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Consumer Purchasing Behavior for Fresh Soursop (*Annona muricata* L.): Evidence from Metro Manila and CALABARZON, Philippines

Dormita R. Del Carmen[1,*], Elda B. Esguerra[1,2] and Arjay A. Gerance[1]

[1]Postharvest Horticulture Training and Research Center, College of Agriculture and Food Science, University of the Philippines Los Baños, College, Laguna Philippines 4031
[2]Institute of Crop Science, College of Agriculture and Food Science, University of the Philippines Los Baños, College, Laguna Philippines 4031

[*]Author for correspondence; e-mail: drdelcarmen2@up.edu.ph

A survey of urban and peri-urban consumers in major market centers and residential estates in Metro Manila and CALABARZON in the Philippines was conducted to determine their purchasing behavior for fresh soursop as influenced by demographic characteristics and preferences. Household income, education and household size were strongly correlated with consumer preference on soursop attributes. As household income increased, consumers tended to look for more desirable attributes which can be classified into search (size, color, peel thickness) and experience (taste, juiciness and pulp texture). Education had a similar influence but to a lesser extent. Consumer household size and fruit size also showed marked correlations, indicating that larger households (those with more members) bought larger fruits. Using cluster analysis, two consumer segments, the size/shape conscious and the taste-discriminating groups were identified. Majority of the consumers were not satisfied with the soursop purchased due to quality defects such as pulp hardening, sour or off-taste, and fruits that did not ripen and fruits with insect/disease damage, which had an adverse impact on their repeat purchase. Moreover, the resulting losses from fruits with defects also impacted on income of stakeholders, particularly the farmers and traders. Quality improvements in the soursop supply chain can, therefore, be undertaken to provide the quality of fruits that will satisfy the different types of consumers, and to reduce losses to increase income of farmers and traders.

Key Words: consumer purchasing behavior, supply chain improvement, soursop, *Annona muricata*

INTRODUCTION

In the Philippines, the increasing trend in fruits and vegetables consumption is reflected in the large proportions of expenses allotted for food. According to the Family Income and Expenditures Survey (FIES), foods consumed at home including fruits and vegetables, constituted the largest share (33.7%) of family expenditures in 2015 (PSA 2017). While rural villages are considered major producing areas for most agricultural products, urban and peri-urban centers including the National Capital Region (NCR) and CALABARZON or Region IVA (Cavite, Laguna, Batangas, Rizal, and Quezon) are reported to have the largest proportions of food expenditures of 36.3% and 39.8%, respectively (PSA 2017). The major fruits such as banana, mangoes and apple are common in the market, but other minor fruit crops, such as soursop, are known to have increasing demand due to its acclaimed nutritional and medicinal values.

Soursop, locally known as guyabano, is rich in potassium, vitamin C, phosphorus, calcium and other micronutrients. Soursop is also known to have anti-cancer properties (Coronel et al. 1983; Hunter 2014). It has huge economic prospect in the local and export markets, both in fresh and processed forms, thus, it is one of the minor crops identified for development. Soursop is widely cultivated in backyards, but currently, there is a campaign to increase its production through commercial plantings. Based on available data in 2003, the total land area planted to soursop in the country was 3,016 ha with Region IVA ranking second (643 ha) (BAS 2003).

Aside from the scanty and seasonal supply of soursop in the country, the fruit is highly perishable with a shelf life of 3–5 d after harvest at ordinary temperature. The

very tender skin which makes soursop prone to mechanical damage, its fast rate of ripening which limits marketability, and the pest and disease damage incurred during production are all contributory factors to the huge losses. In the Philippines, about 50% of the harvested fruits are rejected due to quality defects but some are still used in processing (personal interview with growers and traders). This figure is more or less the same in other tropical countries like Mexico and Nigeria where soursop postharvest loss was estimated at 60% (Espinosa et al. 2013; Osuide 1999).

