats, (5) relate technological innovations with agricultural business, (6) connect salaries with actual job titles/descriptions, (7) recruit through parents and/or trusted high school teachers/counselors, (8) nurture students' interests in agricultural economics (agribusiness) prior to high school, (9) selection of institutions may come first, then majors by prospective students, and (10) selection of major by minority students with higher aptitudes in math, science, and business are more likely to select other traditional fields of study. Although participants' overall satisfaction and understanding of the program were increased, their attitude towards applying to the university and selecting Agribusiness as a major only increased a 'little bit, maybe.'

Keywords: agribusiness careers, teaching, recruitment, and retention

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Predicting Consumer Participation in a Hayride Event of Agri-tourism Activity: A Logit Model Approach

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Abstract

In the U.S. agricultural system, small and medium-sized farmers with limited land and capital resources are unable to compete in the national commodity markets. Direct marketing and agri-tourism are used by these enterprises to increase farm income. Agri-tourism may be broadly defined to include a range of farm-related products and services that are educational, interactive, or recreational in nature. For many farmers, farm resources (land, buildings, equipment) are not utilized for many months of the year. The use of existing infrastructure to generate supplemental farm income is an important strategy for enhancing the profitability of the farm operation. Examples of agri-tourism include Halloween corn mazes and hayrides, hunting and fishing, festivals, farm tours, and bed and breakfasts.

In addition to the direct revenue generation, by bringing non-farm residents to the farm, agri-tourism also benefits farmers in other ways. Agri-tourism creates positive interactions between farmers and non-farmers, contributing to a "culture of understanding" that is necessary for both to coexist. The benefits of agri-tourism also extend beyond the farm gate. Particularly in urbanizing areas, these activities contribute to and enhance overall quality of life as they expand recreational opportunities, diversify the economic base, promote the retention of agricultural lands and open spaces, and contribute to community development.

The present study analyzes the influence of demographic characteristics on the likelihood of a consumer's participation in hayride events during an agri-tourism visit. An Internet survey pertaining to direct marketing and agri-tourism was conducted to document the characteristics of consumers, who buy at farmer-to-consumer direct market outlets and/or visit agri-tourism operations from Mid-Atlantic States during June and July, 2010. A total of 1134 participants completed the survey from Delaware, New Jersey, and Pennsylvania. Of the questions asked, respondents indicated whether they participated in a hayride event during their agri-tourism visit. Based on their responses, a logit model was developed to predict demographic characteristics of respondents who participated in hayrides.

Results indicated that about 67% of respondents participated in hayride activities during their agri-tourism farm visit. According to the model results, those who resided in suburban areas, male respondents, those between 21 and 35 years of age, those between 36 and 50 years age, completed two years degree and who's household annual income was between $40,000 and $59,999 were more likely to participate in hayrides. Conversely, those who resided in urban areas, lived more than 20 years at current location, were under 20 years of age, and who completed a graduate degree were less likely to participate. Study results should provide valuable information for those developing marketing strategies to increase agri-tourism participation and future interest in support of local agriculture. Findings of the logistic regression analyses are consistent with agri-tourism marketing theory from past studies. High intensity of agri-tourism activities should make agri-tourism an increasingly larger part of the total farming operation in the Mid-Atlantic area during off season in the years to come. Results will also help form a coalition of all relevant stakeholders from the Mid-Atlantic States to promote direct marketing and agri-tourism industry in the region and enhance their knowledge of the industry.

Keywords: Mid-Atlantic States, Agri-tourism, Hayrides, Logit Model

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Using The Economist's Big Mac Index for Instruction

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Abstract

The Economist first launched the concept of the Big Mac Index in 1986 as a guide to whether currencies were at their correct exchange rate; it is not intended to be a precise predictor of currency movements around the globe, but simply a way to make exchange-rate theory and discussions a bit more digestible. First used as a humorous illustration, the term "burgernomics" was coined and the Big Mac index became an annual occurrence. It is based upon one of the oldest concepts in international economics – the theory of purchasing-power parity, which argues that the exchange rate between two currencies should in the long run move towards the rate that equalizes the prices of identical bundles of traded goods and services in each country. In other words, a dollar should buy the same amount everywhere.

The reason the Big Mac Index is a better representation of world currencies is because McDonald's Big Mac is made and distributed in over 120 countries on six continents. McDonald's Big Mac is produced to more or less the same recipe in those countries, so the Big Mac Purchasing Power Parity (PPP) is an exchange rate that would leave hamburgers costing the same in each country, including the United States. The index can, however, be distorted by the local input costs and costs of transportation and distribution.

An undergraduate course, Food and Fiber Marketing, in the Department of Agricultural and Applied Economics at the University of Georgia is attended by students enrolled in many other disciplines and colleges than the agricultural economics field. Trying to engage their different learning styles and experiences to develop interactions between the students and the instructor requires some imaginative activities. Since they all seem to enjoy eating fast food, even if not a Big Mac, using the concept of the hamburger as a common currency intrigues them. Comparing the Big Mac PPP with the actual rates signals if a currency is under- or over-valued, which provides an application to the exchange rate and trade discussions without worrying about fluctuating currency/exchange rates. For instance, after its massive currency devaluation a decade ago, Argentina had the cheapest Big Mac at 78¢, while Switzerland had the most expensive Big Mac at $3.81, against the average American price of $2.49; the Argentine peso was the most undervalued currency at the time and the Swiss franc the most overvalued.

Keywords: burgernomics, Big Mac Index, currency valuation, exchange rates, instruction

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Marketing Channels Used by Small Tennessee Farmers

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Abstract

One of the key challenges that small farmers face is marketing their products. National and international markets are difficult to tap into for small farmers due to their inability to compete with large farm operators that dominate these markets. The objective of this study was to examine marketing channels used by small Tennessee Farmers.

A mail survey was sent to 250 selected small farmers in Tennessee. Ninety-two completed responses, representing about 37% response rate, were received. Over half of the farmers had off farm employment. Preliminary analysis showed that 40% used direct marketing; 23% wholesalers; 16% retailers; 14% cooperatives and 4% contract.

More educated farmers tended to avoid middlemen. Farmers operating animal enterprises appear to use middlemen more compared to crop producers. This may be due to feed and other costs involved in maintaining animals. Farmers working off farm tended to use middlemen due to time constraint. Farmers that took risk chose direct marketing reflecting their willingness to accept lower profit if sales do not go as planned. The use of cooperatives is limited indicating that its formation and growth is dependent on mutual trust among the members. The use of contract by a very small percent of farmers may be a reflection of the challenge that small farmers face in generating large volume of their products on a sustained basis which is usually demanded by buyers.

Keywords: Marketing Channels, Small farmers, Tennessee, mail survey, direct marketing

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GAPs Compliance Costs for North Carolina Fresh Produce Producers

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Abstract

The certification of fresh produce producers in Good Agricultural Practices (GAPs) has become a common requirement by wholesale and retail buyers. The Food Safety Modernization Act has provisions for the adoption of traceability systems by farms with fresh produce. The US Food and Drug Administration (FDA) provides guidance for GAPs, but some requirements within these documents, such as traceability, are changing rapidly. Several traceability systems are currently being used by produce producers, and range from professional systems to farmer created systems. This study focuses on two; FoodLogiQ® and farmer created traceability. A focus group composed of various produce farming operations has been tasked to shed light on the challenges produce producers face in implementing traceability systems.

Implementation of a sophisticated, professional system requires a large monetary commitment from the producer. The following figures are estimates producers provided specifically for this study. Initial costs using a FoodLogiQ® system is priced at $5,000-$7,500, and requires additional software such as FAMOUS to handle the operations accounting needs at a cost of $40,000-$50,000. Yearly subscription/maintenance fees of $1,200-$8,500 will also be necessary costs for the producer.

