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Consumer Preference of Table Banana Quality by Income Groups in the Philippines: Hedonic Price Analysis

Romiel John P. Basan

Faculty, Department of Agricultural Economics

College of Business, Development Economics and Management

University of Southern Mindanao, Kabacan 9407, Cotabato

Email: rjay.basan@gmail.com

ABSTRACT

Income has been found to be a strong determinant of consumers' demand for agricultural commodity such as banana, and has been strongly correlated with consumer preference. However, literature on consumer preferences vis-à-vis fruit quality as segmented by income group is lacking. This study aims to determine the table banana preferred by consumers in low-, middle-, and high-income groups and its effect on price. Descriptive statistics and hedonic regression were used to analyze the data. Results revealed that high-income consumers were more discriminating than low- and middle-income consumers in terms of cluster size and fruit length. This means that high-income consumers are willing to pay premium price for banana quality. Consumer under different income class in the society have their own preferences when making purchase decisions with respect to the embodied attributes of banana. A well-informed clientele can be chosen and proper market segmentation and marketing plan can be prepared. Taking into account quality considerations will enable both farmers and traders to further increase their profit.

Keywords: banana quality, consumer preference, income groups, hedonic price analysis

JEL Classification: M31, D1, Q1, and Q11

INTRODUCTION

In a highly differentiated market environment, food quality has become increasingly important as consumers show more concerns about nutrition, health, and quality of food that they eat (Gil et al. 2000). Banana (*Musa* spp.) is one of the fruits widely consumed in the world owing to its affordability and nutritional value. In the Philippines, *Lakatan* and *Latundan* are the common banana cultivars grown for local market (PCARRD 2003) and form part of the Filipino diet as dessert.

Being a lucrative business, the banana industry has maintained its niche in the global market, providing the local market with affordable table banana through intensive research on agronomy and processing. Little attention was given to its marketing aspects (Ashman 2004). As a result, little is known about this fruit's marketability, consumption patterns, and consumer preferences.

As consumers have become more discerning of food products with various characteristics, quality became an important criterion during purchase and consumption, especially for agricultural produce. But there has been no precise quantification of the value of these attributes as well as their effect on the buyer's willingness-to-pay. Thus, this paper explores the use of hedonic price method to make such an evaluation.

Moreover, income has been found to be strongly correlated and has a significant effect on consumer preference. However, no study on consumer preference for banana quality, by consumer income level, has been made.

The general objective of the paper is to determine the quality of table banana that consumers belonging to different income categories preferred, and know the effect of banana quality on price. Specifically, this paper aims to: (1) characterize banana consumers

by income groups; (2) determine the banana quality preferred by low-, middle-, and high-income consumers; (3) determine the effect of these attributes on the price of banana; and (4) suggest policy recommendations to improve banana quality.

REVIEW OF LITERATURE

There are two main approaches that contributed greatly toward the theoretical work on hedonic prices. The first approach was derived from Lancaster's consumer theory (1966) and the second came from a model postulated by Rosen (1974). The Lancasterian model, Rosen's model, and the hedonic price model all surmised that goods possess a myriad of attributes that combine to form bundle of characteristics that the consumer values; but these models have some fundamental differences (Chin and Chau 2003). They also added that Lancasterian model presumes that goods are members of a group and that some or all of the goods in the group are consumed in combination, subject to consumer's budget. Rosen's model, on the other hand, assumed that there is a range of goods but that consumers typically do not acquire preferred attributes by purchasing a combination of goods. The hedonic price approach also does not require joint consumption of goods within a group, thus, Lancaster's approach is more suited to consumer goods, whereas Rosen's model can be associated with durable goods.

Lancaster's hedonic method in measuring utility by using the characteristics possessed by good was used in several studies (Chin and Chau 2003; Bishop and Timmins 2010; Gurung 2013; Kiripidis et al. 2005; Bastian et al. 2002; Ahmann and Kruse 2009; Suthamathy 2012; Edmeades 2006; Malpezzi 2002; Barlow 2008; Khorshiddoust 2009; Kakhi et al. 2010; Vural and Fidan 2009). Agricultural commodities

such as rice (Gurung 2013; Anang et al. 2011), olives (Tamer et al. 2009), fruit juice (Weemaes and Reithmuller 2001), indigenous sheep (Terfa et al. 2013), eggs (Karipidis et al. 2005; Kim and Chung 2011), and indigenous chicken (Bett et al. 2011) used hedonic pricing to assess the marginal value of output characteristics of crops.

