Consumer Preferences for a Fresh-Cut Melon Product – A Potential Value Added Product for Melon Growers

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Introduction

Fruits and vegetables are an important component of the food industry in the United States. In 2000, consumers spent about $75.8 billion on fresh fruits and vegetables (Cook). Fresh-cut produce items that may include bagged specialty salads, baby carrots, stir-fry vegetable mixes and fresh-cut melons are an increasing portion of the consumption of fruits and vegetables. Currently, total yearly sales of fresh-cut products are approximately $10 to $12 billion (IFPA), which represents approximately 10% of total produce sales in the U.S. The consumption of these products is increasing in popularity due to the increasing demand by the American consumer for healthy and easy to prepare foods. Foodservice institutions are also demanding more fresh-cut products in order to reduce labor and waste costs (Shwedel and Costa).

Fresh-cut fruit is the newest class of products to be offered both in retail markets and quick-service restaurants. Industry experts predict that this category will likely overshadow the sales of fresh-cut salads and vegetables in the future. The volume of sales is projected to grow by 20 to 30% annually for the next four years and expected to reach $1 billion to $2 billion in retail sales by 2008 (Miller).

Most of the fresh-cut fruit products offered at the retail level contain some type of melon, as a single fruit or a mix of melons such as honeydews, muskmelons and watermelons. And Indiana melon growers view fresh-cut melons as a potential value-added product. With a value-added product, the melon growers hope to increase the demand for their commodities, market directly to end consumers, enhance the profitability of their farms by offering a more valuable melon product, and aid in the economic sustainability of melon production in the state.

A challenge for Indiana melon growers and processors of melon products in general, is the lack of information regarding the attributes of fresh-cut melon products that are important to consumers. An understanding of consumer's needs and preferences is necessary to manufacture a product that meets their needs and tastes. Products which turn out to be unsuccessful represent a loss of time and money.

The overall objective of this research is to better understand consumer preferences for fresh-cut melon products. The first specific objective is to assess consumer loyalty to existing fresh-cut melon products and the acceptability of a fictitious Indiana-grown brand called "Indymelon". The second objective is to determine which attributes of the value-added melon product do consumers favor the most. The attributes assessed are type of package, type of fruit mix, and amount of fruit leakage (i.e., fruit juices that accumulate at the bottom of the packages).

No other study has assessed the tradeoffs in price, packaging, fruit mix, brand, and juice content that consumers of fresh-cut fruit make when purchasing these types of products. The attributes included in this study belong to other fresh-cut fruit products besides melon thus the results may also apply to other products, such as fresh-cut pineapple. Information generated by this study will allow processors, marketers, and suppliers of fresh-cut fruit to cater to the needs and preferences of consumers successfully.

Methods

A choice based conjoint (CBC) analysis experiment is conducted to assess the importance and preference for several attributes of fresh-cut melon products. CBC analysis is the integration of two micro-econometric tools that were initially used in market research in the early 1970's. It is the integration of conjoint analysis and discrete choice modeling. Conjoint analysis is a multi-

attribute judgmental method used for the development of an algebraic description of the utility of a good (Louviere). Utility, as postulated in Lancaster's 1966 classical work and applied to conjoint analysis, is derived from the attributes or characteristic that a good possesses. With discrete choice analysis, consumer choice from a set of mutually exclusive alternatives can be modeled. These models are based on the axiom that consumers are "rational" in the sense that they will choose the alternative with the highest utility, subject to economic constraints on expenditures. In discrete choice models, choice is considered a function of observable product attributes and the known characteristics of the choice-maker such as the demographics of age or gender (Ben-Akiva and Lerman).

The first step in setting up the CBC analysis experiment is identifying the important attributes of a melon product. Two attributes required as part of this experiment are brand and price. Brands of available fresh-cut melon products are included to assess their brand equity. Price is included to be able to calculate the monetary valuation of the attributes. Through conversations with industry experts and consumers, it was found that other important attributes were fruit mix, package, and juice content. For this study, 4 different levels are assigned to each attribute. The attributes and their levels are described in Table 1.

The second step in setting up a CBC analysis experiment is executing an experimental design to create product concepts or profiles from which consumers will choose. For this study, the random method is utilized. Attribute levels are randomly allocated to product profiles, and product profiles are randomly assigned to choice tasks. The random method has been shown to be the most flexible in estimating all possible attribute interactions, accurate when estimating willingness-to-pay, and more efficient than orthogonal fractional factorial designs (Lusk and Norwood,, Chrzan and Orme, Boyle et al., Roe et al.). For each choice task, a respondent would

be presented with five alternatives from which to choose from. Four alternatives refer to branded product profiles (1 alternative for each brand) and the last refers to an opt-out alternative, which states "I would not buy any of these product alternatives".