Survey questions addressed to the focus group aimed at evaluating two main areas; cost of adoption and managerial time with adoption. Results show a distinct difference between small producers (gross sales of $100,000 per year) and large producers (gross sales of $500,000 or greater per year). Small operations feel the burden of adoption with the initial technology costs (e.g. field scanner, label printer, software). Larger operations noted that the heaviest burden of implementation comes in the added cost of personnel. Participants were asked to place a value on survey questions using a 1-3 scale with 1 being no additional cost, 2 minimal additional cost, and 3 significant additional cost. As a result, producers indicated a field scanner (2.3), printing case

labels (2.5), and additional office personnel (2.5) as the most costly. Participants were asked to evaluate how implementing a traceability system will affect their management time. Average response yielded between minimal additional time and significant additional time (2.7).

The results of the study will provide guidance to producers, farm organizations and policy makers on the costs and potential structural changes occurring as a result of GAPs adoption.

Keywords: Traceability, GAPs, Fresh Produce

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Effect of Promotional Activities on Substitution Pattern and Market Share for Aquaculture Products

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Abstract

We estimate the effect of the supermarket chains promotional activities on the substitution pattern and market share of different aquaculture products. The result show negative effects of own-price elasticities on its product's market shares. Cross-price elasticities have small positive effects on other seafood products' market share. Promotional activities positively affect market share of the product; and these effects do behave differently for different seafood products and diminishes with increasing amount of product promoted. Promotional activities also have an effect on price and reduced the consumer price sensitivity.

Keywords: Promotion, substitution, market share, and seafood

Introduction

The increase in the concentration ratio in the supermarket industry has made supermarket chains an important player in food distribution. Rather than being neutral pass-through between the manufacturers and the consumers, supermarket chains provide many relevant services to consumers, such as one-stop shopping convenience, in-store banking, and additional services such as professional pharmacists. Additionally, supermarket chains can also intervene in setting the final retail prices through promotional activities.

While the literature on the impact of advertising on sales and the degree of competition between firms is abundant, there is a lack of understanding and analysis of the impact of supermarket chains promotions on the sales and the intensity of competition between different brands and product categories. The objective of this paper is to estimate the effect of the supermarket chains promotional activities on the substitution pattern and market share of different aquaculture products. This is relevant to food distribution in at least two aspects. First, accurate measures of substitution patterns between different competing products are crucial for the pricing, and promotion decision making. Ignoring the effect of promotional activities on the price elasticity may produce biased estimates and therefore inaccurate forecasts. Second, promotional activities can affect product market share either directly or indirectly through the price effect. For food distribution managers, it is imperative to estimate both effects.

The Model

Consumers maximize their utility by choosing the product/brand that maximizes their utility given by:

$$(1) \quad U_j = \gamma_j + \alpha p_j + \beta A_j + \phi A_j^2 + \lambda p_j A_j + \varepsilon_j, \quad j = 1,...,J \quad ,$$

Where p_j is the retail price for product j, A_j is the promotional activity for the product j, A_j^2 is the square of the promotional activities included to control for the diminishing return of the promotion activities.[1] ε_j is a random shock. In our context, the promotion variable is defined as the percentage of the volume sales under different type of merchandizing (price reduction, displays, and features). Notice that the interaction between the price and promotional activity will allow us to decompose the price elasticity and the promotion elasticity in two components: a direct component and an indirect component. Further assume that ε_j are independent and identically distributed with a type I extreme value distribution, i.e., $f(\varepsilon) = e^{-e^{-\varepsilon}}$. Then the market shares for the j^{th} product (corresponding to the probability that the j^{th} product is chosen) is given by the following equation:

[1] A high level of promotional activities might send a negative signal to consumers about the quality of the product. As the quality goes down, the promotional activities are increased to help sell the product.

$$(2)\quad s_j = \frac{\exp(\gamma_j + \alpha p_j + \beta A_j + \phi A_j^2 + \lambda p_j * A_j)}{1 + \sum_{k=1}^{J} \exp(\gamma_k + \alpha p_k + \beta A_k + \phi A_k^2 + \lambda p_k * A_k)}$$

Equation (2) corresponds to the multinomial logit. This model presents the advantage of being simple to implement. The estimation proceeds by the inversion proposed by Berry Levinsohn, and Pakes (1995). For the logit model the inversion is given by:

$$(3)\quad \ln(s_j) - \ln(s_0) = \gamma_j + \alpha p_j + \beta A_j + \phi A_j^2 + \lambda p_j * A_j$$

Where s_0 is the market share of the outside good, obtained by subtracting the sum of observed market shares of all the inside brands from 1. Note that the logit model is transformed to a simple linear regression where the natural logarithm of the ratio between the observed market shares of the brands in the set choice with respect to outside good is regressed on product characteristics and the price variables.

The price elasticity of market shares given by equation (3) reduce to:

$$(4)\quad \eta_{jk} = \frac{\partial s_j}{\partial p_k} = \begin{cases} (\alpha + \lambda A_j) p_j (1 - s_j) & for\ j = k \\ -(\alpha + \lambda A_j) p_k s_k & otherwise \end{cases}$$

To the extent that the market share depends on the interaction between the retail prices and the promotional activities, the price elasticity will depend on the scope of promotional activities. An important feature of the above model is that it allows the retailer/processor to analyze how consumer's price sensitivity (elasticity) is affected by the promotional activities.

Notice that the ratio of the logit market shares for any two brands *j* and *l* does not depend on any brands other than *j* and *l*. That is, the relative odds of market shares of brand *j* over brand *l* are the same no matter what other brands are available or what the characteristics of the other brands are. In the logit case the ratio exhibits what is called independent from irrelevant alternatives, or IIA (McFadden 1981; Train 2003).

Data

The above model is estimated using logit regression on weekly scanner data on aquaculture products for different categories of entrée, breaded, and unbreaded fish and seafood products.

This paper used A.C. Nielsen scanner data consisting of US weekly data on consumer purchases (and company sales) quantity and value of catfish, crawfish, clam, shrimp, tilapia, and salmon products from 52 US cities for the June 2008 to June 2010 period. Table 1 (see Appendix) provides the descriptive statistics of the variables used in this estimation.

Results and Discussion

Table 2 presents the results of the estimation of equation (3) with and without the interaction between the retail prices and the promotional activities.

Table 2: Parameter Estimates

Variable	**Price*Promotion included**	
	Estimate	*t-Statistic*
Price	-6.0483	-37.7707
Promotion	1.3407	1.5542
Promotion squared	-3.5332	-2.5111
Price*Promotion	1.3763	2.7529

As expected, the parameter estimate of the variable *price* is negative and statistically significant. This implies that as the price increases, consumers' utility decreases. For the promotional activities, this variable has a positive effect on consumers' utility, though this effect is not statistically significant. For the variable *promotion squared*, the estimate is negative, implying some "diminishing return" of the promotional activities on consumers' utility. This implies that the level of promotional activities has some optimal level where it reaches the highest effect on consumers' persuasion. However, this is not the scope of this paper.

The variable *price*promotion* has a positive and statistically significant parameter. Given that the elasticity is proportional to this estimate and the estimate of the variable *price*, the resulting magnitude of the price elasticity will be reduced by *(-6.0483+ 1.3763* promotion)*.

Turning now to the price elasticity, we use equation (4) to compute the matrix of elasticity's. Due to the high dimension of this matrix *(19*19=361 elasticity's)*, we discuss only the own-price elasticity in detail. On Average, the cross-price elasticity is positive and of small magnitude compared to the own-price elasticity. The elasticity ranges from 0.00007 to 0.3382 with an averageof0.02895andastandarddeviationof0.001691.

For the own-price elasticity, Table 3 summarizes the findings with and without the interaction between price and promotion. For catfish, tilapia, and salmon, the entrée products are more elastic than the breaded and unbreaded product forms. For shrimp products, the canned product form is the most elastic; while the entrée form is the least elastic. When the interaction is included, the average own-price is -6.4791, with a standard deviation of 2.5592, a minimum of -12.9211 and a maximum of -3.2333.