Studies of Ayinde et al. (2010), Edmeades (2006), and Musa et al. (2012) utilized Lancaster's hedonic price model and have found that taste, size and/or number of fingers of the banana fruit, cluster size, weight, softness, and degree of ripeness were considered the most important attributes by the consumers. However, there were also banana quality traits that were less preferred, such as color and appearance.

Product quality, on the other hand, is determined by the set of attributes or characteristics of a food product, as well as how those attributes and characteristics are assured and communicated to consumers (Caswell and Joseph 2007). Human health, food safety, along with several product characteristics such as nutritive value, taste, freshness, appearance, and other sensory characteristics, influence consumer preference (Makatouni 2002; Bonti-Ankomah and Yiridoe 2006).

Mukiibi et al. (2006) revealed that there are several factors that seem to be strongly correlated with consumer preference, namely: income, education, age of household head, household size, price, and quality of produce. However, studies on the factors affecting

consumer preference for fruits and vegetables (Gao et al. 2010; Lehnert 2009; de Pelsmacker et al. 2005; Phuah et al. 2011b; Goldberg and Roosen 2005; Carlos et al. 2005; Clay et al. 2005; Kovacic et al. 2002; Poole and Martínez-Carrasco 2007; Bonti-Ankomah and Yiridoe 2006; Wolf 2002) revealed that significant consumer traits and product quality such as freshness, size, and weight affect the consumers' decision to buy the goods.

METHODOLOGY

Primary data obtained from a survey of 400 sampled banana consumers were used in this study. There were 146 respondents from Davao City, 167 respondents from Manila, and 87 respondents from Cebu City. These consumers were grouped according to their income level as shown in Table 1.

Descriptive statistics were used to characterize consumers and quality preference of consumer-respondents. The Statistical Packages for Social Sciences (SPSS) version 16.0 software was used in this analysis. The one-way analysis of variance (ANOVA) was used in determining the significant difference in consumer traits between income groups.

In conducting ANOVA, equal variance was observed. Levene's test of homogeneity of variance was used in this study. If the significance value is greater than 0.05, then the assumption is not violated (Kumar, John, and Senith 2014) and the result from ANOVA is used. Otherwise, the assumption is violated,

Table 1. Consumer groups and annual family income

Consumer Groups	Annual Family Income (PHP)
Low	Under 40,000–59, 999
Middle	60,000–99,000
High	100,000 and Above

Source: NSO 2012 FIES

and a robust test of equality of means is recommended. A post-hoc test was done to evaluate the pairwise difference among income groups in which the ANOVA was found to be significant. Tukey HSD was used when the assumption of homogenous variance was not violated; otherwise, Games-Howell was used.

The hedonic regression method was used in this study to determine the effect of banana qualities on its price. The estimated coefficients were obtained using the STATA 10.0 software. Separate hedonic regression analyses were applied to income groups. However, low and middle income were combined in the analysis since the number of respondent in low-income group were insufficient to run a regression, thus, only two separate regression were analyzed.

Empirically, the hedonic price estimation/analysis takes the form of:

$$P_{bt} = \alpha_{bt} + \beta_1 SC + \beta_2 FS + \beta_3 CS + \beta_4 FL + \beta_5 R + \beta_6 S + \beta_7 SB + \varepsilon_{bt} \quad (1)$$

where:

- P_{bt} = price of banana (PHP/kilogram)
- SC = dummy variable for skin color
- FS = dummy variable for fruit size
- CS = dummy variable for cluster size
- FL = dummy for fruit length
- R = dummy for the degree of ripeness
- S = dummy for degree of softness
- SB = dummy for surface/skin blemish
- α_{bt} = intercept term
- β_1 - β_7 = slope of the estimated coefficients of banana quality
- ε_{bt} = error term of the model

Equation 1 contains dummy variables, thus, coding numbers were used to characterize and identify the key banana characteristics

that consumers preferred. Based on this coding, indicators or variables with the highest frequency (preponderance) were used as the base dummy for comparison and, therefore, did not appear in the regression result. The description of the dummy variables used in the study was presented in Table 2.

Moreover, Akaike Information Criterion (AIC) was used in determining the “best” functional form for hedonic regression with one having the lowest AIC being the best. Based on the AIC result, semi-logarithmic form was used in the study, Thus, Equation 2 becomes

$$\ln P_{bt} = \alpha_{bt} + \beta_1 SC + \beta_2 FS + \beta_3 CS + \beta_4 FL + \beta_5 R + \beta_6 S + \beta_7 SB + \varepsilon_{bt} \quad (2)$$

For semi-logarithmic equation, the interpretation of the coefficients for dummy variable needs some specific clarification, thus, a reformulation of the model and transformation the coefficients were done. To transform the regression coefficient, Equation 3 was used.

$$\tilde{\theta} = e^{\theta_2 - 1/2 \text{Var}(\theta_2)} - 1 \quad (3)$$

where $\text{Var}(\theta_2)$ is the estimated variance in the coefficient estimated for the dummy variable.