The third and final step in setting up the CBC analysis is formatting the experiment the way it will be presented to respondents. The respondents that are targeted for this study are fresh-cut fruit consumers at supermarkets. Anticipating that consumers at supermarkets would be in a hurry, the survey instrument is designed to be easy to complete. Four choice tasks are presented to each respondent. To ease the recognition of attribute levels, pictures of fruit mix, package and brand are included. Price and fruit juice content are written on the pictures. Respondents are also asked to provide demographic information such as age, income, ethnicity and how regularly they purchase fresh-cut melon products. A sample choice task is presented in Figure 1.

Data

The CBC analysis experiment was conducted in the produce departments of two different retail stores in Indiana. The surveys were administered orally to consumers who were purchasing fresh-cut melons. This strategy is meant to obtain information from actual shoppers, with a point-of-sale context to maximize the validity of the preferences stated in the choice experiment (Batsell and Louviere, Enneking).

By utilizing a convenience sample for this study, the findings may not represent the true preferences of the population of fresh-cut melon consumers in the United States. Instead it represents the preferences of a typical fresh-cut melon shopper at each of the retail stores. At both stores, sampling selection bias with respect to fresh-cut melon consumers is believed to be

non existent. It was observed that people across gender, income categories, education levels, and race were willing to participate in the survey.

A total of 126 respondents completed the survey. Ninety-nine of the respondents were from Lafayette and 27 from Avon. Their responses resulted in 504 choices, which are slightly above the required amount of choices for valid maximum likelihood estimations (Long). The demographic and purchasing behavior of the aggregated respondents can be seen in Table 2.

Approximately 87% of the respondents were women and higher participation by women was expected. Most of the survey participants (42%) were between the ages of 46 and 63. The percentage of households without children was 65%. Thirty-three percent of respondents reported household incomes between $26,000 and $50,000. The second largest income group was $51,000 to $75,000 with 27% of the respondents.

Approximately 93.7% of the respondents were Caucasian. Three percent were African American and 2.4% percent were Hispanic. There were no Asian participants. The ethnicity represented in the respondent sample closely resembles the ethnicity of the Indiana population. According to the 2000 U.S. Census, 87.5% of the population is Caucasian, 8.4% are African Americans, 3.5% are Hispanic, and 1% are Asian.

The majority of survey respondents had a high school degree or higher. Respondents which had a high school degree as the highest level education were 57.9 % of the sample. Respondents with Bachelors degrees or a graduate degree represented 27.8% and 12.7% of the sample, respectively.

All survey respondents consumed at least one package of fresh-cut melons per month. The majority of the respondents (42.9%) claim to consume from 1 to 3 fresh-cut melon products

per month and 40.5% consume 4 to 7 packages per month, whereas 13.5% consume 8 to 12 packages.

Conditional Logit Model

In CBC, the utility that the ith person (i = 1,….,I) derives from the jth alternative may be represented as U_{ij}. This utility is considered a linear function of the alternative product attributes, represented by

$$U_{ij} = \beta x_{ij} + \varepsilon_{ij} \qquad \text{Equation 1}$$

Where β is a vector of coefficients, x is a vector of attributes represented by choice *j* and respondent *i*, and ε is a stochastic error term.

The probability P_{ij} the *i*th respondent chooses the *j*th alternative from choice set C is the probability that the utility for the *j*th choice is greater than the utility for all other *k* choices in the choice set. This can be represented mathematically as follows:

$$P_{is} = P(U_{ij} > U_{ik})\ j \neq k \in C \qquad \text{Equation 2}$$

$$P_{ij} = P(\beta x_{ij} + \varepsilon_{ij} > \beta x_{ik} + \varepsilon_{ik}) \qquad \text{Equation 3}$$

$$P_{ij} = P(\varepsilon_{ik} - \varepsilon_{ij} < \beta x_{ij} - \beta x_{ik})\ j \neq k \qquad \text{Equation 4}$$

Assuming that the error terms (ε_{ij}) are independent and identically distributed with an extreme value distribution (also referred to as Weibull, Gumbel and double exponential distributions) and scale parameter equal to 1, the probability that respondent *i* chooses alternative *j* is:

$$P_{ij} = \frac{\exp(\beta x_{ij})}{\sum_{k=1}^{J} \exp(\beta x_{ik})} \qquad \text{Equation 5}$$

This model is fit to the choice data by means of maximum likelihood estimation. The LIMDEP statistical software is utilized in this study to fit the conditional logit model to the choice data. For analysis, the choices made by the respondents and attributes of the melon products are coded with dummy variables. The response variable, whether or not an alternative is chosen, is coded with a 1 when chosen and 0 otherwise. There are five alternatives for each choice task. Each brand alternative is described by four columns, a 1 for the actual brand and a 0 for each of the other brands. The "none" option is omitted and was assigned a value of 0 for each of the brand columns. For each of the product attribute categories, one of the attribute levels is omitted and the others are assigned a value of 1 if chosen and 0 otherwise.

