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An assessment of consumer preferences for Louisiana strawberries

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AN ASSESSMENT OF CONSUMER PREFERENCES FOR LOUISIANA
STRAWBERRIES

A Thesis

Submitted to the Graduate Faculty of the
Louisiana State University and
Agricultural and Mechanical College
In partial fulfillment of the
Requirements for the degree of
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in

The Department of Agricultural Economics and Agribusiness

by
Michael N. Bruchhaus
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ABSTRACT

Louisiana strawberry production has decreased over a period of years while national production has increased, leading to concern that Louisiana's strawberry industry might disappear. California, the leading producer state, has exploited its production advantages and marketing efficiency to increase production. The objectives of the study were (1) to identify strawberry attributes preferred by consumers in the selected market area, (2) to analyze key demographic factors that influence the decision about sources of and preferences for strawberries, and (3) to identify key steps that the Louisiana strawberry industry might take to improve marketability of product and profitability of its production.

Conjoint analysis (CA) was used to examine consumer preferences for selected product attributes of fresh strawberries in Louisiana. Conjoint designer was used to develop nine hypothetical strawberry products, and two holdout products were created from the attributes (container, pesticide strategy, price, and origin/brand) and their levels. The two container levels were a clear plastic clamshell design and the traditional plastic basket. Pesticide strategy's levels consisted of conventional control strategy and reduced pesticide strategy. Price's levels considered were \$2.99, \$2.49, and \$1.99. Origin/brand's levels were California private company brand or label, Florida private company brand or label, and 'Louisiana produced' strawberries. Data were collected through mail surveys sent to 2,000 randomly selected consumers in Louisiana, the southern half of Mississippi including Jackson, and the metropolitan area of Mobile, Alabama. An Ordinary Least Squares model was used to analyze consumer preferences. The estimated part worth utility values were calculated and used in a cluster analysis to segment consumers based on their preferences. In addition, demographic categories were used to identify preferences among various socioeconomic groups.

The results of the aggregate conjoint analysis indicated consumers put highest relative importance on origin/brand and, to a lesser degree, on price. Pesticide strategy and kind of retail container were rated much lower. CA results also were compared by demographics categories. The cluster analysis identified two clusters that exhibited high importance for origin/brand, one for price, and another for container and pesticide strategy. A standard marketing management model consisting of positioning, pricing, distribution, and promotional strategies was used as an outline for marketing implications. The results suggest that the Louisiana strawberry industry should market more through retail grocery chains and promote local origin/brand. The industry can differentiate itself from competitors by building on the quality, taste, and convenience of the Louisiana strawberry product in local grocery stores. In addition, there is an important segment of price-conscious consumers that might be tapped later in the growing season when prices have already dropped because of market saturation.

CHAPTER 1.

INTRODUCTION

1.1 STRAWBERRY PRODUCTION

Strawberries have become an increasingly important part of the United States fresh fruit industry over the last twenty years, and are second after fresh apples in industry value. Over the last two decades, strawberries have been one of the leading fruits in terms of growth in per capita consumption among fruit and vegetable crops. Between 1990 and 2000, consumption increased about 38 percent from 2.0 kilograms in 1990 to 2.7 kilograms in 2000. Growth occurred in both fresh and processed product forms, but fresh product increased by 48 percent from 1.5 kg per capita in 1990 to 2.2 in 2000, while processed product grew by only nine percent (Cook, 2002).

In 2001, about 46,100 acres of strawberries were harvested in the United States. Of that total, Louisiana harvested 387 acres, the industry leader California harvested 26,400 acres, and Florida harvested 6,500 acres. Louisiana's strawberry yield per acre has averaged 15,000 pounds, compared to about 52,500 pounds in California and about 26,000 pounds in Florida. As measured by total strawberry production, Louisiana accounted for about 9 million pounds, California produced about 1,531 million pounds, and Florida's strawberry production was about 169 million pounds (National Agriculture Statistics Service, 2001). Over the past five seasons, strawberry production in Louisiana averaged 388 acres (Table 1.1). In 2003, according to LSU AgCenter estimates, there were 101 producers in the state, and the crop's gross value was \$6,224,733, though NASS statistics placed the crop's value at about one-fourth less.

Table 1.1 Strawberry Production in Louisiana, 1992-2003

Year	Producers	Acres	Yield (in 1000 flats)	Total Production (flats)	Gross Farm Value (\$)
1992	284	1,157	991	1,146,971	10,322,472
1993	324	1,157	1,738	1,999,047	14,992,857
1994	292	944	1,741	1,642,583	10,676,793
1995	291	858	944	809,872	8,095,725
1996	215	659	803	529,160	5,291,600
1998	137	393	1,644	649,970	6,499,700
1999	133	376	1,630	612,700	6,127,000
2000	149	395	2,072	818,260	9,813,520
2001	130	387	1,821	704,867	8,452,404
2002	134	392	1,710	670,408	8,715,314
2003	101	388	1,783	691,637	6,224,733

Source: Louisiana Agriculture Summaries, 1992-2003.

1.1.1 History of Strawberry Production

The first mention of strawberries occurred sometime between 234-149 BC in the writings of Cato, a Roman senator. The strawberry was first described in literature as early as 1000 AD, and the first sketch of a strawberry plant was printed in 1484 AD (Lesson in Strawberry History).

Legend has it that clever children named the strawberry. After picking the fruit, children strung them on grass straws and sold them by the straw. Another theory is that the name represents the spreading nature of the plant's runners, which are strewn, or anciently strawed, over the ground. The English strawberry comes from the Anglo-Saxon streoberie, not spelled in the modern fashion until 1538 AD (Columbia 4 Kids, 2003).

1.1.1.1 History of Louisiana Strawberry Production

Commercial strawberry production in Louisiana began in 1876, when Dr. W. D. Wilson planted two acres near Independence, Louisiana. In 1920, Louisiana produced 6,500 acres of strawberries and accounted for seven percent of United States production. In the years 1929-

1930, strawberry production reached its highest at about 24,000 acres or 12 percent of United States production.

New Orleans and Memphis were the main markets for Louisiana strawberries until the 1890s, when seasonal surpluses began to appear. Getting the product to market in a salable condition became a problem. One answer was to use pony refrigerators (refrigerator cars with boxes of ice in the center to help preserve the berries while in transit). This enabled shipment of fresh strawberries to more distant destinations, and Chicago quickly became the principal market. In 1896, 10 refrigerator cars were provided by the Merchants' Dispatch Transportation Company. These were the first cars of farm produce to be moved by passenger train service. It was not until about 1915 that enough refrigerator cars were available to handle the supply.

A satisfactory method of selling strawberries also was a problem at that time. The growers delivered their berries to the railway station and consigned them to local commission firms. Freight rates were high on less than carlot shipments, and some of these firms took advantage of the situation by accumulating individual producers offerings at partial lot prices while selling in carlot units. Farmers recognized this problem, and, in 1898, formed a cooperative association for the purpose of shipping berries in carlots. The association shipped on consignment and each grower received his pay directly from the local commission merchant.

In 1901, this association obtained a charter and became the Ponchatoula Farmer's Association. The Association continued to consign berries to a broker in Chicago until 1904, when it began to sell to local buyers. About 1906, the organization established grading standards for fresh strawberries and required its members to provide a better quality product. An auction plan of selling was instituted by the Association, which netted about fifty cents per crate above the price received by individual farmers. A combination of better and more uniform quality

product and the auction method of selling were considered to be responsible for the premium price (Savant, 1946).

1.2 Marketing Options Used by Current Strawberry Growers

Strawberry growers have access to two major market channels, direct and wholesale markets. These alternatives constitute a large percentage of Louisiana's strawberry markets.

1.2.1 Direct Sales. Direct markets are important to Louisiana growers. They include:

- Fruit and vegetable stands provide seasonal production that is sold at a set location, coinciding with harvest schedules. About 20 percent of local strawberry production is distributed through these fruit and vegetable stands. An advantage is producers do not have to travel to different locations to bring their produce to consumers, allowing them more time for production and harvest. A disadvantage is the producer earns less of the total price because he does not always own the stand and must pay for its services.
- Peddlers who purchase from the grower and take the product to their favorite selling locations, which might be roadside locations or some other customer base developed over time. They distribute about 15 percent of the strawberry crop. They are mobile, move among favorite locations, and may have a loyal clientele. Farmers do not get retail price. The peddler may not have a strong knowledge of selling and may lack marketing experience.
- Farmers' markets, owned by private or public entities, where the grower's product is sold directly to the consumer. About 15 percent of strawberry production is sold through farmers' markets. The major advantage is producers are able to sell their produce at a higher price. Consumers get accurate information on the quality of the produce and usually provide a consistent market. The disadvantages are the producers time away

from production operations can reduce productivity, limited market days may put pressure on production and harvest schedules and contribute to insufficient volumes sold, and the producer makes less of the total price because he must pay for the services of the farmers' markets.

- Pick-Your-Own, where customers go to the farm and harvest strawberries from the field. About 10 percent of strawberry production is sold through pick-your-own. Its advantages are costs of harvest labor are decreased, and handling, packaging, shipping, and storage are lower than for other marketing methods. In most cases, payment is immediate with no deductions for shipping, handling, spoilage, or risk of price change. Its disadvantages are operations may suffer losses from inexperienced pickers, too few pickers present to harvest the producer's entire crop or the producer's liability risk may increase due to the potential for accidents (Direct Farm Marketing, 2003).

1.2.2 Wholesale Sales.

Wholesale sales move into grocery retail chains and the foodservice industry, which account for about 40 percent of Louisiana strawberry production. The advantages are large sales volumes, access to markets with large volumes, and low marketing costs. The disadvantage is the lower price. For the retail grocery market, about 10 percent of Louisiana strawberry sales are to the Houston and Dallas, Texas, markets. The remainder, about 30 percent, is sold to two or three major supermarkets, who distribute regionally (Boudreaux, 2003).

1.2.3 Sales Channels for California's Strawberry Production

In California, local and direct marketing is important for many small farmers who sell via certified farmers' markets (there are about 300 farmers' markets in California) and in some cases through farm stands and other local outlets. However, direct to consumer sales probably

represent only about 2 percent of total volume. The remaining 98 percent is sold directly to large retail buyers, wholesalers, or food service distributors, such as Sysco (Cook, 2003). This gives California a major advantage because most consumers shop at retail grocery stores.

1.3 Revenues and Costs by State

Revenues and costs from strawberry production vary widely by state because of differences in climate, production technology, and market channel.

Strawberry production costs are broken down into fixed and variable costs. Fixed cost components are machinery used for field operations, drip and overhead irrigation equipment used for freeze protection, and underground irrigation wells.

In Louisiana, the primary direct expenses per acre are hired labor, packing and harvesting items, plastic, plants, harvest labor, and row covers. Direct expenses in 2002 for Louisiana were estimated at \$12,134.28 per acre. Total Fixed Expenses were estimated at \$527.35 per acre. Total Specified Expenses per acre were \$12,661.63. Gross returns per acre were about \$16,043 (Hinson and Boudreaux, 2003).

Florida ranks second in the United States in the production of strawberries. Production costs in the late 1990s and early 2000s averaged \$17,100 per acre, which made strawberry production one of the most expensive crops to produce in Florida (Mossler and Neshein, 2000). Gross returns per acre were about \$26,508.

In California, total operating costs per acre were \$26,200. Harvesting accounts for about 63 percent of production costs, and harvest labor expense alone is more than 40 percent of the total. California's total gross return on strawberry production was \$32,541 per acre (University of California Cooperative Extension, 2003). California's climate enables a longer production season. Fixed costs are spread over more units, so costs per unit are lower.

Using these costs and yields, Louisiana spends 84 cents per pound of production, compared to Florida's cost of 66 cents per pound and California's cost of 50 cents per pound of production.

1.4 Prices and Promotions

Price patterns also affect Louisiana acreage. As an example, in the 1999-2000 season, Florida produced 18.3 million flats from November to April. However, only 11 percent of that production occurred during November-December, when the average market price was high (\$15.36 per flat). The bulk of the production (38 percent of the total) occurred in March-April, when the average market prices dropped down to \$6.12 per flat (FASS Vegetable Summary, 1999-2000). Louisiana produces most of its strawberries during March-April when California has entered the market and the average market price has decreased from its high in the earlier part of the production season.

The Louisiana strawberry industry has taxed itself only modestly to generate resources for promotion. The Louisiana Strawberry Promotion Board manages a small fund, generated from a per unit contribution of retail sales, to aid in promotions. The Louisiana Strawberry Festival generates significant activity that might be further harnessed for broader industry promotion. These and other activities may be appropriate resources. Then, appropriate use of these resources for marketing and promotional efforts may stimulate demand for the Louisiana product.

1.5 Issues That Affect Production Costs and Competitive Advantage

Some factors that give California and Florida a comparative advantage in strawberry production are not amenable to change. Climate is a primary example. Florida's location permits winter production, when prices are high. Most California production tends toward the southern to

central part of the state, and the location of production near the coast provides a longer growing season and obtains high yields and efficient production.

Louisiana has an early season with relatively high prices. Production ends in May with the advent of summer temperatures. However, the effective end of Louisiana's season is in April, when competition from full-stream California production sends prices lower.

Food safety and environmental friendliness are other factors that influence consumer choices. In Louisiana's warm and humid environment, insecticides and fungicides seem to be essential production tools. However, their use may reduce the potential market to some degree. The use of integrated pest management programs (or other similar programs or certifications) and transferring information about that use could open markets for Louisiana strawberry growers.

The fumigant methyl bromide, which is said to be a major factor in the depletion of the ozone layer (a major environmental concern), has played an important role in strawberry production for over 50 years to control insect, nematodes, pathogens, and weeds. Methyl bromide is being phased out under the Montreal Protocol (Osteen, 2000). Growers currently have no true alternative fumigant, and without a feasible alternative to methyl bromide, strawberry producers will sustain average yield losses of 20 to 40 percent (FAS, 2004). In the United States, methyl bromide is used mainly for tomato, strawberry, and bell pepper crops. California is the largest user, followed by Florida (Champion, 2004). Research suggests strawberry production could continue to decline because of the increased pest damage and cost of using less effective alternatives.

Technology is another area of advantage for California. In production, information on appropriate varieties, chemicals and other production practices are available from a system of

private and public research. In the post harvest handling phase, which is critical to successful shipment of strawberries, California growers understand the need for this technology and have invested in appropriate systems. California's system starts with field-packing, cooling to 34 degrees Fahrenheit in shipping facilities, and loading on refrigerated trucks within 24 hours of harvest for delivery across the country. This distribution system ensures that the product reaches consumers in acceptable condition (California Strawberry Commission, 2003). In contrast, Louisiana growers have made little investment in post harvest handling systems. Handling practices of most Louisiana growers do not create a product with an acceptable shelf life if it were to be marketed into the wholesale system (Picha and Trappey, 2003).

In addition to strawberries, California is the dominant supplier to US markets of many other fruit and vegetable crops. Much agricultural labor, particularly in the production of fruits and vegetables, is provided through migrant worker programs. These workers seek consistent jobs, and the concentration of production there helps farmers retain them.

There are other factors that offer states the opportunities to build competitive advantage. Producing areas, such as Louisiana, can take these actions to maintain and/or build an industry. They are not generic or commodity based. Instead, they encourage product differentiation, development of niche markets, and access into the supply chain.

Consolidation at retail (fewer but larger chain retailers) has had an important effect on the Louisiana strawberry industry. Smaller grocery chains in the market area have failed, replaced by larger firms whose responsibilities are to shareholders and not to a home market. Over the last twenty years, the number of grocery chains in the market area for Louisiana strawberries has diminished from ten to three (Boudreaux, 2003).

Over the last two decades, consumers have been purchasing more produce, more exotic varieties, and more convenient portions and packaging. The implications of these changes on consumer demand filter through the marketing chain.

The foodservice sector has stepped up as a buyer of fresh fruits, while merchant wholesalers (someone who buys large quantities of goods and resells to merchants rather than to the ultimate customers) have declined in importance. Mass merchandisers (e.g., WalMart) have become a major force in food marketing. Purchasing strategies have also changed, with retailers and wholesalers now asking grower-shippers to provide additional services and fees, including marketing fees and inventory services (Dimitri et al., 2003).

1.5.1 Supply Chain Management

Supply chain management (SCM) is a major factor in measuring how well most grocery stores perform in the food products market. Supply chain management is defined as an attempt to coordinate processes involved in producing, shipping and distributing products. This often must happen between independent businesses. Generally, SCM has been performed by large retail corporations with their large suppliers (Vertical net, 2003).

SCM offers the opportunity for important savings. As large retailers strive for efficiency in a competitive marketplace, they have looked to the logistics function to reduce these costs. The year-round shipping potential in California is very attractive to these firms. Each supplier handles a larger proportion of the chain's needs. Farm and supplier size in California have helped to make this process feasible.

Retail grocers have responded to increasing levels of competition in food retailing partly through adoption of SCM practices. A major grocery industry initiative is Efficient Consumer Response (Efficient Consumer Response, 1993), which includes:

- The reduction of non value-adding space (e.g. back room space) and the improved use of current floor space (efficient assortment).
- Providing the right product, to the right place, at the right time, in the right quantity, and in the most efficient manner possible (efficient replenishment).
- Reducing the additional cost for suppliers, brokers, and distributors without losing the purchase incentive for the consumer or eroding the competitive position of the distributor (efficient promotion).
- Creating interest, excitement, and new business opportunities by providing consumers with better, more convenient or lower priced ways to fulfill their needs (efficient product introductions).

With the addition of more sophisticated means of SCM, major grocery retail chains are changing to meet consumer demands. California and Florida are able to meet the strawberry demands of the major grocery retail chains, while Louisiana only supplies those stores in a small way.

1.6 Problem Statement

In a time when fruits and vegetables have been recognized as an important part of a healthy lifestyle, strawberry production has been in decline in many traditional production areas, including Louisiana. In terms of number of producers and acreage, Louisiana's strawberry industry has declined dramatically. The state's competitive position was illustrated by comparing production costs, which showed that total cost per acre of Louisiana production was almost 70 percent higher, and Florida production cost was about 32 percent higher, than California's cost. The reasons behind these statistics include California's favorable climate, advanced production

technology, ability to serve large customers in the market, and changes in retailer market structure.

The retail grocery store is where consumers shop, accounting for about 98 percent of produce sales. California strawberries mostly are sold to large retailers (Cook, 2003). Estimated sales of fresh produce in grocery stores were \$40.6 billion in 2000, sales through foodservice channels were \$34.1 billion, and an estimated additional \$1.1 billion of fresh produce was sold directly from farmers to consumers via farmer's markets, pick-your-own operations, and roadside stands (Cook, 2002). This confirms that the customer base is in the retail grocery store. California is a major supplier for grocery stores, while Louisiana growers use that market in a small way. Also, there has been a loss of small grocery chains that were loyal customers of the Louisiana industry.

As stated, the retail grocery store is where the vast majority of sales dollars are spent. The optimal market channel choice depends on circumstances of individual growers and markets. Louisiana's local markets are strong, but acreage continues to decline. The biggest disadvantage of a direct marketing focus is the loss of potential sales to customers who shop at retail groceries. A larger presence in grocery stores from either reallocation of sales made through produce markets or additional production seems to offer additional sales opportunity.

A major focus of this project is to measure and estimate what kind of strawberry product consumers want. Strawberries have different characteristics like size, freshness, color, and price. Consumer preferences in the local market area have not been identified.

1.7 Problem Justification

This study will be beneficial to Louisiana growers because it will assist their marketing efforts by gathering and analyzing market-oriented information. Research on consumer

preferences will support individual growers' efforts to produce and pack the right products. At the industry level, Louisiana boasts that its product is superior in overall characteristics, particularly taste, to product from other states. Consumer research may suggest overall themes for promotional activities. The state's Strawberry Promotion Board conducts a modest set of in-season promotional activities, including print and broadcast media. Research about consumer preferences should be useful in making appropriate choices about how marketing resources are allocated.

This information should be useful to individual growers and the industry. Individual producers should make an effort to produce a product that fits within store strategies. The industry should evaluate retail merchandising to learn how its efforts can be complementary to retailers' programs.

Knowledge of the strawberry industry, including knowledge of market channels and retail behavior, may promote the entrance of new producers in the industry and/or increase total strawberry production.

Louisiana strawberry production is beneficial to Louisiana agriculture. Production has economic linkages to the local economy. These include purchases of inputs such as agricultural equipment, chemicals, fuel, and an array of services, such as banking and insurance. Louisiana strawberries have a reputation for better taste compared to other states' product. As a result, consumers' knowledge of Louisiana strawberries tasting better could lead to increased production in Louisiana.

1.8 Objectives

1.8.1 General Objective

Louisiana growers have charted a course in terms of marketing strategies, with a strong focus on direct markets, including produce stands, peddlers, farmers' markets, and pick-your-own. However, the bulk of produce sales, including strawberries, moves through grocery stores. While Louisiana's industry is unlike California's, expansion of the industry probably depends on further penetration of the retail grocer channel. The general objective of this study is to assist the Louisiana strawberry industry to gain a larger share of the regional retail grocery store market by collecting and analyzing information about consumer preferences.

1.8.2 Specific Objectives

1. Identify strawberry attributes preferred by consumers in the selected market area.
2. Analyze key demographic factors that influence the decision about source of and preferences for strawberries.
3. Identify key steps that the Louisiana strawberry industry might take to improve marketability of product.

CHAPTER 2

LITERATURE REVIEW

2.1 INTRODUCTION

The review of literature identified little work directed toward consumer preferences for fresh strawberries. However, there was a body of research that addressed consumer preferences for fresh produce items, ornamental plant products, and beef products. These studies addressed objectives similar to those defined for this work. These studies were stimulated by concerns with loss of access to regional and/or national wholesale markets and subsequent reliance on local direct markets. Topics of these research works included consumer preferences for fresh produce and products of garden centers at local superstores, consumer attitudes regarding the value of identification logos on fresh produce, consumer preferences for items grown in-state compared to those grown out-of-state, and country-of-origin labeling (COOL).

Today's retail grocery industry has seen considerable change in its customers' purchasing patterns. Consumers are demonstrating increased concern over their food's quality and safety. Consumers are also searching for more convenience in retail grocery shopping. As a result, they are willing to pay more for products that are quick and easy to prepare. There are several reasons for this increasing trend. A few examples are 1) women are becoming more involved in the workforce, 2) families are becoming smaller, and 3) household incomes are increasing. These factors contribute toward shopping and product convenience.

Faced with a competitive grocery market and an ever decreasing direct marketing channel, branding has become very important for producers to gain a competitive advantage in the market place. Brand image provides consumers with a familiarity that increases convenience in grocery shopping.