Today, the development of any agro-industry, in this case the soursop industry, must be geared and oriented to a market-driven supply chain. The key to succeed in this approach is first to get a better understanding of the consumers' purchasing behavior, their characteristics and product preferences. Assessing the quality factors that drive consumer satisfaction and repeat purchase behavior can provide a basis in the identification of strategies or interventions on how the soursop supply chain actors would be able to meet diverse consumers' needs. Specifically, quality improvements can be undertaken from the production, postharvest handling, and marketing sub-systems of the chain to provide the right quality of soursop at the right place, time, and price to varied types of consumers.

The perception of quality depends on the objective characteristics of the products as well as the subjective value that the consumers attach to it (Steenkamp 1997). Quality characteristics can be categorized into intrinsic and extrinsic attributes (Migliore et al. 2017). Intrinsic attributes refer to the physical characteristics of the product, which are further classified into search attributes (freshness, color, and size) and experience attributes such as taste, aroma, and ripeness (Badar et al. 2015). Search attributes can be identified before purchase of a product while experience attributes can only be determined after consumption.

Extrinsic attributes do not constitute a physical part of the product, but consumers consider these as increasingly important cues in their purchase decision (Migliore et al. 2015). These include food safety, environment-friendly production, origin (Moor et al. 2014), and price. Knowing what consumers value in a product can be complex given the differences in consumer behavior, which is greatly influenced by individual socio-economic background (Badar et al. 2015). Since consumer preferences are heterogeneous, identification of specific consumer groups or segments that have similar attitudes toward product attitude is deemed critical (Gao et al. 2011).

This study analyzed consumer behavior in purchasing fresh soursop as basis for recommending a course of action for supply chain improvement. Analysis included determining consumer demographic characteristics and preferences for soursop, and, ascertaining the relationship between these factors. Aligning supply chain practices with consumer purchasing behavior will bring increased customer satisfaction and help minimize product losses. It can also bring about an increased consumer demand for soursop and increase profits of chain actors to propel the growth and ensure sustainability of the emerging soursop industry.

METHODOLOGY

The study made use of structured survey questionnaires which were developed based on the results of two preliminary focus group discussions (FGDs) conducted within the university campus. Important information on quality attributes and purchase behavior, which include a number of intrinsic, extrinsic and quality cues, were selected from the results of these FGDs comprising 10 participants each. The questionnaire was divided into two parts. The first section determined the demographic profile of soursop consumers while the second dealt with the consumers' usage, purchase behavior and attribute preference.

Purposive sampling was used in the selection of 200 respondents based on two criteria: (1) they are consumers of fresh soursop, and (2) they have bought soursop for the past 12 mo prior to the duration of the study. Since Region IVA is one of the major producers of soursop, consumer surveys were administered in major market centers, private and government institutions, and residential estates in urban areas of CALABARZON (or Region IVA) and Metro Manila cities adjacent to the region.

Data on demographic characteristics, consumption behavior and attitudes, and attribute preferences for soursop were presented and discussed using descriptive statistics such as percentages, means, frequency counts, and attribute rankings. Spearman's rank order correlation was used in assessing the relationship between demographic characteristics and quality attribute preferences. The analysis assessed the strength and direction of association between the variables and identified their significance that relate to or affect consumer attribute preferences. Clustering analysis via k-means method was done to identify market segments.

RESULTS AND DISCUSSION

Consumer demographic characteristics, and preference attributes for fresh soursop determined to a large extent the consumer purchasing behavior. Based on these factors,

consumer segments were also identified. These information served as basis in recommending supply chain improvement, particularly in identifying quality improvement strategies from production, postharvest handling and marketing.