Independence of Irrelevant Alternatives

The conditional logit model is based on the assumption of independence of irrelevant alternatives (IIA). This assumption makes the conditional logit model simple and easy to use. For a conditional logit model to satisfy the IIA assumption, the ratio of the probabilities of choice associated with other alternatives in a choice set should be preserved. That is, the ratio of the probability of choosing an Indymelon product and the probability of choosing a Meijer brand product is unaffected by the absence or presence of a Del Monte product. This characteristic allows the analyst to add new alternatives without having to re-estimate the model. The assumption of IIA relies on the assumption that the errors of the model are independently distributed across alternatives. If violations of the IIA property do occur, alternative models that do not assume that errors are independently distributed across alternatives are recommended (Louviere et al.). Examples of these models include: the heteroskedastic extreme value model, the multinomial probit model and the random parameters logit model.

Train has suggested that violations of the logit assumptions have less effect when estimating average preferences than when forecasting substitution patterns. Since the purpose of this study is to better understand the average preferences for fresh-cut melons, the simple conditional logit model is considered to be an approximation and appropriate for the purpose of this study.

Locality on Preferences

Data was obtained through surveys that were distributed in two different locations. For the data to be pooled, the preferences for melon products in both locations need to be similar. A way to test for similar preferences or preferences regularity (Louviere et al.) is to examine whether there is a statistical difference in estimated conditional logit coefficients between the Lafayette and Avon localities. The hypothesis is:

$$H_0 : \beta'_{Lafayette} = \beta'_{Avon} \qquad \text{Equation 6}$$

The statistic that is employed to test this hypothesis is $-2(LL_J - \sum LL_l)$, where LL_J is the log-likelihood value at convergence of the model that takes into account data from both locations, and $\sum LL_l$ is the summation of the log-likelihood value of the estimated models for each location. Equality of error variance for both locations is assumed. This statistic is asymptotically chi-squared distributed with K(L-1) degrees of freedom, where K is the number of coefficients estimated for the models and L is the number of treatments, which is two in this case since there are two localities. To evaluate the statistic, three different main effects models are estimated: a full sample model, a model for Lafayette and a model for Avon. The coefficients and log-likelihood values of each model are shown in Table 3.

The signs of the estimated coefficients for the utility function of the melon product are the same across the three models. The resulting value of the statistic to test preference regularity is 11.44 with 14 degrees of freedom. The critical chi-squared value at a 95% significance level is 23.68. The null hypothesis which states equality of preferences in Avon and Lafayette can't be rejected. Thus the data from Lafayette and Avon can be pooled to estimate a single model.

Models with Interactions

The random method of assigning attributes to product profiles and profiles to choices allows for the estimation of two types of models: main effects models and models that include interaction effects that may occur between attributes. Interactions have been identified as important factors that should not be overlooked in CBC analysis models (Louviere et al.). For this reason, thirteen different models that include interactions are estimated and are shown in Table 4.

The interaction effects are not statistically significant at the 5% level. This results in failure to reject the null hypothesis that all the coefficients for interaction effects are equal to zero. This means that the effects of price, juice content, fruit mix, and package do not depend on brand. The fact that the interactions of brand and price with demographic variables are not statistically significant, means that price and brand preferences are not affected by the age, income and education of consumers or the quantity of products they typically buy in a month. This results in the failure to reject the hypotheses that demographic variables have no effect on brand choice and price sensitivity. In other words, preferences for brand and price of a melon product do not differ across age, income, education and regularity of purchase. As a result of

this, the main effects model can not be improved significantly by the inclusion of interaction effects.

Main Effects Model Results and Discussion

The main effects model consists of fourteen different estimated coefficients. The first four coefficients pertain to alternative specific constants for the Del Monte, Ready Pac, Meijer and Indymelon brands. These constants are estimated relative to the "none" alternative which has an implicit value of 0. The rest of the attribute coefficients are estimated relative to one of the attribute levels. That attribute level is omitted from the model since its effect can be defined from the estimated effects of the other three attribute levels. For example, for the fruit mix attribute the melon plus grape fruit mix is omitted. The estimated effects of watermelon mix, cantaloupe mix, and melon mix are relative to the melon-grape mix. Any statistical differences that occur are estimated relative to the attribute level that is omitted. The other omitted attribute levels in this model are square package and considerable juice. Utility is modeled as:

$$\begin{aligned}\text{Utility} = {} & \beta_1\,(\text{Del Monte}) + \beta_2\,(\text{Ready Pac}) + \beta_3\,(\text{Meijer}) + \\ & \beta_4\,(\text{IndyMelon}) + \beta_5\,(\text{Price}) + \beta_6\,(\text{Watermelon Mix}) + \\ & \beta_7\,(\text{Cantaloupe Mix}) + \beta_8\,(\text{Melon Mix}) + \beta_9\,(\text{Bowl Package}) + \\ & \beta_{10}\,(\text{Tamper Proof Package}) + \beta_{11}\,(\text{Cup Package}) + \\ & \beta_{12}\,(\text{No Juice}) + \beta_{13}\,(\text{Slight Juice}) + \beta_{14}\,(\text{Moderate Juice})\end{aligned} \qquad \text{Equation 10}$$

where β_1, β_2, β_3, and β_4 are brand specific constants, and β_5 through β_{14} are coefficients that denote the effect of the respective attribute level on utility. Table 5 contains the estimated coefficients, standard errors, and statistical significance of the main effects model.