Food safety has also become very important to today's grocery shoppers. With the threat of children becoming dangerously overweight, healthier food entrees are becoming more important to most households. In addition, consumers are becoming more aware of pesticide strategies practiced by producers, and some consumers in certain areas are showing increased demand for naturally grown and/or organically produced products.

As mentioned in the first chapter, the Louisiana strawberry industry is declining. Competing effectively with stronger markets has become a major challenge to local growers. Knowledge of consumer preferences, effective promotion programs, and demand stimulating merchandising methods are critical factors to the industry's future viability.

2.2 CONSUMER PREFERENCE LITERATURE

2.2.1 Examples of Study Objectives in Consumer Preference Literature

The following studies illustrate the kinds of questions that have been asked and indicate generally the statement of objectives from the literature. These studies have as their commodity focus fruit and vegetable crops, either individually or in broad groups. The literature contains many other similar studies. Examples of the objectives, which generally have a focus on characteristics of products, include evaluation of consumer responses to hypothetical apple products (Baker, 1999) and evaluation of rhododendron nursery stock product characteristics that influence decisions of Connecticut landscapers and retailers (Gineo, 1990). Other studies evaluated consumer behavior with respect to purchase regularity, satisfaction, origin, willingness to pay for fresh produce (Eastwood et al., 1987), country of origin labeling (Schupp and Gillespie, 2001), and explanation of attitudes toward purchase of locally-produced fruits and vegetables as explained by population demographics (Govindasamy, 1998). In addition, the explanations of the impact of state-logo labeling as an influence on purchase of local produce

also appeared in the literature review. Advertising's impact on choice of garden center, along with the impact of demographics, was the topic of a similar study (Safley et al., 1998). Food safety, specifically concerned with potential contamination from the irradiation process, was another facet investigated and hypothesized to be explained by demographic attributes of respondents (Aiew, 2003). These studies demonstrate the desire to explain and forecast consumer behavior and preferences for products on the basis of respondent characteristics.

2.2.2 Methodology Common to Consumer Preference Studies

2.2.2.1 Data Collection

The approaches to data collection were similar across these studies. Each study used the general idea of the Dillman Protocol (Dillman, 2002). Each study focused on a particular geographical region. There were examples of mail questionnaires in highly populated areas (Govindasamy, 1998) and in rural areas (Eastwood et al., 1997; Brooker and Eastwood, 1989). In some cases, focus groups were used prior to the survey (Baker, 1999). These studies sent initial mail outs, and as the questionnaires were received, follow up mailings were sent with an additional copy of the survey. The personal interview was another means of data collection. Examples included interviews of individual customers at particular store locations (Safely, 1998; Aiew, 2003) and of principal buyers of nursery stock in the specific firm (Gineo, 1990). County telephone books were used as a list source, with random samples of households drawn from the list (Govindasamy, 1998). A national mailing list was used in another study as a source, with random samples of households drawn from the list (Baker, 1999). These studies indicate the various means available to sample the surrounding population to gather information relevant to the study of characteristics and preferences regarding consumers purchasing decisions.

2.2.2.2 Analytical Tools

Today, various statistical techniques such as conjoint analysis (CA) and contingent valuation (CV) are being used as evaluation techniques. CA is a multivariate technique used to quantify the value that people associate with different levels of product and service attributes. Respondents trade product attributes against each other to establish product preference and the relative importance of attributes. CA has proven to be useful in identifying attributes which are relatively more important to consumers, allowing marketers to supply products with preferred attributes (Baker, 1999; Gineo, 1990; and Harrison and McLennon, 2003). CA also has been used in market segmentation to identify the attributes consumers value in a specific market segment and to understand the characteristics of those consumers.

In the CV procedure, participants are asked a series of questions regarding a new product or new attribute concerning the amount they would be willing-to-pay from choices researchers have specified (Nalley, 2004).

The literature search also revealed studies that used cluster analysis to develop market segments, (Baker and Burnham, 2001; Baker and Crosbie, 1993). Cluster analysis groups objects based on the characteristics they possess in order to aid in marketing decisions. Cluster analysis classifies respondents, products, or other entities so that each object is very similar to others in the cluster with respect to some predetermined selection criteria (Hair et al., 1995).

The literature review also revealed studies that used logit and probit models as statistical analysis tools. In these models, the dependent variable is a dummy or binary variable and is expressed as a linear function of one or more independent variables. Logit models change the problem of predicting probabilities within a (0, 1) interval to the problem of predicting the odds of an event's occurring within the range of the real number line (Pindyck and Rubinfeld, 1998).

In addition, the log of the odds that a particular outcome would be observed is estimated. Probit models provide an appropriate means of estimating the slope and intercept parameters of the relationship between dependent and independent variables (Pindyck and Rubinfeld, 1998).

2.3 SELECTION OF FACTORS AND ATTRIBUTES

2.3.1 Origin

Throughout the literature review, a number of factors were identified that affect consumer preferences and purchasing decisions of products. Origin/branding is very common in the analysis of consumer preferences. Origin is found in studies revealing preferences toward locally produced fruits and vegetables (Govindasamy et al., 1998; Brooker and Eastwood, 1989; Eastwood et al., 1987), beef products (Grannis et al., 2000), and wines and other beverages (Terry and Callahan, 1992). Country of origin has been identified as an important attribute in the beef (Schupp and Gillespie, 2001) and mutton industries (Clemens and Babcock, 2004).

2.3.1.1 Preference for Local Production

The effectiveness of the Jersey Fresh Program in terms of consumer awareness was evaluated (Govindasamy et al., 1998). The Jersey Fresh Program was defined as a state-sponsored agricultural marketing program. It was implemented to improve the regional economy, increase local employment, promote the sustainability of agriculture, and preserve open space.

The logit model was chosen for Govindasamy's study. The model assumed that the probability of a consumer being aware of Jersey Fresh produce depended on the influence of selected independent variables associated with each consumer. A focus group and consumer pre-test were used to modify and refine the survey instrument. Data were collected on the shopping habits of consumers and their sociodemographic characteristics using Dillman's survey method.

The questionnaires were mailed to a random sample of New Jersey residents using the latest telephone books of each county as the source for addresses.

In Govindasamy's study, the dependent variable was whether the respondent had heard of the program or seen the logo. Consumer behavior variables were:

- Whether the logo was useful in identifying and selecting among types of produce
- Frequency of shopping for fresh produce during the summer
- Degree of concern about the origin of fresh produce
- Number of grocery stores which handle produce with the Jersey Fresh Logo
- Most important attribute in deciding where to shop for fresh produce

In addition, demographic information was reported.

In Govindasamy's study, the results indicated that about 77 percent of consumers were aware of the Jersey Fresh program from produce displays and television advertisements. About 82 percent linked the logo with quality produce from New Jersey. About 70 percent of those who had purchased Jersey Fresh produce indicated the levels of quality and freshness were very good in comparison to other fresh produce. About 48 percent of the respondents shopped twice a week for fresh produce. Roughly 83 percent of consumers shopped at supermarkets and about 46 percent at farmers' markets. Price of the produce and special in-store demonstrations were ranked highest among the various advertisements to attract consumers. The results from the two separate logit models (behavioral model and demographic model) indicated that those who shop at more than one supermarket, those who frequently shopped at direct marketing facilities, and those who frequently read food advertisements were more likely to exhibit an awareness of the Jersey Fresh Program.

In another study on the topic of preferences for local products, consumer behavior with respect to purchase regularity, satisfaction, origin, and willingness to pay for selected local versus non-Tennessee grown fresh produce was evaluated (Eastwood et al., 1987). The main hypothesis was that the effects of independent variables are predictable within a variable and across the categories of the demographic variables. In addition, these effects would vary by consumer preference and specific produce item.

Probit regressions in Eastwood's study were used for five dimensions of consumer behavior:

- The overall regularity with which consumers purchase fresh produce.
- The purchase regularity for selected items.
- The levels of consumer satisfaction among selected fresh produce.
- The effectiveness of campaigns emphasizing locally grown produce.
- Consumer willingness to pay for local versus out-of-state commodities.

Since most of the United States population is urban and is less likely to have access to homegrown produce, this segment was targeted by Eastwood. The survey was conducted during the spring and summer. Consumers were expected to have positive attitudes toward locally grown fresh produce at this time of the year, based on media coverage and produce availability from personal or friends' gardens.

Eastwood et al. developed, pilot tested, and revised a questionnaire. Major sections of the survey instrument focused on consumer satisfaction with fresh produce, questions about selected fresh produce of interest in Tennessee, and basic socioeconomic information. Apples, broccoli, cabbage, peaches, and tomatoes were the commodities. Higher income resulted in higher probability of purchasing fresh produce regularly. Households in the highest income

group had a significantly lower probability of being satisfied with the purchase of fresh produce than households with lower incomes. Older households had a preference for local tomatoes, while younger households had no preference for origin of tomatoes. Willingness to pay varied among commodities and socioeconomic variables. Black households were less willing to pay a premium price for local tomatoes. Professionals were willing to pay a premium price.

Another study on the topic of preference for local production used a probit formulation to investigate whether state logos, an identifying symbol used for advertising on a product package, affected the consumer's decision to purchase selected food products (Brooker and Eastwood, 1989). The study focused on the potential for enhanced sales of locally generated, fresh or processed products in local retail stores.

Brooker and Eastwood collected data from a mail survey of 750 consumers at the county level. The questionnaire addressed consumer preferences on a number of topics for fresh local products, such as preferences about buying local products and should logos identify local produce.

The results from Brooker and Eastwood's study showed that about 93 percent of the respondents believed that a logo should be used to identify locally-grown produce. About 89 percent would like information on the origin of produce sold in supermarkets. However, about 95 percent said a supermarket would be helpful to them if it identified locally grown produce.

2.3.1.2 Country-of-Origin Labeling (COOL)

Consumers are interested in knowing the country-of-origin of their food products (Schupp and Gillespie, 2001). Binomial probit analysis was used to analyze the attitudes of respondents toward country-of-origin labeling of fresh and frozen beef. The study focused on

the demographic characteristics of consumers and the interest they showed toward labeling of fresh or frozen beef in grocery stores and restaurants.

In Schupp and Gillespie's study, a mail-out survey was sent to 2,000 households. Along with socioeconomic data, respondents were asked a series of questions regarding their attitude toward imported beef compared to domestic beef, country-of-origin labeling, and how the labeling should be done. The two dependent variables used for the probit analysis were:

- Do you favor compulsory country-of-origin labeling of fresh or frozen beef in food stores?
- Do you favor restaurants being required to document on the menu the country-of-origin of fresh or frozen beef used in their meals?

The results from Schupp and Gillespie's study indicated that consumers were slightly less interested in the country-of-origin labeling of fresh beef served in restaurants compared to fresh beef sold in grocery stores. Nearly 86 percent of the respondents rated United States beef better than imported beef. Education and income were not significant for grocery stores nor was income significant for restaurants. Households with a single parent or with children living at home appeared to be less concerned about country-of-origin labeling.

2.3.2 Food Safety

In recent years, consumers have placed more importance on issues of food safety and environmental quality, such as pesticide usage. In addition, food safety has received increased attention in the media. Retail stores have focused more on providing higher quality and safer food products for their customers. They have used labeling to provide this assurance. Product quality is also a reflection of the supplier. All of these issues will help develop a better understanding between the retailer and the supplier.

Throughout the literature review, the discussion of food safety was found in studies revealing preferences toward reduced pesticide usage in fresh produce (Baker, 1999; Armah, 2001; and Baker 2001) and the use of crop rotations on potato farms (Lazarus and White, 1984), along with many others. In addition, the discussion of food safety includes the area of microbial viruses/bacteria (e-coli) research (Aiew et al., 2003; Veeman and Adamowicz, 2001), as well as issues of whether the food safety issue is reshaping the retail food supply chain (Woods et al., 2003).

2.3.2.1 Pesticide Usage

In a nationwide survey, CA was used to evaluate consumer responses to hypothetical apple products (Baker, 1999). Product attributes included price, quality, pesticide use levels and the corresponding cancer risk, and type of government inspection. The general objective was to determine differences between consumers belonging to market segments based on food safety preferences relative to pesticide use.

Variables representing pesticide usage and assurance of regulatory compliance were the primary focus of Baker's study. Previous research indicated that price and quality characteristics (including size, color, and the absence of physical damage) were the factors most commonly mentioned by consumers as influencing their purchase decisions. The first attribute represented the levels of price, while the second attribute represented the levels of damage on the fruit which consumers might face. Pictures of apples depicting three levels of damage were presented. The third attribute represented the total health risk to consumers resulting from three hypothetical pesticide usage regulations. The last attribute represented a type of food safety compliance program. The latter indicated that many consumers wanted assurance of food safety regulations and preferred reduced exposure to pesticides.

A major purpose of Baker's study was to study food safety valuation. In the conjoint analysis methodology, a conjoint designer program reduced the full factorial design from 54 combinations to 11 product profiles. Respondents were asked to rate these hypothetical product profiles where the value 11 represented the most preferred and 1 denoted the least preferred. Each score could be used more than once. Follow-up focus group sessions ensured that the surveys would be clearly understood by the respondent and be administered correctly.

In Baker's study, the respondents were asked to provide information on their socioeconomic status and attitudes (through a set of psychographic questions). Predictive results were found by using the List of Values (LOV) developed by the University of Michigan Survey Research Center in conjunction with the demographic variables (Kahle and Timmer, 1983).

Baker's study of consumer preferences for food safety attributes is an important component of the segmentation structure because results indicate that consumers in these segments differ based on demographic and psychographic characteristics. Pesticide policy had the highest relative factor importance of about 61 percent, price had a relative factor importance of about 15 percent, damage had a relative factor importance of about 14 percent, and the certification program had a relative factor importance of about 10 percent. Cluster analysis yielded four separate market segments. Safety Seekers primarily were determined by type of pesticide policy and the associated cancer risk. The Balanced Buyers segment favored more balanced concern for price, quality, and food safety attributes than consumers in the other three market segments. Price Pickers were very sensitive to price. Perfect Produce consumers were most concerned with the level of damage attribute.

In another study on the topic of pesticide usage, a binominal logit model was used to examine the relationship between cluster analysis and CA to identify consumer response to

genetically modified foods (Baker and Burnham, 2001). Based on f-statistics and t-values, and the interpretation of the researchers, three clusters were identified. The three attributes that were used in the study formed the basis for the three clusters.

Respondents in Baker and Burnham's study were divided into two segments based on their preferences for either willingness to accept GMOs (consumers from two of the three clusters) or avoiding GMOs (consumers from the other cluster). These two segments formed the dependent variable and they were assigned the values 1 and 0 respectively. The independent variables consisted of:

- Socioeconomic characteristics
- Risk preferences
- Knowledge and opinions of GMO foods

In Baker and Burnham's study, the results from the logit analysis indicated that the segment to which a consumer belonged was not based on socioeconomic characteristics. However, the respondent's level of risk aversion and opinions regarding GMO foods were strong indicators of whether a consumer belonged to a segment that accepted or rejected GMO foods. Consumers that were risk averse belonged to the Safety Seekers cluster. Similarly, consumers who believed GMO foods would have a positive result on the safety and quality of their food were in the clusters which approved GMO foods.

2.3.2.2 Microbial Viruses and Bacteria Awareness

Consumers' willingness to buy and pay for irradiated ground beef was the subject of a microbial bacteria study (Aiew et al., 2003). Irradiation is one way to kill bacteria and parasites, removing them as a potential cause of food-borne illness. However, many consumers are concerned about the irradiation process. They fear that radioactive contamination might occur or

that the food product's taste or other attributes might be affected. Previous studies had revealed consumers' concerns about food safety, and consumers ranked food safety more important than store promotions or the quality of the product being sold. The main objectives of the study included:

- Assessing consumers' knowledge and acceptance of food irradiation
- Measuring the effects of information about food irradiation on consumer acceptance
- Eliciting the willingness to pay for irradiated ground beef

In Aiew's study, data were provided by personal interviews of 484 consumers at 13 selected stores in major cities in south-central Texas. Interviewees received information on the nature and benefits of food irradiation and the differences between the uses of electron beam and gamma rays to irradiate food products. Before and after the presentation of information, respondents self-identified their position on food irradiation. Respondents who were willing to buy an irradiated product (ground beef) were asked about their willingness to pay a premium, and how much.

In Aiew's study, after respondents were given information about the nature and benefits of irradiation, about 89 percent became willing purchasers. After being given information on the difference between electron beam and gamma rays, about 94 percent were willing to buy.

About 97 percent of consumers were willing to pay 10 more cents per pound for irradiated meat in the first bid offer. As bid value increased, fewer respondents were willing to pay premium prices for the irradiated meat. In the second bid offer, respondents who were unwilling to pay 10 cents more per pound for irradiated ground beef in the first bid offer were willing to pay 5 cents more per pound, and 67 percent said they would pay a premium of 20 cents per pound.

The subject of another study was to understand Alberta consumer perceptions of foods containing a range of pesticide residues and hormonal treatments (Veeman and Adamowicz, 2001). Two surveys were conducted, the first by telephone and the second by mail.

The telephone survey resulted in a random sample of 1,240 Albertan residents. This survey used CV questions to find the willingness to pay for food products that had reduced pesticide use and hormonal treatments from biotechnological processes.

The results from the telephone survey used by Veeman and Adamowicz indicated that respondents were more concerned about pesticide use than the use of hormones in food production. Demographical information indicated that women were more concerned about pesticide residues than men. As knowledge of these issues increased, so did respondents' concerns. In addition, even as the cost of food increased, consumers still chose to restrict pesticide or hormone use.

In Veeman and Adamowicz's study, the mail survey sought to gain perceptions of consumers about the use of the naturally occurring hormone recombinant bovine somatotrophin (rBST) to increase milk production. A conditional logit model of consumer choice was used to analyze consumers' opinions regarding the riskiness of these enhancements on consumer welfare. The goal of the survey was to understand welfare changes from rBST.

The approach to Veeman and Adamowicz's study was to create an actual market condition so consumer welfare could be determined given conditions of labeled and non-labeled rBST milk. In this study, the base situation showed there was a welfare loss when consumers were informed that milk might contain rBST. Analysis of alternatives indicated slightly less consumer welfare loss for male compared to female food purchasers, and for higher levels of education and income, with the introduction of rBST. When consumers were offered the choice

of milk labeled “rBST-free”, then consumer welfare losses associated with introduction of rBST declined. Consumers were able to make more informed decisions regarding whether to purchase and consume the product.

2.3.3 Other Studies that Identified Attributes for Consumer Preferences

Hedonic modeling, a model that characterizes a particular product and may be resolved into a number of basic characteristics which determine its quality (Pearce, 1992), was used to determine consumers’ willingness to pay for different characteristics of natural Christmas trees (Davis, 1993). Tree characteristics included price, height, needle texture, and color. The objectives of Davis’s study were (i) to determine how individuals value the natural characteristics of Christmas trees and (ii) if individual’s knowledge of Christmas tree species would cause marginal prices to differ among species.

In Davis’s study, the results showed the most frequently observed needle length is two inches, with length somewhat depending on the different types of Christmas trees. The most frequently observed color preference was green. About 80 percent of the sample reported preferences for straight trunks, thick branch density, and trees with full-shape. About 49 percent reported a preference for soft needle texture.

In Davis’s study, to determine if marginal prices differed across species (Fir, Spruce, and Pine), dummy variables were constructed for specie. The results showed the Fir-tree consumers were willing to pay about \$4 per half-foot increase in the height of a tree. Spruce and Fir-tree consumers were willing to pay a premium of about \$11 for dense-branch spacing. Spruce-tree consumers discounted the value of full shape by about \$20, while Pine-tree consumers were willing to pay a premium of about \$12 for soft needle texture.

Identifying product characteristics which influence the decisions of Connecticut landscapers and retailers when purchasing rhododendron nursery stock from wholesalers was the subject of another study (Gineo, 1990). CA was used as the tool to analyze the data. Similar to Baker, Gineo used a fractional factorial design. The stratified random sample represented the proportions of retailers and landscapers in the list, consisting of 24 firms, where 54 percent were landscapers and 46 percent retailers.

Product rankings and information on purchases were obtained through personal interviews of buyers of nursery stock from wholesalers. Firms were also asked about individual purchases based on their attributes, delivery time, color, and origin.

Gineo's results showed that the dominant characteristics affecting buyer preferences were plant quality, followed by the offering of a full line of plants, height of the plant, and the option to pay for purchases on a cash basis.

2.4 EVALUATING RESPONSES TO ADVERTISING AND PRODUCT PRESENTATION

How well a particular grocery store advertises its products usually has a direct effect on its sales. In addition, advertising local products in grocery stores may contribute to increased sales. This is due to the presentation of the product which may encourage consumer acceptance and provide grocery shopping convenience.

The effectiveness of advertising and promotional programs conducted by independent garden centers was analyzed in this study (Safley et al., 1998). Personal interview surveys were conducted in four North Carolina cities. Surveys were conducted on Fridays and Saturdays at one garden center each weekend over a four-week period. Of a total of 1,789 interviews, there were 1,469 usable observations. Before customers entered the store, information about products they intended to purchase and the kind of advertisement (if any) they were responding to was

collected. Customers were interviewed again as they left the store to identify purchases actually made, amount spent, and socioeconomic characteristics. From store managers, the researchers obtained information about promotional efforts for the past 30 days. These included copies of newspaper advertisements and inserts, direct mail brochures, radio spots and television commercials.

About 8 percent of respondents interviewed on the specific date said that some component of the store's advertising influenced their decision to shop at that store. Of that group, the largest component, about 67 percent, said they had seen newspaper advertisements (or inserts). About 18 percent said they had seen newsletters. The other forms of advertisements were mentioned by smaller numbers of customers.

Among those customers whose visit was not in response to a specific kind of advertisement, 35 percent indicated that store location was the most important factor in their destination decision, followed by 15 percent who identified plant quality, and about 14 percent who identified the store's large selection. Referral by friends and customer service were other reasons for choices of garden centers.

CHAPTER 3

METHODOLOGY

3.1 CHOICE OF STATISTICAL MODEL

In this chapter, conjoint analysis (CA) and cluster analysis as methodologies to analyze consumer preferences for fresh strawberry attributes are discussed.

CA is a multiattribute procedure used to understand how respondents develop preferences for products or services. It measures how consumers value a hypothetical or non-hypothetical product or service (Hair et al., 1995).

CA was developed as a measurement technique from the mathematical psychology and psychometric fields to establish the relative importance of a product's many attributes (Green and Wind, 1975). CA's usage has increased considerably over the last thirty years. In the 1970s, approximately sixty percent of all CA studies were related to consumer goods, twenty percent to industrial goods, and the remaining twenty percent was carried out for transportation and financial services (Cattin and Wittink, 1982). In a few cases, the techniques have been based upon developments in attitude measurement as relevant to modeling of brand choices and other kinds of evaluative judgments (Green and Carmone, 1970). CA applications have become common in marketing and agribusiness research in addition to the applications mentioned above (Harrison et al., 2001).