Table 3: Own-Price Elasticity with and without Price-Promotion Interaction

Product	**With Price-Promotion Interaction**		**Without Price-Promotion Interaction**	
	Estimate	*t-Statistic*	*Estimate*	*t-Statistic*
Catfish				
Entrée	-5.7762	-5.2306	-5.9038	-5.6207
Breaded	-3.2333	-7.8160	-3.3344	-8.5817
Unbreaded	-3.8159	-10.9021	-4.2080	-13.0490
Crawfish				
Entrée	-4.5168	-7.5411	-4.6824	-8.3377
Unbreaded	-10.5304	-11.8229	-11.3220	-14.4460
Clams				
Entrée	-4.6801	-10.8540	-5.0733	-15.3280
Breaded	-9.2243	-13.3664	-10.0090	-17.8620
Unbreaded	-4.6703	-1.9484	-4.8752	-1.9940
Canned	-4.9547	-14.2117	-5.3410	-18.8190
Shrimp				
Entrée	-5.5013	-10.6175	-6.2445	-10.8920
Breaded	-7.3735	-15.6008	-8.2526	-23.9180
Unbreaded	-6.8725	-11.9619	-7.9778	-11.6720
Canned	-12.9211	-29.3060	-13.7060	-39.0940
Tilapia				
Entrée	-9.3159	-12.8064	-10.5300	-15.5310
Breaded	-6.8721	-10.7345	-7.7572	-13.5730
Unbreaded	-4.2538	-7.8549	-4.8916	-8.7867
Salmon				
Entrée	-7.2591	-8.3123	-8.3912	-9.3915
Canned	-4.1416	-8.4289	-4.4992	-9.8691
Unbreaded	-7.1899	-14.0431	-8.0585	-18.0770

When the price-promotion is not included, the own-price elasticity ranges from -13.7060 to -3.3344, with an average of -7.1083 and a standard deviation of 2.8003. Notice that the own-price elasticity decreases in magnitude when the price-promotion is included. This shows that promotion plays an important role in reducing the consumers' price sensitivity. This is good as consumers will continue to buy the good with a price change and products will therefore need to compete on other levels, such as quality, brand, etc.

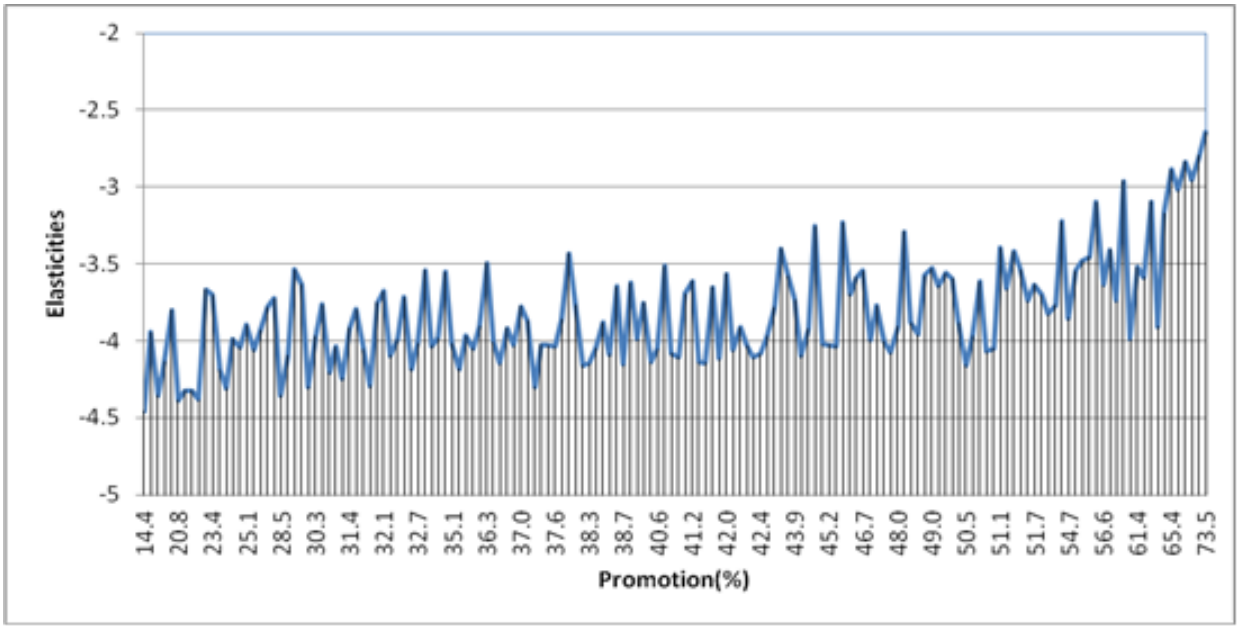

Figure1: Relationship between own-price elasticity and promotion for unbreaded catfish

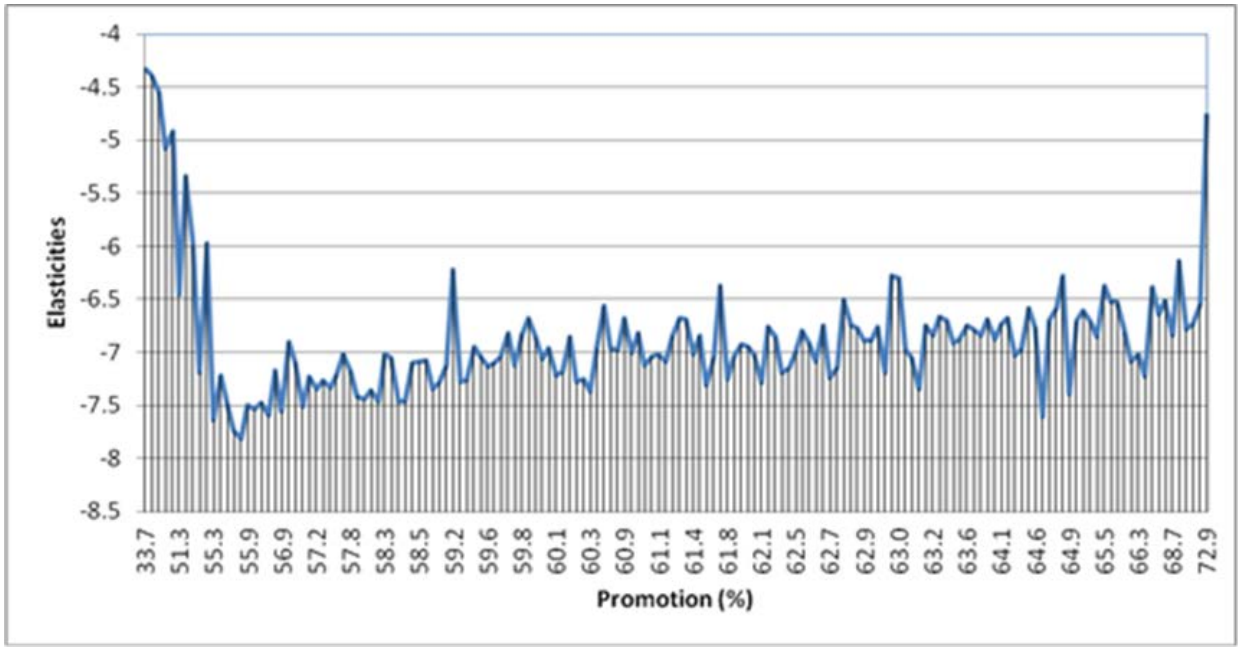

Figure 2: Relationship between own-price elasticity and promotion for unbreaded shrimp