Demographic Characteristics of Respondents

Of the 200 consumer respondents who participated in the study, 68% were from CALABARZON and the remaining 32% were from Metro Manila. Respondents were mostly women (74%) because in the Philippines, they usually do the shopping (Table 1). While more than half of the consumers were married (56%), many belonged to the singles group (42%). Majority of them were in the 21–40 age group (52%), with college education (65%), had an income level between PhP150,000 and PhP500,000 per annum (49%), and with a household size of 4–6 members (60%). Results showed that soursop appeals to relatively younger generations with relatively higher income level and education.

Purchasing Pattern and Behavior

Reasons for Buying

Consumers purchased soursop mainly for its health and nutritional benefits (71%) (Fig. 1), an indicator of increasing consciousness of urban dwellers in the Philippines to include fruits, specifically soursop, in their diets for a healthy lifestyle. The other reasons for purchasing the fruit such as family preferences (57%) and flavor/taste (39%), on the other hand, affirm its delectable taste. Due to seasonality, soursop fruits are not offered in the market year-round, and some consumers bought the fruit because of its availability (28%). Still, some consumers bought the fruit because they preferred locally grown fruits than imported ones, considered the price as affordable, and for a few, the fruit was used as a gift for friends. Some consumers are now putting importance to credence values such as social responsibility attached to buying local fruit to support local farmers and of giving nutritious fruits as gift to friends. Price affordability is also considered.

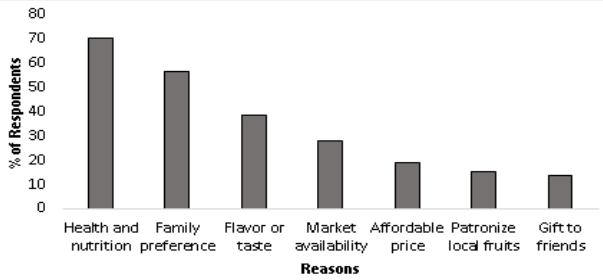

Fig. 1. Reasons for purchasing soursop, 200 respondents, Philippines, 2017.

Table 1. Demographic characteristics of 200 soursop consumers, Philippines, 2017.

Characteristics		Frequency	Percent
Gender			
	Male	53	26.5
	Female	147	73.5
Civil Status			
	Single	83	41.5
	Married	111	55.5
	Widowed/separated	6	3.0
Age			
	20 and below	15	7.5
	21 to 40	105	52.8
	41 to 60	70	35.0
	61 and above	10	5.0
Education Level			
	Elementary	1	0.5
	High School	39	19.5
	College	129	64.5
	Graduate Level	31	15.5
Household Income			
	Php150,000 and below	72	36.0
	Php150,001 to Php250,000	48	24.0
	Php250,001 to Php500,000	50	25.0
	Php500,001 and above	30	15.0
Household Size			
	1 to 3 members	52	26.0
	4 to 6 members	119	59.5
	7 members and above	29	14.5
Place of Residence			
	National Capital Region (NCR)	63	31.5
	CALABARZON	137	68.5

*1 USD = 52 PhP Exchange rate as of December, 2017

Frequency, Volume of Purchase, Market Source and Reason for Choice of Source

Due to the present scarcity and seasonality of soursop supply and the distance of major growing areas to the urban market centers in Luzon, majority of the respondents could not buy it frequently. Most respondents bought it once a month or twice a year (Table 2). The quantity also ranged from one to three pieces (less than 500 g to 2 kg). Wet markets are still the major sources of the fruit, followed by fruit stands along the roadside. About 13% bought the fruit from supermarkets, while another 13% picked it from their own tree in their backyards. Among the reasons for the choice of source were accessibility, lower price, capability of providing the quality and size desired, and established buyer-seller relationship.

Intrinsic and Extrinsic Quality Attributes Preferred by Consumers

Majority of the consumers were concerned with the intrinsic attributes or the physical qualities of soursop. In

Table 2. Quantity and frequency of purchase of soursop, 200 respondents, Philippines, 2017.