Another technique used to evaluate hypothetical or limited markets valuations in marketing and environmental research is contingent valuation (CV). CV is used in marketing research to analyze how much consumers would be willing to pay for a product. A common application of CV is analyzing the value of a natural resource such as an environmental amenity.

However, CV does not account for tradeoffs between a product's attribute or the value of an attribute's levels.

CA will be the best valuation technique to achieve the objectives for this study because:

- A researcher interested in the importance of product attributes can ask respondents to rate or rank them individually or as a whole.
- Several attributes can be put into the same study and the researcher can observe the tradeoffs that consumers make among the product attributes, identifying important factors to consumers.
- The process is similar to the situation consumers face in choosing among products in their everyday purchasing decisions.
- The CV and auction techniques tend to focus on price and willingness to pay, rather than the importance of price relative to other attributes. They can not achieve the objectives of this study because of their inability to measure consumer preferences for different variations of products or services (Table B.1).

3.2 REVIEW OF CONJOINT ANALYSIS THEORY

The conjoint approach uses the theory of consumer choice, where subjects' preferences can be measured in terms of individual attributes of the products or services (Gan and Luzar, 1993). In CA, a set of attributes defines a product or service. Levels are the values associated with each attribute. For example, an attribute for a product might be price, and the levels for this attribute might be expressed as \$1.50, \$2.50, and \$3.50. When the attributes and associated levels are combined into hypothetical products, the result is known as a product profile (Hair et al., 1995; Ozayan, 1997).

The respondent's only task is to rate or rank specific product profiles. The CA procedure decomposes their ratings or rankings into specific values called part worths, which are measured by a set of regression coefficients. The part worths can be added up to get total utility for the product, for individuals or aggregated over individuals.

3.2.1 Utility Preference Theory

This discussion follows general utility theory (Pindyck and Rubinfeld, 2001). A consumer's utility is the satisfaction obtained from goods and services. In theory, choices among products or bundles of products are represented using the concepts of indifference curves and budget lines. Indifference curves are convex from the principle of diminishing marginal utility. An indifference curve defines combinations of bundles of goods that have a given level of utility. Utility is the numerical score representing the satisfaction that a consumer gets from a given product or service. The level of utility is represented by a set of indifference curves which have numerical indicators and can be used to generate a utility function.

The budget specifies the amount of dollars a consumer can spend on goods and services. The ratio of prices determines the slope of the budget line. The consumer moves to the highest indifference curve possible given the budget constraint, representing the maximum utility attainable. Increases in buying power, from an increased budget or lower prices, allow an individual to move to another indifference curve to increase satisfaction.

In CA, utility is the conceptual basis for assessing the value of a product or service. As mentioned above, in general utility theory, individuals make decisions based on their budget constraint choices between bundles of products. However, in CA, individuals' constraints are presented by choices between product or service levels. Individuals must make tradeoffs among these levels to achieve maximum satisfaction. The individual uses a rating or ranking scale as

the numerical indicator. An individual's total utility for a product is the summation of individual attribute part worths. A researcher can use multiattribute analysis to study how the respondent makes decisions among the alternative attributes to maximize his utility (Keeney and Raiffa, 1993). Consumers evaluate the costs and benefits, competing products' attributes, and opinions of each product before making a final decision among product profiles. Therefore, identifying these product characteristics may help marketers gain competitive advantage in positioning their products.

Consumers integrate information about different determinant characteristics to shape overall impressions of product profiles (Louviere, 1988). This is known as information integration theory (IIT). IIT provides a theoretical basis for complex decision-making. It has three stages:

- Valuation – judgments are made about the product's attributes.
- Integration (psychophysical judgment formation) – the judgments made towards individual attributes are combined across attributes to get an overall valuation.
- Response formation – the respondents have evaluated the attributes and integrated all preferences toward deciding on the overall best product.

It is assumed that the individual's highest possible level of total utility for a particular product is achieved with his/her final decision (Anderson, 1991).

The combination of part worth utility values for the levels of each attribute of the product can be summed to give the respondent's total utility for that product. The part worth utility estimates are formed by combinations of attributes so that the total utility for a wide range of products can be determined. In equation 3.1,

$$[3.1] \quad U_j = f(X_{1j}, X_{2j}, \dots, X_{nj}; Z_1, Z_2, \dots, Z_n; \Theta_n) + e$$

the general form of the individual utility equation is illustrated. U_j represents the utility an individual acquires from product j , X_{ij} represents the i th attribute level for product j , Z_i represents the socioeconomic profile for each individual ($i = 1, \dots, N$), Θ_n represents a vector of parameter estimates for each attribute level, and e is an error term. Estimated part worths of the product attributes are called main effect variables and are represented by variables X . Socioeconomic variables are included in this formulation to illustrate that they affect utility (Fields, 2002).

In this study, CA will be used to identify consumer preferences for fresh strawberries as a function of a bundle of attributes. A bundle or profile is a hypothetical product using different combinations of attributes and levels. The development of a conjoint profile or bundle is demonstrated below (Figure 3.1).

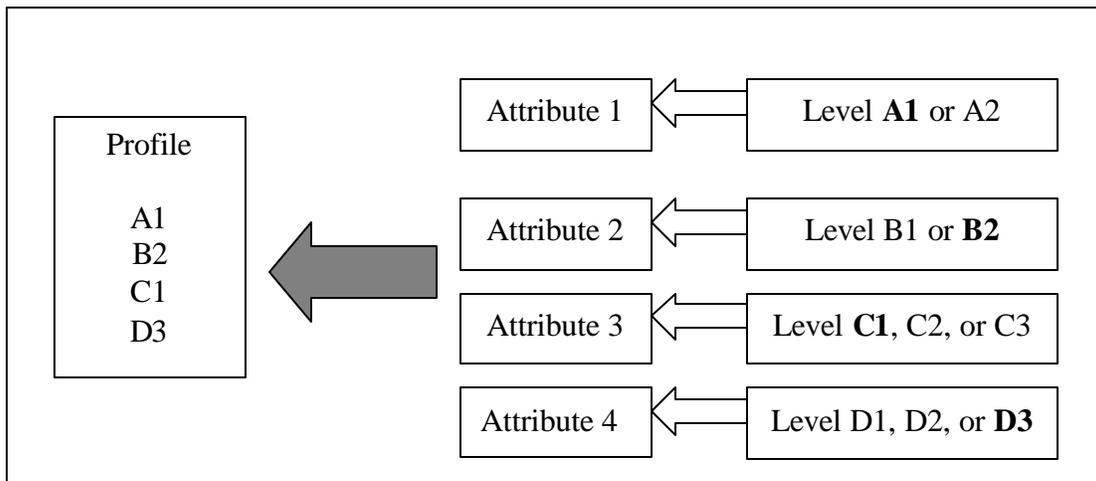


Figure 3.1. Attributes and Levels Leading Toward Profiles
Source: (Sambidi, 2003)

3.2.2 Methodology of Conducting Conjoint Analysis

The steps involved in conducting CA are outlined below (Green and Srinivasan, 1978).

3.2.2.1 Selection of the Preference Model

3.2.2.1.1 The Composition Rule

The composition rule is used in CA to explain an individual's preference makeup, or how the respondent combines the part worths of the factors to gain overall worth. Two common forms of the model are the main effects model and the main effect with interactions model (Hair et al., 1995).

The main effects model allows respondents to add up the part worth values of each attribute to get the total value for a combination of attributes. For example, assume that a hypothetical product has three attributes and their part worths are 1, 2, and 3. The total worth would be 6 (Hair et al., 1995). Each respondent's total utility is the sum of the part worth of each attribute. This assumes that the attribute's impact on utility is independent of the levels of other attributes (Green and Srinivasan, 1978).

The main effects with interactions model is similar to the main effects model in the basic composition rule. "It assumes the consumer sums the part worths to get an overall total across the set of attributes. The difference between the main effects with interaction model and the main effects model is that the former allows for certain combinations of levels to be slightly higher or lower than just their sum" (Hair et al., 1995). From the earlier example, the interactive model would allow for the sum of the three levels to be more or less than six.

The main effects model is the most common because it accounts for a majority of the deviation in respondent's preferences (Green and Srinivasan, 1978). An advantage of the main effects model compared to the main effects with interactions model is it allows for increased

statistical efficiency because fewer parameters have to be estimated. However, a disadvantage to the main effects model is if the interactions are not included in the specification then they cannot show up in the model.

An advantage of the main effects with interactions model compared to the main effects model is it may be a more accurate representation of how respondents value a product. However, a major disadvantage of the main effects with interactions model is it decreases the statistical efficiency of the model as a result of the increased number of part worth approximations. The increased number of parameters becomes a burden on the rating or ranking by respondents and adds statistical inefficiency to the study.

Furthermore, the results of the interaction effects in the main effects with interactions model are usually not significantly different from zero (Green and Srinivasan, 1978). “Many times, adding interaction terms to models decreases predictive power because the reduction in statistical efficiency is not offset by increases in predictive power gained from the interactions. The interactions predict substantially less variance than the main effects, often not exceeding a 5 to 10 percent increase in explained variance. Interaction terms are most likely to be substantial where attributes are less tangible, particularly where emotional reactions play a large role” (Hair et al., 1995).

In summary, this study chose to use the main effects model because (i) it captures most of the variance and predictive capability, (ii) use of interaction terms increases the inefficiency of the regression equation, and (iii) significant interaction effects are not likely to be observed because product attributes are mostly tangible rather than emotional.

3.2.2.1.2 Part Worth Relationship

The part worth relationship focuses on the assumptions made about the relationship between the levels of an attribute. Either a linear, quadratic, or separate part worth relationship can be specified (Figure 3.2). The linear or vector part worth relationship is the most limiting form because only a single part worth is estimated for an attribute. The quadratic form assumes

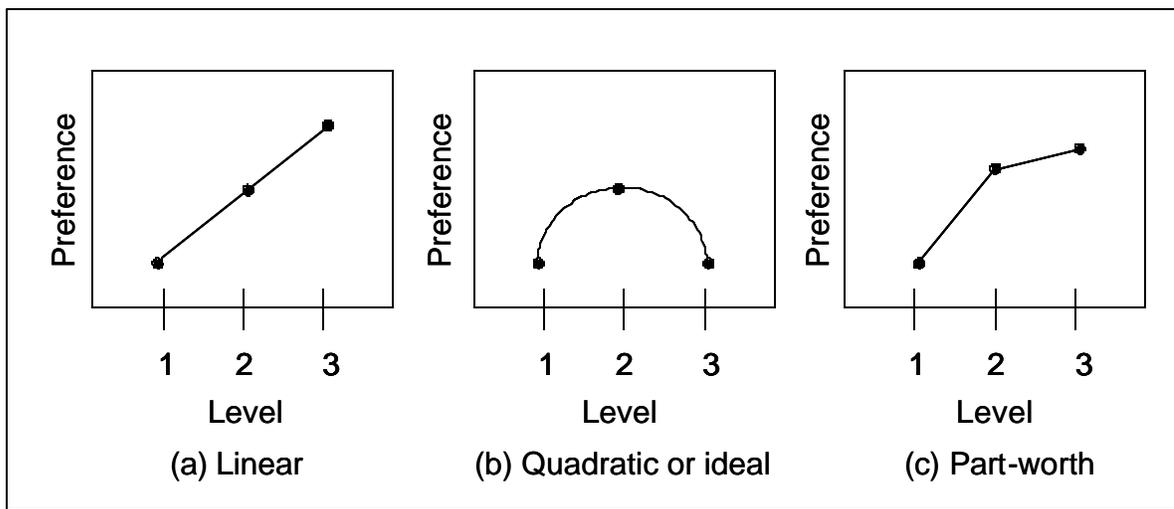


Figure 3.2. The Three Types of Relationships between Factor Levels in Conjoint Analysis
Source: Hair et al., 1995

curvilinear relationships. Because the separate part worth model allows separate part worth estimates for each attribute level, it is the most general form of the part worth relationship (Green and Srinivasan, 1978). The separate part worth relationship provides more detailed information about a respondent's preference structure. The separate part worth relationship is the most flexible choice and a unique utility level is estimated for each attribute (Baker and Crosbie, 1993). Individual utility from part worth relationships can be shown in the main effects utility function below. A main effects utility function assumes independence of the attributes.

$$[3.2] \quad U_j = b_1 x_{1j} + b_2 x_{2j} + \dots + b_n x_{nj}$$

In this linear equation, b_i represents the weight or part worth utility for each attribute for the given product profile. In addition, this utility function allows individuals to add together the separate contributions of each level to gain total utility for the profile.

In this study, the separate part worth formulation was chosen as the relationship between consumer decisions and attribute levels because it provides more information and is less restrictive on individual preference structures for attribute levels, relative to linear and quadratic relationships.

3.2.2.2 Design of the Experiment

The design process includes determining the number of attributes and attribute levels to analyze, the manner in which the product profiles are to be presented, and the measurement scale to be used for the dependent variable.

Determining the Number and Design of Attributes and Levels

All appropriate attributes which independently represent the factors that can have an impact on the decision making process should be included in the model. As a result, when assessing an individual's utility for a product or service, it is important for the researcher to consider every important attribute (Keeney and Raiffa, 1993).

For a CA study to be successful, the researcher must be able to describe the product in terms of each attribute's relevant values (Hair et al., 1995). Understanding potential customers and assessing attributes relevant to their needs are very important. An attribute is irrelevant if it does not positively or negatively influence consumer preferences (Lancaster, 1971). Attributes should be sufficiently descriptive such that the respondent can visualize the actual product or service. However, avoiding attribute multicollinearity, which implies a problem with distinction

between attributes, is important. Once enough information is collected on the product or service to describe it, the often difficult assignment is reducing the number of attributes or levels within attributes. It is important to remember that too few attributes and levels causes important information to be left out of the model and reduces the predictive capabilities, but too many attributes increases the number of profiles a subject must evaluate. A well specified model uses estimation procedures that are reliable, and at the same time accurately represents respondents' preferences (Green and Srinivasan, 1978).

Research shows that the number of levels among attributes should be balanced. When one attribute has more levels than others, the relative importance of that attribute is higher. This may lead to inefficient and inaccurate results.

3.2.2.2.1 Product Profile Presentation

The next step in establishing a successful CA is to specify the presentation method for the data collection. The objective of CA data collection is to express to the respondent the attribute combinations in the most realistic and efficient manner (Hair et al., 1995).

CA data collection procedures can involve three basic presentation methods: the two-factor-at-a-time approach (also referred to as "trade-off procedure"), the full-profile approach (Johnson, 1974), and the pairwise comparison method, all of which are also used as attribute presentation methods (Hair et al., 1995).

In the trade-off procedure, respondents are asked to rank pairs of factor levels from the most preferred to the least preferred (Green and Srinivasan, 1978). This procedure is simple and reduces the risk of information overload on the respondents. However, this approach lacks realism, because only two attributes are being considered at one time. The trade-off procedure is used when there is a range of 7 to 10 attributes (Hair et al., 1995).

The full-profile approach involves presenting respondents with a number of hypothetical product concepts. Here each concept is described in terms of a specified level for each factor. For example, given four attributes each with three levels, the total number of profiles resulting from all possible combinations of all attribute levels will be $4^3 = 64$, and every profile will have its unique combination of attribute levels. Then respondents are asked to rank or rate these combinations. These data can be utilized to estimate individual utility values (part worth fitting) to each attribute level (Gan, 1992).

It has been suggested in the full profile approach that respondents cannot easily interpret profiles involving more than five to seven attributes (Green and Tull, 1978). The advantages to utilizing the full-profile approach in data collections are as follows:

- The description of the concepts is more realistic since all aspects of the product or service are considered at the same time.
- The concept evaluation task can employ either a rating or ranking scale.
- The respondents must make fewer judgments than in the case of the two-attribute trade-off approach (Green and Tull, 1978).

A fractional factorial design can reduce the problem of too many attributes in a full-profile approach. To effectively test the effects of factors on respondent preferences, a fractional factorial design consists of a number of representative profiles that represent the product or service (Halbrendt et al., 1991). The number of profiles needed depends on the composition rule used by the respondent. The design must be constructed assessing orthogonality in order to accurately represent the model form and eliminate error. This process can be repeated until satisfactory designs are created (Hair et al., 1995).

The pairwise combination combines the trade-off and full profile methods. It is a comparison of two profiles. It is similar to the trade-off method in that only two profiles are being evaluated. However, unlike the trade-off method, the pairwise combination method uses pairs of multiple attributes instead of pairs with a few attributes. As a result, this method is important in many specialized CA studies that use a large number of attributes (Hair et al., 1995).

In this study, the full-profile presentation method was used for the design of the stimuli. This method was the most popular in literature and it allowed the use of fractional factorial design to reduce the number of profile combinations to a usable number which increased the likelihood of the respondent completing the task as well as its accuracy.

3.2.2.2.2 Measurement Scale of Dependent Variable

3.2.2.2.2.1 Experimental Design

A metric scale, used for rating, or a non-metric scale, used for ranking, are two scales used for respondents' evaluation and measurement of possible products. When rating scales are used, respondents usually grade perceived benefits on metric scales (Gustafsson et al., 2000). However, ranking scales only present an ordinal relationship (order of preference). Ranking scales have the following advantages over rating scales:

- When only a few products are evaluated, consumers discover that the rank order approach is simpler (Green and Srinivasan, 1978).
- Ranking allows respondents to format product profiles from most preferred to least preferred (Harrison et al., 2002).

However, ranking scales have the following disadvantages compared to rating scales:

- Respondents cannot express indifferences between alternatives.

- When a large number of product profiles are given, the ranking task is difficult.

Rating scales allow respondents to provide more of their opinion because they have ranges of choices among competing alternatives. The rating scale's main advantage over the ranking scale is the amount of information it may contain. Rating scales provide both ordinal measures of preferences and cardinal measures. Cardinal and ordinal properties of utility can be expressed because order, indifference, and interest for various product profiles have been expressed (Harrison et al., 2002). Each alternative within the rating scale contains the absolute measures of preference. In addition, by comparing responses among various alternatives the relative measures can be determined. Because respondents can give identical ratings among alternatives and the rating scale approach can be administered by mail without much explanation, it is likely to be more reliable than the ranking method (Green and Srinivasan, 1978).

3.2.2.3 Selection of the Estimation Method for the Part Worth Utilities

Conceptualizing attributes as components of a product has a long history. Attributes should represent a single concept, and be utilized in the model so that any problems with indicating utility preferences among individuals are minimized (Lancaster, 1971). Selection of attributes and their levels is important to protect against bias.

To understand the desired attributes by marketers and consumers, conversations with marketing experts and an investigation of the literature were conducted. An extension specialist at Mississippi State University reported that many Mississippi residents seek Louisiana strawberries at the expense of competitors, such as California product (Hood, 2003). In addition to significant sales through direct markets to consumers, small quantities are shipped to grocery chains in cities such as Dallas and Memphis (Boudreaux, 2003). Because of ripeness at harvest and freshness, the Louisiana strawberry is acknowledged over an extended geographic area as

having an excellent taste. Therefore, this identification by consumers may help local growers sell their product into larger markets.

An interview with a marketing and graphic design consultant was conducted to investigate opportunities for Louisiana strawberry promotions (Gagliano, 2003). Marketing strategies for the Louisiana strawberry industry were discussed to help identify specific attributes that consumers may prefer in strawberries. These marketing strategies included attention to:

- The appearance of the strawberry in grocery stores
- Providing a high quality and consistent product to the public
- Stickers or logos indicating Louisiana produced

The marketing consultant mentioned that Louisiana growers need to sell their product at retail grocery stores because most grocery shopping is done there. Therefore, Louisiana growers will need to have more of a business attitude when selling their berries. This means they will need to become more involved in learning wholesalers' needs and serving the market's demands (Gagliano, 2003).

Combining results from the literature on consumer preferences in Chapter 2 and information from extension specialists and the marketing consultant, several attributes that might be important to consumers come from the following areas:

- Origin – consumers are interested in product origin because they may want to support local industry, want freshness, are concerned about sanitation and other standards, and for a number of other reasons. As a result, issues such as country-of-origin labeling and identification of local products are becoming focal points.
- Food safety – consumers are concerned about their own and their children's diets and nutrition, about impacts of pesticide residues, and about genetic modification of plants.

- Convenience – consumers think that they have less time to search for the products they want and comparable limited time to prepare foods in their house. Convenience can be provided by restaurants, grocery stores and other outlets by making products easy to find, providing preparation services such as pre-cut items, and reducing food preparation requirements.
- Size and color – consumers evaluate the size and color of fresh produce while in the grocery store. Though it is assumed most consumers do not taste strawberries in the grocery store, an assumption is made that they have an expectation about taste of berries from alternative sources.

The literature cited earlier suggests that respondents can make only a limited number of comparisons without being overwhelmed by the number of choices. In many studies, the number of attributes has been reduced in order to decrease the number of parameters to be estimated. In general, most studies used three to five attributes with each having a balanced number of levels. In this study, the instrument contained a similar number of attributes and levels as compared to other studies.

In the construction of the instrument, the participants were asked to assume that the strawberry products were of medium to large size, and that their choices among the products were based on some other factors.

The four factors and their levels were as follows:

- Container – the levels for container are the clear plastic clamshell design and the traditional plastic basket. The new clear plastic clamshell design is part of a transformation in grocery merchandising. It provides better protection for the strawberries and offers a cleaner appearance compared to the traditional plastic basket.

In addition, food safety requirements are now requiring products to be covered and the plastic basket is an imperfect alternative to the clamshell container in this situation.

- Pesticide strategy – the levels of pesticide strategy are conventional application strategy and reduced pesticide strategy. Food safety and health issues are increasingly important to consumers. In the conventional control strategy, pesticides are applied on a regular schedule that is expected to control most insect or disease problems. In the alternative strategy, farmers apply pesticides only when problems are observed or anticipated.
- Price per unit (pint or pound) – the levels of price per unit are \$ 1.99, \$2.49, and \$2.99. A representative retail price during the season appeared to be about \$2.00, while \$3.00 was a relatively high price. Using \$1.99 as the base price, it was increased by 25 and 50 percent, to reflect respondent’s reaction to price changes.
- Brand – the levels of brand are a California private company brand or label, a Florida private company brand or label, and a “Louisiana produced” strawberry indicated by a sticker or logo. Brand carries an image that customers can identify and suggests a quality product. The two highest producing states, California and Florida, along with Louisiana, were included.