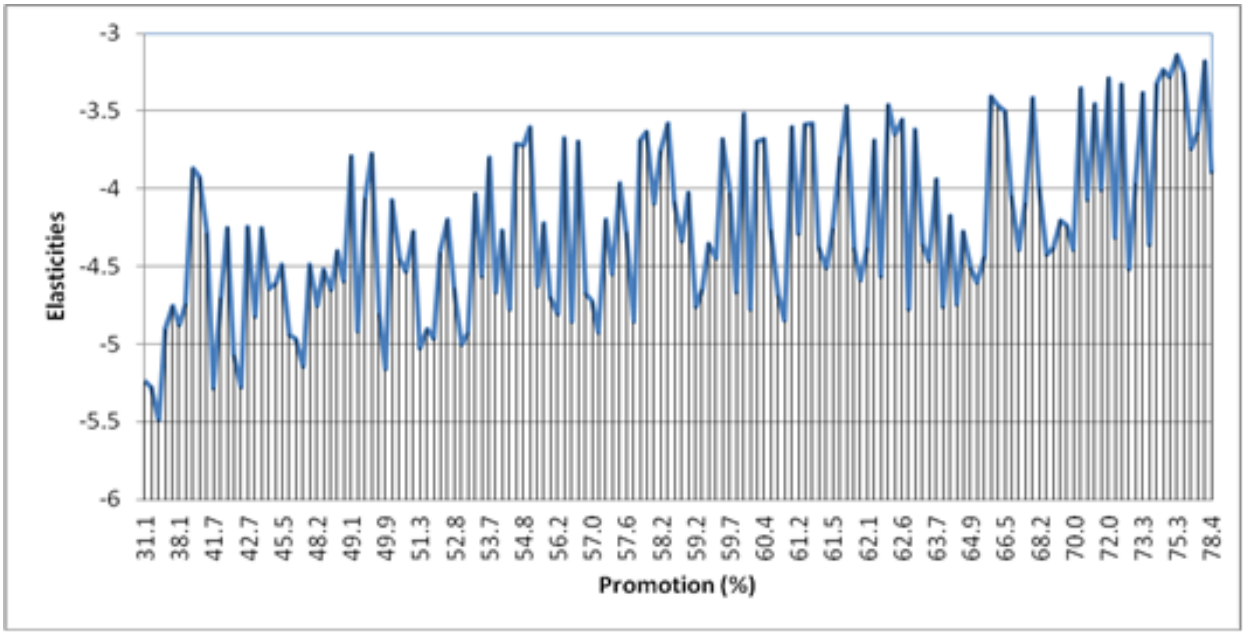

Figure 3: Relationship between own-price elasticity and promotion for unbreaded tilapia

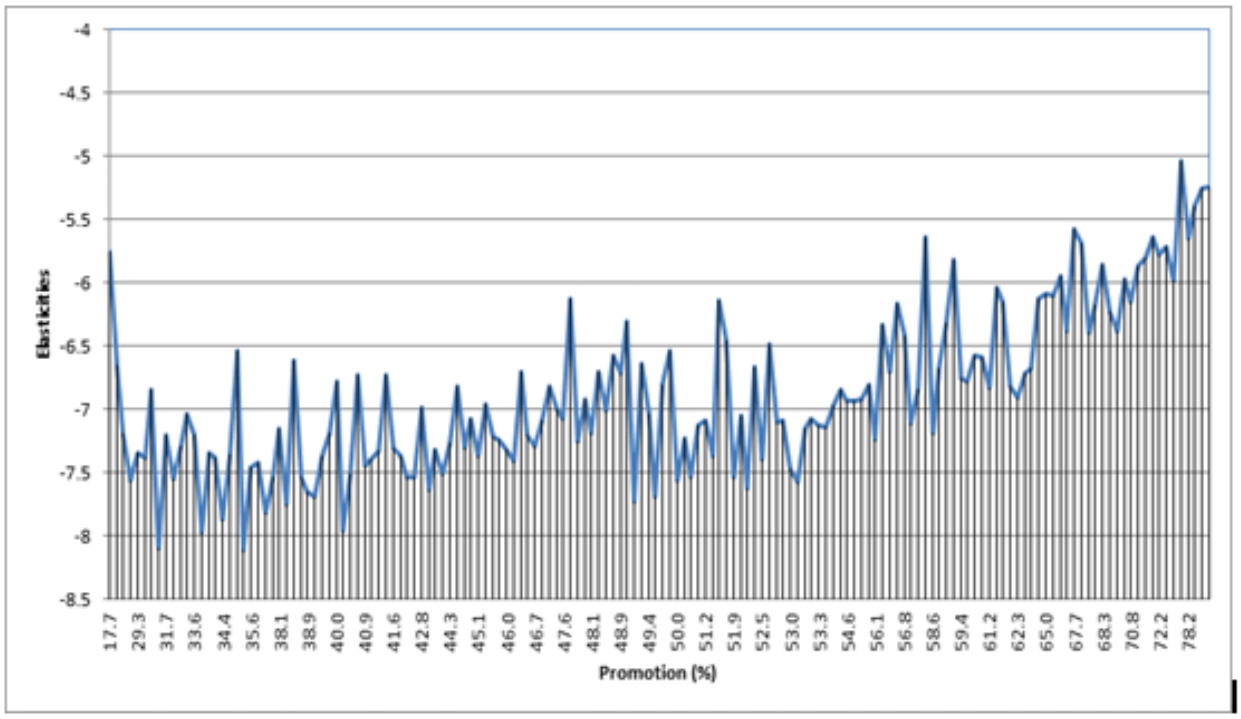

Figure 4: Relationship between own-price elasticity and promotion for breaded tilapia

Acknowledgements

This study was funded in part by the Southern Regional Aquaculture Center.

Conclusions

All own price elasticities have negative effects on its product's market shares. When product price increases there will be a decrease in market share. Cross-price elasticity had a small positive effect on other seafood products' market share. Promotional activities had a positive effect on market share of the product, though this effect does behave differently for different seafood products and diminishes with increasing amount of product promoted. Promotional activities also had an effect on price and reduced the consumer price sensitivity.

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Appendix 1.

Table 1: Descriptive Statistics

Variable	Mean	StdDev	Minimum	Maximum
Catfish Entrée				
Dollar Sales	3265.64	1247.10	554.41	6538.50
Quantity (lb.)	772.74	385.76	119.00	2465.00
Price ($/lb.)	4.4209	0.7891	2.0597	5.7657
Promotion (%)	10.41	18.20	0.00	90.62
Breaded Catfish				
Dollar Sales	36874.17	12812.17	16863.66	83594.19
Quantity (lb.)	14940.90	5767.45	7211.00	50676.00
Price ($/lb.)	2.4975	0.2919	1.3663	3.2025
Promotion (%)	13.97	16.37	0.42	84.71
Unbreaded Catfish				
Dollar Sales	395600.90	153660.92	151959.33	820177.59
Quantity (lb.)	124362.47	44947.56	47795.00	242443.00
Price ($/lb.)	3.1578	0.2434	2.3840	3.5300
Promotion (%)	41.32	11.91	14.37	73.45
Crawfish Entrée				
Dollar Sales	37518.25	6598.65	24935.51	60385.69
Quantity (lb.)	10993.71	2986.01	5988.00	20134.00
Price ($/lb.)	3.5068	0.4218	2.3343	4.5230
Promotion (%)	16.13	10.17	1.63	51.45
Unbreaded Crawfish				
Dollar Sales	228848.72	67600.92	134831.45	484959.05
Quantity (lb.)	26944.02	7461.70	16112.00	50707.00
Price ($/lb.)	8.4821	0.5892	6.8082	9.7494
Promotion (%)	30.99	14.43	5.26	71.15
Clams Entrée				
Dollar Sales	217337.99	56218.17	144052.78	490481.08
Quantity (lb.)	57776.88	17379.03	36666.00	145849.00
Price ($/lb.)	3.8027	0.2483	2.1723	4.1314
Promotion (%)	34.73	14.79	8.81	73.94
Breaded Clams				
Dollar Sales	73693.20	15570.61	49822.26	126608.97
Quantity (lb.)	9882.69	2329.37	6295.00	18767.00
Price ($/lb.)	7.4962	0.4209	6.1273	8.3348
Promotion (%)	34.84	10.70	8.98	64.94
Unbreaded Clams				
Dollar Sales	41829.79	17209.22	24373.88	155704.76
Quantity (lb.)	19341.38	21769.09	4535.00	120991.00
Price ($/lb.)	3.6513	1.8366	0.4882	6.3589
Promotion (%)	22.09	16.15	2.92	83.94
Canned Clams				
Dollar Sales	748594.13	216746.49	521403.96	1701660.27
Quantity (lb.)	187611.10	57001.64	127787.00	423410.00
Price ($/lb.)	4.0124	0.2125	3.5068	4.3614
Promotion (%)	32.07	11.16	10.09	58.65