The main effects model is statistically significant at the 0.01% level as denoted by the likelihood ratio test. This test rejects the null hypothesis that the probability of an individual choosing a melon product alternative is independent of the value of the parameters in the utility function obtained through the conditional logit model. Thus it can be inferred that at least one of the attribute effects is non-zero. The pseudo R-squared value of 0.17 also suggests that the attributes in the conditional logit model do have an important role in explaining the consumer's choice of melon products.

All brand specific constants are statistically different from the "none" option. This means that all branded alternatives are preferred over a no purchasing option. Surprisingly, the fictitious Indymelon brand has an estimated coefficient similar to the other brands. The values for all brand coefficients are within the standard errors which points to a lack of statistical difference between them. Therefore, a fresh-cut melon product produced by the melon growers of Indiana can give consumers utility similar to the utility of national, regional, and store brands. The brand equity of brands that have existed for a long time, such as Del Monte does not apply to fresh-cut melon products and indicates that consumers are interested in other attributes besides brand.

Price is estimated as a continuous variable. It is statistically significant with a negative value. This agrees with consumer theory which states that the utility of a good or service decreases as its own price increases. With each dollar increase in price there is a decrease in utility.

Three fruit mix levels are compared to the melon-grape mix. The melon-grape mix was anticipated to give consumers the highest utility since as noted from retail scan data consumers tend to prefer variety in their fresh-cut fruits. The preference for fruit variety in a fresh-cut melon product is supported by the results. The preferences for watermelon and cantaloupe mixes are significantly less than for a product with a melon-grape mix. The melon mix is not significantly different to the melon -grape mix. The utility of a product with a melon mix is less than that of a melon-grape mix product. In order of increasing preference, consumers prefer cantaloupe, watermelon, melon and melon-grape mixes. The results indicate that fruit mixes do affect consumer's purchasing decisions.

In terms of packaging, only the cup package is statistically significantly different from the squared package. The cup package is significantly less preferred than the squared package. The cup package has a negative coefficient, an indication of the dislike that fresh-cut melon consumers have towards this package. The effect of a package with a tamper proof device is not statistically different from the effect of a simple bowl or squared package. This implies that there is some preferential advantage in packages available for fresh-cut products.

An attribute that consumers are highly concerned with is the amount of melon juices that accumulate at the bottom of the package. The moderate juice, slight juice and no juice levels are all significantly more desired than the considerable juice level. Consumers prefer fresh cut melon products with the least amount of juice on the bottom of the package as possible. Consumers prefer no juice above all other levels of juice. Therefore, fruit juices are an important choice attribute for consumers.

All attributes have some level of statistical significance. To understand which of the attributes has the most impact on consumer choice, the relative importance of the attributes can

be assessed. For this, the range of lowest to highest coefficient for each attribute is divided by the total ranges of all attributes. The following equation demonstrates the relative importance (R.I.) for the packaging attribute:

$$R.I. = \frac{\beta_{10} - \beta_{11}}{[\beta_3 - \beta_4] + [\beta_5(2.50) - \beta_5(3.70)] + [0 - \beta_7] + [\beta_{10} - \beta_{11}] + [\beta_{12} - 0]} \quad \text{Equation 11}$$

Where the β's refer to the estimated coefficients of the conditional logit model, and the numbers in parenthesis refer to the lowest fresh-cut melon price ($2.50) and the highest price ($3.70). Whenever the lowest or highest coefficient refers to an omitted variable in the model, a 0 is utilized. Figure 2 presents the relative importance of the attributes for the fresh-cut melon product included in the survey.

The most important attribute of a fresh-cut melon product is packaging. The package is the first experience that a consumer has with a product (Bernstein and Moskowitz). From this study, it is apparent that the cup shaped package is not well accepted by consumers of fresh-cut fruit. Whereas, packages with a flatter shape such as the bowl, squared, and tamper proof packages are more appealing and preferred.

The second most important attribute is the amount of fruit juices on the bottom of the package. Consumers prefer packages with no juice on the bottom of the package. They associate juice content with the freshness of fresh-cut fruit, thus a product with no juice is considered fresher.