The factors listed above are not the only factors that are important to consumers, but they are items that the consumer can observe at retail, with the exception of the pesticide application strategy. The attributes and their levels resulted in 36¹ product combinations (profiles). A conjoint design program (Bretton Clark, 1987) was used to create a fractional factorial design that maintained orthogonality and provided the respondent with fewer profiles to rank or rate.

¹ Combinations resulted from 4 attributes each having 2, 2, 3, and 3 levels respectively, $2 \times 2 \times 3 \times 3 = 36$ possible combinations.

This design allowed all the model’s parameters to be estimated with nine products (two holdouts were included for model validation).

3.2.3 Description of Demographic Questions

Demographic characteristics help marketers understand customers to more effectively market a product or service to specific groups of people. Based on the literature review, this study used the following characteristics: household composition, age, gender, racial/ethnic background, level of education completed, current employment status, and household income. In most cases, demographics were reported as categories (Appendix A).

These demographic characteristics will be segmented to understand consumer preferences among various groups of people. Each demographic category is expected to have its own preferences toward strawberry attributes (Table 3.1). Examining the part worth functions’ signs to see if their coefficients are consistent with prior expectations is a way to check the model’s validity (Acito and Jain, 1980).

Table 3.1 Expected Signs of Attributes for each Demographic Category

Demographic category	Expected sign and rationale
Household income	<i>Kind of container</i> – no expected sign. The clamshell was introduced to protect the product from contamination during marketing. Its advantages accrue regardless of income level.
Less than \$20,000	<i>Pesticide strategy</i> – positive for reduced pesticide use. Low income households satisfy basic needs, while others
\$20,000 to \$39,999	increasingly can afford products with special attributes as income rises.
\$40,000 to \$59,999	<i>Price</i> – negative. Low income households satisfy basic needs. Since strawberry products are a discretionary purchase, price is
\$60,000 to \$79,999	expected to be rated lower in importance at higher income levels.
\$80,000 to \$99,999	<i>Origin/brand</i> – positive for Louisiana origin. Louisiana strawberries are preferred because they are fresher, have a
More than \$100,000	‘taste better’ reputation, and their purchase supports local growers. In addition, this attribute is expected to be rated higher as income increases.

Table 3.1 continued

Household composition	<i>Kind of container</i> – no expected sign. The advantages of the clamshell container would accrue regardless of household composition.
Single person	
Single with children	
Couple (no children)	<i>Pesticide strategy</i> – households with children prefer the reduced pesticide strategy because children may be more susceptible.
Couple (children 13 to 20)	
Couple (children 0 to 12)	
Couple (no children at home)	<i>Price</i> – negative for larger households because per capita incomes may be lower.
Other	<i>Origin/brand</i> – positive for Louisiana origin.
Education	<i>Kind of container</i> – no expected sign. The advantages of the clamshell container would accrue regardless of education.
Less than high school	
High school graduate or GED	<i>Pesticide strategy</i> – positive. Respondents with more education are more aware of and concerned with food safety issues.
Some college/technical school	
College Bachelor’s degree	
Some graduate study	<i>Price</i> – negative. Lower education usually signifies lower incomes, so the expected impacts are similar.
Advanced degree	<i>Origin/brand</i> – positive. Expected impacts should be similar to the impacts of increasing incomes. As a result, usually based on higher education.
Racial/ethnic background	<i>Kind of container</i> – no expected sign. The advantages of the clamshell container accrue regardless of racial/ethnic background.
White (Caucasian)	
Black (African American)	
Hispanic	<i>Pesticide strategy</i> – no expected sign.
American Indian	<i>Price</i> – no expected sign.
Asian	<i>Origin/brand</i> – no expected sign
Other	
Employment	<i>Kind of container</i> – no expected sign. The advantages of the clamshell container accrue regardless of employment.
Still in school	
Employed part-time	<i>Pesticide strategy</i> – no expected sign
Employed full-time	<i>Price</i> – negative for those in the workforce, because they are expected have higher incomes and price would be less important.
Unemployed	
Retired	
Other	<i>Origin/brand</i> – no expected sign
Age	<i>Kind of container</i> – no expected sign. The advantages of the clamshell container accrue regardless of age.
	<i>Pesticide strategy</i> – positive for reduced pesticide use. Younger to middle-aged respondents are more concerned about pesticide issues because they may have children or grandchildren.
	<i>Price</i> – negative. Income typically increases with age until retirement, suggesting less concern about price
	<i>Origin/brand</i> – no expected sign

Table 3.1 continued

Gender	<i>Kind of container</i> – no expected sign. The advantages of the clamshell container accrue regardless of gender.
Male	<i>Pesticide strategy</i> – women are expected to be more concerned about food safety than men.
Female	<i>Price</i> – women are expected to be less sensitive to price than men.
	<i>Origin/brand</i> - no expected sign.

3.2.4 Pretest of Survey

Questions involving whether the document asked the appropriate questions for the study and if the questions could be interpreted by the general population were through pretests among the following groups:

- Changes in the questionnaire were made based on review by committee members.
- Support staff in the Department of Agricultural Economics reviewed the questionnaire for clarity.
- An LSU extension agent who is familiar with the strawberry industry reviewed the questionnaire.
- Support staff at the university’s Facility Services office reviewed the questionnaire. Employees of this office represent diverse segments of the population in terms of educational attainment and racial characteristics. The staff evaluated the questionnaire in terms of its clarity to a general audience.
- The final revised questionnaire was taken to the committee members for final evaluations.

The instrument was modified and evaluated as appropriate during each stage of the pretest.

3.2.5 Data Collection

3.2.5.1 Method of Data Collection

Consumer data can be collected in many ways. However, household surveys are popular in marketing research. Surveys can be administered four ways: telephone, mail, in person, or internet. The advantages and disadvantages of different data collection procedures are evaluated next (Table 3.2).

Table 3.2. Advantages and Disadvantages of Different Data Collection Procedures

	Advantages	Disadvantages
Telephone Interview	<ul style="list-style-type: none"> • Interviewer can clarify questions if needed • Can sample using random-digit dialing. 	<ul style="list-style-type: none"> • Relatively more expensive compared to mail or internet. • Potential for interview bias (occurs from the variability in the communication between interviewer and respondents). • Difficulty for interviewers to hold the attention of respondents.
Mail Survey	<ul style="list-style-type: none"> • Relatively low cost • Ease of administration • Geographical flexibility • Pictures and diagrams can be included in the questionnaire. 	<ul style="list-style-type: none"> • Characteristically low response rate • Need for follow-up surveys to increase response rates • Construction and wording of instrument are critical to avoid misinterpretation
In-person	<ul style="list-style-type: none"> • Provides reliable data • Interviewer can clarify questions that a respondent may misunderstand. 	<ul style="list-style-type: none"> • Sample may be limited due to budgetary and time constraints
Internet survey	<ul style="list-style-type: none"> • Cost reduction potential • Overcome international boundaries • Reduces time required for sending and receiving surveys 	<ul style="list-style-type: none"> • Respondents may not have computer skills • Security and confidentiality issues • Respondents may not have internet or email access

Source: Dillman, 2002

For this study, a mail survey was used because it provided a reasonable cost method of transporting information from respondent to researcher and a sample large enough to evaluate differences in demographic characteristics.

3.2.5.2 Survey Administration

The target population for this study was all households where the head was at least 21 years old. The restriction on age was chosen because these households generally are out of school and make decisions for themselves. In addition, this group of consumers represents the population that makes most of the food purchasing decisions. The instrument was designed to be acceptable across the range of educational, geographic and cultural differences in the population.

The target population was identified by specifying these constraints. The survey population was supplied by a commercial vendor who had access to a national database. The vendor was instructed to select names from Louisiana, the southern half of Mississippi including Jackson, and the metropolitan area of Mobile, AL. The entire state of Louisiana was included because the logo could be attractive to all residents. The areas of Mississippi and Alabama that were included generally were within a 100 mile radius of Ponchatoula, the center of Louisiana strawberry production, with exceptions to include population centers just outside that radius. The vendor selected at least one household from every zip code in the geographic regions chosen and then a proportional number to the population from each zip code.

The survey was organized and conducted by the researchers during March, 2004. *The Tailored Design Method* (Dillman, 2002) was used to guide the procedures. About 2,000 surveys were bulk mailed to the randomly selected households during the second week of March, 2004. Labels indicating the person's name and address were printed directly on the envelope from the list provided by the vendor. A cover letter was sent with the questionnaire (Appendix

B). The letter included a short background introduction to the Louisiana strawberry industry, why the study was being conducted, and the importance of their response to the success and usefulness of the study. The postcard reminder was sent two weeks later (Appendix B). It included a short reminder of the importance of filling out the survey, and thanked those who had already responded. During the third week of April, a reminder letter and questionnaire were sent (Appendix B). The letter served two purposes, (1) it thanked the individuals who had responded and (2) reminded those who had not responded to do so as soon as possible because their participation was important to the success of the study. Some studies used incentives as a way to increase the survey response rate, but in this project no incentive was provided.

3.2.5.3 Content of the Questionnaire

In addition to the conjoint analysis design, other sections of the questionnaire addressed other market segmentation needs. The following segments describe the questionnaire:

- The purchase frequency of fresh strawberries.
- The percentages of strawberries bought from retail grocery stores (national chains or other supermarkets and grocery stores) and direct markets (farmers' markets, peddlers, and pick-your-own).
- Identification of the most common state of origin of the fresh strawberries purchased and identification of some characteristics of strawberries from the three states that are often the sources of strawberries found in grocery stores in their area.
- Willingness to pay more for Louisiana strawberries, and the additional amount per pint they would be willing to pay.

- Demographic and socioeconomic factors. Questions were related to household composition, age, gender, racial/ethnic background, education level, employment status, and household income (Appendix A).

3.2.5.3.1 Content of the Conjoint Section

The conjoint section of the questionnaire was a two-page design. The first page included an explanatory paragraph, the factors and levels, and an explanation of the numeric rating scale, and the second page presented the 11 hypothetical strawberry products, which included 9 products used in the estimation and 2 holdout products (Appendix A). Respondents were asked to rate the strawberry products based on their preferences using the 1 to 7 rating scale, where 1 was the product definitely liked the least and 7 was the product definitely liked the best. Respondents were instructed that if two products had the same overall appeal, they could be rated the same. Respondents also did not have to use all the numbers in the rating scale.

3.2.5.3.1.1 Model Specification

As mentioned earlier, consumers' utility for a product is assumed to be an additive function of the part worth utilities. Utility functions are estimated using a regression model which minimizes the error sums of squares (ESS). The respondent's preference ratings (assumed combination rule) and attribute utility functional forms are calculated from this estimate. For the standard Ordinary Least Squares (OLS) model, y_i is the dependent variable and x_i are the independent variables. The linear form of the model for observation i is given as

$$[3.3] \quad y_i = \beta_0 + \beta_1 x_{1i} + \dots + \beta_m x_{mi} + u_i$$

where the β_i are coefficients to be estimated and u_i is an additive random "error" term representing variation in y_i that was not explained by the independent variables x_i (Swinton and Labarta, 2003).

OLS has the following assumptions:

- The dependent variable can be continuous or limited
- X values are fixed in repeated sampling
- Zero mean value of disturbance u_j
- Homoscedasticity or equal variance of u_j
- No autocorrelation between the disturbances (residuals or errors)
- Zero covariance between x_{mi} and u_j
- The number of observations must be greater than the number of parameters to be estimated
- Variability in X values (Gujarati, 2003)

In this study, the part worth utilities for the main effects are estimated using OLS. When estimating CA, a special case of OLS is used where the dependent variable is usually limited in range and categorical (or discrete) because of the restriction on the rating scales. The independent variables, which are formed from a constructed experiment, are either dummy or categorical variables (Gujarati, 2003).

In many CA studies, the number of parameters is usually close to the number of profiles rated. In this study, the respondents rated 11 hypothetical products. Therefore, the degree of freedom ($N - 1$) is three², because one constraint is placed on the data when deviations are measured about the sample mean (Pindyck and Rubinfeld, 1998).

² Eleven products were rated and seven choices on the rating scale, 11 minus 7, then N minus 1 equals 3 degrees of freedom.

3.2.5.3.1.2 Empirical Model

In this study, respondents were presented with 11 hypothetical strawberry products. They were asked to rate each product using a rating scale from 1 to 7. The fresh strawberry products had four attributes:

- Container with two levels
- Pesticide strategy with two levels
- Price with three levels
- Brand with three levels

Demographic characteristics such as household composition, age, gender, racial/ethnic background, level of education, current employment status, and household income before taxes, may be related to individual preferences for fresh strawberry products. SPSS, a software package used for data management and analysis, was used to estimate overall consumer preferences for the strawberry attributes (SPSS, 1997). The following empirical model was used to estimate overall consumer preferences:

$$[3.4] \quad W_i = B_{i1} + B_{i2} \text{ Plastic} + B_{i3} \text{ Clamshell} + B_{i4} \text{ Conventional} + B_{i5} \text{ Reduced} + B_{i6} \\ \$1.99 + B_{i7} \$2.49 + B_{i8} \$2.99 + B_{i9} \text{ California} + B_{i10} \text{ Florida} + B_{i11} \text{ Louisiana} \\ + e_i$$

where W is the preference level for the i th individual, B_{i1} is the intercept, and Plastic represents the traditional plastic basket. Clamshell represents the new clear plastic clamshell design. Conventional represents the traditional control strategy. Pesticides are applied on a regular schedule that is expected to control most insect or disease problems. Reduced represents an integrated pest management control strategy, in some portions of the growing season farmers may apply pesticides only when problems are observed or anticipated. Prices are represented by the price per unit (pint or pound) \$1.99, \$2.49, \$2.99. Brands are represented by California

private company brand or label, Florida private company brand or label, or a sticker or logo indicating 'Louisiana produced' strawberries.

The relative importance of each attribute is computed from the part worth utility values. The relative importance for an attribute is calculated by dividing the range of its level by the sum of the ranges across all attributes. The utility range for an attribute is the difference between the highest and lowest part worth utilities. The relative importance for the i^{th} attribute is calculated as follows:

$$[3.5] \quad RI_i = [\text{Utility Range}_i / \text{S Utility Ranges for all attributes}] \times 100,$$

where, RI_i is the relative importance measure for the i^{th} attribute. The part worth estimates from the empirical analysis are used to determine the optimal strawberry product across all 11 products that were produced by the fractional factorial design.

3.2.5.3.1.3 Validation

The part worth values will be examined to determine if the signs of the coefficients are consistent with expectations in order to check for the model's validity. To measure the goodness of fit, R^2 (the proportion of variation in the dependent variable explained by the regression model) is reported.

Pearson's and/or Kendall's tau are measures of correlation between the observed and estimated preferences used to assess reliability of the model. Correlation coefficients of the products ratings used for estimation should always be high. Most conjoint studies collect a holdout sample of ratings by respondents (usually two or three hypothetical products) to assess predictive accuracy (Hair et al., 1995). Kendall's tau measures correlation between observed and estimated scores for the holdout profiles and may be a better indication of the fit of the model, since these profiles were not used to estimate scores (SPSS, 1997). The predictive validity of the

model is measured by calculating the predicted and the actual preference scores of the holdout products' reported utility (Acito and Jain, 1980).

The measures of goodness of fit (R^2) and correlation (Pearson's and Kendall's) will be used as the appropriate evaluations of validity and reliability of the model and are calculated by the software during the estimation procedure.

3.3 CLUSTER ANALYSIS

3.3.1 Overview

One of the primary objectives of this study was to collect and analyze key demographic and lifestyle factors that influence the decision about source of and preferences for strawberries consumed in the household. Cluster analysis was used to classify consumers into relatively homogeneous groups according to their individual part worth utility values for similar strawberry attributes.

The importance of market segment identification deals with understanding the attributes valued by consumers in a particular market segment. Therefore, researchers are able to identify segmentation that will provide information on how products and services may be developed to meet consumers' unique needs. Promotion and advertising programs may be designed to target specific consumers in the market segment, and distribution systems suitable to that segment may be utilized.

Cluster analysis groups objects based on the characteristics they possess. It classifies respondents, products, or other entities so that each object has similar characteristics to others in the cluster (Hair et al., 1998).

Cluster analysis creates groups that are similar among attribute preferences and individual variables. The objective of cluster analysis is to maximize the internal (within-cluster)

homogeneity of the objects in addition to maximizing the external (between-cluster) heterogeneity (Fields, 2002). Understanding the homogeneity among consumers will assist with understanding factors that influence a consumer's strawberry purchasing decision.

3.3.2 Cluster Analysis Methods

In cluster analysis, the researcher specifies the variate, the set of variables representing the characteristics used to compare objects in the cluster analysis. The variate is not specified by the cluster analysis. Smaller distances indicate greater similarities. Similarity is measured by the Euclidean distance (a measure of the length of a straight line drawn between two objects) between each pair of observations (Hair et al., 1998). Equation 3.6 shows the Euclidean distance for two points having dimensions (X_1, Y_1) and (X_2, Y_2) .

$$[3.6] \quad \sqrt{(X_2 - X_1)^2 + (Y_2 - Y_1)^2}$$

3.3.3 Cluster Algorithms

The most frequently used clustering algorithms are classified as either hierarchical or nonhierarchical.

3.3.3.1 Hierarchical Procedure

In hierarchical, the construction of a treelike structure (dendrogram), which represents the formation of the clusters, is constructed. This procedure produces $N - 1$ cluster solutions, where N is the number of objects. Hierarchies are established by either an agglomerative or a disruptive procedure. In the agglomerative method, each observation starts out as one cluster and in each ensuing step the two bordering clusters are combined into a new aggregate cluster. The divisive procedure is the opposite of the agglomerative method. The divisive procedure begins with one large cluster containing all of the observations. In each ensuing step the most

dissimilar observations are removed and placed into similar clusters. The process continues until each observation is in one of a number of separate clusters (Hair et al., 1998).

3.3.3.2 Nonhierarchical Procedure

Once the number of clusters is specified, nonhierarchical procedures assign objects into clusters. Unlike the hierarchical approach, the nonhierarchical procedure does not just continue to make clusters, but it identifies the best clusters based upon the number specified by the researcher. A cluster center is identified and all objects are assigned to the most similar cluster until the number of clusters specified has been reached (Hair et al., 1998).

The selection of the seed, a center point identified by the researcher, needs adequate pre-knowledge. It is difficult to select the seed when the researcher does not have enough information about the respondents (Johnson and Wichern, 2002). This procedure was not adopted because we did not have sufficient prior knowledge to select the seed.

3.3.4 Constructing Market Segments

The hierarchical agglomerative procedure was adopted for this study. In previous studies, cluster analysis used the Ward's minimum variance method to analyze the relative factor importance scores for various attributes (Baker 1999; Baker and Burnham, 2001). Ward's method is used to find the exact minimum variance using squared Euclidean distance measures (equation 3.6) (Aldenderfer and Blashfield, 1984). Equation 3.7 is based on minimizing the "loss of information" from joining two groups. The information lost is measured by the increase in the sum of the squared deviations (ESS) of every consumer in the cluster from the cluster mean. Minimization of the loss of the information is realized by combining two clusters with the smallest increase in ESS. The method tends to create small clusters indicating fairly

homogeneous clusters are being combined. In this study, Ward's method is used because it is regarded as a very efficient means of identifying segments.

For a given cluster k , let ESS_k be the sum of the squared deviations of every item in the cluster from the cluster mean (centroid). If there are currently K clusters, define ESS as the sum of the ESS_k or $ESS = ESS_1 + ESS_2 + \dots + ESS_K$. Initially, each cluster consists of a single item, and, if there are N items, $ESS_k = 0$, $k = 1, 2, \dots, N$, so $ESS = 0$. At the other extreme, when all the clusters are combined in a single group of N items, the values of ESS are given by equation 3.7 (Johnson and Wichern, 2002).

$$[3.7] \quad ESS = \sum_{j=1}^N (x_j - \bar{x})(x_j - \bar{x})$$

In equation 3.7, x_j is the multivariate measurement associated with the j^{th} item and \bar{x} is the mean of all the items.

Although one cluster may contain every item and represent the perfect fit, it is meaningless to interpret. There must be more than one cluster to identify the heterogeneity between different clusters. Therefore, it is important to decide when to stop clustering, which is the tradeoff between the number of clusters and the degree of heterogeneity between clusters (Hair et al., 1998). A desired situation is where the number of clusters is meaningful to interpret and simultaneously represent the data. In order to measure the quality of clustering, the pseudo F-statistic, the pseudo t^2 statistic, the scree plot (visual for showing the similarities and dissimilarities between the clusters), the total variance explained, and the author's judgment were used (Table C.2 Column *PSF*).

Descriptive statistics will be analyzed once each cluster has been defined. This may help identify the demographic and socioeconomic factors that are important in deciding consumers'

preferences among segments. Clear distinctions among demographic and socioeconomic factors will help researchers to understand which attributes are more important to each segment.

3.4 Marketing/Management Model

The following basic marketing/management principles will guide objective three of this study to identify key steps that the Louisiana strawberry industry might take to improve marketability of product and market access.

- **Product Strategies** – transforming an undifferentiated, low profit commodity into a differentiated, more profitable product. Branding is one of the most important product strategies. It helps to differentiate the product from competitor’s offerings. In addition, innovation is a product strategy. Three types of innovation that have important implications in food marketing are: (i) new marketing methods and techniques that increase organizational efficiency, (ii) new products or services that add value to products in the eyes of consumers, (iii) and new business organizations that could add value and volume to food marketing (Kohls and Uhl, 2002).
- **Pricing Strategies** – identifying the correct price to sell a product and gain consumer satisfaction. Pricing is important in food marketing and to the types of customers the product is marketed toward. Not only can pricing be psychological and time based but also one of the main attributes encouraging consumers to purchase products.
- **Distribution Strategies** – selling the product in the correct marketing channel to maximize profits. Most food producers would prefer to sell their product through mass markets because of a larger customer base. However, there are more selective alternatives such as smaller higher priced grocery stores catering to a higher quality product. “Marketing

teaches that there is no one best strategy for reaching consumers and multiple strategies are often preferred to a single approach (Kohls and Uhl, 2003).”

- Promotional Strategies – marketing the product through visible advertisements. There are many choices for promotions, (which is to remind, inform, or persuade). Promotions need to be competitive because food producers have to influence the buying decisions of consumers and store managers who display the products.

CHAPTER 4

RESULTS

This chapter discusses the quantitative and descriptive results from the mail-out survey. The first section discusses the demographical data on the respondents, their buying habits, the part worth estimation and description of product profiles, and finally the cluster analysis and part worth estimation of each cluster.

Surveys were mailed to 2,000 households in Louisiana, Mississippi, and Alabama. Of the 2,000 surveys mailed, responses were received from 401 (20.05 percent of sample) individuals. However, not all the returned surveys were completed. In addition, five surveys were not delivered because of incorrect addresses. Only 309 returned a completed questionnaire for a 15.45 percent useable response rate. Data were checked individually for quality of response. One observation was eliminated because there was no variation in the product ratings.