Item	Frequency	Percent
Frequency of purchase		
Once to more than twice per week	44	22.0
Once per month	72	36.0
Once or twice per year	84	42.0
Quantity purchased		
1 piece (less than 500 g)	57	28.5
1 piece (500 g to 1.0 kg)	89	44.5
2-3 pieces or more (1.1 kg to 2.0 kg)	36	18.0
Source of soursop		
Wet market	112	56.0
Roadside stall or fruit stand	72	36.0
Supermarket	23	12.5
Own tree and others	23	12.5

terms of search attributes, consumers were particular with the size, shape, peel quality and color (Fig. 2a). Specific search attributes preferred by consumers were oblong-shaped and medium-sized fruits, thin peel, and those with dark green peel color.

For experience attributes, consumers were particular more with the taste (sweetness, sourness, and its balance) (75%), juiciness (61%) and mouth feel texture (smoothness of pulp) (56%) (Fig. 2b). Specifically, consumers preferred fruits with smooth pulp texture with just a little grittiness, good balance of sweetness and sourness, and very juicy taste.

Though some credence variables are not yet major cues in consumer purchase behavior, the growing consciousness for the environment, food safety and social responsibility have created attribute values for organic fruit production and origin. Primarily, however, price has always been an important attribute considered by consumers in their purchase decision (Fig. 2c). Soursop is commonly produced in backyards, thus consumers may look at it as organic or grown without the use of chemical fertilizer and pesticides. A small proportion of consumers (7%) who frequently buy soursop also associate desired fruit attributes to place of production, hence, they have a certain preference for its origin.

Consumer Dissatisfaction

For the consumer's purchase satisfaction, majority (69%) indicated that they were not able to buy the quality of soursop that they preferred. Based on experience attributes, the primary reasons of disappointment were: not the desired taste – either too sour or have bland/off-taste, and hardening of the pulp (Fig. 3a). Minor reasons were the gritty pulp texture and darkening of both pulp and peel.

As to search attributes, the main complaints were:

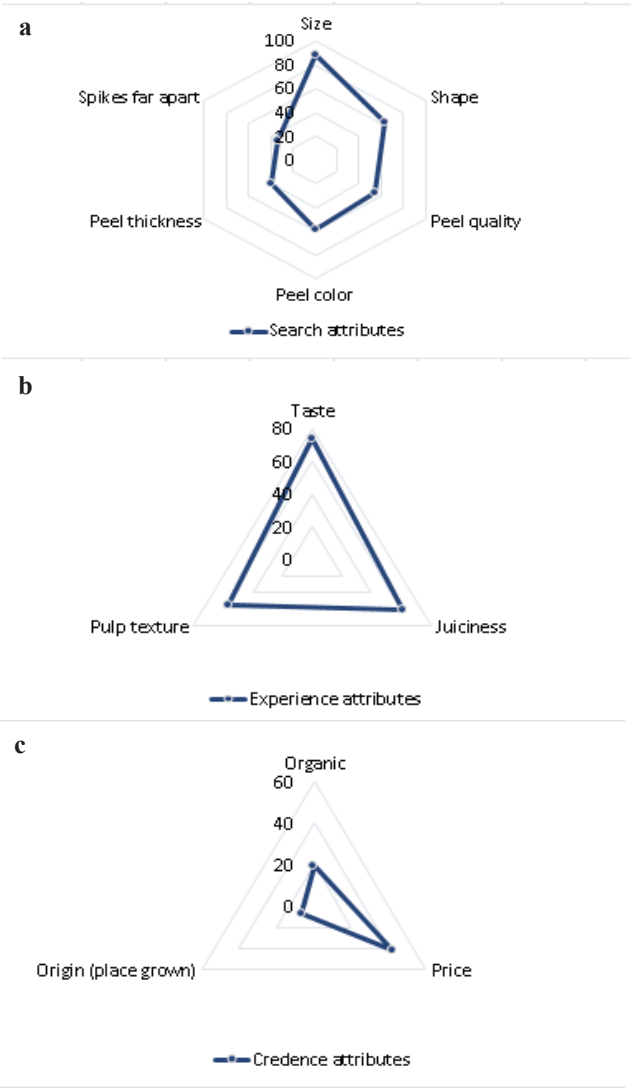

Fig. 2. Intrinsic (a, b) and extrinsic (c) attributes consumers looked for in soursop, 200 respondents, Philippines, 2017.