Table 1: *Continued*

Variable	Mean	StdDev	Minimum	Maximum
Shrimp Entrée				
Dollar Sales	1658542.78	296159.83	1030538.66	2635499.56
Quantity (lb.)	357354.46	80208.81	196804.00	660580.00
Price ($/lb.)	4.7047	0.4290	3.8277	5.8347
Promotion (%)	52.28	8.12	37.28	73.01
Breaded Shrimp				
Dollar Sales	1737769.62	465353.12	1154046.61	3662179.02
Quantity (lb.)	282462.89	86988.25	174620.00	643517.00
Price ($/lb.)	6.2097	0.2537	5.4396	6.7073
Promotion (%)	47.17	9.67	30.51	73.86
Canned Shrimp				
Dollar Sales	348500.53	128062.91	224641.32	989443.78
Quantity (lb.)	34041.47	12827.80	20971.00	96066.00
Price ($/lb.)	10.2693	0.2628	9.5027	11.0001
Promotion (%)	25.22	6.68	14.53	44.00
Unbreaded Shrimp				
Dollar Sales	16963070.31	4453172.71	12048436.55	40494060.33
Quantity (lb.)	2726423.92	745255.21	1866766.00	6967594.00
Price ($/lb.)	6.2679	0.5129	3.7634	7.0444
Promotion (%)	60.70	5.16	33.67	72.90
Tilapia Entrée				
Dollar Sales	399219.29	192956.29	109941.59	1031555.53
Quantity (lb.)	50641.43	25120.12	14249.00	142684.00
Price ($/lb.)	7.8918	0.5096	6.2957	9.2545
Promotion (%)	50.91	9.91	20.70	77.27
Breaded Tilapia				
Dollar Sales	228840.42	77358.83	124047.26	545061.86
Quantity (lb.)	40163.18	16527.30	20225.00	114221.00
Price ($/lb.)	5.8126	0.4286	4.4900	6.6071
Promotion (%)	50.60	12.80	17.72	84.35
Unbreaded Tilapia				
Dollar Sales	2138386.72	713954.37	997615.15	4931757.54
Quantity (lb.)	582099.35	195132.31	223069.00	1418501.00
Price ($/lb.)	3.6999	0.4196	2.8805	4.4851
Promotion (%)	57.78	10.17	31.08	78.42
Salmon Entrée				
Dollar Sales	840489.46	154220.74	459036.06	1332894.82
Quantity (lb.)	136197.60	35322.15	62944.00	307225.00
Price ($/lb.)	6.2980	0.6701	4.3385	7.8217
Promotion (%)	59.78	9.54	34.08	86.30
Canned Salmon				
Dollar Sales	2502279.50	341588.21	1793250.67	3581701.09
Quantity (lb.)	745264.30	156982.81	449523.00	1354943.00
Price ($/lb.)	3.4124	0.3401	2.5542	4.0019
Promotion (%)	35.64	9.76	19.29	68.46
Unbreaded Salmon				
Dollar Sales	1318176.58	331819.69	728207.03	2259141.96
Quantity (lb.)	220443.39	65316.51	104095.00	420415.00
Price ($/lb.)	6.0572	0.3306	5.0735	7.4389
Promotion (%)	47.66	8.55	28.25	69.28

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Analyzing Students' Use and Assessment of Nutrition Facts Labels

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Abstract

Frequency of using Nutrition Facts labels is influenced positively by age, gender, and number of minutes exercised, but negatively by freshman classification and body mass index. Seniors and students who exercised an average of 37 minutes per session are more likely to assess food labeling information as being useful to them. Confidence about how to use food labels to choose a healthy diet is influenced by age, body mass index, and minutes exercised. Older students and seniors are more willing to learn how to use food labels to choose a nutritious diet than their corresponding counterparts.

Keywords: Nutrition Facts, body mass index, college students, ordered probit model

Introduction

Despite its implementation more than 17 years ago, Nutrition Facts labels have not led to reductions in overweight and obesity rates in the United States. In fact, rates have escalated since implementation of labeling information on most processed food products. Nationally, the obesity rate has increased more rapidly among segments of the population who consistently eat low-cost, high-calorie, low-nutrient food products. Young adults often fall into this category because of their lack of nutritional knowledge and their propensity to consume foods high in fat, sugar, and sodium. Because eating habits can be concretized as early as high school, Brooks and Tepper (1997) investigated high-school students' nutritional habits to ascertain perceptions about body image, knowledge about nutrition, and attitudes toward overweight, obese people, and dieting. The results suggest that students have misperceptions about being overweight compared to actually being overweight, and that more girls than boys are dieting. Participants also receive the bulk of their nutritional information from the media and know very little about food and nutrition, obesity risks, and the danger of excessive dieting. Thus, nutrition should be incorporated in the curriculum with strong emphases on the importance of balanced nutritional regimes, and the risks and consequences of excessive dieting (Brooks and Tepper 1997).

At the university level, more researchers also are recognizing students' lack of nutritional knowledge and are attempting to educate students about nutrition to stem the U.S. obesity epidemic. For example, Downes, Probart, and Mattes (1995) assess university students' comprehension of food labeling information shortly after implementation of the Nutrition Facts labels and conclude that of the students who read the labels the majority read the information on fat and calorie content. Reading is directly linked to concerns about weight or health. However, a majority of students cannot use the labeling information to compute the percent of calories from fat or to adjust the % Daily Value for their personal situation. Computations improved marginally after classroom intervention. Therefore, without some nutrition education, college students will be unable to interpret key areas of basic food label information. Jasti and Kovacs (2010) suggest that male and minority ethnic students are less likely to read the food labeling information on trans-fat than females and non-Hispanic whites. Thus, nonuse of labeling information on trans-fat results in higher consumption of fried food. To them, trans-fat education and promotion of food label use are needed for college students, but especially for the high-risk groups comprising of males and ethnic minorities. Tanaka and colleagues (2009) intimate ~~initiate~~ that food labels are intended to create greater awareness about portion distortions. However, a majority of the students who report that they read labels do not read the information on serving size and calories. Thus, nutrition professionals must continue their efforts to show students how to use labels to guide portion choices.

Misra's (2007) study on relationships among nutrition education, knowledge, attitude, nutritional supplement use, and incidence of reading food label in a group of college students suggest that nutrition education, age, sex, and attitude influence label use, and that label reading behavior is positively affected by prior nutrition education and students' attitude. Mackesy et al. (2008) focus on students' interest in, and reasons for reading the Nutrition Facts labels. Their findings suggest that male and female students pay great attention to fat content when reading labels, but differ in their focus on other nutrients such as protein and caloric content. Females tend to focus on caloric content, while males focus on protein content. Non-label readers list laziness or lack

of interest as the main reasons for not reading labels. The authors also conclude that educational programs are needed for college students, but specifically on the importance of using food labeling information when making food choices.