4.1 DEMOGRAPHIC RESULTS

A relatively high proportion of the respondents, almost 2/3, was female (Table 4.1). Instructions sent with the survey asked that it be completed by the household member who made most of the purchasing decisions about fruits and vegetables. Since that tends to be the female of the household, a high female proportion was not surprising. For comparison, the average female percentages in Alabama, Mississippi, and Louisiana are 52 percent.

Most respondents had attended some college, and more than 40 percent had a Bachelor of Science or higher degree. State population averages in Alabama, Mississippi, and Louisiana were 30, 22 and 20 percent, respectively, who had attended some college, and 21, 12, and 12 percent, respectively, had a BS or higher degree. Respondents appeared to be substantially better educated than state populations.

Average age of respondents was about 50 years, compared to average ages in Alabama, Mississippi, and Louisiana of 36, 34, and 34, respectively. While these differ, it is not appropriate to compare them directly. A state average includes the entire population, while this sample was taken from household lists of individuals and families. Those under 21 were excluded when the mailing list was created, so a higher average age was expected.

Over half of the respondents (53 percent) were employed full time. State averages for Alabama, Mississippi, and Louisiana were 56 percent, 54 percent, and 55 percent, respectively. This is an appropriate comparison, and the results are very similar.

About 37 percent of the respondents had annual household incomes below \$40,000, another 26 percent were in the range of \$40,000 to \$59,999, and the final 37 percent had annual incomes greater than \$60,000. Using mid-points in each income category, the average income from the survey was about \$53,000. If so, it would be substantially higher than the state household income averages for Alabama (\$34,135), Mississippi (\$31,330) and Louisiana (\$32,566) (U.S. Census Bureau, 2000).

Couples with no children at home were the most common type of household. Households with children less than 20 years of age accounted for 29 percent of respondents. About 36 percent, 40 percent, and 39 percent of Alabama, Mississippi, and Louisiana households, respectively, had children less than 18 years old living at home (U.S. Census Bureau, 2000), so it appears that the sample included fewer households with children.

An overwhelming number of respondents were Caucasians. Alabama, Mississippi, and Louisiana had Caucasian populations of 71, 61, and 64 percent, respectively.

Table 4.1. Demographic Characteristics of Survey Respondents, Louisiana, Mississippi and Alabama, Louisiana Strawberry Preference Survey, 2004.

	Question	Frequencies	Responses (%)
Gender	Male	111	36
	Female	198	64
Educational Level	Less than high school	6	2
	High school graduate or GED	68	22
	Some college	105	34
	Bachelor's degree	49	16
	Some graduate study	19	6
	Advanced degree	59	19
Employment Status	Still in school	3	1
	Employed part-time	22	7
	Employed full-time	164	53
	Unemployed	15	5
	Retired	74	24
	Other	31	10
Household Characteristics	Single	65	21
	Single with children	19	6
	Couple (no children)	49	16
	Couple (children aged 13 to 20)	43	14
	Couple (children aged 0 to 12)	46	15
	Couple (no children at home)	71	23
	Other	15	5
	Other	15	5
Household Income	Less than \$20,000	43	14
	\$20,000-\$39,999	71	23
	\$40,000-\$59,999	80	26
	\$60,000-\$79,999	34	11
	\$80,000-\$99,999	37	12
	\$100,000 or more	43	14
Racial/Ethnic Background	Caucasian	221	89
	African American	22	9
	Other	6	2

4.2 CONSUMER PURCHASE PATTERNS

A description of consumer habits concerning strawberry consumption is presented next. During the February to April period, 82 percent of the respondents ate fresh strawberries at least occasionally (Table B.2). Written notes from the respondents indicated that some people are allergic to fresh strawberries, and others don't like them.

During the Louisiana production season, almost half the respondents who purchased fresh strawberries did so less than once per month (Table B.2). On the other hand, about one-fifth purchased fresh strawberries more than once per week.

During May through January, more than 50 percent of respondents purchased fresh strawberries (Table B.2). This indicates a continuing demand for the product across the year. Almost 2/3 of respondents thought the strawberries they purchased came from Louisiana (Table B.2). Those identifying other states were a small percentage.

Given the importance of retail grocery stores as sellers of produce in general, identifying the specific outlets used by respondents to purchase strawberries is important. These choices are affected by the availability of the product, a number of lifestyle changes, such as busy schedules, and the additional time constraints on women in the workforce. These factors suggest that convenience is a major factor in where the consumer shops (Cook, 2001). Price, of course, is also an important consideration. About 64 percent of respondents purchased strawberries in grocery stores while 36 percent purchased from direct marketing outlets (Table B.2).

There are alternative kinds of retail outlets, primarily the regional/national retailers, the much smaller local chains, and individual grocers. About 42 percent³ of respondents who purchased strawberries shopped at national grocery chains (WalMart, Winn-Dixie, Albertson's, and others). Using the same logic and procedure as explained in footnote 1, about 22 percent of respondents who purchased strawberries did so at local supermarkets, such as Calandro's, Matherne's and Calvin's (Table B.2).

³ From Table B.2, 64 percent of respondents who purchased strawberries did so in retail stores, and, 66 percent of respondents who purchased at retail groceries chart did so at large national chains. Multiplying these yields the appropriate value, or $(.64)(.66) = .4224$ (100) = 42.24 percent.

About 20 percent ⁴ of respondents who purchased strawberries did so from farmers' markets. Other studies have indicated that an attraction of farmers' markets is the personal contact between consumers and farmers. Another factor may be an enhanced sense of trust and confidence in the safety of the product.

Again using similar calculations, about 14 percent of all respondents bought fresh strawberries from peddlers (Table B.2). Previous studies have indicated that convenience is a major factor in deciding to buy from peddlers.

The other kind of direct marketing is pick-your-own (PYO). This often is a family event where parents and children go to the farm to pick strawberries and enjoy the outing. Not all PYO customers are families, of course. PYO seems to have become less popular because consumers are busy, spend less time at home, and look for convenience in most shopping experiences. Similar calculations, based on results in Tables B.5 and B.7, indicated that slightly over 1 percent of all survey respondents purchased fresh strawberries from a PYO outlet.

4.3 OVERALL CONSUMER PREFERENCE RESULTS FOR STRAWBERRY PRODUCTS

Conjoint analysis was used to estimate the importance of retail strawberry product attributes and the influence of demographic characteristics on respondents' preferences.

4.3.1 Average Ratings

Product ratings ranged from 2.704 to 6.004 (Figure 4.1; Table B.3). Product 10 ('clamshell', 'Louisiana produced' logo, reduced pesticide strategy, and priced at \$1.99) received the highest average rating. Product 8 ('clamshell', 'Louisiana produced' logo, conventional application strategy, and \$1.99) had the second highest average rating. Alternatively, product 6

⁴ Using the procedure in footnote 1, 36 percent from Table B.2 multiplied by 56 percent from Table B.2 = 20.16 percent.

(plastic basket, major California label, conventional pesticide application strategy, and \$2.99) received the lowest average rating. Products 2 and product 9 received low average ratings compared to the other products. However, none of the products were given a very low rating.

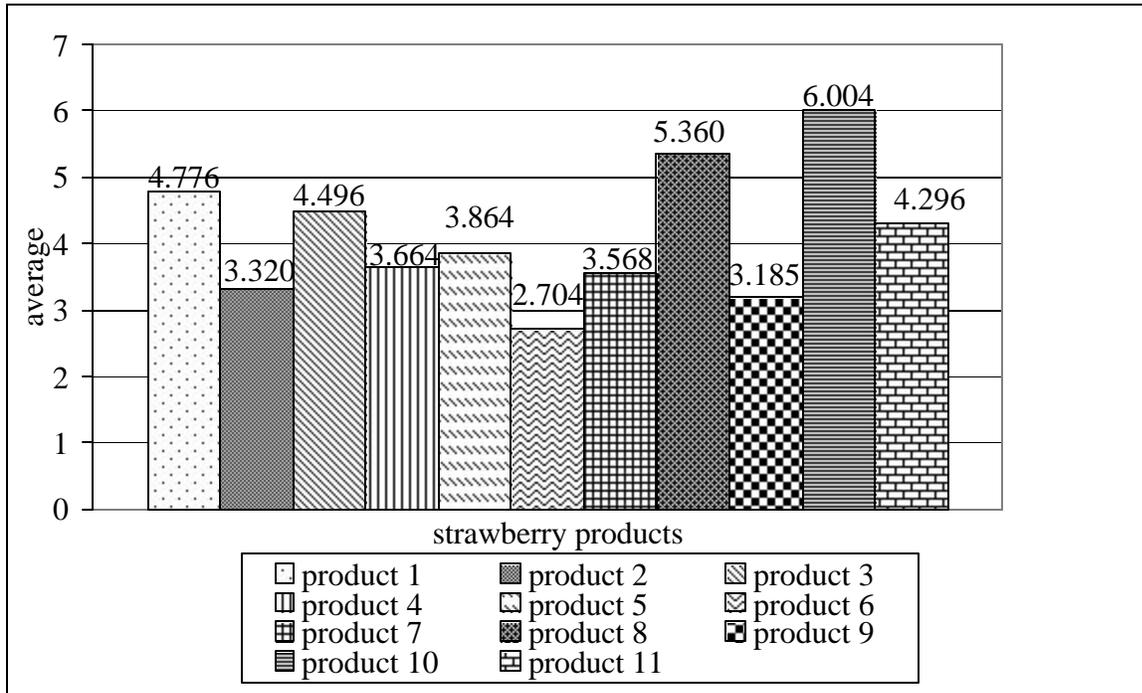


Figure 4.1 Respondents' Ratings of Strawberry Products with Differing Characteristics, Louisiana Strawberry Preference Survey.

Attributes of the highest average rated products were:

- Clamshell
- 'Louisiana produced' logo
- \$1.99

Attributes describing the lowest average rated products were:

- Either major California or Florida label
- Conventional pesticide application strategy

Products 10 and 11 were the holdouts used in this study.

4.3.2 Conjoint Analysis Results

In addition to the relative importance measure of preference, the conjoint analysis model estimates the contribution of each level of each attribute, called part worths, to overall preference. These are used to calculate the estimate of preference for combinations of attributes and levels that define products. The part worths and relative importance of attributes were calculated using the SPSS CA module. Using the conjoint analysis option in SPSS, the part worths and standard errors for individual observations were calculated. SPSS does not calculate a model that aggregates over all observations. Therefore, no overall estimates of part worths and standard errors are calculated. As a result, a test of the hypothesis that part worths at the aggregate level are different from zero is not available. SPSS does calculate overall or aggregate relative importance from the individual part worth estimates.

SPSS CA module was used in this research instead of SAS or LIMDEP because of its user friendliness and marketing/management approach to problem solving, whereas SAS or LIMDEP are used mainly for quantitative and econometric analysis.

Part worth estimates were largest for origin/brand, followed by price, container, and pesticide strategy. The validation of the model was measured with four goodness of fit measures including R^2 of .996, Pearson's R of .998, Kendall's tau of 1.000, and Kendall's tau for holdouts of 1.000 (Table 4.2). The estimated preferences were calculated by taking the regression constant (3.8918) and adding the part worths (Table 4.9). The results of the Kendall's tau for holdouts statistics indicated a value of 1.000 (Table 4.2). These results were verified by manual calculations in Microsoft Excel, with identical results.

The results presented indicate that the most important attribute was origin/brand, contributing 54.38 percent to the overall preference rating (Table 4.3). The price of a fresh

Table 4.2. Part worth Values for Attributes and Levels, Conjoint Analysis Results, Louisiana Strawberry Preference Survey, 2004.

<u>Attribute/Level</u>	<u>Part worths</u>
Container	
Clamshell	.1459
Plastic basket	-.1459
Origin/Brand	
California private company	-.5721
Florida private company	-.4275
Louisiana produced	.9996
Level of Pesticide Use	
Conventional control strategy	-.1412
Reduced pesticide strategy	.1412
Price per Unit	
\$1.99	.4159
\$2.49	-.0875
\$2.99	-.3284
Measures of Fit: $R^2 = 0.996$; Pearson's $R = 0.998$; Kendall's tau = 1.000 (Significance = .0001); Kendall's tau for 2 holdouts = 1.000	

strawberry product was determined to be the second most important attribute, contributing 25.75 percent. The third most important attribute was container, contributing 10.10 percent. The least important attribute was type of pesticide strategy, contributing 9.77 percent to the relative importance.

Table 4.3. Relative Importance of Attributes, All Respondents, Conjoint Analysis Results, Louisiana Strawberry Preference Survey, 2004.

<u>Factors</u>	<u>Relative Importance</u>
Container	10.10
Origin/brand	54.38
Pesticide strategy	9.77
Price	25.75

4.3.3 Consumer Utility Values

Consumer utility values of all product profile combinations were calculated using the additive decision model. This allowed for the ranking of the 36 strawberry product combinations (profiles) and the 11 products tested by conjoint analysis. The following formula was used:

$$[4.1] \quad U_{ijk} = G + \sum W_{ijk},$$

where U_{ijk} is the total utility for the product profile defined by the attribute combination given by levels ijk , G is the overall constant (mean preference rating) given by the OLS intercept, and $\sum W_{ijk}$ is the summation of all part worth utilities connected with the product profile defined by levels ijk (Harrison et al., 1998).

Respondents' utility values for each product combination are presented below (Table 4.4). The most preferred product using the expected utility was the 'clamshell' container, Louisiana produced strawberries, a reduced use pesticide control strategy, and \$1.99 per unit. In addition, the same product had the highest actual mean rating (Figure 4.1 and Table 4.4). In contrast, the least preferred product, using the expected utility values, was the traditional plastic basket, California private company brand, the conventional pesticide control strategy, and \$2.99 per unit. In addition, the same product had the lowest actual mean rating (Figure 4.1 and Table 4.4). Utility values were consistently within one-tenth of the expected utilities and actual mean rating except for actual mean rating order numbers 1 and 5 (Table 4.4). The major factors consumers used in deciding on a strawberry product were local origin/brand, and the lower priced product.

4.4 ANALYSIS OF PREFERENCES BY DEMOGRAPHIC GROUP

Demographic variables were used to identify which categories of consumers preferred certain strawberry attributes. Categories for the demographic variables were chosen during the survey's design based on literature review and a range of categories that would allow the survey population to give meaningful results. CA was conducted for each of the categories within the demographic variables, searching for patterns of behavior that seemed to offer promise in marketing or promotion (Table 3.1).

Table 4.4. Calculated Expected Utility and Actual Mean Rating Values for Strawberry Products, Louisiana Strawberry Preference Survey, 2004

<u>Product Specifications</u>				<u>Expected Utility</u>	<u>Order</u>	<u>Actual Mean Rating</u>	<u>Order</u>
Clamshell	La	As needed	1.99	5.594	1	6.004	1
Clamshell	La	Scheduled	1.99	5.453	2	5.360	2
Plastic basket	La	As needed	1.99	5.303	3		
Clamshell	La	As needed	2.49	5.091	4		
Plastic basket	La	Scheduled	1.99	5.020	5		
Clamshell	La	As needed	2.99	4.850	6	4.776	3
Clamshell	La	Scheduled	2.49	4.809	7		
Plastic basket	La	As needed	2.49	4.799	8		
Clamshell	La	Scheduled	2.99	4.568	9		
Plastic basket	La	As needed	2.99	4.558	10		
Plastic basket	La	Scheduled	2.49	4.517	11	4.496	4
Plastic basket	La	Scheduled	2.99	4.276	12		
Clamshell	Fla	As needed	1.99	4.167	13		
Clamshell	Ca	As needed	1.99	4.023	14	4.296	5
Clamshell	Fla	Scheduled	1.99	3.885	15		
Plastic basket	Fla	As needed	1.99	3.876	16	3.864	6
Clamshell	Ca	Scheduled	1.99	3.740	17	3.664	7
Plastic basket	Ca	As needed	1.99	3.731	18		
Clamshell	Fla	As needed	2.49	3.664	19		
Plastic basket	Fla	Scheduled	1.99	3.593	20		
Clamshell	Ca	As needed	2.49	3.519	21	3.568	8
Plastic basket	Ca	Scheduled	1.99	3.449	22		
Clamshell	Fla	As needed	2.99	3.423	23		
Clamshell	Fla	Scheduled	2.49	3.382	24	3.320	9
Plastic basket	Fla	As needed	2.49	3.372	25		
Clamshell	Ca	As needed	2.99	3.278	26		
Clamshell	Ca	Scheduled	2.49	3.237	27		
Plastic basket	Ca	As needed	2.49	3.228	28		
Clamshell	Fla	Scheduled	2.99	3.141	29	3.185	10
Plastic basket	Fla	As needed	2.99	3.131	30		
Plastic basket	Fla	Scheduled	2.49	3.090	31		
Clamshell	Ca	Scheduled	2.99	2.996	32		
Plastic basket	Ca	As needed	2.99	2.987	33		
Plastic basket	Ca	Scheduled	2.49	2.945	34		
Plastic basket	Fla	Scheduled	2.99	2.849	35		
Plastic basket	Ca	Scheduled	2.99	2.704	36	2.704	11

4.4.1 Household Income Categories

CA results were compared across household income levels (Table 4.5). Compared to the overall model (Table 4.3), price was relatively more important than origin/brand for the bottom income level. The income levels \$60,000 to \$79,999 and \$80,000 to \$99,999 were combined because these two categories had fewer respondents respectively and combining would give the researchers an idea of the relative importance of attributes in middle to high income categories.

Table 4.5. Conjoint Analysis Results by Demographic Category: Household Income, Louisiana Strawberry Preference Survey, 2004.

<u>Numbers and Factors</u>	<u>Relative Importance</u>				
	<u>Less than \$20,000</u>	<u>\$20,000 to \$39,999</u>	<u>\$40,000 to \$59,999</u>	<u>\$60,000 to \$99,999</u>	<u>More than \$100,000</u>
N	31	45	58	57	37
Container	7.14	16.27	10.98	9.54	10.26
Origin/brand	33.33	49.08	56.60	57.26	45.96
Pesticide strategy	17.35	12.07	5.90	12.35	15.60
Price per unit	42.18	22.57	26.52	20.85	28.18

The relative importance of origin/brand increased with income, as expected (from about 33 percent to about 57 percent, but decreased at the highest category). For price, importance decreased (from about 42 percent for the lowest category to between 20 percent and 30 percent in the higher categories). The expectation was that price would be less important as income increased, but its importance was similar except for the lowest category. The importance of pesticide strategy was expected to increase with income. Instead, it was lowest for the middle income category, and moved higher in importance for both the lower and the higher income categories.

4.4.2 Household Composition Categories

The importance of origin/brand generally was as expected, with higher importance for couples with no children at home (63 percent), and lower for singles (Table 4.6). Price was most

important to couples with young children at home (about 37 percent), while the other household types were similar in regard to price. Type of container was most important for households with no children (about 24 percent). Singles, single with children, and couples with teenage children indicated more concern regarding pesticide strategy than did the other household categories. This variable's importance was expected to be higher for households with children (either single or couples), but that pattern was not observed consistently. Pesticide strategy had almost no impact on product ratings by couples with no children.

Table 4.6. Conjoint Analysis Results by Demographic Category: Household Composition, Louisiana Strawberry Preference Survey, 2004.

Household Composition	N	<u>Factors and Relative Importance</u>			
		<u>Container</u>	<u>Origin/brand</u>	<u>Pesticide strategy</u>	<u>Price per unit</u>
Couple, children aged 0 to 12 at home	38	9.42	45.98	7.16	37.44
Couple, children aged 13 to 20 at home	41	11.66	54.84	11.49	22.00
Couple, no children at home	54	4.60	62.97	9.83	22.59
Couple, no children	41	23.81	55.24	1.90	19.05
Single, with children	14	11.66	54.84	11.49	22.00
Single	40	12.37	48.08	17.94	21.60

4.4.3 Education

The education categories were combined into two groups based on higher education and lower education because the researchers wanted to identify how education levels affect relative importance. Differences in relative importance between these groups seemed smaller compared to other demographic variables. Origin/brand was less important to the ratings for the B.S. and higher category (about 52 percent to about 57 percent) (Table 4.7), in contrast to the expected relationship. Pesticide strategy was more important for respondents with higher education, as

expected (7 percent to 13 percent). The relative importance of price was similar between the categories (25 percent to 26 percent), a result that was not consistent with the expectation that respondents with a higher education would have placed a higher value on this attribute.

Table 4.7. Conjoint Analysis Results by Demographic Category: Education, Louisiana Strawberry Preference Survey, 2004.

<u>Number and Factors</u>	<u>Relative Importance</u>	
	<u>Some college credit or lower</u>	<u>B.S. degree or more</u>
N	142	106
Container	10.84	9.33
Origin/brand	56.66	51.72
Pesticide strategy	7.07	12.58
Price per unit	25.44	26.38

4.4.4 Race

Racially, a large majority was Caucasian. CA results for non-Caucasians were based on few observations. Caucasians placed higher importance on origin/brand (Table 4.8) (about 56 percent to about 40 percent) and less on price (about 25 percent compared to about 33 percent). Non- Caucasians placed more importance on container.

Table 4.8. Conjoint Analysis Results by Demographic Category: Race, Louisiana Strawberry Preference Survey, 2004.

<u>Number and Factors</u>	<u>Relative Importance</u>	
	<u>Caucasians</u>	<u>Non-Caucasians</u>
N	219	26
Container	9.03	19.29
Origin/brand	55.85	39.76
Pesticide strategy	9.93	8.31
Price per unit	25.19	32.64

4.4.5 Employment Categories

The employment categories were combined to two groups of part-time and full-time employees and other categories because the researchers wanted to compare relative importance among respondents in various work environments. Origin/brand was important for the ‘employed’ categories (52 percent to 59 percent) (Table 4.9). Price and pesticide strategy were more important for the part-time and full-time category compared to other categories (28 percent compared to 20 percent, and 11 percent to 8 percent, respectively). For price, however, the ‘employed’ were expected to place less importance on price.

Table 4.9. Conjoint Analysis Results by Demographic Category: Employment, Louisiana Strawberry Preference Survey, 2004.

<u>Number and Factors</u>	<u>Relative Importance</u>	
	<u>Part-time and Full-time</u>	<u>Other categories</u>
N	155	92
Container	8.71	13.63
Origin/brand	52.03	59.11
Pesticide strategy	10.76	7.50
Price	28.50	19.75

4.4.6 Age

The age categories were divided into three groups based on the average age of respondents (50 years old), therefore given a younger category and an older category from the average age. Origin/brand was higher in relative importance as age group increased but, both price and kind of pesticide strategy declined (Table 4.10). These were the expected relationships for pesticide strategy and price (Table 3.1).