In addition, Variance Inflation Factor (VIF) and Tolerance (TOL) were used in testing for model’s multicollinearity problem and White’s general test was used to check for homoscedasticity problem. The Chow test (F-test) was used to determine the variation in the demand for banana quality between income groups.

Table 2. Description and coding of variables in the hedonic model

Variables	Coding
Price	<i>Market price of banana per kilogram (PHP/kg)</i>
Fruit Skin Color	1: Green 2: Green Yellow 3: Yellow
Fruit Size	<i>The size of fruit in terms of its diameter</i> 1: Small (22 mm–30 mm) 2: Medium (31 mm–36 mm) 3: Large (37 mm–40 mm)
Cluster Size	<i>The number of fingers per hand</i> 1: Small (10 fingers–15 fingers) 2: Medium (16 fingers–18 fingers) 3: Large (>18 fingers)
Fruit Length ^a	1: Small (<15 cm) 2: Medium (16 cm–19 cm) 3: Large (>19 cm)
Ripeness	1: Moderately ripe 2: Ripe 3: Very Ripe
Softness	1: Not soft 2: Moderately soft 3: Soft
Surface Blemish	1: Trace/Light 3: Medium 4: Severe

Notes: a Measured based on middle finger in the outer row, from the blossom end to the base of the pedicel, where the edible flesh ends (PNS for Banana 2008)
PHP 1.00 = USD 44.67 average for December 2014

RESULTS AND DISCUSSION

Consumers Characteristics by Income Groups

The average age of low-income earners was 33 years old; the middle-income earners were 36 years old; and the high-income earners were 34. Most of the income earners had spent 11–14 years in school. However, none of them, except for high-income earners, reached more than 14 years. On the average, the results revealed a direct relationship between level of income and level of education (Table 3).

As to occupation, majority of the middle- and high-income earners were employed; most of the low-income earners were unemployed. Most respondents in the group are male (52%) and married (56%). About 76.5 and 70 percent of the respondents in the middle- and high-income groups, are female and married, respectively.

The average household in both low-income and middle-income group was composed of five members. The latter received an average monthly income of PHP 6,663.00 while the former earned PHP 3,232.00. The average per capita income of PHP 792.59 for low-income group and PHP 1,569.70 among middle-income group. In the high-income group, average household size was four, average monthly income of PHP 16,218.81 and a per capita income of PHP 3,879.88. The result shows that, as income increases, household size decreases, confirming what Lantican et al. (1996) had found.

Based on the ANOVA (Welch) result, age, education, monthly income, and per capita income were found to be significant. This implies that these variables vary significantly among the three income groups. Further, the Games-Howell test results showed a significant

pairwise difference between the average age of middle-income and high-income earners. On the other hand, the test revealed a significant pairwise difference in average number of years spent in school, monthly average income, and average per capita income. The study of Lantican et al. (1996) also revealed the same findings about the behavior of monthly and per capita monthly income.

Banana Characteristics Preferred by Consumer-respondents by Income Groups

Table 4 provides the detailed presentation of the specific banana characteristics preferred by consumers among income groups. Majority of the low-income earners chose yellow bananas (56%), medium fruit size (52%), and cluster size (44%). They likewise preferred medium-sized fingers (36%) that are ripe (76%), moderately soft (76%), and with only a trace of surface blemish (60%). Middle-income and high-income earners also preferred banana that is yellow (61.4% and 29.2%, respectively), and medium in size (62.9% and 50.6%, respectively).

However, middle-income earners preferred bananas in a medium cluster size (44.7%) and with medium-sized banana finger (50%). The high-income earners liked bananas in large clusters (51%) and with large fingers (51.4%). As larger fruits command higher prices, high-income earners are more willing to pay for larger banana fruits as compared to middle-income earners. Consequently, both income groups preferred bananas that are moderately ripe, soft, and with only a light surface blemish.