Rose and colleagues (2007) examine daily whole-grain intake and body mass index of college students. Their findings suggest that average daily intake of whole grains is less than one serving and is statistically significantly higher in normal weight students than in those who are overweight or obese. Therefore, interventions are needed to persuade students to increase their intake to the recommended minimum of three servings per day. Ha and Cain-Bish (2009) examine how nutrition intervention techniques affect college students' fruit and vegetable consumption and nutritional knowledge. Their results indicate that females respond better to the intervention than males, and that after intervention consumption of fresh fruits and vegetables increased, while consumption of French fries decreased. Thus, nutrition intervention in a classroom setting is an effective way to prevent chronic diseases and increase fruit and vegetable consumption among college students. Driskell, Schake, and Detter's (2008) study on use and nonuse of the nutritional labeling Nutrition Bytes containing information from Nutrition Facts label found greater use among female students and that use was linked to general knowledge, and to concerns about overall health, calories, and nutrient content. Nonuse was associated with an unwillingness to change one's mind about a given food item or to time constraints. Women were more likely to review information on serving size and ingredients, while men were more interested in protein content.

Dooley, Novotny, and Britten's (1998) rationale for undertaking their research project was to give undergraduate students in pre-professional, science-based programs hands-on experiences in conducting scientific research. Therefore, students interviewed shoppers and assessed their understanding and use of nutrition labels. The findings suggest that frequency of use is invariant to age, but not to ethnicity, and that Caucasians use labels more frequently than other ethnic groups. Ninety percent of the shoppers correctly answered questions on serving size, calorie, and fat content, and correctly compared similar products, while one-third could explain the numbers in the % Daily Value column. At the national level, Ollberding, Wolf, and Contento (2010) found that label users read the list of ingredients, information on serving size, and any pertinent health claims when making food purchasing decisions. Further, use was statistically significant across all selected demographic characteristics, and mean nutrient intake between users and nonusers was statistically significant for total energy, total fat, saturated fat, cholesterol, sodium, dietary fiber, and sugars. The authors advanced the view that although food label use was associated with improved dietary factors, label use alone was not enough to modify behavior and to lead to improvements in health outcomes. We agree with their view. Therefore, we examine food label use among a selected group of university students and their assessments of the Nutrition Facts labels to tailor nutrition intervention strategies toward their needs.

Objectives

The study's overall goal is to examine the factors which influence students' use and assessments of food labels. Specifically, we examine factors influencing (a) frequency of using labels, and students' assessments of (b) food labels' usefulness, (c) their levels of confidence about using labels, (d) and their interest in learning how to use food labels.

Methods and Procedures

The study's data were compiled from a random sample of 441 university students during spring and fall 2008. The survey generated data on students' general attitudes toward health and diet, knowledge of links between diet and health, sources of nutritional information, food label use, weight, height, perceptions of weight and health, and sociodemographic characteristics (age, academic classification, household size, marital status, family's annual household income, race, and gender). To satisfy the stated objectives, students were asked: How often they read food labels (READ), and to register their levels of agreement on the following statements. Information on food labels is useful to me (USEFUL). I feel confident that I know how to use food labels to choose a healthy diet (CONFIDENT). I would like to learn more about how to use food labels to choose a nutritious diet (LEARN).

Given the discrete nature of the response categories (READ, USEFUL, CONFIDENT, and LEARN), the ordered probit modeling technique is used to estimate the relationships between the response categories and independent variables. The selected independent variables are age (AGE), household size (HSIZE), freshman (FRESHMAN), sophomore (SOPHMORE), junior (JUNIOR), gender (FEMALE), body mass index (BMI), and average minutes exercised (MINEX). The response categories for READ are never, rarely, sometimes, and often; those for USEFUL, CONFIDENT, and LEARN are strongly disagree, somewhat disagree, neutral, strongly agree, and somewhat agree. All response categories are collapsed into categories, never, rarely or sometimes, and often for READ, and strongly or somewhat disagree, neutral, and strongly or somewhat agree for USEFUL, CONFIDENT, and LEARN, respectively.

Results and Discussion

The estimated results for the label use model (Table 1) suggests that use is influenced positively by age, gender, and number of minutes exercised, but negatively by freshman classification and body mass index. Freshmen are 11-percentage points less likely to read labels often than seniors, while female students are about 7-percentage points more likely to use labels often compared to male students. In Table 2, four of the independent variables have statistically significant coefficients and suggests that older students, seniors, and those who exercised regularly are more likely to find the information on the Nutrition Facts label useful. Further, freshmen and sophomores are 11 and 17-percentage points less likely, respectively, than seniors to report that food labeling information is useful to them. For the confident model, age, body mass index, and minutes exercised statistically significantly influence students' levels of confidence in their ability to use labels to choose a healthy diet (Table 3). The inverse relationship between confidence levels and BMI implies that the heavier students are the less confidence they have in their ability to use labels to make healthy food choices. Minutes exercised positively influence confidence levels. As age increases willingness to learn how to use labels to choose a nutritious diet rises by two-percentage points. This finding dovetails well with the result that seniors are 10-percentage points more likely than freshmen to agree with the statement on learning more about food labels (Table 4).

Table 1: Estimated Results for the Label Use Model

Independent Variables	Estimated Coefficients	P-Value	MARGINAL EFFECTS Never	Rarely/Sometimes	Often
			Prob (y=0)	Prob (y=1)	Prob (y=2)
CONSTANT	0.7394** (0.3325) [a]	0.0262			
AGE	0.1609** (0.0075)	0.0313	-0.0048	-0.0008	0.0056
HSIZE	0.0199 (0.0341)	0.5600	-0.0059	-0.0010	0.0069
FRESHMAN	-0.3234** (0.1423)	0.0230	0.0995	0.0103	-0.1098
SOPHMORE	-0.1684 (0.1601)	0.2927	0.0520	0.0052	-0.0572
JUNIOR	0.1549 (0.1690)	0.3591	-0.0443	-0.0112	0.0555
FEMALE	0.1894* (0.1112)	0.0885	-0.05700	-0.0085	0.0656
BMI	-0.0192** (0.0093)	0.0387	0.0057	0.0010	-0.0067
MINEX	0.0042*** (0.0015)	0.0046	-0.0012	-0.0002	0.0015
μ_1	1.2806*** (0.7560)	0.0000			

[a] Standard errors are in parentheses. *Other Statistics:* Log Likelihood = -449.5357; Log Likelihood restricted = -468.2672; Model Chi-Squared (8) = 37.4631***; *, **, and *** imply statistical significance at the 10, 5, and 1 percent levels of probability, respectively.

Note: Coefficient for FEMALE in Table 1 above under prob(y=0) should be -0.0570 and not -0.05700

Table 2: Estimated Results for the Useful Model

Independent Variables	Estimated Coefficients	P-Value	MARGINAL EFFECTS Strongly Disagree/ Somewhat Disagree	Neutral	Strongly Agree/ Somewhat Agree
			Prob (y=0)	Prob (y=1)	Prob (y=2)
CONSTANT	1.3310*** (0.3832) [a]	0.0005			
AGE	0.0225** (0.0092)	0.0148	-0.0040	-0.0035	0.0075
HSIZE	-0.0087 (0.0397)	0.8273	0.0015	-0.0014	0.0029
FRESHMAN	-0.3236* (0.1667)	0.0523	0.0611	0.0500	-0.1111
SOPHMORE	-0.4673** (0.1846)	0.0114	0.0983	0.0689	-0.1672
JUNIOR	-0.0634 (0.2080)	0.7607	0.0116	0.0099	-0.0215
FEMALE	-0.0425 (0.1288)	0.7414	0.0075	0.0067	-0.0142
BMI	-0.0151 0.0106	0.1517	0.0027	0.0024	-0.0051
MINEX	0.0042** (0.0018)	0.0184	-0.0008	-0.0007	0.0014
μ_1	0.6827*** (0.0710)	0.0000			

[a] Standard errors are in parentheses. *Other Statistics:* Log Likelihood = -336.3982; Log Likelihood restricted = -349.8852; Model Chi-Squared (8) = 26.9740***; *, **, and *** imply statistical significance at the 10, 5, and 1 percent levels of probability, respectively.