Table 4.10. Conjoint Analysis Results by Demographic Category: Age, Louisiana Strawberry Preference Survey, 2004.

<u>Number and Factors</u>	<u>Relative Importance</u>		
	<u>Under 40</u>	<u>40 to 60</u>	<u>Greater than 60</u>
N	46	137	61
Container	9.18	9.80	12.36
Origin/brand	48.07	52.06	63.63
Pesticide strategy	14.01	10.39	4.56
Price per unit	28.74	27.75	19.45

4.4.7 Gender

For gender, origin/brand was higher in relative importance for men (Table 4.11). Price also was less important for women, as expected. Pesticide strategy, as expected, was much higher in importance for women.

Table 4.11. Conjoint Analysis Results by Demographic Category: Gender, Louisiana Strawberry Preference Survey, 2004.

<u>Number and Factors</u>	<u>Relative Importance</u>	
	<u>Females</u>	<u>Males</u>
N	161	86
Container	10.85	8.19
Origin/brand	51.17	59.60
Pesticide strategy	14.13	1.88
Price per unit	23.84	30.34

4.4.8 Retail Grocery Shoppers

Respondents also reported their purchase behavior in terms of whether a majority of fresh strawberry purchases was made at retail grocery stores. Understanding these consumers' preferences is important for marketing strawberry products in retail grocery stores. There was no expectation for this category. Origin/brand and price had similar relative importance for consumers who shopped at retail grocery stores (about 40 percent and about 33 percent) (Table

4.12). Compared to overall conjoint results (table 4.3), type of container was similar and kind of pesticide strategy had higher importance for these respondents.

Table 4.12. Conjoint Analysis Results when most Strawberries were Purchased through Grocery Stores, Louisiana Strawberry Preference Survey, 2004 (N = 222)

<u>Factors</u>	<u>Relative Importance</u>
Container	13.74
Origin/brand	39.97
Pesticide strategy	13.61
Price per unit	32.69

4.4.9 Frequency of Purchase

Origin/brand was most important to the ratings and increased with frequency of purchase (Table 4.13), followed in importance by price which declined with frequency. There were no expectations for this category.

Table 4.13. Conjoint Analysis Results by Frequency of Strawberry Purchase during the Louisiana Season, Louisiana Strawberry Preference Survey, 2004.

<u>Number and Factors</u>	<u>Relative Importance</u>	
	<u>Every two weeks or less</u>	<u>Weekly or more</u>
N	200	45
Container	10.06	9.10
Origin/brand	47.99	62.53
Pesticide strategy	11.05	12.27
Price per unit	30.90	16.09

4.5 CLUSTER ANALYSIS RESULTS

After the demographical segments were identified and analyzed, cluster analysis was used to classify consumers into relatively homogeneous groups according to their individual part worth utility values (preference structures).

To obtain the clusters, the statistical software, SAS[®], was used for the analysis. The procedure PROC CLUSTER was used and METHOD = WARD was specified (SAS, 2004).

The result of the cluster history is shown in Appendix C. The total possible combinations were 249. They were joined together until all units had been put into one cluster (agglomerative procedure). The pseudo F-statistic peaked at two clusters (52.3) and pseudo t^2 statistic peaked at one cluster (52.3), which indicated that either two clusters or one was the best choice. However, the BSS (between group sum of squares) measured on the y-axis of the scree plot decreased sharply until the x-axis (the 249 observations) reached four clusters. The “elbow” point suggested four clusters as a good choice (Appendix C). In addition, the more variance accounted for by the clusters, the better they explain the model. Four clusters accounted for 77 percent of the total variance, compared with two clusters that accounted for 66 percent and one cluster that accounted for 52 percent. As a result, the researchers decided on four clusters.

Using the four clusters identified in the procedure, descriptive statistics were calculated and discussed. Conjoint Analysis by cluster was used to identify the relative importance of the attributes.

4.5.1 Analysis of Summary Statistics by Clusters

In this section, the summary/demographic characteristics of the clusters are presented and issues of representativeness are discussed. The descriptive statistics help validate the heterogeneity that exists between the four clusters (Table 4.14).

4.5.1.1 Cluster Overviews

Cluster 1 had the most respondents (85) relative to the other three clusters. Clusters 2, 3 and 4 had 70, 35 and 59 observations, respectively.

4.5.1.1.1 Household Composition

In the discussion of household composition, the ‘other’ category is undefined and was not included in the comparisons.

In cluster 1, ‘single with children’ was the smallest category at 3 percent of respondents, while ‘couples with no children at home’ was largest with almost 31 percent of respondents (Table 4.14). These categories also were highs and lows relative to the other clusters. The other five categories in this demographic section had similar values.

The ‘single’ category was largest in Cluster 2 and when compared to the other three clusters (Table 4.14). ‘Single with children’ was lowest in this cluster, but highest among the clusters. The other household composition categories were very consistent throughout cluster 2, and in the midrange compared to other clusters.

The ‘couples’ categories dominate in cluster 3. ‘Couples no children’ and ‘couples teenage children’ totaled about 57 percent of the cluster, and were highest among the clusters. ‘Couples children 0 to 12’ and ‘couples no children at home’ combined were about 28 percent of the cluster. ‘Single’ was the lowest category in the cluster and relative to the other clusters.

Cluster 4 was similar to cluster 2. It had the largest percentage in the categories ‘single’ and ‘couples children 0 to 12’, and these values were highest relative to the other clusters. ‘Couple teenage children’ and ‘couples no children’ were smallest percentages in the cluster and among the clusters (Table 4.14).

4.5.1.1.2 Age

The average was evenly distributed throughout the clusters at 51 years except that the average of cluster 3 was 47 years (Table 4.14).

Table 4.14. Descriptive Statistics of the Four Clusters Identified, Louisiana Strawberry Preference Survey, 2004.

<u>Number and Demographic Factors</u>	<u>Clusters</u>			
	1	2	3	4
N	85	70	35	59
Household Composition	<u>Percentage</u>			
Single person	11.76	23.53	2.86	20.69
Single with children	3.53	8.82	8.57	8.62
Couple (no children)	15.29	16.18	28.57	13.79
Couple (children 13 to 20)	16.47	16.18	28.57	12.07
Couple (children 0 to 12)	16.47	13.24	14.29	18.97
Couple (no children at home)	30.59	17.65	14.29	18.97
Other	5.88	4.41	2.86	6.90
Age				
Average	51.60	51.29	47.51	51.05
Gender				
Male	37.65	35.74	48.57	22.41
Female	62.35	64.29	51.43	77.59
Racial/ethnic background				
Caucasian	97.59	88.57	91.43	75.86
Non – Caucasian	2.41	11.43	8.57	24.13
Level of education completed				
< high school	-	4.29	-	1.69
High school graduate or GED	17.65	12.86	22.86	33.90
Some college/technical school	37.65	47.14	31.43	18.64
College Bachelor's degree	14.12	11.43	22.86	23.73
Some graduate study	8.24	5.71	5.74	6.78
Advanced degree	22.35	18.71	17.14	15.25
Employment				
Still in school	-	2.86	-	-
Employed part-time	7.14	8.57	2.86	10.17
Employed full-time	58.33	52.86	68.57	45.76
Unemployed	2.38	7.14	8.57	5.08
Retired	22.68	18.57	11.43	23.73
Other	9.52	10.00	8.57	15.25
Household Income				
< \$20,000	8.00	14.93	8.82	20.00
\$20,000 to \$39,999	21.33	14.93	17.65	25.45
\$40,000 to \$59,999	24.00	28.36	32.35	20.00
\$60,000 to \$79,999	9.33	17.91	11.76	3.64
\$80,000 to \$99,999	18.67	14.93	14.71	7.27
> \$100,000	18.67	8.96	14.71	23.64

4.5.1.1.3 Gender

It was expected that ‘females’ would be the largest gender category of each cluster because 64 percent of the respondents were female (Table 4.1).

In cluster 1, ‘female’ was the larger of the two categories with over 62 percent of respondents, while ‘male’ was the smaller of the two with almost 38 percent of respondents (Table 4.14).

Cluster 2 was similar to cluster 1. ‘Female’ was the larger category of the two gender categories with over 64 percent of the cluster, while ‘male’ was the smaller with almost 36 percent of cluster (Table 4.14).

In cluster 3, ‘female’ was the larger category with over 51 percent of respondents, while ‘male’ was the smaller with almost 49 percent of respondents (Table 4.14). The ‘female’ category was the lowest relative to the other clusters, while the ‘male’ category was the highest relative to the other clusters.

In cluster 4, ‘female’ was the larger category with almost 78 percent of the cluster, while ‘male’ was the smaller with over 22 percent of the cluster. The ‘female’ category was the highest relative to the other clusters, while the ‘male’ category was the lowest relative to the other clusters (Table 4.14).

4.5.1.1.4 Racial/ethnic Background

In the discussion of racial/ethnic background, the ‘Non – Caucasian’ category consisted of Black (African American), Hispanic, American Indian, Asian, and Other.

In cluster 1, ‘Caucasian’ was the larger of the two categories at almost 98 percent of the cluster, while ‘non – Caucasian’ was the smaller of the two with over 2 percent of the cluster (Table 4.14). ‘Caucasian’ was the highest in this cluster relative to the other clusters.

In clusters 2 and 3, 'Caucasian' was the larger of the two categories at almost 89 and over 91 percent of respondents respectively, while 'non – Caucasian' was the smaller with over 11 percent and almost 9 percent of respondents respectively (Table 4.14).

In cluster 4, 'Caucasian' was the larger of the two categories at almost 76 percent of respondents, while 'non – Caucasian' was the smaller with over 24 percent of respondents (Table 4.14). 'Non – Caucasian' was the highest relative to the other clusters.

4.5.1.1.5 Education

In cluster 1, 'some graduate study' was the smallest category at about 8 percent of respondents, while the category 'less than high school' had no respondents. The category 'some college/technical school' was the largest with almost 38 percent of respondents. 'Advanced degree' was the highest relative to the other clusters (Table 4.14). The other categories in this demographic section had similar values.

The education category 'some college/technical school' was the largest in cluster 2 and the highest compared to the other clusters (Table 4.14). 'Less than high school' was lowest in this cluster, but highest among the clusters. The education categories 'some graduate study', 'college Bachelor's degree', and 'high school graduate or GED' were all lowest among the clusters.

No one education category in cluster 3 stood out relative to the other clusters. 'Some college/technical school' was the largest at over 31 percent of the cluster, while 'some graduate study' was the smallest category at almost 6 percent of the cluster. The category 'less than high school' had no respondents.

In cluster 4, 'less than high school' was the smallest category at about 2 percent of respondents, while 'high school graduate or GED' was largest with almost 34 percent of

respondents. ‘Some college/technical school’ had the smallest percentage relative to the other clusters, while ‘college Bachelor’s degree’ was the highest among the clusters (Table 4.14).

4.5.1.1.6 Employment

In cluster 1, ‘unemployed’ was the smallest category at 2 percent of respondents, while ‘employed full-time’ was largest with 58 percent of respondents (Table 4.14). ‘Unemployed’ was lowest relative to the other clusters. The other four categories in this demographic section had similar values.

The ‘employed full-time’ category was largest in cluster 2 (Table 4.14). ‘Still in school’ was lowest category in this cluster, but no other cluster had any respondents in the category. The other employment categories were consistent throughout cluster 2, and in the midrange compared to other clusters.

The ‘employed full-time’ category was the highest in cluster 3 at 68 percent, while ‘employed part-time’ was the smallest category at about 3 percent (Table 4.14). These categories also were highs and lows relative to the other clusters. The other five categories in this demographic section had similar values.

Cluster 4 differed from the other clusters in terms of employment categories. It had the highest percentage of ‘employed part-time’ relative to the other clusters at 10 percent and the lowest percentage of ‘employed full-time’ relative to the other clusters at almost 46 percent. The employment category ‘unemployed’ was the low for this cluster at 5 percent. In addition, the employment category ‘retired’ was the highest relative to the other clusters at about 24 percent (Table 4.14).

4.5.1.1.7 Income

The higher income categories dominate in cluster 1. The income categories ‘\$60,000 - \$79,999’, ‘\$80,000 - \$99,999’, and ‘greater than \$100,000’ totaled about 47 percent of the cluster. However, only the category ‘\$80,000 - \$99,999’ was highest among the clusters. The other three categories were in the midrange compared to the other clusters.

In cluster 2, the income category ‘\$40,000 - \$59,999’ was the largest with over 28 percent of respondents, while ‘greater than \$100,000’ was the smallest category at 9 percent (Table 4.14). The category ‘greater than \$100,000’ was the low relative to the other clusters. The other four categories in this demographic section had similar values.

In cluster 3, ‘\$40,000 - \$59,999’ was the largest with over 32 percent of respondents, while ‘less than \$20,000’ was the smallest category at about 9 percent (Table 4.14). The category ‘\$40,000 - \$59,999’ was the high relative to the other clusters. The other income categories in cluster 3 were in the midrange compared to other clusters.

Cluster 4 was dominated by lower income categories. ‘Less than \$20,000’, ‘\$20,000 - \$39,999’, and ‘\$40,000 - \$59,999’ totaled 65 percent. Only ‘\$40,000 - \$59,999’ was the low relative to other clusters, while ‘less than \$20,000’ and ‘\$20,000 - \$39,999’ were highs among clusters. The income categories ‘\$60,000 - \$79,999’ and ‘\$80,000 - \$99,999’ were lows relative to other clusters. However, the income category ‘more than \$100,000’ was the high among clusters (Table 4.14).

4.5.2 Analysis of Preferences by Clusters

The relative importance of attributes was calculated based on clusters identified in the previous section. Some distinct differences among the preferences for the product attributes were expected among the clusters because preference structures were the basis of clustering.

Analysis of demographics provides information about the kind of consumers who make up each cluster.

The expected signs were seen for every factor level except scheduled pesticide strategy in cluster 3 and the origin/brand California label in cluster 4. However, pesticide strategy was low in relative importance compared to the other attributes in cluster 3. In cluster 4, origin/brand's relative importance was less important to respondents compared to the other attributes.

Pearson's R, R^2 , Kendall's tau, and Kendall's tau for holdouts were used to measure the goodness of fit for each cluster. The Pearson's R for the first cluster was .999, second cluster was .998, third cluster was .997, and fourth cluster was .983. The R^2 for the first cluster was .998, second cluster was .996, third cluster was .994, and the fourth cluster was .966. The Kendall's tau for the first cluster was .889, second cluster was .873, third cluster was .944, and the fourth cluster was .833. The Kendall's tau for holdouts was all 1.000 for each cluster. All of these correlation coefficients reveal quality goodness of fits.

4.5.2.1 Relative Importance for Cluster 1

Cluster 1 was given the name "Local product loyalists" because origin/brand was most important. 'Louisiana produced' had a positive utility value (Table 4.15). Price was next in importance, followed by container. Pesticide strategy was a very small factor for this group at 2.52 percent. There were 85 of these loyalists, and the group characteristics were predominantly 'couples no children at home', oldest, mostly female, the highest proportion of Caucasians, and the most respondents with household income greater than \$60,000.

4.5.2.2 Relative Importance for Cluster 2

Cluster 2 was given the name "Safe first loyalist" because origin/brand was most important and pesticide strategy showed higher importance than cluster 1. 'Louisiana produced'

and pesticide strategy ‘as needed’ each had positive utility values (Table 4.15). Price was next in importance, followed by pesticide strategy. Container was a very small factor for this group at 1.56 percent. There were 70 safe first loyalists, and the group characteristics were predominantly single households, second to oldest, mostly females, mostly Caucasians, the highest proportion of some college/technical school, the only cluster with respondents still in school, and the highest proportion with household incomes between \$60,000 to \$79,999.

4.5.2.3 Relative Importance for Cluster 3

Cluster 3 was given the name “Price explorers” because price was most important. ‘\$1.99’ price had a positive utility value (Table 4.15). Origin/brand was next in importance. Pesticide strategy and container were very small factors for this group at 3.22 and 2.83 percent respectively. There were 35 price explorers, and the group characteristics were predominantly couples with no children or couples with teenage children, youngest, a similar proportion of females and males, mostly Caucasians, the highest proportion of full-time employment, and the highest proportion of household incomes between \$40,000 - \$59,999.

4.5.2.4 Relative Importance for Cluster 4

Cluster 4 was given the name “Safety seekers” because container and pesticide strategy were most important. ‘Clamshell’ and ‘as needed’ each had a positive value (Table 4.15). Origin/brand was next in importance and price was a small factor for this group at 9.13 percent. There were 59 safety seekers, and the group characteristics were predominantly single and couples with young children or no children at home, the highest proportion of female, the lowest Caucasian-to-African American ratio, highest proportion of high school graduate or GEDs, the highest proportion of part-time and retired employment, and the most respondents with household incomes less than \$60,000.

Table 4.15. Relative Importance and Part worth Values for Attributes and Levels of All Clusters, Conjoint Analysis Results, Louisiana Strawberry Preference Survey, 2004.

Factor	Cluster 1		Cluster 2		Cluster 3		Cluster 4	
	Relative Importance	Part worth						
Container	4.90		1.56		2.83		35.46	
Clamshell		.1010		.0190		.0524		.4167
Plastic basket		-.1010		-.0190		-.0524		-.4167
Origin/brand	77.66		67.90		19.05		25.96	
Ca. label		-1.2484		-.6492		-.2889		.3258
Fla. label		-.7072		-.3587		-.1270		-.2844
La. produced		1.9556		1.0079		.4159		-.0414
Pesticide strategy	2.52		14.54		3.22		29.45	
Scheduled		-.0520		-.1774		.0595		-.3460
As needed		.0520		.1774		-.0595		.3460
Price	14.92		16.00		74.90		9.13	
Low		.3242		.2413		1.4921		.1168
Medium		-.0327		-.1492		-.2127		-.0188
High		-.2915		-.0921		-1.2794		-.0979
	Constant = 3.3732		Constant = 4.8163		Constant = 4.1468		Constant = 3.3908	
	Measures of Fit							
Pearson's R	.999		.998		.997		.983	
Kendall's tau	.889	Significance level = .0004	.873	Significance level = .0006	.944	Significance level = .0002	.833	Significance level = .0009
Kendall's tau for 2 holdouts	1.000		1.000		1.000		1.000	

The signs of the part worth values for cluster 4 differed from previous results. The total distances between the high and low part worth values for origin/brand and price in this cluster were less relative to these attributes in the other clusters (Table 4.15). The origin/brand category ‘California private company origin/brand or label’ had a positive part worth value, in contrast to every other demographic category and cluster where ‘Louisiana produced’ was the preferred origin/brand.

4.5.3 Discussion of Results from Analysis of Demographic Categories and Cluster Analysis

The results of analysis of preferences by demographic categories and clusters above can guide marketing opportunities for the Louisiana strawberry industry. Origin/brand and Price were the main focus of consumer preferences.

The first two clusters were similar in that they both preferred ‘Louisiana produced’ origin/brand as their most desired attribute, so they are combined in this discussion. “Local market loyalists” showed they were very interested in the origin/brand of fresh strawberry products. This preference was consistent with preferences expressed by the demographic categories of couples, mostly Caucasian, higher education, retired or full-time employees, and higher income. Selling opportunities might be enhanced by strengthening the Louisiana origin/brand image in the retail grocery store and direct market channels.

“Price explorers” were very price conscious shoppers. In addition, the respondents who shopped at retail grocery stores rated price high in importance. Analysis of this cluster’s ratings indicated preferences for ‘low’ prices. As a result, marketing strategies could be devised that focus on particular shoppers who were couples, younger, mostly Caucasian, working class, and medium income consumers. Catering to these consumers might be achieved through the retail (particularly discounters) market. However, the origin of the product is more important to most

consumers and when used properly may overcome price. Therefore, the main focus of marketing could be focused on origin/brand.

“Safety seekers” were relatively more concerned with the ‘clamshell’ containers and ‘reduced pesticide strategy’. This cluster may be considered the food safety segment in terms of preferring the “safer” attributes. It may have brought into focus the issue of the ‘clamshell’ container not only as a device to protect against bruising from physical damage, but also as a device to protect against contamination from bacteria/germs from handlers and other customers. As a result, marketing strategies for this group may focus on single, female, mostly Caucasian, with low to medium education, and lower incomes. However, the low to medium education and lower incomes are not associated with safety concerns in results reported by Baker, and by Veeman and Adamowicz

The majority of the clusters and demographic categories were consistent in that origin/brand was most important to consumers and to a lesser degree price. However, cluster 4 differed from all demographic categories and clusters in that the combination of ‘clamshell’, ‘reduced pesticide strategy’, and ‘private California company brand or label’ all had positive part worth values.

CHAPTER 5

SUMMARY AND CONCLUSIONS

The overall objectives of the study were to: (1) identify strawberry attributes preferred by consumers in the selected market area, (2) analyze key demographic factors that influence the decision about source of and preferences for strawberries, and (3) identify key steps that the Louisiana strawberry industry might take to improve marketability of product.

Production and shipping of fresh strawberries in the U.S. are dominated by California, which has exploited its production advantages and marketing efficiency in the retail grocery sector to increase its market share. Louisiana's primary market channels are local and direct markets. These markets are strong, but Louisiana's acreage continues to decline. The biggest disadvantage of a direct marketing focus is the loss of potential sales to customers who shop at retail groceries.

Consumers have demonstrated increased interest in food quality, safety, origin, and product convenience. As a result, a major focus of this project was to ascertain consumer preferences for strawberry products, such as size, freshness, color, price or other attributes.

5.1 QUESTIONNAIRE DESIGN, DISTRIBUTION AND RESPONSES

A questionnaire was developed to identify consumers' purchasing behaviors, preferences for strawberry products, and demographic characteristics. The first section of the questionnaire focused on the purchase frequency of fresh strawberries. More than 80 percent purchased at least occasionally. During the Louisiana production season, 46 percent of the respondents who purchased fresh strawberries did so less than once per month, and less than 20 percent purchased strawberries more than once per week. Given the importance of retail grocery stores as the dominant channel used by consumers to purchase food, the researchers were interested in the

outlets used by respondents to purchase strawberries. Results indicated that about 64 percent of respondents purchased strawberries in grocery stores, while 36 percent purchased from direct markets.

Respondents were asked to choose the most common state of origin of the fresh strawberries they purchased. Sixty-three percent of respondents identified Louisiana, while 11 percent identified California. Those identifying Florida and “other” as the most common states of origin of fresh strawberries purchased were a small percentage.

The middle section listed strawberry attributes that consumers may see in a grocery store setting. The attributes were container, pesticide strategy, price, and origin/brand.