good outside quality but inferior inside quality, and with insect and disease damage (Fig. 3b). Of lesser importance was non-ripening of the fruits and high price. Blemishes on the peel were considered important only by a few consumers. These indicate the need for quality improvement, which should give foremost consideration in enhancing the taste, peel quality (without insect and disease damage or blemish), and pulp quality (without hardening and with smooth texture).

Determining Market Segments for Soursop

Correlation between Consumer Characteristic and Attribute Preference

Age, education, household income and household size were significantly associated with consumers' preference for certain specific soursop attributes (Table 3). The

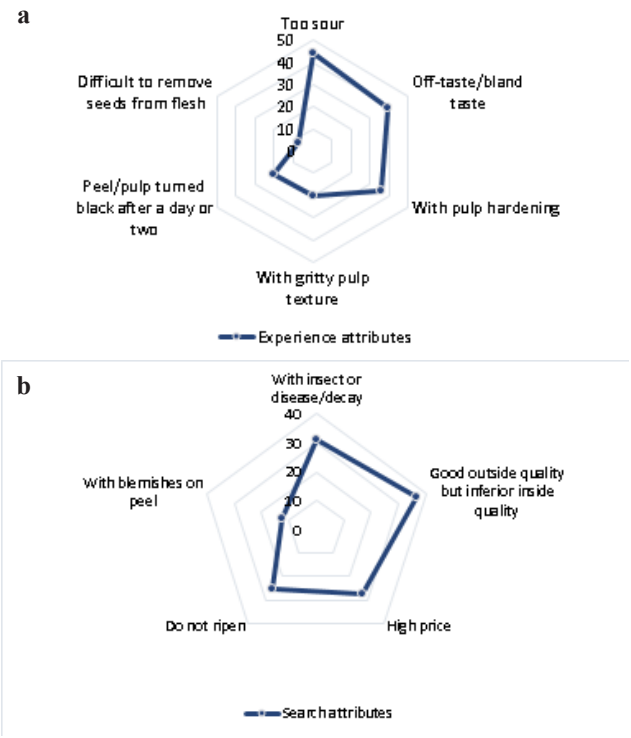

Fig. 3. Disappointments from soursop purchase, 200 respondents, Philippines, 2017.

relationship of selected demographic variables and quality attribute preferences have been corroborated in the studies of Steven et al. (2011), Gao et al. (2011), and Wang et al. (2016).

Age was positively correlated only with fruit shape, meaning that as consumers aged, they became more particular with the shape of soursop that they purchased. Education on one hand is highly correlated with peel thickness, taste, and juiciness and significantly correlated with peel color. Household income had a similar attribute correlation as that of education but additional attributes such as smoothness of pulp, fruit size, and peel quality were also significant. These would imply that as household income increased, consumers became more discriminating and looked for several attributes, both search and experience, including price, to get maximum satisfaction/utility. Education had a similar influence but to a lesser extent.

There was a high association between household size and fruit size. Other quality attributes such as shape, peel quality and juiciness also had a positive but lesser correlation with household size. This result indicates that with increase in household size, consumers had more preference for big-sized fruits and to a lesser extent for oblong shape, clean peel quality, and juicy ones. Results of correlation analysis can be used as basis for consumer stratification for better product positioning.

Consumer Segments

Using cluster analysis, two consumer segments were identified. One segment can be considered as the size/ shape-conscious group and the other is the taste-discriminating group (Table 4). The first group looked for search attributes, while the other gave importance to

Table 3. Correlations between selected demographic characteristics and soursop attributes, 200 respondents, Philippines, 2017.