The third most important attribute is fruit mix and the least important attributes are price and brand. Consumers favor fruit variety when purchasing fresh-cut fruit. Consumers are not as concerned with price. A markup of $1 will not affect consumers as much as having a melon product in a cup package. The brand attribute is the least important attribute of all. This may be

due to the fact that fresh-cut fruit products are relatively new and consumers have not yet become loyal to a specific brand.

Marginal Effects of Attributes on Choice

The coefficients that are estimated for the conditional logit model pertain to a utility function. The coefficients can only be interpreted as the effect that a certain attribute has on the overall utility of a product. To assess the impact that attributes have on the probability of choice, marginal effects need to be estimated. Marginal effects measure the change in the probability of choosing a particular melon product given a change in an attribute of the product and can be estimated as follows;

$$\text{Marginal Effects} = \beta_{ik} X_{ikq}(1-P_{iq}) \qquad \text{Equation 12}$$

Where β_{ik} is the beta coefficient for alternative *i* and the *k*th attribute, X_{ikq} is the value of the *k*th attribute for the *i*th alternative and *q*th individual, and P_{iq} is the probability of the *q*th individual choosing the *i*th alternative. Elasticities are evaluated at the mean value of the attribute level. The direct elasticies of all attributes on a Del Monte, Ready Pac, Meijer and IndyMelon product are tabulated in Table 6.

All marginal effects have the same signs across branded alternatives. The marginal effect of price on choosing an Indymelon product is -8.89. This means that a one dollar increase in the price of an Indymelon product would result in 8.89% decrease in the probability of choosing that product. The marginal effect of price for the other brands can be interpreted similarly. Of all brands, Del Monte is the least price sensitive product, followed by Indymelon, Ready Pac, and Meijer.

The marginal effects for the other attributes (package, mix, and juice) are relative to their omitted attribute levels. The attribute levels with the highest positive effect on the probability of purchase are: tamper proof package, no juice, and melon-grape mix. The melon-grape mix is the omitted attribute level so its actual impact on the probability of choice is not measured. However, all other levels of fruit mix have a negative effect compared to melon-grape mix. Thus melon-grape mix has a higher positive effect than the other mix options. The attributes with the highest effects on probability of purchase are recommended to be included in a melon product to increase its overall probability of purchase.

Using an IndyMelon product as an example it can be shown that the effect of a cup package on the probability of choosing an Indymelon product is a decrease of 18.97% compared to the probability of choosing an Indymelon product with a square package. However, the probability of choice is increased by 3.05% when utilizing a tamper proof package instead of a square package. The probability of choosing an Indymelon product is increased by 17.35% when the product has no juices instead of a considerable amount of juice at the bottom of the package. Similar interpretations can be made about the other attribute levels for each branded alternative.

Willingness to Pay for Melon Product Attributes

Willingness-to-pay (WTP) is the estimate of the amount of money an individual is willing to pay to obtain a benefit from a specific change in attribute level, such as obtaining a melon product with a melon mix instead of a product with just cantaloupe. The WTP estimates are derived by determining the price difference between attribute levels that will invoke indifference between them. This can be calculated by the difference of beta coefficients of two attribute levels divided by the negative of the price coefficient. For example, a consumer is

willing to pay \$0.49 more to obtain a Meijer product than an Indymelon product. This is calculated as follows:

$WTP = (B_{meijer} - B_{Indymelon}) / (- B_{Price}) = (3.13 - 2.88)/(-0.52) = \$0.49.$ Equation 13

Similar calculations are performed to estimate WTP for the different brand names and attributes levels. To account for variability in WTP estimates, the confidence intervals at a 95% level are also estimated. The variance of WTP estimates needed to calculate the confidence intervals can be estimated by the following equation (Greene):

$$Var[WTP] \approx \left(\frac{\partial WTP}{\partial \beta}\right)' \left(Var[\hat{\beta}]\right) \left(\frac{\partial WTP}{\partial \beta}\right)$$ Equation 14

The derivatives of WTP with respect to the model parameters need to be estimated and multiplied by the variance – covariance matrix of the parameters. The square root of the variance is then multiplied by the critical t-value of 1.96. The WTP and their respective 95% confidence intervals are shown in Table 7.

The WTP estimates to move from an Indymelon product to other branded products are positive, yet the confidence intervals range from negative to positive values. Confidence intervals that contain a zero WTP within the range indicate that WTP for brands is not statistically different.

WTP estimates from least to most preferred levels for the other attributes are positive, with their 95% confidence intervals above zero. A fresh-cut fruit consumer is willing to pay \$1.73 on average for a product with melons and grapes instead of just cantaloupe. Similarly, a consumer would pay \$2.13 dollars more for a product in a squared package than a cup package. Consumers are willing to pay \$1.95 to obtain a no juice product instead of a product with considerable juice.