The last section collected demographic and socioeconomic factors. Questions were related to household, age, gender, racial/ethnic background, education level, employment status, and household income.

5.2 STATISTICAL RESULTS LEADING TOWARDS MARKETING/MANAGEMENT IMPLICATIONS

5.2.1 Conjoint Analysis

To estimate the empirical importance of hypothetical strawberry products, conjoint analysis (CA) was used to understand the contributions of levels of each attribute to a respondent’s total preference structure.

The part worth coefficients of attributes were estimated using SPSS’ Conjoint Analysis module, and relative importances were calculated from the estimates. Eleven hypothetical products were rated on a scale of 1 to 7. The product that received the highest average rating of 6.004 was clamshell, ‘Louisiana produced’ logo, reduced pesticide strategy, and price \$1.99. The product clamshell, ‘Louisiana produced’ logo, conventional application strategy, and price \$1.99 had the second highest average rating of 5.360. Alternatively, the product plastic basket,

major California label, conventional application strategy, and price \$2.99 received the lowest average rating of 2.704. These levels of the attributes generally indicated the kind of product that was preferred, and that was not preferred.

The attribute found to have the highest relative importance, with a value of 54.38, was origin/brand. Origin/brand was hypothesized to be the most important attribute to respondents. Earlier studies indicated that locally grown fresh produce was an attribute consumers preferred (Govindasamy et al., 1998; Brooker and Eastwood, 1989). In Govindasamy's study, those consumers who grocery shop at more than one store, at direct markets, and who read advertisements are more aware of the local fresh produce programs. In Brooker and Eastwood's study, most respondents indicated they wanted to see a label on fresh produce indicating that it was locally produced.

Most conjoint studies use price as one of the attributes to measure tradeoffs. In Baker's results, the attribute price was a distant second in relative importance. As a result, price was hypothesized to be important to consumers, but not as important as origin/brand. In this study, price was next in relative importance after origin/brand, followed by container and pesticide level.

However, given that food safety and country-of-origin labeling have become important in consumer preferences for food products over the last few years, it was hypothesized that the attribute pesticide strategy would have been more important to respondents. The relative importance in this study of food safety (represented by pesticide strategy) was 14 percent, a substantial contrast to Baker's results from a study on consumer preferences. Baker's food safety attribute was a fresh apple product with disease probabilities linked to pesticide residues, and had a relative importance of 61 percent. The studies differed substantially in terms of

geographic regions sampled, construction of the food safety attribute (Baker's very explicit pesticide/disease link), and publicity that suggested a link between pesticides and disease that might have affected the Baker study.

The dataset was analyzed by demographics. For income, origin was less important in the low income group, while price was most important. Pesticide strategy was least important in the mid-income ranges.

For household composition, origin was most important to 'couples no children at home', and least important to 'singles'. Price was most important to 'couples young children at home'. Pesticide strategy was most important to 'singles' and least important to 'couples no children at home'.

For education, origin/brand and pesticide strategy were somewhat higher in importance for the 'BS and lower' group, while the price and container factors were less important. For employment, origin and price were less important for employed respondents. For gender, 'women' placed less importance on origin/brand, but more importance on price.

For age, origin was more important with higher age, price and pesticide strategy were less important. For race, however, origin/brand was more important and price was less important for 'Caucasians'.

5.2.2 Market Segments from Cluster

Using the statistical software SAS[®], CA used individual part worth utility values from the four strawberry attributes to divide the respondents into relatively homogeneous groups. The differences between clusters may help identify marketing opportunities.

The first cluster, described as "Local product loyalists," had a high relative importance for origin/brand. This segment had the most respondents, as would be expected, because brand

was the dominant attribute relative to the other three attributes (Table 4.3). The respondents in this segment were older couples with no children at home. About 98 percent were Caucasian, and the group had the highest percentage of advanced degrees, the lowest percentage of unemployed, and the most respondents with household incomes greater than \$60,000.

The second cluster, “Safe first loyalists,” had a high relative importance for origin/brand and, to a lesser degree, pesticide strategy. This segment was slightly more concerned about food safety issues than cluster 1, indicated by the relative importance value for pesticide strategy. This was the second largest group and it was more similar to the overall importance results than any of the other three clusters (Table 4.3 and Table 4.14). Respondents in this segment were about the same age as the respondents in cluster 1. However, cluster 2 had higher proportions of single and single with children households, minorities, respondents that were less educated and more unemployed, and lower incomes, relative to brand hunters. Households with younger children and single household consumers were more concerned about food safety and reduced pesticide strategies because of concerns of child safety..

The third cluster, “Price explorers,” was concerned about price. This segment had the smallest number of respondents. Household composition was mostly couples without children and couples with teenage children. Price explorers were the youngest respondents in the survey results, and there was an even distribution of males to females. The third cluster was mostly Caucasian, fairly consistent with the other three clusters in terms of highest level of education completed, had the highest percentage unemployed and employed full-time, and price explorers earned a slightly lower income than the two local product loyalist segments.

The fourth cluster, “Safety seekers,” indicated a high relative importance for container, pesticide strategy, and, to a lesser degree, brand. This segment had the highest percentage of

single households and was similar in age to the “local product loyalist” segment. It also had the highest percentages of females and African Americans relative to the other three clusters. Safety seekers also had the least education (34 percent had a high school/GED degree or less as their highest level of education completed), the least full-time but the highest “other” employment, and the lowest household income relative to “local product loyalists” and “price explorers.” The group was concerned with food safety, and preferred the California product.

5.2.3 Steps that the Louisiana Strawberry Industry Might Take to Improve Marketing

As mentioned in chapter 3, Kohls and Uhl said “Marketing teaches that there is no one best strategy for reaching consumers and multiple strategies are often preferred to a single approach.” Therefore, the marketing/management model consisting of product, pricing, distribution, and promotion strategies is presented below as a way to improve marketability of the Louisiana strawberry product and profitability of its production. The promotion strategies are based on the product and pricing strategies. While the distribution strategies are associated with the other three strategies, they are not based on the same marketing principles but more of a channel distribution marketing approach. Therefore, these four strategies can lead towards important implications for Louisiana strawberry marketing.

5.2.3.1 Product Strategies

Product strategies for the Louisiana strawberry industry may be classified as (i) high quality product for the local/direct market and (ii) standard product for the low cost mass market.

5.2.3.1.1 High Quality Product for the Local/Direct Market

The industry should embody the notion of the ‘best’ product, with a minimum level of evidence of defective products, whether from bruising or disease, or from other blemishes or perceptions of defect.

Higher quality strawberry products are usually preferred by consumers but are more expensive than lower quality products. Applying this principle to the fresh strawberry market, higher quality products usually are sold in smaller or upscale grocery stores or direct markets, where consumers are willing to pay a higher price for a product with different attributes, compared to the more standard product available through national grocers.

Preferred strawberry product characteristics like size, freshness, taste, and color help justify a premium product price. Particularly for freshness and taste, Louisiana has an excellent reputation in the geographic area surrounding the production area and in the direct/local market channel.

Food safety as an attribute may help to position Louisiana's strawberry as a premium product, despite results suggesting that pesticide strategy was low in relative importance. Food safety is becoming more important to consumers. Safety and health impacts of food products on children are a particular concern. Clusters two and four rated pesticide strategy more important than did the other two clusters. Since Louisiana strawberries are usually handled by less stages in the supply chain, they may be regarded as having less chances to obtain harmful residues (bacteria/germs) from handlers.

Other factors that could help the Louisiana industry position itself as a high quality product are recognition of trends such as smaller households and the factors such as convenience that smaller households perceive as important. Dual worker households with busy after work and after school schedules often spend little time on meal preparation.

Research results identified origin/brand as the most important attribute. While all strawberry product labels indicate origin and almost all Louisiana growers have their own label, a prominent and consistently used logo that consumers perceive as a brand could be used by all

growers to assure consumers that the Louisiana strawberry has the attributes they expect. A high service level and addressing convenience items would be a hallmark of a premium product, illustrating an understanding of consumers and trends that helps assure that consumers get the products they want. As an example, the standard strawberry container size is the one pound clamshell or basket container. Because of perishability, the standard size may be larger than a small household can consume before some portion must be discarded. Another size might be more appropriate. These issues could help define a premium product either in the direct or the local grocer markets.

Support of the Louisiana origin/brand and its image may be another way to market a high quality product. Promotion by Louisiana's industry has been done at a minimal level based on funding availability. If the current program is not sufficient, then some ideas for support of the Louisiana-origin berry and its image are: (i) growers provide support through additional assessments, and (ii) grants from state and federal sources. Cooperation and partnering with other producing states could enhance the possibility of outside promotion funding.

5.2.3.1.2 The Standard Product: Selling to the Regional Grocery and Discount Mass Merchandiser Markets

Grocery retailing is becoming very concentrated. The national grocers, such as Albertson's, compete with the discount mass merchandisers, such as WalMart. While these retailers work to position themselves in a variety of ways, such as number of stores, price is important. An 'everyday low price' strategy is one strategy, and others include price reductions associated with advertising and promotions. Another factor important to the large retail grocers is cost. Supply chain management issues that include reducing the number of suppliers and consequently being able to reduce the number of buyers are important. Producer/shipper companies that supply the large majority of product to these retailers typically adopt a low cost,

standard product approach to production. Most Louisiana growers probably will not choose to pursue this market. However, it is the channel where most consumers shop for food products, including fruits and vegetables. These stores provide the distribution system that make products available long distances from production areas. Meeting the contract demands of large retailers is difficult. If this strategy was adopted by Louisiana producers, one or more growers probably would have to expand significantly, or the small to medium sized growers would need to find ways to cooperate to provide the needed volume of product. Achieving an objective of industry expansion probably would include sales to major retailers, and producers would probably modify some portion of production practices to be cost competitive.

The large retailers do have incentive to procure some needs locally. The product is a link to the communities in which large retailers operate, and they do wish to be perceived as good neighbors. However, they will stock Louisiana strawberries only if it helps achieve their sourcing, profit, and/or market share goals. Firms and/or industries in other areas are meeting those expectations. Addressing the issues of getting product into major retail grocery stores involves additional levels of competition with other producing areas and cooperation with large retailers.

5.2.3.2 Pricing Strategy

Alternative market channels available to growers provide an opportunity for price appropriately for different markets. Consumers with most preference for and allegiance to the local strawberry probably purchase through the local/direct markets. As a result, the growers usually receive a higher price and have lower transactions costs. This would provide the growers with a higher return. Price would be based on what the market will pay.

In this study's results, price was second in relative importance among the four attributes. In addition, a willingness-to-pay section was included in the questionnaire. About 75 percent of the respondents who were willing to pay more for a Louisiana product indicated they would pay 20 cents more per pint (Appendix D). This further supports that growers may have some price influence in the local/direct market.

“An important lesson in marketing is that not everyone wants the highest quality product and almost everyone is willing to sacrifice some quality for a lower price” (Kohls and Uhl, 2002). In this study, the respondents who shopped at retail grocery stores rated low price per unit as an important factor, and in the aggregate results respondents indicated preference for ‘low’ prices. While Louisiana growers prefer to position their product as the premium product, they must consider this preference in the light of competition and use price as a factor in optimizing revenue.

Mass Merchandisers sell their products at lower prices than local/direct markets. Most consumers shop at these large grocery stores because of convenience and lower prices. The quantity of berries in the market place drives the price of the product in the market. With more production, it might be possible to enter the major food retailer and discount mass merchandise stores to provide a low cost product to price conscious consumers. However, the best opportunity to market to these consumers may be late in the season when large amounts of strawberries are available for sale.

Besides pricing strawberries based on the time of the season and between the marketing channels, strawberries could be graded for color and size and priced accordingly. Extra labor would be required because strawberries are field-packed, but might bring a more quality-oriented approach to marketing. Such standards are used in some large volume fruit and vegetable items,

such as tomatoes. Sorting strawberries based on color and size could be attractive in the local direct market. Since consumers already associate good taste with Louisiana strawberries, consistently good size and color may provide a stronger bargaining position for growers.

5.2.3.3 Distribution Strategies

As mentioned in chapter 1, Louisiana growers have two market channel alternatives, direct/local and wholesale markets.

Local growers may continue and build upon the partnership with and serve the needs of local retailers, and wholesalers, such as Associated Grocers. Interviews with produce managers and analysis of advertisements, not reported in this study, support that these kinds of businesses appear to perceive Louisiana strawberries and other local products as offering one area of competitive advantage. These grocers have a great deal of knowledge about consumer preferences, and could be strong contributors to growers' success. They are a supply chain that could make the product available to more consumers at reasonable cost. The notions of coordination, cooperation, and partnering in the supply chain are the drivers of efficiency in the supply chain management process. Strawberry growers should proactively seek to serve the need and requirements of these retailers.

The relationship with local wholesalers may be strengthened if growers: (i) demonstrate they are reliable suppliers of a high quality strawberries to the market, (ii) provide high service level, such as frequency of delivery, and (iii) find ways to support sales, through advertisements and other kinds of value-added activities across the product line

Survey respondents purchased much more frequently from retail stores than from local/direct markets. Still, 36 percent of respondents purchased from direct markets, representing an important component of the market. Given the barriers to the major retail

market, we can expect that most of the Louisiana strawberry crop will continue to be marketed through the local/direct market channel. This market is still strong in Louisiana. Local produce stands, fresh produce stores, large scale produce stands such as Southside Produce in Baton Rouge, and the Strawberry Festival continue to attract visitors and promote the selling of local product.

Some suggestions for serving the direct market channel include: (i) maintain quality and support the Louisiana brand image as mentioned in the high quality product strategies section, and (ii) improve the supply chain to find more, effective ways to supply the diverse markets in the metropolitan areas, neighborhoods, and communities in this part of the south.

5.2.3.4 Promotional Strategies

Once the relationship between product positioning, price, and distribution strategies are established, then the promotion of the product takes place. Promotions relate to local/direct and other retailer markets and are dependent on the choices above.

Louisiana's small growers have little money for promotion. There is a fund administered by the Louisiana Strawberry Promotion Board that provides generic support for the industry. All segments of the industry are represented on the Board. Funds are from a voluntary contribution for each unit retailed within the state. The Board makes decisions about expenditures. Posters and brochures are printed, but most funding goes to radio and television spots in the state's major media markets. This activity provides a basis for further promotion.

In addition, Louisiana may build competitive advantage by using a Louisiana-produced sticker on the clamshell container. This strategy involves identifying Louisiana product and associating a high product quality image to the target market. A non-product specific logo sticker is available through the state Department of Agriculture, but is not widely used even

though its use may enhance sales in retail markets. Growers use their own brand name on the label in the retail grocer channel.

Grocery store managers and growers might increase sales further by working together to make sure that they have the 'Louisiana produced' product available for sale. In addition, Louisiana growers need to supply or cooperate with retailers to provide promotions such as: posters, recipes, and brochures. Retailers indirectly support sales of Louisiana strawberries through advertising (newspaper and inserts). Growers and the industry may be able to find ways to encourage this activity by retailers. Suggestions for in-store merchandising would be an example. These merchandising activities may tie into adding value to strawberry products, i.e. chocolate covered at Valentine's Day or strawberry shortcake. An advantage over the California or Florida strawberry is that consumers in this market prefer the local products, so banners in retail grocery stores, in addition to posters that already are available, might help consumers locate Louisiana products when they enter the store.

What other kinds of support activities could growers contribute to the industry? They might act as the industry's ambassadors and promoters by providing farm tours, speaking in schools, being available for television and radio interviews, speaking at civic clubs, and other similar opportunities. They might work with the restaurant industry to promote strawberries as part of the dessert menu, or in other ways as components of meals. In media tours conducted in each of the past three years, newspaper food editors and writers have been invited to a program that encourages writing about strawberries by providing background material and contacts. Such articles are perceived by the public as a more objective information source compared to advertising. These free or low-cost publicity activities burnish the image of the Louisiana

industry, and performing these activities in other parts of the market area also may be supportive of the strawberry industry as an economic development activity.

These ideas may raise some interesting questions for produce marketers, particularly for strawberry promotions, in Louisiana. Are the consumers provided with the product attributes they prefer? Can these attributes be combined in such a way that consumers are more satisfied with their purchases? These questions bring into focus the objectives of this study. As producers and retailers continue to work together at supplying and promoting the preferred products then the industry may have enhanced potential for growth.

5.3 LIMITATIONS AND FUTURE RESEARCH OF THE STUDY

CA was used in this research to understand the preference structure of consumers for fresh strawberry attributes. Because CA allowed for a limited number of attributes to be compared, respondents were not presented with the complete product that might be seen in a grocery store. Therefore, when making actual decisions in a retail store, the consumer may make tradeoffs among attributes that were not included in this study.

As mentioned in chapter 4, SPSS does not calculate a model that aggregates over all observations. Therefore, no overall estimates of part worths and standard errors are calculated. As a result, a test of the hypothesis that part worths at the aggregate level are different from zero is not available. SPSS does calculate overall or aggregate relative importance from the individual part worth estimates. Depending on the objectives of the study, this limitation could be crucial.

Instead of using the clear plastic clamshell design and the traditional plastic basket as the levels of the container attribute, the researchers might have emphasized convenience by allowing

a tradeoff between the traditional one pound clamshell and a smaller product more appropriate to smaller households.

This survey was conducted in the geographical areas of Louisiana, the southern part of Mississippi including Jackson, and the metropolitan area of Mobile, Alabama. However, a broader area of the southern United States could have been the geographical focus of the survey. However, time and money constraints kept the researchers from pursuing the specific areas of east Texas, and the Memphis, Tennessee metropolitan areas. The preferences for Louisiana strawberries may not have been the same in these areas.

Other limitations to this study were in the area of demographics. The majority of the respondents were Caucasian females with high levels of education and incomes. Future research could focus on the population that did not have a high percentage of responses. For example, future studies may focus on the African American population, in order to understand their specific preferences when purchasing fruits and vegetables or the increasing Hispanic population. Additional research could focus on consumer psychographic mindsets and lifestyle characteristics as a marketing tool. The VALS (Values and Life Styles) measurement approach is one procedure to categorize consumers for program purposes (Kahle and Timmer, 1983). In addition, it would be interesting to compare results obtained in this study to markets in California and Florida.

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APPENDIX A

STRAWBERRY PREFERENCE QUESTIONNAIRE AND CORRESPONDENCE

A Survey of Strawberry Preferences



Department of Agricultural
Economics and Agribusiness



Thank you for taking time to respond to this survey. Your responses will be kept confidential. No individual information will be revealed.

We ask that this survey be completed by the member of the household who makes most of the purchasing decisions regarding fruit and vegetables for home use. Please respond according to your typical strawberry purchases during the months of February, March and April, unless a specific question requires another time frame.

1. In this household, we eat fresh strawberries at least occasionally (mark one). ? yes ? no
- *If you checked no, please answer questions 7 to 13 and return the form in the enclosed envelope. Thank you!*
- *If you checked yes, please continue.*
2. How frequently do you purchase fresh strawberries during the February to April season (mark one)?
? once per month or less ? once every two weeks ? at least once per week

During the rest of the year, we buy fresh strawberries at least once every 3 months (mark one). ? yes ? no

3. For fresh strawberries you purchase during the February to April season:
 - A. What percentage is from
___ all retail grocery stores?
___ direct markets, including farmers' markets, peddlers, pick-your-own? (should total 100%)
 - B1. Of the total *from supermarkets and grocery stores*, what percentage is from national chains? Or ___ other supermarkets and grocery stores? (should total 100%)
 - B2. Of the total from *direct markets*, what percentage is from
___ farmers' markets? ___ Peddlers? ___ Pick-your-own? (should total 100%)
 - C. What is the most common state of origin of the fresh strawberries you purchase? (mark one)
? California ? Florida ? Louisiana ? other ? don't know

4. As a consumer, you choose to buy products that suit your preferences. We have chosen some factors that make strawberries more or less attractive to purchase. One example of a factor is the kind of container. You might be familiar with the traditional plastic basket, but a new container that provides more protection and makes the product easier to see is the clear plastic clamshell. Other factors include pesticide strategy, price, and brand. In addition, you have choices between different values or levels for each factor. In this question, we ask you to rate some products that have different levels or options of these four factors. The levels are given in the table below:

Factor	Levels or options
Container	<ul style="list-style-type: none"> - clear plastic clamshell design (see illustration at right), or - the traditional plastic basket (not shown) 
pesticide strategy	<ul style="list-style-type: none"> - in the conventional control strategy, pesticides are applied on a regular schedule that is expected to control most insect or disease problems - in a reduced use control strategy, in some portions of the growing season farmers may apply pesticides only when problems are observed or anticipated
price per unit (pint or pound)	<ul style="list-style-type: none"> - \$2.99, - \$2.49, or - \$1.99
Brand	<ul style="list-style-type: none"> - California private company brand or label, - Florida private company brand or label, or - a sticker or logo indicating 'Louisiana produced' strawberries

As you can see, many distinct 'products' could result from combining these levels of the four factors. We have selected 11 distinct strawberry products from the possible combinations.

Please rate each of the 11 products on the facing page using the following scale

- 1 I definitely like this product least**
- 2 I like this product a lot less than the average**
- 3 I like this product a little less than the average**
- 4 I think this is the average product among these combinations**
- 5 I like this product a little more than the average**
- 6 I like this product a lot more than the average**
- 7 I definitely like this product best**

If two products have the same overall appeal, you can rate them the same. You don't have to use all the numbers in the 1 to 7 rating scale.

Each product is described in the table on the next page. Assume that the strawberry itself is of *medium to large size*, and that differences among the products are in the four factors and their levels.

Please place your rating of each product in the space beside the product number. You may want to review all the products before you begin to rate them.