Attribute		Spearman's Rho Correlation			
		Age	Education	Household Income	Household Size
Fruit size	Correlation coefficient	.030	.024	.171*	.246**
	Sig. (2-tailed)	.672	.731	.015	.000
Fruit shape	Correlation coefficient	.148*	-.009	.045	.160*
	Sig. (2-tailed)	.037	.904	.517	.024
Peel quality	Correlation coefficient	-.004	.061	.086	.148*
	Sig. (2-tailed)	.954	.394	.228	.038
Peel color	Correlation coefficient	-.050	.139*	.169*	-.084
	Sig. (2-tailed)	.479	.049	.017	.238
Peel thickness	Correlation coefficient	.025	.183**	.218**	-.121
	Sig. (2-tailed)	.730	.009	.002	.087
Taste	Correlation coefficient	-.096	.316**	.364**	-.138
	Sig. (2-tailed)	.176	.000	.000	.050
Juiciness	Correlation coefficient	-.088	.231**	.350**	-.159*
	Sig. (2-tailed)	.213	.001	.000	.025
Pulp texture	Correlation coefficient	-.094	.138	.293**	-.012
	Sig. (2-tailed)	.184	.051	.000	-870
Price	Correlation coefficient	-.025	.098	.155*	.016
	Sig. (2-tailed)	.722	.167	.028	.819

*Significant at 95% confidence level
**Significant at 99% confidence level

Table 4. Consumer segments for soursop based on cluster analysis (attribute ranking), 200 respondents, Philippines, 2017

Size/Shape-Conscious Segment	Taste-Discriminating Segment
Attribute Ranking	
1 Small to medium-size fruit	1 Balance of sweetness and sourness
2 Round and oblong shape fruit	2 Moderate to very juicy
3 Sweet taste	3 Medium size fruit
4 Green peel	4 Oblong shape fruit
5 Slightly juicy	5 Smooth with little grittiness
6 Smooth texture	6 Yellow-green peel
7 Not very price conscious	7 Moderately price conscious
Socio-demographic Characteristics	
Middle age (41 to 60 yr old)	Younger age (21 to 40 yr old)
Majority female; few male	Majority female, few male
High school to college level	College to graduate level
Lower to middle income level	Higher income level
(PhP 150,000 to 250,000 per year)	(PhP 250,000 and above)
Majority are married	Majority are single
Household size of 4–6 members	Household size of 4–6 members

experience attributes. In terms of demographic characteristics, majority in the size-conscious group were within the 41–60 age range, had high school to college education, in the lower to middle income level, were married, and had 4–6 household members.

Those in the taste-discriminating group were relatively younger, in the 21–40 age range, with college to graduate level education, in the higher income level, and had 4–6 household members. The proportion of male and female members is almost the same for the two consumer segments. Information on these two consumer market segments could provide another basis for market positioning of soursop, specifically in setting marketing/ selling strategies suitable to the different consumer segments.

Implication for Supply Chain Improvements

The information obtained in this study can be an important input in identifying possible improvement opportunities along the supply chain including priority researchable areas to pursue. Consumer preference, which mostly considers the intrinsic fruit attributes, can be met by making major changes in the production (including input) and postharvest handling systems of soursop.

Quality improvement needs to start in the production system of the fruit. The preferred fruit size (small, medium, large), taste (balance sweetness and sourness), and peel and pulp quality can be addressed by varietal selection and development. Quality improvement will involve identification of existing varieties planted, and evaluation of quality characteristics in the different production areas and systems. Appropriate varieties could be selected from existing ones or new varieties may need to be developed through breeding to meet consumer preferences.