Table 3. Estimated Results for the Confident Model

Independent Variables	Estimated Coefficients	P-Value	MARGINAL EFFECTS Strongly Disagree/ Somewhat Disagree	Neutral	Strongly Agree/ Somewhat Agree
			Prob (y=0)	Prob (y=1)	Prob (y=2)
CONSTANT	0.9054*** (0.3439)[a]	0.0085			
AGE	0.0194** (0.0080)	0.0158	-0.0056	-0.0021	0.0077
HSIZE	-0.0007 (0.0363)	-0.9856	0.0002	-0.0001	-0.0003
FRESHMAN	-0.2064 (0.1481)	0.1637	0.0609	0.0210	-0.0818
SOPHMORE	-0.2562 (0.1675)	0.1262	0.0782	0.0237	-0.1018
JUNIOR	0.1707 (0.1845)	0.3550	-0.0469	-0.0200	-0.0669
FEMALE	0.0352 (0.1170)	0.7633	-0.0102	-0.0038	-0.0140
BMI	-0.0194** (0.0096)	0.0430	0.0056	0.0021	-0.0077
MINEX	0.0027* (0.0016)	0.0823	-0.0008	-0.0003	0.0011
μ_1	0.6850*** 0.0602	0.0000			

[a] Standard errors are in parentheses. *Other Statistics:* Log Likelihood = -430.9708; Log Likelihood restricted = -466.8563; Model Chi-Squared (8) = 24.3621***; *, **, and *** imply statistical significance at the 10, 5, and 1 percent levels of probability, respectively.

Table 4. Estimated Results for the Learn Model

Independent Variables	Estimated Coefficients	P-Value	MARGINAL EFFECTS Strongly Agree/ Somewhat Agree	Neutral	Strongly Disagree/ Somewhat Disagree
			Prob (y=0)	Prob (y=1)	Prob (y=2)
CONSTANT	0.2521 (0.3890)[a]	0.5169			
AGE	0.3996*** (0.0094)	0.0000	-0.0088	-0.0060	0.0148
HSIZE	0.0480 (0.0379)	0.2053	-0.0105	-0.0073	0.0178
FRESHMAN	-0.2785* (0.1604)	0.0825	0.0639	0.0406	-0.1045
SOPHMORE	-0.2744 (0.1815)	0.1307	0.0656	0.0387	-0.1043
JUNIOR	-0.2898 (0.1264)	0.1898	0.0704	0.0402	-0.1106
FEMALE	0.0859 (0.1217)	0.4801	-0.0190	-0.0129	0.0319
BMI	0.0041 (0.0108)	0.7060	-0.0009	-0.0006	0.0015
MINEX	-0.0024 (0.0016)	0.1176	0.0005	0.0004	-0.0009
μ_1	0.7100*** (0.0668)	0.0000			

[a] Standard errors are in parentheses. *Other Statistics:* Log Likelihood = -379.8389; Log Likelihood restricted = -396.5320; Model Chi-Squared (8) = 33.3862***; * and *** imply statistical significance at the 10 and 1 percent levels of probability, respectively.

Summary and Conclusions

Food labels have been on most processed food products since August 1994, yet overweight and obesity rates continue to climb in Louisiana especially among adolescents and young adults. The study's intent was to examine food label use and students' assessments of labels so as to tailor nutrition intervention strategies toward their needs. The results suggest that food labels are making some difference in expanding students' nutritional knowledge. However, we concur with other researchers that work must continue to help students to adopt healthier eating habits. Our findings also suggest that nutrition intervention must target freshmen, sophomores, juniors, and males because of their low involvement with food labels. In the case of male students, we could direct some of our efforts toward fraternities and other male-oriented student organizations. Finally, because many students develop life-long eating habits in college, and are also at the stage where they start families, if good eating habits are developed in college and transferred to next the generation, the United States may experience a reversal in its overweight and obesity rates, and a lowering in the costs for treating diet-related illnesses.

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Do Price Premiums Exist for Local Products?

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Abstract

We employ econometric techniques to develop models (one each for apples, blueberries, 2% milk, and spring mix) in which the dependent variable is the price per unit of product. Product price is a function of product attributes (local, organic, conventional, and package size), metropolitan area, retail outlet type, price promotion, and season of the year. We aim to identify the price differential of the attribute 'local' while controlling for other sources of price variability. Results found a price premium for local for 2% fluid milk, blueberries, and spring mix but not for apples. Organics has a significant and positive effect on price for all four products.

Keywords: price premiums, local, organic

Introduction

Demand for locally produced food has increased sharply in recent years, as certain consumer segments seek out local foods to support local farmers and the local economy, or because local foods represent a desirable set of production and distribution practices. An important question for members of supply chains that produce and distribute local food products is: Does the attribute 'local' exhibit retail price premiums in the marketplace?

Literature Review

Most studies on prices for local foods elicit consumer willingness to pay for local foods that measure consumer intentions but not behavior. Eastwood, Brooker, and Orr (1987) in Tennessee, found no local preference except in the case of tomatoes. They postulated that perhaps there were regional or geographic differences in demand for local products and/or a preference for local was an emerging trend.

Various studies since then have found willingness to pay a premium for local products, which varies by geography, product, and consumer demographics. In 2002, Loureiro and Hine found that consumers in Colorado were willing to pay approximately 9 percent more for local potatoes. In Missouri, Brown (2003) found 58 percent of consumers unwilling to pay premium for any foods but 22 percent were willing to pay at least a 5 percent premium. In 2006 Darby et al., found a willingness to pay for locally produced strawberries in Ohio of $0.64 and $1.17 of supermarket and direct market shoppers respectively (on average 27 percent of retail price). They also reported that consumers responded to cues provided in the intercept surveys.

Giraud, Bond, and Bond (2005) found consumer preferences for locally made specialty food products across Northern New England and a willingness to pay, on average, of 9 percent. This willingness to pay varied by the base price of the product but was similar across three New England states. The researchers therefore argued that willingness to pay varies by state and by product as well as demographics. In 2008 Carpio and Isengildina-Massa conducted a phone survey of South Carolinian consumers and found consumer willingness to pay for locally grown products. Respondents indicated willing to pay premiums of 23 percent and 27.5 percent for animal products and produce respectively. Hinson and Bruchhaus (2005) found Louisiana consumers have a willingness to pay of 21 percent on average for strawberries.

Methods

There is very limited evidence of the price differentials between local and other food types using actual retail price data. A systematic analysis of food retail prices that controls for multiple product attributes can provide valuable information on price premiums for local food products.

In this study we employ weekly data on prices for five food products (apples, blueberries, 2% fluid milk, and spring mix) spanning the period 01/01/2009 – 12/31/2009. These price data were

hand-collected from thirty retail outlets in five U.S. metropolitan areas. The retail outlets include a variety of formats, including farmers markets, natural food stores and conventional supermarkets (both regional and national chains as well as independent supermarkets). The metropolitan areas where data were collected include Washington, DC; Syracuse, NY; Minneapolis-St. Paul, MN; Sacramento, CA; and Portland, OR. Although these market locations are typical of a wide range of retail outlets for these products, they may not be fully representative of all potential outlets from local and non-local food supply chains.

We also collected information on the product attributes, including variety, price promotion, product label or brand, and packaging offered to consumers.

For the purposes of this study, a local product was defined as one that is raised, produced, and processed in the locality or region where the final product is marketed. Each study area defined its "locality or region" according to how its consumers might perceive the definition of "local" in their area. The geographies defining "local" for each study area are listed below. Some geographies are defined by state or county boundaries while others are based on MSA boundaries defined by the U.S. Census Bureau.

- Syracuse, NY: New York State
- Portland, OR: Oregon and Washington State
- Sacramento, CA: Sacramento, CA, MSA, composed of El Dorado County, Placer County, Sacramento County, and Yolo County
- Twin Cities, MN: Minnesota and Wisconsin
- Washington, DC: Washington-Baltimore-Northern Virginia Combined Statistical Area, composed of the Baltimore-Towson, MD MSA; Culpeper, VA, and Lexington Park micropolitan statistical area; Washington-Arlington-Alexandria, DC-VA-MD-WV MSA; and Winchester, VA-WV, MSA; plus the counties immediately adjacent (i.e. share a border to the combined statistical area.