<p>Product 1 <i>Container:</i> clamshell <i>Brand:</i> 'Louisiana produced' logo <i>Level of pesticide use:</i> protection is applied as needed <i>Price:</i> \$2.99</p>	<p>Product 7 <i>Container:</i> clamshell <i>Brand:</i> major California label <i>Level of pesticide use:</i> protection is applied as needed <i>Price:</i> \$2.49</p>
<p>Product 2 <i>Container:</i> clamshell <i>Brand:</i> major Florida label <i>Level of pesticide use:</i> planned application schedule <i>Price:</i> \$2.49</p>	<p>Product 8 <i>Container:</i> clamshell <i>Brand:</i> 'Louisiana produced' logo <i>Level of pesticide use:</i> planned application schedule <i>Price:</i> \$1.99</p>
<p>Product 3 <i>Container:</i> plastic basket <i>Brand:</i> 'Louisiana produced' logo <i>Level of pesticide use:</i> planned application schedule <i>Price:</i> \$2.49</p>	<p>Product 9 <i>Container:</i> clamshell <i>Brand:</i> major Florida label <i>Level of pesticide use:</i> planned application schedule <i>Price:</i> \$2.99</p>
<p>Product 4 <i>Container:</i> clamshell <i>Brand:</i> major California label <i>Level of pesticide use:</i> planned application schedule <i>Price:</i> \$1.99</p>	<p>Product 10 <i>Container:</i> clamshell <i>Brand:</i> 'Louisiana produced' logo <i>Level of pesticide use:</i> protection is applied as needed <i>Price:</i> \$1.99</p>
<p>Product 5 <i>Container:</i> plastic basket <i>Brand:</i> major Florida label <i>Level of pesticide use:</i> protection is applied as needed <i>Price:</i> \$1.99</p>	<p>Product 11 <i>Container:</i> clamshell <i>Brand:</i> major California label <i>Level of pesticide use:</i> protection is applied as needed <i>Price:</i> \$1.99</p>
<p>Product 6 <i>Container:</i> plastic basket <i>Brand:</i> major California label <i>Level of pesticide use:</i> planned application schedule <i>Price:</i> \$2.99</p>	

5. Again think about fresh strawberries you purchase in grocery stores. The left column in the table below identifies some characteristics of strawberries, and across the top are 3 states that often are the source of strawberries found in grocery stores in your area. Strawberry characteristics may vary between growing areas. For the February to April season, which source do *you* feel is superior for each factor listed on the left side of the table (mark one source for each characteristic)?

Characteristic	some sources of strawberries			
	<u>California 1</u>	<u>Florida 2</u>	<u>Louisiana 3</u>	<u>don't know 4</u>
color	?	?	?	?
size	?	?	?	?
taste	?	?	?	?
shelf life	?	?	?	?

Please turn to the last page!

6. This question asks about your willingness (or unwillingness) to pay more for strawberries produced in Louisiana. This willingness might be based on loyalty to local farmers, a preference for taste or for fresher product, or some other factor(s). If you were in a grocery store and were considering whether to purchase strawberries that were essentially identical except that one was from Louisiana and the other was from California or Florida, please indicate *the additional amount you would be willing to pay* for the Louisiana product (mark one box below).

I would not pay more for Louisiana strawberries, or

The additional amount per pint I would be willing to pay for a Louisiana strawberry product is:

\$0.20 \$0.40 \$0.60 \$0.80 \$1.00 or more

7. Please describe your household (mark one).

single person couple (no children) couple (children 0 to 12)
 single with children couple (children 13 to 20) couple (no children at home)
 other _____

8. Your age? _____

9. Your gender? (mark one) male female

10. Which of the following best describes your racial/ethnic background (mark one)?

white (Caucasian) black (African American) Hispanic
 American Indian Asian other

11. What is the highest level of education you completed (mark one)?

less than high school high school graduate or GED some college/technical school
 college Bachelor's degree some graduate study advanced degree

12. Which category best describes your current employment status (mark the most appropriate box)?

still in school employed part-time employed full-time
 unemployed retired other

13. Which category contains your 2003 household income before taxes (mark one)?

less than \$20,000 \$20,000 to \$39,999 \$40,000 to \$59,999
 \$60,000 to \$79,000 \$80,000 to \$99,000 more than \$100,000

Consumer Survey Cover Letter

March, 2004

This survey is part of a marketing research initiative by the Louisiana Strawberry Festival Foundation and other segments of the strawberry industry. It was designed to take less than 15 minutes of your time. It's intent is to collect and provide information that the industry and its individual members may use to improve service to their customers and to consumers. Your household is among a group chosen to participate in this study.

Please assist us by taking a few minutes to complete the questionnaire and return it to us in the enclosed envelope. For the study to be truly accurate, it is very important that this questionnaire be completed and returned by you.

You may be assured of complete confidentiality. Your name will never be connected with your answers in any way. Identification marks on the questionnaire are for mailing purposes only, allowing us to check your name off the mailing list when your questionnaire is returned. The results of this research will be made available to the public through the University and through the Strawberry Festival Foundation Board.

If you have any questions regarding the questionnaire or require additional information, please call the LSU research team, or correspond with us at the address above.

Thank you for your cooperation.

Sincerely,

Roger A. Hinson
Professor
225-578-2753

Michael N. Bruchhaus
Graduate Research Assistant
225-578-8579

Follow – up Postcard

Recently you were mailed a survey seeking information about your preferences for strawberries. This card is a reminder to please fill out the survey. If you have already completed and returned it to us please accept our thanks. If not, please do so as soon as possible. It is extremely important that your survey be completed and returned by you so that the results of this study will be truly representative of consumer strawberry preferences. If by some chance you did not receive the questionnaire, or it has been misplaced, please call us at (225) 578-8579 or (225) 578-2753 and we will get you another one in the mail to you today.

Sincerely,

Roger A. Hinson
Professor

Michael N. Bruchhaus
Graduate Research Assistant



Department of Agricultural Economics and Agribusiness
101 Agricultural Administration Building
Louisiana State University
Baton Rouge, LA 70803-5604
Phone: (225) 578-2753
FAX: (225) 578-2716
E-Mail: rhinson@agctr.lsu.edu

April 21, 2004

To households selected for this survey:

A few weeks ago, a questionnaire seeking information about preferences for strawberries was mailed to you. According to our records, we haven't yet received your response. If you did respond or if your response is in the mail, thank you.

If you haven't responded, please consider that we have undertaken this research project after the strawberry industry recognized the need for information about consumers' preferences for products. The industry expects to use this information to provide you with products that you like better. However, for the results of this research to be truly representative, everyone's information is needed. Therefore, we are asking again that you complete the questionnaire and return it as soon as possible.

Your contribution to the success of this research is greatly appreciated. In the event that your questionnaire has been misplaced, a replacement is enclosed.

Sincerely,

Roger A. Hinson
Professor
225-578-2753

Michael Bruchhaus
Graduate Research Assistant
225-578-8579

APPENDIX B
SUMMARY TABLES

Table B.1 Advantages and Disadvantages of Hypothetical and Non-Hypothetical Valuation Methods

<u>Method</u>	<u>Advantages</u>	<u>Disadvantages</u>
Conjoint Analysis (Hypothetical)	<p>Repeated measures design allows for:</p> <ul style="list-style-type: none"> • Lower cost than auctions • Focusing on product attributes • Analyzing trade-offs between attributes to indicate individual respondent's preferences 	<ul style="list-style-type: none"> • Less focus on specific attributes • Limited to discrete choices instead of open-ended questions • Limited number of product profiles • May be confusing to respondents
Contingent Valuation Method (Hypothetical)	<ul style="list-style-type: none"> • Able to analyze specific policies and WTP for an attribute • Sample size can be larger than auctions • Relatively inexpensive compared to auctions 	<ul style="list-style-type: none"> • Large divergence between consumers' statement and their actual behavior • Consumers may be unfamiliar with the product • Vulnerable to strategic, starting point, ordering effect, and other biases
Experimental Auction Method (Non-Hypothetical)	<ul style="list-style-type: none"> • More accurate measure of WTP than CV method because money helps remind respondents of their budget constraints • Based on behavior not intentions • Real incentive mechanism • Less external distractions and strategic behaviors • Absence of non-response bias 	<ul style="list-style-type: none"> • Higher costs than CV • Regional restrictions • High chance of non-responsive samples • Bias because of financial incentives • Artificial settings of experiments are the difference between lab and real life

Source: Nalley, 2004; Mitchell and Carson, 1989

Table B.2. Various Purchasing Behavior Characteristics of Louisiana Consumers, Louisiana Strawberry Preference Survey, 2004.

	<u>%</u>
<u>Strawberry Consuming Households</u>	
Yes	82
No	18
<u>Frequency of strawberry purchases, Louisiana season</u>	
Less than once per month	46
Once every two weeks	35
Greater than once per week	19
<u>Strawberry Purchase Patterns, May to January</u>	
Yes	51
No	49
<u>Origin of Strawberries You Purchase</u>	
California	11
Florida	2
Louisiana	63
Other	2
Don't know	22
<u>Strawberry Purchase Locations, Louisiana Production Season (February to May)</u>	
Location	
Retail grocery stores	64
Direct markets	36
<u>Strawberry Purchases by Kind of Grocery Store</u>	
National chains	66
Other	34
<u>Strawberry Purchases from Direct Markets</u>	
Farmer's Market	56
Peddlers	40
Pick-your-own	4

Table B.3. Respondent's Rating of Strawberry Products with Differing Characteristics, Louisiana Strawberry Preference Survey, 2004.

<u>Product</u>	<u>Average Rating</u>
1	4.8
2	3.3
3	4.5
4	3.7
5	3.9
6	2.7
7	3.6
8	5.4
9	3.2
10	6.0
11	4.3

Table B.4 Part worth Values of Strawberry Attributes for Demographic Categories, Louisiana Strawberry Preference Survey, 2004.

Categories	Clamshell	Cup	CA	FL	LA	Scheduled	As Needed	Low	Med	High
Income										
< \$20,000	0.0565	-0.0565	-0.1613	-0.1828	0.3441	-0.1371	0.1371	0.3441	-0.0215	-0.3226
\$20,000 - \$40,000	0.2246	-0.2246	-0.5169	-0.3213	0.8382	-0.1667	0.1667	0.3527	-0.0821	-0.2705
\$40,000 - \$60,000	0.1116	-0.1116	-0.6911	-0.516	1.2072	-0.024	0.0240	0.5292	-0.1601	-0.3691
\$60,000 - \$100,000	0.1710	-0.1710	-0.7510	-0.5498	1.3008	-0.2213	0.2213	0.4330	-0.1188	-0.3142
> \$100,000	0.1645	-0.1645	-0.5702	-0.3333	0.9035	-0.2500	0.2500	0.4474	-0.0088	-0.4561
Household Composition										
Couple children age 0-12	0.1603	-0.1603	-0.5812	-0.4017	0.9829	-0.1218	0.1218	0.6838	-0.0940	-0.5897
Couple children age 13-20	0.1557	-0.1557	0.5497	-0.3655	0.9152	-0.1535	0.1535	0.3187	-0.0497	-0.2690
Couple no children at home	0.0667	-0.0667	-0.6707	-0.4828	1.1535	-0.1424	0.1424	0.3535	-0.0525	-0.3010
Couple no children	0.2778	-0.2778	-0.237	-0.5259	0.763	-0.0222	0.0222	0.2519	-0.0593	-0.1926
Single with children	0.1557	-0.1557	-0.5497	-0.3655	0.9152	-0.1535	0.1535	0.3187	-0.0497	-0.2690
Single	0.1479	-0.1479	0.4389	-0.2722	0.7111	-0.2146	0.2146	0.3194	-0.1222	-0.1972
Education										
Some college/technical school or less	0.1375	-0.1375	-0.4957	-0.4468	0.9425	-0.0897	0.0897	0.3388	-0.0319	-0.3069
Bachelor's degree or higher	0.1557	-0.1557	-0.6635	-0.3994	1.0629	-0.2099	0.2099	0.5220	-0.1635	-0.3585
Racial/ethnic background										
Caucasian	0.1364	-0.1364	-0.6273	-0.4318	1.0591	-0.1500	0.1500	0.4242	-0.0879	-0.3364
non-Caucasian	0.2006	-0.2006	-0.0453	-0.3909	0.4362	-0.0864	0.0864	0.3745	-0.0700	-0.3045
Employment										
part-time or full-time	0.1384	-0.1384	-0.6225	-0.4088	1.0313	-0.1709	0.1709	0.4993	-0.0926	-0.4067
Other categories	0.1595	-0.1595	-0.4707	-0.4421	0.9128	-0.0878	0.0878	0.2676	-0.0729	-0.1947
Age										
Under 40	0.1348	-0.1348	-0.4988	-0.4137	0.9125	-0.2057	0.2057	0.4657	-0.0875	-0.3783
40 to 60	0.1494	-0.1494	-0.5658	-0.4556	1.0214	-0.1583	0.1583	0.4778	-0.1094	-0.3684
> 60	0.1506	-0.1506	-0.5692	-0.4113	0.9805	-0.0556	0.0556	0.2495	-0.0253	-0.2242
Gender										
Female	0.1579	-0.1579	-0.5273	-0.4341	0.9614	-0.2055	0.2055	0.3816	-0.0697	-0.3119
Male	0.1169	-0.1169	-0.6424	-0.4163	1.0587	-0.0268	0.0268	0.4917	-0.1175	-0.3742

APPENDIX C
THE CLUSTER PROCEDURE

Ward's Minimum Variance Cluster Analysis

Table C.1. Eigenvalues of the Covariance Matrix, Louisiana Strawberry Preference Survey, 2004.

<u>Product</u>	<u>Eigenvalue</u>	<u>Difference</u>	<u>Proportion</u>	<u>Cumulative</u>
1	1.96532357	1.07277486	0.356	0.356
2	0.89254872	0.07694717	0.1617	0.5177
3	0.81560154	0.23271564	0.1478	0.6655
4	0.58288591	0.08864318	0.1056	0.7711
5	0.49424272	0.0719422	0.0895	0.8606
6	0.42230053	0.07526512	0.0765	0.9371
7	0.3470354	0.3470354	0.0629	1
8	0	0	0	1
9	0	0	0	1
10	0	0	0 -0.000	0 1.0000
11	0	-0.0000	1	0

Source: Strawberry Preference Survey

Root-Mean-Square Total-Sample Standard Deviation = 0.708387

Root-Mean-Square Distance Between Observations = 3.322631

The Cluster Procedure
Ward's Minimum Variance Cluster Analysis

Table C.2. Cluster History Results of Selected Steps, Louisiana Strawberry Preference Survey, 2004.

<u>NCL</u>	<u>Clusters Joined</u>		<u>FREQ</u>	<u>SPRSQ</u>	<u>RSQ</u>	<u>PSF</u>	<u>PST2</u>
248	35	52	2	0	1	.	.
237	98	117	2	0.0001	0.999	59.5	.
226	CL244	118	3	0.0002	0.997	38.9	2.7
215	94	247	2	0.0002	0.995	32.2	.
204	CL228	CL245	4	0.0003	0.992	28.3	2.4
193	127	175	2	0.0003	0.989	26.1	.
182	CL210	122	3	0.0004	0.985	24.6	1.4
171	114	140	2	0.0004	0.981	23.6	.
160	123	183	2	0.0005	0.976	22.8	.
149	CL240	CL173	4	0.0006	0.97	22.1	2.2
138	CL222	163	4	0.0006	0.964	21.5	3.8
127	CL195	CL193	4	0.0008	0.956	21	2.5
116	CL160	165	3	0.0009	0.947	20.5	1.8
105	125	245	2	0.001	0.936	20.3	.
94	188	242	2	0.0012	0.924	20.2	.
83	CL136	203	3	0.0015	0.909	20.2	2.2
72	74	CL170	3	0.0017	0.891	20.4	4.2
61	CL88	CL97	5	0.0022	0.869	20.8	2.5
50	CL128	CL74	7	0.0026	0.842	21.7	2.8
39	CL79	CL106	5	0.0037	0.807	23.1	3
28	CL52	CL200	20	0.0057	0.758	25.6	9.8
17	CL36	CL22	26	0.0117	0.662	28.4	7.6
6	CL8	CL28	85	0.0356	0.429	36.5	21.4
5	CL11	CL10	43	0.0404	0.389	38.8	13.2
4	CL5	CL7	59	0.0455	0.343	42.7	10.5
3	CL9	CL16	105	0.0715	0.272	45.9	38.7
2	CL3	CL4	164	0.0968	0.175	52.3	28.3
1	CL6	CL2	249	0.1748	0	.	52.3

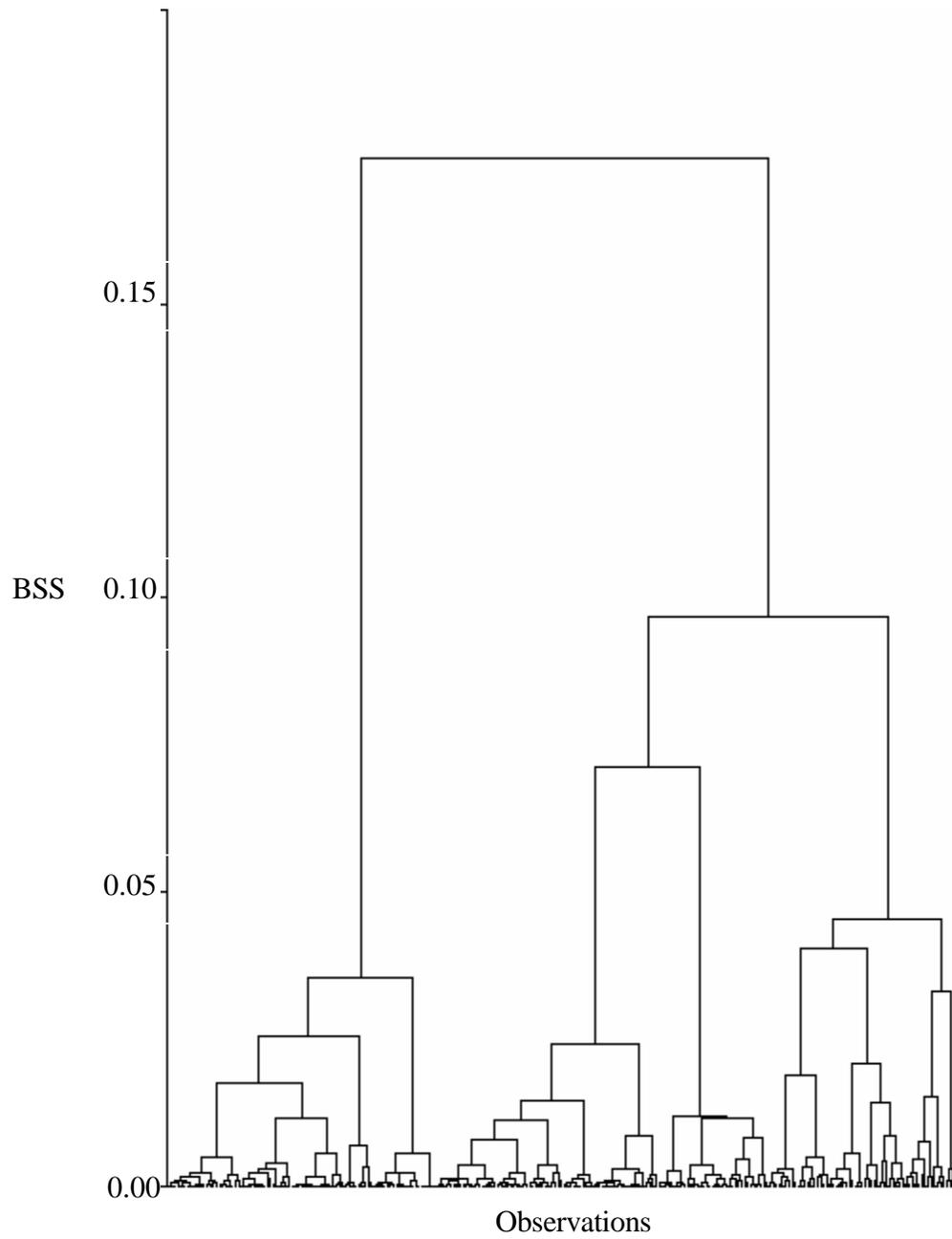


Figure C.1 Tree-graph Explaining Average Utilities of Each Individual Response, Louisiana Strawberry Preference Survey, 2004

APPENDIX D
WILLINGNESS TO PAY

Willingness to Pay

As indicated in Chapter 2, many studies have determined whether customers are willing to pay more for a specific product or service. Similarly, preferences for the Louisiana strawberry should be reflected in willingness-to-pay more for the Louisiana product or brand.

About 76 percent of all respondents indicated they would pay more for Louisiana strawberries than for competitors' products (Table D.1). When only those who responded they would pay more were considered, the proportions that would pay an additional 20 cents (10 percent), 40 cents (20 percent), or 60 cents (30 percent) more were each a little more than $\frac{1}{4}$ of the total, or 79 percent in total (Table D.1). Those who would pay more than 60 cents more were about $\frac{1}{5}$ of the total. As expected, most respondents would pay more, but only a few would pay the higher premiums. So, about 36 percent⁵ of all respondents were willing to pay 60 cents or more per pint, and using the same procedure and logic, 40 percent⁶ of all respondents would pay less than 60 cents per pint for Louisiana strawberries. From an earlier study, consumers in Tennessee were asked whether they were willing to pay more for branded, locally grown tomatoes in supermarkets (Brooker et al., 1988). Results indicated as the price of locally grown tomatoes increased from 30 to 50 cents above non-locally grown tomatoes, there was a 26 percent decline in number of respondents who would pay that premium. It is important to remember that consumer responses in survey situations are not highly predictable of their behavior in an actual purchasing situation, and as prices increase there is a tradeoff between the local product's characteristic, desire to support the local industry, and saving money.

⁵ From table D.1, 26 percent of respondents are willing to pay 60 cents more per pint, 8 percent are willing to pay 80 cents more, and 13 percent are willing to pay \$1 more, for a total of 47 percent. From table D.1, 76 percent of respondents said they would be willing to pay more per pint for Louisiana product. Multiplying these yields the appropriate value, or $(.47)(.76)(100) = 35.72$ percent.

⁶ Using the procedure in footnote 3, 53 percent from Table D.1 multiplied by 76 percent from table D.1 = 40.28 percent.

Table D.1 Respondents Willingness to Pay More for Louisiana Strawberries, Louisiana Strawberry Preference Survey, 2004.

	<u>%</u>
<u>Respondents willing to pay more</u>	
Yes	76
No	24
<u>Additional Amount Respondents were Willing to Pay per Pound for Louisiana Strawberries</u>	
\$0.20	25
\$0.40	28
\$0.60	26
\$0.80	8
\$1.00	13

VITA

Michael Bruchhaus was born on October 17, 1980. He grew up in the small community of Elton, Louisiana. His father, Donnie, farmed rice, crawfish, and soybeans on the family farm. From an early age, it was apparent that Michael loved agriculture. As he grew up helping his father on the farm, little did he know that the rest of his life was being molded from the religious values and integrity his father and the rest of his family were teaching him.

At an early age, Michael excelled in athletics. Through athletics he learned the value of hard work and determination. However, because of serious athletic injuries in high school, he decided to focus on academics instead of just an athletic lifestyle. He graduated from Elton High School in 1999. He received his Bachelor of Science degree from McNeese State University in Lake Charles, Louisiana, in 2003 where he majored in accounting. Upon graduation, Michael started his Master of Science degree at Louisiana State University, majoring in agricultural economics and focusing on agricultural business management.

Whatever the future holds for Michael will not be determined by him but by the Lord, who guides his every step. Michael has been impacted by many people in his life and he hopes to have the same impact on more people in the future. He is a candidate for the Master of Science degree in agricultural economics in August 2005.