Table 3. Socio-economic characteristics of table banana (Lakatan and Latundan) consumers by income groups, producing (Davao City) and consuming markets (Manila and Cebu City), 400 sample consumer-respondents, Philippines, 2014

Socio-economic Characteristics	Income Groups		
	Low	Middle	High
Number of Respondents	25	132	243
Average Age	33 ^a	36 ^a	34 ^b
Education			
6 yrs. and below	7 (28)	2 (1.5)	7 (2.9)
> 6 yrs. - 10 yrs.	8 (32)	60 (45.5)	18 (7.4)
11 yrs. - 14 yrs.	10 (40)	70 (53)	172 (70.8)
>14 yrs.	0	0	46 (18.9)
Average (in years)	10 ^a	11 ^b	13 ^c
Occupation			
Employed	12 (48)	91 (68.9)	199 (81.9)
Unemployed	13 (52)	41 (31.1)	44 (18.1)
Sex			
Male	13 (52)	31 (23.5)	73 (30)
Female	12 (48)	101 (76.5)	170 (70)
Marital Status			
Single	11 (44)	47 (35.6)	117 (48.1)
Married	14 (56)	85 (64.4)	126 (51.9)
Average Household Size	5 ^a	5 ^a	4 ^a
Average Household Monthly Income	3232.00 ^a	6663.22 ^b	16218.81 ^c
Average Per Capita Income (PHP/mo)	792.59 ^a	1569.7 ^b	3879.88 ^c

Notes: Means followed with the same letter are not significantly different from each other at 5% level.

Post-hoc test: Games-Howell test

Figures in parenthesis are percentage of respondent reporting.

Table 4. Distribution of specific table banana characteristics preferred in Lakatan and Latundan by 400 consumer-respondents, by income groups, Philippines, 2014

Characteristics	Income Groups		
	Low (n=25)	Middle (n=132)	High (n=243)
Banana Characteristics			
Skin Color			
Green (SC1)		6.8	4.6
Green-Yellow (SC2)		32.6	29.2
Yellow (SC3)	56	61.4	29.2
Fruit Size			
Small (1)	12	9.1	6.2
Medium (2)	52	62.9	50.6
Large (3)	36	28	43.2
Cluster Size			
Small (1)	16	12.9	6.6
Medium (2)	44	44.7	42.4
Large (3)	40	42.4	51
Fruit Length			
Small (1)	12	12.9	7.4
Medium (1)	36	50	41.2
Large (3)	52	37.1	51.4
Degree of Ripeness			
Moderate (1)	20	22	11.5
Ripe (2)	76	74.2	84.8
Very Ripe (3)	4	3.8	3.7
Softness			
Not Soft (1)	12	3.8	1.6
Moderate (2)	76	85.6	87.2
Very Soft (3)	12	10.6	11.1
Surface Blemish			
Trace/light (1)	60	52.3	64.6
Medium (2)	36	30.3	26.7
Severe (3)	4	17.4	8.6

Hedonic Relationships by Income Groups

The hedonic regression was used in order to quantify or approximate the value of the banana quality preferred by the consumer-respondents and thus determine its effect on the consumers'

willingness-to-pay. This also explains the effect of banana attributes in the formation of price of the fruit in the market.

The estimated hedonic regression is presented in Table 5 and the transformed coefficients for the banana quality are shown in Table 6.

Low-Middle-income consumers. Based on the estimated hedonic regression, the decision of the low-middle income consumers to pay a premium or ask for a discount was significantly affected by skin color, fruit size, cluster size, and degree of ripeness. As to skin color, both green and green-yellow significantly affect the price, but negatively. This means that price will decrease by 22 and 12 percent, respectively, and thus, attract a discount commensurate to its negative coefficients. Although low-middle income consumers preferred medium-sized bananas, small and large bananas could also increase the price by 23 and 7 percent, respectively, relative to the increase caused by medium-sized bananas. This suggests that consumers are willing to pay for these sizes at different prices. Large cluster size was positively significant. This implies that the larger the cluster, the greater the willingness of consumers to pay a premium price. Ripe bananas were preferred by consumers, therefore, price will decrease by 13 percent if they are just moderately ripe. Other banana attributes found to be not significant were fruit length, softness, and surface blemish.

High-income consumers. The price paid by high-income consumers was affected by skin color, fruit length, softness, and surface blemish. Green bananas were found to be negatively significant, which means that price will decrease by 19 percent and thus attract a discount for this specific color. Fruit length, on the other hand, was considered an important variable that high-income consumers were sensitive to. Small (short) and medium-sized

finger, although significant, negatively affected the price of banana. This means that banana fingers that are small and medium command a 20 percent and 18 percent decrease in price, respectively, implying that the longer the banana fingers, the higher the price. High-income consumers are willing to pay a premium for this.

High-income consumers preferred soft bananas, therefore, consumers will ask for a discount at 28 percent of the price if bananas were not soft. They also wanted bananas with a light surface blemish, but they did show sensitivity to medium surface blemish, and it was positively significant. This suggests that price will increase by 7 percent relative to the price of those with trace/light blemish. It further implies that high-income consumers are also willing to pay a premium price for medium blemish. The high-income consumers did not show sensitivity to fruit size, cluster size, and degree of ripeness.