The marginal WTP estimates may seem too high for a melon product which typically sells for $3.00. Yet a study by Lusk and Schroeder found that marginal WTP estimates are in general not statistically different across hypothetical and actual payment situations. The benefit of WTP estimates is that they indicate the preference of an attribute in units that consumers are familiar with, monetary units. The magnitudes of the WTP estimates agree with the relative importance of attribute levels. The more important an attribute to the consumer, the higher the WTP will be for that attribute.

The conditional logit model in this study expresses the probability of purchase of a branded fresh-melon product. The sum of the probabilities for all brands equals one, thus the probabilities can be used as a proxy to market shares. Due to the assumption of IIA, the market share for two competing brands can be assessed. For example, a Meijer and an Indymelon product having the same attribute levels would capture a 56% and 44% market share respectively. This is a sizeable portion considering that Indymelon is a fictitious brand. The market share of the Indymelon product could be increased by offering a more appealing fresh-cut melon than Meijer. For example, if the Meijer product had a moderate amount of juice and if the Indymelon product had no juice, all else equal, then the Indymelon would be more preferred by consumers and would capture a market share of 51%, compared to 49% for a Meijer product. Similarly, an Indymelon product could capture a higher market share by improving on the current characteristics of fresh-cut melon products already offered in the retail markets..

Implications

The empirical results of this study indicate a high potential for an Indiana-grown value added fresh-cut melon product at the retail store level. Existing brands in the market place have

not gained statistically significant brand equity which gives them a competitive advantage over new brands. An Indymelon branded product, *ceteris paribus*, may be able to penetrate the market and compete well with existing brands including Del Monte, Ready Pac, and Meijer. At this moment, brand is not as important as other fresh-cut melon attributes. However, existing brands will try to increase their brand equity and consumer loyalty as time progresses. Thus, for an Indymelon brand to actually capture a significant portion of the market share, the brand label should be strongly promoted by Indiana growers.

The results of this study can be used to make better production and pricing decisions. Producing a fresh-cut melon product with the most desirable attribute levels will have the most acceptability and capture the highest market share at the retail level. A product that offers the most desirable characteristics to consumers will have a competitive advantage over products that do not.

Melon growers should focus on providing an appealing package with the ability to absorb fruit juices. There are several types of packages that can be used for fresh-cut fruit that vary in shape, color and tamper proof mechanisms. It is clear from this study that melon growers should not use cup-shaped transparent packages, since this package was the least preferred by consumers. A tamper-proof, bowl and squared package were equally preferred by consumers, so the package with the least cost could be used.

This study also showed that consumers are willing-to-pay a premium for packages that have no fruit juices on the bottom. Currently, several companies are offering absorbing pads or "diapers" that absorb fruit juices which can be placed inside any package. The diapers are not effective at absorbing fruit juices and packages that use them typically have a considerable accumulation of juices at the bottom. Melon growers should consider using a package with a

better absorption mechanism so that juices are no longer visible to consumers. The cost of this package may be higher than other packages, yet the premium that consumers are willing-to-pay for a product with no juices may cover the cost.

This study showed that on average, fresh-cut fruit consumers favor fruit mixes. However, there are consumers that prefer only watermelon or cantaloupe melon products too. An Indiana grown fresh-cut melon product should include several fruit mixes, including: cantaloupe only, watermelon only, and melon mixes. Including grapes in addition to the melon mix may seem more appealing to consumers, yet this study showed that there are no statistically significant differences in preference between a melon mix and a melon-grape mix. Adding grapes to a fresh-cut melon product would result in added production costs for which consumers are not willing-to-pay and may also contradict the Indiana grown concept since table grapes are not produced in Indiana during the melon season. Thus it would not be necessary to add grapes to an Indymelon product.

This study could be conducted on a larger scale to test whether or not similar preferences for fresh-cut melon products hold in neighboring states, such as Missouri, Illinois, Ohio and Michigan. Indiana melons are marketed in these states and they are also potential markets for an Indiana-grown fresh-cut melon product. Preferences in the food service sector should also be assessed, since it is also a potential market for fresh-cut melons.

The effects of 5 fresh-cut melon attributes were examined in this study. Packaging was the most important attribute. A study that focuses solely on packaging could provide more specific preferences regarding the package. Attributes that could be included as part of the study include: color of the package, absence or presence of nutritional information, different logos for the same brand and type of fruit juice absorbing devices used with the package.

In this study, fruit quality and taste were considered to be the same across all products. In reality, there are plenty of melon varieties with different colors, tastes and aromas that are used in fresh-cut products. A study that assesses the preferences for specific melon colors, tastes and aromas would be very useful at aiding production decisions at the farm level.