In addition, the product label or marketing materials had to convey information about where, how and by whom it was produced (or some combination of those three), i.e. have a "farm identity". For example, we defined store brand milk as being domestically produced in the US but not as being local. Even though in most cases, the milk was produced and processed within the local geography, it did not meet the second criteria, that the label or marketing materials had to convey information about where, how and by whom it was produced and have a farm identity within the local geography.

We employ regression techniques to develop four models (one each for apples, blueberries, 2% milk, and spring mix) in which the dependent variable is the price per unit of volume of the product. In our models, product price is a function of a vector of product attributes (local, organic, conventional, package size, and price promotion), metropolitan area, retail outlet type, and season of the year. We aggregate prices by retail type within each metropolitan area and use the median aggregated price to control for differences in variability in pricing between retailers of the same type. Variables and definitions are listed in Table 1.

Table 1: Variables and Definitions

Independent Variable	Definition
Season of the year	indicated by dummies for Spring, Summer, and Fall (Winter=reference variable)
Price promotion	Sale or promoted price = 1; otherwise = 0
Package size	2% milk = ½ gallon; blueberries and spring mix = ounces; apples = pounds
Metropolitan study area	indicated by dummies for Syracuse, Washington DC, Portland, and Sacramento (Twin Cities = reference variable)
Retail type	indicated by dummies for natural foods store and farmers market (supermarket = reference variable)
Place of origin	indicated by dummies for imported and local (U.S. domestic = reference variable)
Organic	Organic = 1; otherwise = 0
Additional variables for spring mix:	
Bulk – no packaging	Bulk packaging = 1; otherwise = 0
Additional variables for apples:	
Bulk – no packaging	Bulk packaging = 1; otherwise = 0
Apple variety	indicated by dummies for Braeburn, Empire, Haralson, Honeycrisp, Pink Lady, Gala and Fuji (combined), and Other; (Red Delicious = reference variable)

Results

Regression results indicate that a price premium for local exists for 2% fluid milk, blueberries, and spring mix but not for apples. Regression coefficients for these four products are presented in Table 2 (see Appendix). Results indicate that many, if not most, factors significantly affect prices, including seasonality and its effect on supply; geographic regions with variable consumer demands and costs of living; retail outlet type and existing supply chain efficiencies; organic production; and product origin, including local, domestic, and imports. If we control other sources of variation, such as study area/geography, season, promotions, and retail type, and focus on product attributes, such as origin, organic production, and package size, we see that origin and organic production are significant determinants of retail prices. In the case of apples, variety, another product attribute, was another important trait affecting price.

Price premiums as a percent of the intercept plus most common package size are calculated and shown in Table 3. Premiums for local were calculated as 20.8 percent for spring mix, 16.2 percent for 2% milk, and 8.7 percent for blueberries. The impact of local on price for spring mix was greater than any other variable, including organic. Direct comparisons of these premiums to the premiums in the willingness to pay studies are difficult because the products are not the same. However, the more perishable products in the willingness to pay studies, Louisiana and Ohio strawberries, Michigan greens, and Florida fresh produce, posted a range of 21 percent to 36 percent premiums while premiums for blueberries and spring mix in our study had premiums of 8.7 percent and 20.8 percent respectively. In general, premiums observed in this study were lower than what has been reported in willingness to pay studies.

Results indicate that organics had a significant and positive effect on price for all four products. Premiums for organic products were calculated and were higher than the premiums for local, except for the case of spring mix (Table 3).

Table 3: Percent Price Premiums Found for Local and Organic Products

Local	**% Premium**
2% Milk	16.2
Blueberries	8.7
Spring Mix	20.8
Apples	(not significant)
Organic	**% Premium**
2% Milk	82.9%
Blueberries	27.9
Spring Mix	12.9
Apples	18.0

Conclusions

Analyses indicate that most price differences are explained by product attributes, such as local, organic, variety (in the case of apples), and packaging, as well as season of the year, promotion pricing, retail outlet type, and metropolitan area. The results illustrate the variety of factors influencing pricing and the scale of the response.

Premiums calculated in this study were lower than those reported in willingness to pay studies. Consumers may over-estimate their interests in local when presented with a survey as opposed to actual purchases. In addition, the price data were collected in 2009 during the recession crisis. Any premiums for local and/or organic may have suffered.

We also suggest that the results for the product attribute “local” hinge on the definitions of local used in these models and that the changes in the definitions of local could alter the results. Definitions of local rely on consumer perceptions on what is local. In addition, consumers may have different perceptions as to what is local according to different products. Fluid milk is costly to transport long distances, and would likely be labeled as local by many existing definitions, yet consumers do not think of milk purchased in the grocery store as a store brand as being a local

product. And, in general, milk packaging does not provide any information that would help to identify the milk as being locally produced or processed.

The price premiums observed in these models with our current definition of local may be linked more to perceptions of farm identity, farm size, label information and marketing than to a "local" geography.

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Appendix 1.

Table 2: Regression Estimates for Factors Associated with the Price

	Milk *($ per 1/2 gal.)*	**Blueberries** *($ per lb.)*	**Spring Mix** *($ per lb.)*	**Apples** *($ per lb.)*
Mean Price	$3.18	$9.77	$8.99	$1.66
N	1,607	1,105	2,014	3,732
R^2	0.790	0.546	0.765	0.762
Independent Variable	**Coefficient** *(std. dev.)*	**Coefficient** *(std. dev.)*	**Coefficient** *(std. dev.)*	**Coefficient** *(std. dev.)*
Constant	2.067	10.374	13.220	1.220
	(.041)***	(.486)***	(.129)***	(.042)***
Fall	-0.122	3.23	-0.069	0.015
	(.034)***	(.355)***	(.102)	(.014)
Spring	-0.033	2.142	0.087	-0.014
	(0.034)	(.362)***	(.101)	(.015)
Summer	-0.109	-1.013	0.086	0.062
	(.034)***	(.394)***	(.102)	(.018)***
Syracuse, NY	0.246	-0.852	0.344	-0.184
	(.036)***	(.338)**	(.139)**	(.036)***
Washington, DC	0.129	-0.613	-0.038	-0.132
	(.045)***	(.387)	(.118)	(.035)***
Portland, OR	-0.035	-1.799	-1.154	-0.415
	(.033)	(.323)***	(.095)***	(.036)***
Sacramento, CA	0.357	1.04	-0.706	-0.351
	(.042)***	(.303)***	(.092)***	(.036)***
Price promotion	-0.363	-3.992	-1.857	-0.597
	(.034)***	(.312)***	(.138)***	(.022)***
Package size	--	-0.247	-0.474	-0.047
		(.019)**	(.008)***	(.005)***
Natural foods store	0.016	0.513	0.417	-0.092
	(.026)	(.254)**	(.089)***	(.016)***
Farmers market	0.613	0.336	-0.354	-0.153
	(.050)***	(.414)	(.221)	(.020)***
Imported	--	0.891	--	-0.013
		(.299)***		(.021)
Local	0.334	0.773	2.254	0.012
	(.032)***	(.365)**	(.195)***	(.016)
Organic	1.714	2.477	1.397	0.34
	(.025)***	(.231)***	(.088)***	(.013)***
Bulk-no packaging	--	--	-0.136	0.668
			(.117)	(.022)***

Varieties				
Braeburn	--	--	--	-0.195
				(.039)***
Empire	--	--	--	0.063
				(.022)**
Haralson	--	--	--	0.38
				(.054)***
Honeycrisp	--	--	--	1.2
				(.035)***
Pink Lady	--	--	--	0.618
				(.023)***
Gala/Fuji	--	--	--	0.324
				(.038)***
Other	--	--	--	-0.018
				-0.134

* Significant at .1; ** Significant at .05; *** Significant at .01