The next step is to undertake improvements in the cultural management practices such as fertilizer application and pest management which can also address most of the disappointments identified by consumers. The application of fertilizer like potassium that is known to enhance soursop sweetness, and use of integrated pest management to produce fruits that are free from insect damage and decay while assuring consumers safety are some of the technologies that can be introduced. There may also be a need to undertake research on minimizing fruit hardening and at times, failure to ripen.

Establishing the appropriate maturity indices is also necessary because eating quality is greatly determined by fruit maturity. Harvesting time has been shown to have significant effects on fruit quality, especially on firmness and peel color (Lem et al. 2017). Premature harvesting can result in poor fruit quality and does not allow the development of full flavor and aroma, and immature fruits may develop a bitter taste when ripened off the tree (Bueso 1980; Coronel et al. 1983).

Since they are considered as a minor fruit, harvested soursops are not handled carefully especially at the early maturity stage. Although its peel is somewhat leathery, it is highly susceptible to mechanical damage, especially during its fully ripe stage (Bueso 1980). Moreover, the fruit ripens very fast, within 3–5 d after harvest at ambient condition, thus, limiting the marketability of the fruit. To address this problem, studies in delaying the ripening process and shelf-life extension have been conducted for soursop fruits. In Mexico, the use of 1-methylcyclopropene (1-MCP), an inhibitor or ethylene receptor, followed by refrigerated storage can delay ripening by 7 d (Espinosa et al. 2013). In the Philippines, the use of hot water treatment extended the shelf life of soursop for 2 d at ambient condition (Franco 2019).

There are limited studies in developing techniques to regulate ripening of soursop, an area of research that can be pursued in the country. Determining the physical and chemical characteristics as well as the postharvest behavior of fruits grown in different production areas in the country can also provide useful information to traders and processors on their product sourcing decisions.

Notably, most consumers are price sensitive, as indicated in their response to disappointments in soursop purchase. Therefore, growers and traders need to produce

and supply soursop in an efficient manner by lowering costs but provide the desired quality so that it can be sold at a competitive price.

The information on various consumer segments based on the association between demographic characteristics and soursop attributes, and on clustering analysis can provide a basis for market positioning. This would entail offering product mixes by segregating the fruits according to attributes desired by specific consumer segments. The market may be segmented according to attribute preferences of consumers such as those whose major need is to get the desired size and shape of soursop, and those that pay much attention to taste, juiciness and pulp texture smoothness. Target markets should focus on convincing consumers that these attributes confer a value added to them (Moser et al. 2011).

CONCLUSION

The study revealed that buying behavior of consumers in the urban and peri-urban areas of CALABARZON and Metro Manila, Philippines were influenced by their demographic characteristics and their preference for quality attributes for soursop fruits. Among the demographic characteristics, household income, education and household size were strongly correlated with consumer preference on soursop quality attributes. As household income and level of education increased, consumers tended to look for more desirable attributes which can be classified into search (size, color, and peel thickness) and experience (taste, juiciness, and pulp texture) attributes. On the other hand, household size had a high correlation with fruit size, indicating that consumers with larger household size tended to buy larger fruits. Using cluster analysis, two consumer segments, the size/shape conscious and the taste-discriminating groups were identified. The dissatisfaction of majority of consumers with the soursop purchased due quality defects such as pulp hardening, sour or off-taste, and fruits that did not ripen and with damage, had adverse impacts on their repeat purchase. Moreover, the losses incurred due to these defects also impacted on the income of stakeholders. Several suggestions can be undertaken on quality improvements in the soursop supply chain from production, postharvest handling to marketing in order to provide the quality of fruit that will provide maximum satisfaction to different types of consumers. Direct and indirect players in the supply chain such as producers, handlers, traders, marketers and researchers, among others, can undertake the identified improvements and the concomitant priority researches. Consequently, the effects of these moves would translate to increased market demand from repeat purchase of satisfied consumers, and increased marketable fruits from reduced losses, which could propel the development of the emerging soursop industry.

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