This study has applied a well known quantitative tool in market research to assess preferences for a relatively new convenience at retail stores. No other study has assessed the tradeoffs in price, packaging, fruit mix, brand and juice content that fresh-cut melon consumers make when purchasing these types of products. The results of this study point out the most important attributes of a fresh-cut melon product. The attributes included in this study belong to other fresh-cut fruit products too, thus the results may also apply to other products, such as fresh-cut pineapple. Information generated by this study will allow processors, marketers and suppliers of fresh-cut fruit to cater to the needs and preferences of consumers successfully.

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Table 1. Attributes and Attribute Levels for a Fresh-Cut Melon Product.

Attributes	Levels
Brand	o Del Monte (national brand)
	o Ready Pac (regional brand)
	o Meijer (private / store brand)
	o Indymelon (fictitious brand)
Price	o $2.50 per pound
	o $2.90 per pound
	o $3.30 per pound
	o $3.70 per pound
Fruit mixes	o Cantaloupe only
	o Watermelon only
	o Cantaloupe, honeydew, and watermelon
	o Cantaloupe, honeydew, watermelon, and grapes
Fruit leakage	o No juice at bottom of package
	o Slight amount of juice at bottom of package
	o Moderate amount of juice at bottom of package
	o Considerable amount of juice at bottom package
Package	o Bowl with push-on lid
	o Inverted cup with push on lid
	o Tamper proof bowl
	o Squared container with push on lid

Table 2. Respondents' Demographics and Purchasing Behavior.

Gender	**Frequency**	**Proportion**
Male	16	12.7 %
Female	110	87.3 %
Age		
18 – 25	22	17.5 %
26 – 45	34	27.0 %
46 – 63	53	42.0 %
Above 63	17	13.5 %
Children in Household		
Present	43	34.1 %
Absent	83	65.9 %
Income (thousand)		
$25 or less	28	22.2 %
$26 to $ 50	41	32.5 %
$51 to $75	34	27.0 %
Above $76	23	18.3 %
Ethnicity		
Caucasian	118	93.7%
African American	4	3.0 %
Hispanic	3	2.4 %
Asian	0	0 %
Other	1	0.9 %
Highest Level of Education		
Some High School	2	1.6 %
High School	73	57.9 %
Bachelors	35	27.8 %
Graduate	16	12.7 %
Fresh-Cut Fruit Purchases per Month (1 pound packages)		
None	0	0 %
1 to 3	54	42.9 %
4 to 7	51	40.5 %
8 to 12	17	13.5 %
More than 13	4	3.1 %

Table 3. Conditional Logit Model Estimates by Locality

Attribute	Full Sample Set		Lafayette Sample		Avon Sample	
Del Monte constant	2.91*	(0.48)	3.07*	(0.54)	2.45*	(1.05)
Ready Pac constant	3.00*	(0.47)	3.11*	(0.54)	2.72*	(1.05)
Meijer constant	3.14*	(0.48)	3.34*	(0.54)	2.55*	(1.04)
Indymelon constant	2.88*	(0.47)	2.98*	(0.53)	2.65*	(1.05)
Price	-0.52*	(0.13)	-0.60*	(0.14)	-0.28	(0.28)
Watermelon Mix	-0.60*	(0.16)	-0.54*	(0.18)	-0.82*	(0.35)
Cantaloupe Mix	-0.90*	(0.16)	-0.82*	(0.18)	-1.23*	(0.36)
Melon Mix	-0.11	(0.14)	-0.13	(0.16)	-0.09	(0.37)
Bowl Package	-0.19	(0.15)	-0.22	(0.17)	-0.07	(0.32)
Tamper Proof Package	0.18	(0.15)	0.20	(0.16)	0.14	(0.32)
Cup Package	-1.10*	(0.18)	-1.21*	(0.21)	-0.82*	(0.37)
No Juice	1.01*	(0.18)	1.16*	(0.19)	0.64	(0.35)
Slight Juice	0.97*	(0.17)	1.16*	(0.20)	0.40	(0.35)
Moderate Juice	0.73*	(0.17)	0.82*	(0.20)	0.49	(0.37)
Log-likelihood	-675.36		-520.82		-148.82	
No. of observations	504		396		108	

* denotes significance at the 0.01%
Numbers in parenthesis are standard errors

Table 4. Statistical Significance of Models that Include Interaction Effects

Model	Log-likelihood(LL)	LL Ratio	DF Difference	Significance
Main effects only	-675.4	0	0	No
Brand x Price	-673.5	3.79	3	No
Brand x Juice	-671.1	8.47	9	No
Brand x fruit mix	-669.3	12.2	9	No
Brand x Package	-669.6	11.62	9	No
Price x no children	-675.3	0.12	1	No
Price x ages	-674.0	2.72	3	No
Price x incomes	-674.9	1.01	3	No
Price x education	-673.6	3.62	3	No
Price x quantity	-674.6	1.62	3	No
Brand x ages	-670.0	5.4	12	No
Brand x income	-670.3	10.2	12	No
Brand x education	-667.5	15.8	12	No
Brand x quantity	-667.3	16.12	12	No