Comparison of hedonic relationships by income group. Table 5 indicates that, as income level rose, consumers became slightly discriminating. The calculated R^2 statistics showed that the embodied attributes explained 72.22 percent ($R^2 = 0.7222$) and 67.98 percent ($R^2 = 0.6798$) for low-middle and high-income groups, respectively. As observed, the F-ratios significantly increased as income level increased. However, the fit of the model was inversely related among the income groups as income level increased.

Since $F_{22, 356} = 2.59 > 1.57$ (critical F value), the hypothesis of equality is rejected. There is evidence showing that banana qualities affecting price among low- and middle-income consumers are different from those traits affecting price in high-income consumers.

Table 5. Estimated hedonic regression for the characteristics affecting consumer choice for banana by income groups, Philippines, 2014

Characteristics	Income Groups	
	Low-Middle	High
Skin Color		
Green (SC1)	-0.21*** (-2.64)	-0.17** (-2.08)
Green-Yellow (SC2)	-0.11*** (-2.62)	0.04 ^{ns} (0.91)
Fruit Size		
Small (1)	0.25*** (3.09)	-0.09 ^{ns} (-0.72)
Large (3)	0.09* (1.69)	0.005 ^{ns} (0.10)
Cluster Size		
Small (1)	0.001 ^{ns} (0.02)	-0.10 ^{ns} (-0.74)
Medium (2)	a	0.04 ^{ns} (0.72)
Large (3)	0.12* (1.86)	A
Fruit Length		
Small (1)	-0.08 ^{ns} (-0.92)	-0.18** (-1.95)
Medium (1)	0.09 ^{ns} (1.54)	-0.17*** (-3.05)
Degree of Ripeness		
Moderate (1)	-0.11** (-2.16)	-0.03 ^{ns} (-0.54)
Very Ripe (3)	0.04 ^{ns} (0.40)	-0.12 ^{ns} (-1.29)
Softness		
Not Soft (1)	-0.06 ^{ns} (-0.67)	-0.27** (-2.20)
Very Soft (3)	0.002 ^{ns} (0.04)	0.003 ^{ns} (0.06)
Surface Blemish		
Medium (2)	0.01 ^{ns} (0.04)	0.09** (2.08)
Severe (3)	-0.07 ^{ns}	-0.06 ^{ns}
R2	0.7222	0.6798
F	15.84***	21.23***
N	157	243

Notes: Characteristics followed by letters and not seen in the table are base dummy variables.

Figures in parenthesis are t-values.

***, **, * - Significant at 1%, 5%, and 10% level;

ns – not significant

Table 6. Transformed hedonic regression coefficients by income groups for different banana characteristics, Philippines, 2014

Characteristics	Income Groups	
	Low-Middle	High
Skin Color		
Green (SC1)	-0.22	-0.19
Green-Yellow (SC2)	-0.12	0.02
Fruit Size		
Small (1)	0.23	-0.14
Large (3)	0.07	-0.02
Cluster Size		
Small (1)	-0.03	-0.16
Medium (2)	a	0.01
Large (3)	0.09	a
Fruit Length		
Small (1)	-0.12	-0.20
Medium (2)	0.06	-0.18
Degree of Ripeness		
Moderate (1)	-0.13	-0.05
Very Ripe (3)	-0.01	-0.15
Softness		
Not Soft (1)	-0.10	-0.28
Very Soft (3)	-0.03	-0.02
Surface Blemish		
Medium (2)	-0.01	0.07
Severe (3)	-0.09	-0.09

Notes: Characteristics followed with letter and are not shown in the table are the base dummy.

CONCLUSIONS

High-income consumers were more discriminating than low-middle-income consumers. The former were willing to pay a higher premium price than the latter. However, low-middle income consumers did not show sensitivity to surface blemish in contrast to high-income consumers, thus, low-middle-income consumers accept bananas either with or without blemish.

With the use of hedonic pricing method, the study revealed that consumers between income groups attach economic importance to banana quality. This was evident in their preferences when making purchase decisions on banana with respect to its embodied attributes. Although there is a difference in preference in banana quality attributes in each consumer segment, these embodied characteristics of banana affect its price in the market.

RECOMMENDATIONS

Improvement of banana quality by using new technologies such as gamma ray irradiation or adopting government-recommended package of technologies could be done as these technologies have already been proven to significantly enhance banana characteristics. A well-informed customer-base and proper market segmentation and marketing plans can be crucial in ensuring that quality characteristics sought by various consumer groups are provided.

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