DF stands for degrees of freedom
Statistical Significance was assessed at a 5% level
Critical chi-square values for 1, 3, 9, and 12 DF are 3.8, 7.8, 16.9, and 21.0 respectively

Table 5. Results of main effects model

Variable	DF	Coefficient	SE	Chi-Square	Pr > X^2
Del Monte constant	1	2.90901	0.47520	37.47	< 0.0001
Ready Pac constant	1	3.00461	0.47470	40.07	< 0.0001
Meijer constant	1	3.13736	0.47654	43.34	< 0.0001
Indymelon constant	1	2.88341	0.47303	37.16	< 0.0001
Price	1	-0.51754	0.12556	16.99	< 0.0001
Watermelon Mix	1	-0.59974	0.15808	14.40	< 0.0001
Cantaloupe Mix	1	-0.89549	0.16252	30.36	< 0.0001
Melon Mix	1	-0.11002	0.14397	0.59	0.4448
Bowl Package	1	-0.19304	0.15111	1.63	0.2014
Tamper Proof Package	1	0.17775	0.14504	1.50	0.2204
Cup Package	1	-1.10481	0.17890	38.14	< 0.0001
No Juice	1	1.01019	0.16769	36.30	< 0.0001
Slight Juice	1	0.97389	0.16930	33.09	< 0.0001
Moderate Juice	1	0.72889	0.17451	17.45	< 0.0001
Likelihood Ratio	22			271.6	< 0.0001
Pseudo R-squared	0.17				

Table 6. Marginal Effects of Attributes on Melon Products

Attribute	Del Monte	Ready Pac	Meijer	Indymelon
Price	-8.66	-9.39	-10.38	-8.89
Moderate Juice	12.19	13.22	14.62	12.52
Slight Juice	16.29	17.67	19.54	16.73
No Juice	16.89	18.33	20.27	17.35
Watermelon Mix	-10.03	-10.88	-12.03	-10.30
Cantaloupe Mix	-14.98	-16.25	-17.97	-15.38
Melon Mix	-1.84	-2.00	-2.21	-1.89
Bowl Package	-3.23	-3.50	-3.87	-3.32
Tamper Proof Package	2.97	3.23	3.57	3.05
Cup Package	-18.48	-20.04	-22.16	-18.97

Table 7. WTP Estimates and Confidence Intervals

Change in Attributes	Mean WTP	95% Confidence Interval
Indymelon to Del Monte	$0.05	-$0.50 -- $0.60
Indymelon to Ready Pac	$0.23	-$0.31 -- $0.77
Indymelon to Meijer	$0.49	-$0.06 -- $1.05
Cantaloupe to Watermelon Mix	$0.57	-$0.13 -- $1.28
Cantaloupe to Melon Mix	$1.52	$0.59 -- $2.44
Cantaloupe to Melon-Grape Mix	$1.73	$0.72 -- $2.74
Cup to bowl package	$1.76	$0.67 -- $2.85
Cup to square package	$2.13	$0.92 -- $3.35
Cup to tamper proof package	$2.48	$1.14 -- $3.82
Considerable to moderate juice	$1.41	$0.47 -- $2.35
Considerable to slight juice	$1.88	$0.79 -- $2.89
Considerable to no juice	$1.95	$0.82 -- $3.08

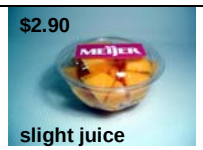
Choice # 1					I would not buy any of these.

Figure 1. Example of a choice task

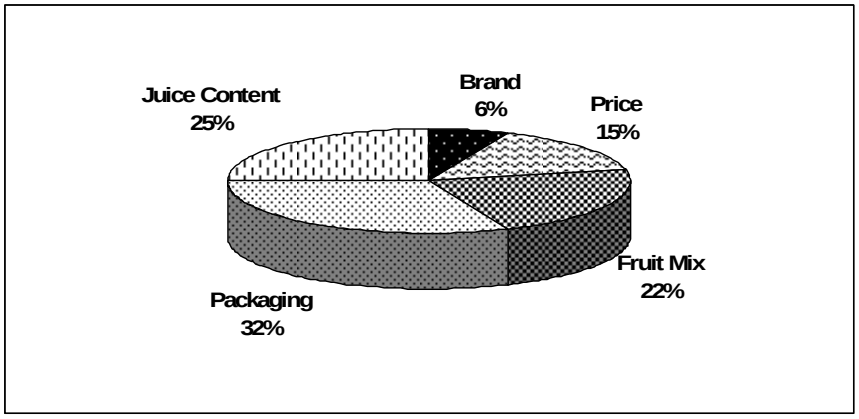


Figure 2. Relative importance of fresh-cut melon attributes